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The Role of Perceived Nonshared Environment and Personality Traits in the Etiology of Bulimia Nervosa

Pascale M. Lehoux

A Thesis

in

The Department

of

Psychology

Presented in Partial Fulfilment of the Requirements

for the Degree of Doctor in Philosophy at

Concordia University

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ABSTRACT

The Role of Perceived Nonshared Environment and Personality Traits in the Etiology of Bulimia Nervosa

Pascale M. Lehoux, Ph.D.
Concordia University, 2000

Both environmental and genetic factors play an important role in the etiology of Bulimia Nervosa (BN). A number of critical environmental factors in the development of BN are not shared by family members; specifically, perceived nonshared environmental factors (e.g., differential parent-child relationships) may be more influential in the development of psychopathology and personality than are shared factors (e.g., general family dynamics). Therefore, the present study was designed to identify the differential environments experienced by bulimics and their sisters by assessing nonshared environmental influences associated with BN. In particular, sibling differential experiences and the influence of personality traits on the risk of developing BN were addressed. Forty bulimics and their non-eating disordered sisters were assessed for (a) eating pathology, (b) perceived nonshared environmental factors in three areas (i.e., differential parent-child relationship, quality of the sibling relationship, developmental experiences), (c) personality traits (i.e., implusivity, affective instability, narcissism), and (d) psychopathology. In general, bulimics exhibited higher levels of eating disturbances and psychopathology than sisters. Furthermore, compared to their sisters, bulimics reported being more insecurely attached to their fathers, higher levels of past shape and weight-related teasing experiences, and greater impulsivity, affective instability, and narcissism. However, perceptions of differential parental affection, quality of the sibling relationship, childhood sexual and physical abuse, as well as perceptions of parental

dieting behaviors were identified as perceived shared environmental features. In terms of an etiological understanding of BN, the results of the logistic regression analyses revealed that both specific nonshared risk factors (i.e., perceptions of shape and weight-related teasing) and nonspecific risk factors (i.e., insecure paternal attachment, narcissism) significantly distinguished bulimics from their sisters, after accounting for depression and anxiety. Therefore, these perceived nonshared environmental influences may constitute vulnerability factors that predispose individuals to the development of BN. Implications of these findings are discussed in the light of existing models of risk factors involved in the etiology of BN.

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INTRODUCTION

Statement of the problem

Bulimia nervosa (BN) is a disorder defined by the presence of a specific pattern of symptoms that emerge from a complex integration of biological, psychological, and environmental influences which are best explained by using a multidimensional biopsychosocial approach (Garfinkel & Garner, 1982; Johnson & Connors, 1987). BN is estimated to affect about 2% of women during their lifetime (Fairburn & Beglin, 1990). Both clinical observations and empirical findings examining etiological factors associated with BN underline the importance of addressing the underlying features that characterize this disorder. First, it is generally assumed that eating disorders including BN are dimensional illnesses, with underlying biological (i.e., heritable influences on mood, impulse-control and personality traits), psychological (i.e., body image distortions, ego-deficits, developmental trauma), and social pressures (i.e., the importance attributed to thinness) causes (Connors, 1996; Fairburn, Welch, Doll, Davies, & O'Connor, 1997; Humphrey & Stern, 1988; Johnson & Connors, 1987; Strober & Humphrey, 1987). BN is a disorder that is currently considered to consist of three principal components: (a) binge eating; (b) inappropriate weight-control behaviors (e.g., vomiting, laxative and diuretic abuse, excessive exercises, fasting); and (c) overvalued importance attributed to shape and weight in self-evaluation (DSM-IV; American Psychiatric Association, 1994). Furthermore, it is generally assumed that BN is grounded in a breakdown of cognitive and physiological controls on eating behaviors, which results from prolonged periods of dieting (Herman & Polivy, 1980; Polivy & Herman, 1985). According to this model, any stimulus that impinges on the extremely difficult task of warding off hunger (i.e.,

emotional arousal, competing cognitions such as thinking "I have blown it") could be capable of disinhibiting hunger. This experience of dieting or dietary restraint is thought to be influenced by genetic and physiological predispositions, as well as by psychological vulnerabilities that are often influenced by familial and social contexts (Halmi, 1994; Strober & Humphrey, 1987). Body dissatisfaction, feelings of fatness, and dieting behavior are extremely common in the female population (Connors & Johnson, 1987). They touch a very heterogeneous group of women, ranging from women with no life impairments to those with eating disorders. As Striegel-Moore (1993) and colleagues have underlined (Striegel-Moore, Silberstein, & Rodin, 1986), investigations of this topic must address the fact that only a minority of women develop a clinically diagnosable eating disorder. Therefore, factors that differentiate the most vulnerable group must be identified. The most useful exploration of vulnerabilities must go beyond an investigation of differences between eating disordered individuals and those without an eating disorder. Rather, it is important to examine the pathways that may lead (a) to some aspects of an eating disorder but not necessarily to a clinical syndrome, (b) to diagnosable pathology other than an eating disorder, or (c) to no disorder at all. However, the mechanisms that lead from a vulnerability to actual development of BN are still unknown.

In this theoretical and empirical context, several apparently disparate risk factors have been identified. These include for example a family history of an eating disorder (e.g., Kendler, MacLean, Kessler, Heath, & Eaves, 1991), affective disorder (Logue, Crowe, & Bean, 1987), and substance abuse (e.g., Bulik, 1987). In addition, a history of exposure to adverse events and circumstances such as sexual and physical abuse (e.g., Everill & Waller, 1995; Welch & Fairburn, 1994), the presence of certain personality

traits such as impulsivity and narcissism (see Vitousek & Manke, 1994), and dysfunctional family interactions (e.g., Strober & Humphrey, 1987) also represent risk factors involved in the development of BN. Unfortunately, studies focussing only on the etiology of BN are scarce with most of the research having focussed on anorexia nervosa, the first identified eating disorder in the literature (e.g., Fairburn & Beglin, 1990). In addition, most studies had a narrow perspective and have investigated only a limited number of putative risk factors. As a result, almost nothing is known about the relative contribution of different classes of risk factors, and whether or not they interact in influencing the etiology of BN.

Family pathology has been considered an important risk factor for the development of BN since Russel (1979) first described the disorder. The existing etiological models of BN, which attempt to take into account family factors, fail to address the multidimensional aspect of the etiology and also the issue of specificity. In other words, it still remains unclear if specific family interactional patterns exist that are causally related to the onset of BN (Strober & Humphrey, 1987). More specifically, individuals suffering from BN and their families are studied in an effort to find a specific type of family pattern that is associated with this disorder. However, such an approach comprises many limitations. For instance, it minimizes the variability among families of eating disordered individuals despite the increasing appreciation of the heterogeneity of family environments within the population of eating disordered individuals, which needs to be taken into account if the pathogenic familial influences are to be delineated more accurately (Kog & Vandereycken, 1989ab; Strober & Humphrey, 1987).

While it has been argued that bulimics have specific types of family relationships

characterized by chaotic interactions with high levels of conflict and violence, inadequate or inconsistent expression of emotions, low cohesiveness, and lack of parental warmth and care (e.g., Humphrey, 1989; Stern et al., 1989), some studies do not support the hypothesis that different forms of eating disorders are characterized by distinct family environments. For example, Rastam and Gillberg (1991) reported high levels of family disturbances in families of anorexic patients while two studies (Steiger, Liquornik, Chapman, & Hussain,1991; Waller, Slade & Calam, 1990a) found no differences between anorexic and bulimic patients' perception of their families. However, these studies, by only addressing elements pertaining to general family structure relationships and/or atmosphere, failed to assess nonshared environmental features. In other words, they failed to address specific relationships and experiences within (or outside) the family, which may be characteristic of each family member separately (i.e., specific parent-child relationships, sibling relationships, developmental trauma, and social experiences outside the family).

There are two ways of understanding such heterogeneity in family functioning among families of bulimics: (1) By examining the specific nonshared environmental factors associated with each sibling in a bulimic's family; and (2) through examination of the covariation of eating disordered individuals' personality traits and nonshared environmental factors.

The traditional approach to studying the relationship between individuals' environment and their development assumes that children in the same family are exposed to similar environmental influences, such as socio-economic status, child-rearing attitudes, and other parenting styles. For this reason, several family environmental

measures such as parental affection warmth and control, intellectual stimulation provided, discipline and rearing practices have been studied in relation to one child in the family, namely the identified bulimic patient, and compared across families. These between or across family environment measures are related to adjustment, personality, and outcome of one child per family. This traditional between-family approach to studying behavior-environment interactions has been used extensively in the domain of eating disorders at the expense of neglecting within-family environmental influences. Maccoby and Martin (1983), studying socialization processes in children, underlined that behavior-environment relationships found using the between-family approach usually have been small and that most of the variance lies within rather than between families. Low-order resemblance between siblings suggests that environmental influences relevant to psychological development operate in such a way as to make siblings in the same family different rather than similar to each other (Rowe & Plomin, 1981).

It is in this context that the concept of nonshared environmental factors, defined as the specific environments and experiences unique to each sibling in a given family, become important. The terms shared and nonshared environment are operationally defined by behavior-geneticists as environmental influences that have resulted in sibling similarity or dissimilarity; they are inferred through outcome (Hoffman, 1991). Converging evidence from family, adoption, and twin studies demonstrates the important role played by genetic factors in personality formation, such as in susceptibility to psychopathological disorders in bulimic individuals (Fichter & Noegel, 1990; Strober, 1991). An additional finding emerging from these very same studies concerns the strong influence of the environment on the expression of personality and psychopathology

phenotypes (Pike & Plomin, 1996). However, contrary to popular belief, the most robust of these nongenetic factors involves experiences that cause members of the same family to differ in their behavior and in their tendency to have the disorder. In other words, what appears to be the major contribution to personality and psychopathology development is not shared family environment but rather heredity and its interaction with life experiences unique or specific, to a given individual.

The available evidence that genetic factors are involved in the creation of sibling differences in behavior and in psychopathology comes from adoption and twin studies. Paradoxically, these same results also document the importance of nongenetic factors: Most sibling differences, particularly regarding psychological traits, are not explained by genetic differences between individuals. These findings underline implications that radically change the way we think about environmental origins of behavior. As emphasized by Dunn and Plomin (1990a), the arguments so far can be expressed as a syllogism: (1) If siblings are so different, and (2) if genetic factors account for only a small portion of these differences, then (3) nongenetic factors must be primarily responsible for sibling differences. This argument can be taken further by stating that all environmental influences operate to make siblings growing up in the same family different, not similar. Thus, environmental factors that appear important to development are those that two children in the same family experience differently. This is a revolutionary concept because it contradicts much of the rationale underlying many theories and research studies. Since Freud's interpretation of how family experiences influence personality and adjustment, psychologists have generally assumed that the differences that matter vary from family to family. For example, if parents have known

stressful relationships with their own parents, it is assumed that these experiences will influence their relationships with their children in the same manner. This view is also prevalent in the study of development: Researchers who want to understand such environmental influences have made comparisons between families instead of looking at specific non-shared environmental factors within families. This has been generally the case for studies aimed at understanding the role of family and developmental factors in the etiology of BN (e.g., Humphrey, 1989; Waller, Slade, & Calam, 1990b).

In fact, many aspects of family environment associated with BN such as the general family climate, family conflict, expressiveness and cohesiveness, boundaries, and specific parental behavior (i.e., abuse, neglect) have been considered (e.g., Bulick, Sullivan, & Rorty, 1989; Johnson & Flach, 1985; Ordman & Kirshenbaum, 1986) and a variety of methods have also been used such as self-report questionnaires and interviews. Many of these studies support links between family environment and BN (Humphrey, 1986; 1987; 1989; Kog & Vandereycken, 1989ab), although a limited number of studies have investigated outcome for more than one child in the family. Findings concerning the role of family factors in the development of BN are unfortunately limited to between family factors. Furthermore, the research in this area is too limited to conclude that siblings are "sick" or "at risk" (Vandereycken, 1995). Moreover, clinicians and researchers appear to be primarily interested in the problems of sibship, while overlooking the bulimics'quality of relationship with her siblings (e.g., over identification with, attachment to a sibling).

In general, by studying only one child per family, investigators have not been able to explore whether or not siblings in the same family experience the family environment

similarly and which components of the latter are shared or not. Nor are researchers able to determine which aspect of the environment contributes specifically to the development of BN. Although parental warmth and control may be important factors in understanding an individual child's self-worth, each sibling in the family may have different experiences with each parent. This is not to underestimate the contributions of previous studies that have looked at general family factors. Instead, it is argued that sibling studies can extend the understanding of the etiology and development of BN by providing information about shared and nonshared experiences. By only examining one child per family, researchers have implied that the important differences in environmental experiences occur between families but differences within families have been left unexplored. This has been true for nonclinical research, but even more so for clinical studies.

The present study was thus designed to examine the differential environments experienced by each individual in families of bulimics by directly assessing and identifying differential experiences of siblings and by examining the relationships of such experiences to the development of BN. These goals represent one of the first steps in the investigation of nonshared environmental influences in the development of BN. Two categories of differential environment influences have been identified: Unsystematic and systematic (Plomin & Daniels, 1987). Unsystematic nonshared environmental influences are defined as random, idiosyncratic effects, for example, life events. These unsystematic events may aggregate over time, making children growing up in the same family different from each other. However, systematic nonshared environmental influences include such factors as parental treatment and sibling interactions. These factors are believed to act systematically and differentially on siblings in the same family to make them different

rather than similar to each other. Rowe and Plomin (1981) developed a conceptual framework to study those systematic nonshared influences. This framework includes parental treatment, sibling interaction, extra-familial network influences, and experiences such as developmental trauma, which are likely to be specific to one individual in the family. In the present study, all of these domains were assessed because there were very few leads as to which were the most important sources of nonshared environmental influences in the study of BN.

Therefore, in light of the preceding elements, several points will be developed in the next sections. After outlining important issues and considerations in the domain of behavior genetics, as well as nonshared environmental factors and siblings, each of the risk factors that are believed to play an important role in the development of BN will be reviewed and integrated into an etiological model. Specifically, the present study has two main goals: (1) To explore the specific nonshared environmental factors associated with the development of BN, namely family relationships (e.g., differential parental treatment, attachment, quality of the sibling relationship), developmental experiences (e.g., sexual and physical abuse) and eating-related developmental history (e.g., teasing about physical appearance and weight as well as parental dieting behavior); and (2) to study the influence of personality traits namely impulsivity, affective instability and narcissism on nonshared environmental influences and their role as possible mediators in the etiology of BN.

Nonshared Environmental Influences and BN

The role of nonshared environmental risk factors in development and psychopathology

Behavioral genetics research uses twin and adoption designs to

disentangle sources of familial resemblance and to identify specific genes involved in behavioral dimensions and psychopathology (Plomin, Owen, & McGuffin, 1994a). Resemblance among siblings had long been known to exist for many traits; twin and adoption methods made it possible to explore the extent to which familial resemblance occurs for reasons of shared heredity, shared or nonshared family environment (Plomin, Chipuer, & Neiderhiser, 1994b). At the turn of the 20th century, the data began to indicate that heredity was an important source of familial resemblance for cognitive abilities, personality, and psychopathology. It became clear that genetic influence was substantial for most domains of behavior. However, little attention was paid to the importance of the environmental component of the variance, which also plays a crucial role in development and psychopathology. In fact, heritability, which is an estimate of the proportion of phenotypic (observed) variance for a trait due to genetic variance, seldom exceeds .50. This means that environmental factors are at least as important as genetic factors in the origin of most behavioral dimensions and disorders. Furthermore, for nearly all dimensions and disorders, shared family environment does not appear to be a major source of environmental influence (Plomin et al., 1994b).

In fact, results from traditional behavior genetic studies consistently yield a surprising finding concerning the environment: Empirically, the environmental influence of primary importance is of nonshared variety (Plomin & Daniels, 1987). More specifically, the environmental factors that have a functional effect appear to make siblings in the same family different from one another rather than similar (Dunn & Plomin, 1990a). For the three major areas studied by behavioral geneticists (i.e., personality, cognitive ability, psychopathology), the majority of the environmental

contribution is of the nonshared variety. This finding has many implications as most research has focussed on shared environmental factors, whereas differences within the family are frequently left unexplored (Rutter et al., 1997). This conceptualisation leaves aside the factors that can make two sisters growing up in the same family environment so different from one another, more particularly in terms of developing psychopathological disorders such as BN. In order to address this question properly, one needs to consider the differences in experiences of sisters, in other words, the specific nonshared environmental factors within the family. These factors have been shown, as previously outlined, to be pertinent in the understanding of behavioral development, parent-child interactions, personality and psychopathology (e.g., Baker & Daniels, 1990; Dunn & McGuire, 1994; Kendler, 1995; Pike & Plomin, 1996). It is in this framework of within-family comparisons that pertinent developmental issues concerning the etiology of BN can be judiciously addressed and that the quest for similarities and differences between siblings can be carefully evaluated.

Until recently, studies of differences within a family have not gone beyond the study of family constellation variables in the domain of eating disorders. In fact, the effects of birth-order, age and sex of siblings do not give us relevant information about the propensity to develop an eating disorder. Furthermore, when socio-economic status is controlled for, and when siblings from the same families are compared, birth-order-behavior relationships approach zero (Ernst & Angst, 1983).

In the past fifteen years, researchers have identified differential experiences within the family that are related to differential developmental and psychopathological outcomes. This research has generated an entire field of empirical research aimed at

answering the question posed in Plomin and Daniels's (1987) paper: Why are children in the same family so different? The content of this research was greatly influence by Rowe and Plomin's (1981) formulation that the causes of differences in outcome among siblings were to be found in differences in the environments they experienced. A number of research studies, therefore, attempted to investigate the origins of nonshared environmental variance among siblings. For example, some authors reported a positive psychological adjustment for those siblings who also experienced more maternal closeness, a greater degree of friendship within the sibling relationship, more power in the family decision making, and more parental chore expectations (Daniels, 1986; Dunn, Stocker, & Plomin, 1990). A significant relationship between positive and negative parenting styles and children's perceptions of their self-worth has also been found, that is, siblings who perceived higher self-worth also perceived more positive parenting (McGuire, Neiderhiser, Reiss, Hetherington, & Plomin, 1994). In addition, Tejerina-Allen, Wagner, and Cohen (1994) reported a significant relationship between differential parental discipline and suicidal ideation. Specifically, the child who received more severe punishment compared to their sibling had higher suicidal ideation. Children's perception of sibling differences in punishment were more closely linked to suicidal ideation than maternal perceptions. Furthermore, children who experienced their mothers as being more controlling and less affectionate with them compared with their siblings were more likely to manifest symptoms of anxiety and depression (Dunn & McGuire, 1994).

While perceptions of nonshared environment have been explored in the field of developmental psychopathology, the specific perceptions of differential environment in bulimic participants and their sisters have not been properly addressed in the literature.

The issue of nonshared environmental influences and BN will be considered in the next section.

BN: The necessity of considering nonshared environmental influences.

Regardless of which biopsychosocial influence is considered, the importance of environmental and genetic factors in the etiology of BN has been acknowledged. Nevertheless, there is disagreement as to the specific mechanisms by which these variables influence the etiology of this eating disorder.

Several methodologies have been employed to study the impact of environmental and genetic influence on the etiology of BN, for example family, twin, and genetic studies. The tendency for a disorder to cluster among relatives is the foundation for intergenerational transmission, which has been demonstrated to play an important role for all major categories of psychopathology. Family studies have generally indicated that the prevalence of eating disorders is seven to 12 times higher in relatives of bulimic and anorexic individuals compared to controls (e.g., Kasset et al., 1989; Lilenfeld et al., 1998; Treasures & Holland, 1990;). Specifically, the rate of BN in relatives of bulimic patients tends to range from 1.7% to 9.6% (e.g., Hudson, Pope, Jonas, Yurgelun-Todd & Frankenburg, 1987; Kassett et al., 1989; Keck et al., 1990; Treasures & Holland, 1995). These rates suggest that BN aggregates in families and that there is a genetic propensity to develop this disorder.

Because genetic and environment components cannot be disentangled in the family study approach, the study of twin pairs has become an important focus of research in psychiatric genetics as it can separate the effects of genes from environmental influences. In fact, it is through twin research that the importance of nonshared

environment was discovered. A discussion and review of twin study methodology are beyond the objectives of this study (see Bulik, Sullivan, Wade, & Kendler (2000) for a more extensive review). However, a brief description of a few important notions in the understanding of twin research is provided below.

Comparisons of trait similarity among monozygotic (MZ) and dizygotic twins (DZ) make possible the decomposition of observable trait variance into three important factors: additive genetic, shared environment, and nonshared environment effects (Plomin, DeFries, & McClearn, 1990). It is therefore assumed that because MZ twins share 100% while DZ twins share about 50% of their genes, additive genetic effects on a trait or on a disorder –such as BN- are inferred when MZ correlations are approximately twice DZ twin correlations (Hoffman, 1991; Pike & Plomin, 1996; Plomin et al.,1990). However, shared environmental influences are inferred when MZ and DZ twin correlations are equal, as these factors are identical to twins growing up in the same family (Hoffman, 1991; Pike & Plomin, 1996; Plomin et al., 1990). Finally, nonshared environmental influences make twins different. These influences are therefore inferred when MZ twin correlations are less than 1.00 or when neither MZ nor DZ twins are significantly correlated (Hoffman, 1991; Plomin et al., 1990). Respective genetic and environment contributions to particular traits or disorders can be determined through MZ/DZ correlation comparisons and biometrical model-fitting analyses are used to obtain the magnitudes of these effects when the contribution of additive genetic, shared and nonshared environment effects are examined at the same time (Plomin, 1994; Plomin et al., 1990).

In general, findings from the above-described twin methodologies suggest that

nonshared as opposed to shared environmental factors contribute to the development of eating pathology. Estimates have in fact indicated that 17 % to 46% of the variance in BN (Bulik, Sullivan, & Kendler 1998; Bulik et al., 2000, Kendler et al., 1991; Kendler et al., 1995) can be explained by nonshared environmental factors. The remaining variance has been generally attributed to genetic effects. Similarly, a study on eating attitudes in adult twin pairs conducted by Rutherford, McGuffin, Katz, and Murray (1993) suggested that, while shared environmental influences were close to zero, unique environmental and additive genetic influences have a larger role to play in the development of disordered eating in the general population.

One twin study, however, reported different findings in terms of the relative contribution of shared and nonshared environmental factors in the propensity to develop BN. Kendler et al. (1995) investigated the genetic and environmental contributions for BN along with five other psychiatric diagnoses, specifically generalized anxiety disorder, panic disorder, specific phobias, major depression and alcoholism. Their findings revealed the important role of shared environmental factors (41% of the variance) in BN. Genetic factors and individual-specific factors accounted for around 30% and 29% of the variance respectively. Furthermore, studies of eating pathology reported significant shared environmental effects in adult twins (Wade, Martin, & Tiggeman, 1998). They found that the environment played a powerful role in shaping the participants' attitude toward shape, weight, eating and food, which explained between 38% and 100% of the variance. Environmental influences, whether shared or nonshared, therefore, appear to play a substantial role in the development of overvalued ideas of shape and weight, which have been conceptualised as being core factors in the development of BN. The influence

of shared environment does appear to affect some, but not all aspects of eating pathology. This finding clearly indicates that future studies of the genetic and environmental contributions for BN should use multifaceted and dimensional environmental measures.

In sum, despite the fact that BN appears to be influenced by shared environmental effects, twin investigations do suggest a significant role for nonshared environmental influences in the development of this eating disorder. It is important to note that these nonshared environmental effects have been found to be significant in all twin studies, despite the presence of shared environmental factors (i.e., Kendler et al., 1995). The next step is to delineate the significance and the role of these nonshared environmental factors in order to better understand how they influence the development of BN.

Wonderlich, Ukestad, and Perzacki (1994) are the only researchers who have investigated perceived childhood nonshared environment factors in bulimic patients compared to normal controls using the Sibling Inventory for Differential Experience (SIDE; Daniels & Plomin, 1985ab). Bulimic individuals were more likely than controls to rate their fathers as showing less affection and more control toward themselves than toward their sibling. In addition, ratings of maternal affection and control, quality of the sibling relationship, and peer relationships in the bulimic participants did not differ from the control group. These data provide preliminary evidence suggesting that the paternal relationship may be a source of nonshared environmental factors associated with BN. One limitation of the study was that it did not include an assessment of the psychiatric comorbidity in the bulimic probands, nor did it include a psychiatric control group. A more important limitation is that the siblings' outcome and perception of nonshared childhood factors was not assessed. Therefore, "true" perceptions of nonshared

environmental factors were not specifically evaluated.

In summary, there appears to be consensus that the influence of environmental factors on BN is substantial. However, there is still some uncertainty about the extent and type of environmental risk factors (i.e., shared or nonshared). Those investigations utilizing greater methodological sophistication and larger samples of participants indicate that 50% to 70% of the variance is made up of environmental influences.

Siblings of bulimic patients. Siblings of eating disordered patients have been fairly neglected in the literature on eating pathology. As outlined previously, some attention has been paid to twins in attempts to explore the respective role of genetics and environment in the etiology of eating disorders. A few studies, involving mainly anorexic participants, evaluated the prevalence of an eating disorder in the sisters of the eating-disordered participants compared to a control group (e.g., Strober, Morrell, Burroughs, Salkin, & Jacobs, 1985; Theander, 1970). A greater incidence of anorexia nervosa was found in the anorexic participants' sisters than in control groups. However, the incidence of BN in siblings of bulimic individuals has not been specifically investigated in the literature.

Compared to normal families, siblings of eating disordered individuals appear to show a greater likelihood of developing eating and weight problems themselves, as well as other forms of mental disorders, such as affective and substance abuse problems (see Vandereycken & Van Vreckem, 1992). However, no significant differences regarding family size were found in bulimics compared with anorexic, overweight, and normal control participants (e.g., Dolan, Evans & Lacey, 1989; Weis & Ebert, 1983). In addition, no significant differences in birth order were found between bulimics and normal controls

(e.g., Dolan et al., 1989; Weis & Ebert, 1983), between bulimics and restrictive anorexics (Garfinkel, Moldofsky, & Garner, 1980; Vandereycken & Pierlott, 1983), and between normal weight bulimics and controls (Herzog, 1982). Other variables such as the presence of all-female sibships were found to be over represented in families of bulimics (Lacey, Gowers, & Bhat, 1991). However, the absence of a sibling or the relative position of the eating-disordered individual within the family did not have a significant impact on the prognosis of the eating disorder (see Vandereycken & Van Vreckem, 1992). In addition, Sights and Richards (1984) reported strong sibling rivalry between sisters in bulimic families, but they did not interview the siblings directly.

In general, studies on eating disorders including siblings have been mostly conducted with anorexic participants. Those studies that included bulimic individuals have been mostly concerned with (a) exploring the relative contributions of genetics and the environment in the etiology of BN using twin designs, and (b) descriptive variables such as family size and birth order. No study has specifically compared bulimic participants and their sisters in terms of eating pathology, parent-child relationships, quality of the sibling relationships (i.e., warmth, conflict, rivalry), developmental experiences, and personality traits. Furthermore, the use of siblings as controls in the domain of eating disorders, specifically BN, in order to assess differential family relationships, developmental experiences and personality divergences has not been employed. In the present study, bulimic participants and their sisters were compared on a variety of eating, family, developmental and psychopathology variables.

In the next section, possible sources of nonshared environmental factors that may influence the development of BN will be reviewed, namely (a) family factors (i.e.,

general family dynamics associated with BN and attachment), (b) developmental trauma (i.e., sexual and physical abuse), (c) eating-related developmental experiences, as well as (d) personality traits hypothesized to play a role in its etiology (i.e., impulsivity, affective instability, narcissism).

Environmental Risk Factors Involved in the Vulnerability to BN

The role of the family in the conceptualisation of BN: Theoretical issues and empirical findings. Theoretical views on BN have focussed either on intrapsychic deficits and conflicts of the individual bulimic patient, usually from a self-psychology or object relations perspective (Goodsitt, 1983; Johnson & Connors, 1987; Swift & Letven, 1984), and from a family systems point of view (e.g., Minuchin, Roseman, & Baker, 1978; Selvini-Palazzoli, 1974). There have been few attempts to integrate these two theoretical formulations and to consider the biopsychosocial factors, which are thought to be important in the etiology of BN. This eating disorder offers an ideal context for an integrative formulation because, so often, different levels of analyses stemming from both the family systems approach and the psychoanalytic orientation are necessary in order to arrive at a better understanding of its etiology (Johnson & Connors, 1987; Stern, 1986).

Several theoretical models have attempted to take into account the role of family factors in the development of BN. Root, Fallon, and Friederich (1986) delineated three types of bulimic families: Perfect, overprotective, and chaotic. They suggested that all three types of families have boundary problems, attach unusual significance to weight and appearance, and are characterized by extreme levels of paternal (versus maternal) power. However, these three types are thought to differ in the nature of their family

conflicts, rules, family of origin issues, and the interpersonal function of the bulimic symptoms. For example, bulimic symptoms in the demanding and often critical perfect family type may symbolize hostile individuation efforts, whereas the same behaviors in the disengaged and abusive chaotic family may represent self-abuse, a search for nurturance, or dissociation from a problematic environment. In all types, the bulimic symptoms are thought to reflect the difficulty that the family experiences negotiating the affected child's transition from adolescence to young adulthood.

On the basis of psychodynamic theory, Johnson and Connors (1987) differentiated restricting anorexics from bulimics in terms of the degree of maternal involvement with the affected child. The restricter's self-starvation is thought to reflect an effort to assert and separate from a highly overinvolved mother, whereas the bulimic's binging represents an attempt to avoid the emptiness and dysphoria associated with maternal unavailability. The authors note that mothers of bulimic individuals are not blatantly neglectful; rather, they display a subtle emotional unavailability and may struggle with their own intrapsychic deficits in the realm of affect dysregulation. Within this perspective, the mother's unavailability may be a critical factor in the development of self-regulatory problems that predispose the individual to develop BN.

In an effort to integrate systems theory and object relations theory in a family-based conceptualisation of BN, Humphrey and Stern (1988), relied heavily on Winnicott's (1965) concept of deficient holding environment. They suggested that the bulimic family system is characterized by several deficits in nurturance, soothing and tension regulation, as well as in empathy and affirmation of separate identities. Humphrey and Stern (1988) postulated that in bulimic families, all members have

experienced various forms of failures in the parental holding environment which are intergenerationally transmitted.

The family typologies described above highlight both the variability among families with a bulimic member and the cognitive and affective processes within such families, but they are based mostly on clinical observation and not empirical examination. The psychodynamic models of Johnson and Connors (1987) and Humphrey and Stern (1988) are also clinically interesting but rest in part on posited mechanisms and concepts (i.e., projective identification) that are difficult to operationalize and to test empirically. Another limitation is that they do not account for how the affected individual chooses dieting, binging, and purging as symptoms rather than depression, drug use or some other breakdown in interpersonal functioning that may be related to problematic family transactions.

There are a large number of empirical studies that assess the role of family functioning in eating disorders (see Kog & Vandereycken, 1989b and Eisler, 1995, for reviews). A first body of research attempted to assess family functioning in bulimic patients compared with normal controls. Most studies agree that families with an eating-disordered individual do show greater levels of family pathology than families of control participants (e.g., Kog & Vandereycken, 1989b; Waller, Slade, & Calam, 1990ab). Bulimic anorexics have been found to rate their families as (a) more isolated, and non-disclosing, less involved, supportive and organized (Humphrey, 1986), (b) more negative, and contradictory in their communications (Humphrey, Apple, & Kirshenbaum, 1986), (c) more belittling, ignoring, less helping, trusting and nurturing (Humphrey, 1987), and (d) less cohesive, and expressive and more conflicted (Stern et al., 1989). Individuals

diagnosed with BN generally report more family problems than normal control participants including poorer general family functioning, greater levels of parental rejection, more conflict, and less warmth, cohesion, expressiveness, nurturing behavior and independence (e.g., Blouin, Zuro, & Blouin, 1990; McNamara & Loveman, 1990). Bulimic families have also been found to be characterized by less maternal care and greater levels of maternal hostile enmeshment (e.g., Humphrey, 1989; Pole, Waller, Stewart, & Parkin-Feigenbaum, 1988), as well as by less paternal affection and more paternal controlling behaviors towards bulimics than toward siblings (Wonderlich et al., 1994). Furthermore, Kendler et al. (1991) found in a non-clinical population-based study of twins that low paternal care was one of the risk factors for the development of BN. However, some studies did not find differences in perceptions of family functioning between bulimic and normal control families when levels of depressive symptomatology were controlled (e.g., Blouin et al., 1990; Wonderlich & Swift, 1990).

A second body of research has been centred on assessing differences in family functioning between types of eating disordered patients (i.e., anorexic versus bulimic participants). In general, the majority of studies tend to report a marked binger-restricter dichotomy with bulimic and bulimic-anorexic participants reporting greater and different family pathology than restricting anorexic participants (e.g., Humphrey, 1988; Kog & Vandereycken, 1989b). However, Wonderlich and Swift (1990) reported that differences in perceptions of family functioning between anorexic and bulimic families disappeared when rates of depression were controlled for.

A third body of research has compared family functioning between eating disordered participants and psychiatric controls. In general, eating disordered participants

show either less or comparable levels of family pathology (e.g., Stuart, Laraia, Ballenger, & Lydiara, 1990), depending on which type of psychiatric control group is chosen. Moreover, the family interactional styles characteristic of bulimic families are likely seen in other types of psychopathology. For example, Blouin et al. (1990) reviewed data that depressed individuals commonly report that their families are conflicted, non-cohesive, non-expressive, and disorganized. Furthermore, patients suffering from an anxiety disorder have described their parents as highly critical, frightening controlling, and angry (Shear, Cooper, Klerman, Busch, & Shapiro, 1993). In sum, there is a general tendency for most pathological groups, including families of bulimics, to describe their families as being low in warmth and support as well as high in control and intrusion (Calam, Waller, Slade, & Newton, 1990).

Finally, no research has compared perceptions of family functioning within bulimic families, taking into account both the bulimic participant and her sibling's perception of family characteristics. This approach has been used with bulimic-anorexic patients and their parents, who held similar perceptions of family functioning. These perceptions were characterized by greater levels of perceived dysfunction than in normal control families (Humphrey, 1986; 1987). In such studies, eating-disordered patients rated their families as more dysfunctional than did their parents (Stern et al., 1989; Waller et al., 1990b).

In the theoretical and empirical contexts outlined above, the heterogeneity of eating disordered patients may be, therefore, better understood if aspects of family interactional styles of bulimic patients are conceptualised as general risk factors for general psychopathology rather than as specific elements increasing the vulnerability to

develop BN. In addition, looking at intra-familial differences in parent-child relationships in order to understand why certain family members develop eating-related symptoms while their siblings do not, may offer a clearer understanding of the mechanisms that lead an individual to develop BN. By only taking into consideration general family factors such as warmth, conflict, neglect, and by only investigating one child per family, the existing studies failed to investigate the differential experiences and nonshared environmental factors that pertain to each sibling's world. Such an approach may offer a more specific understanding of the risk factors involved in the etiology of BN and constitutes the central goal of the present study.

Attachment: Source of differential parental treatment in bulimic families. Attachment, which may be conceptualised as "the propensity of human beings to make strong emotional bonds to particular others" (Bowlby, 1977), is considered to have an important influence in a wide range of psychological functions including many of those that are disturbed in bulimic individuals. Attachment theory suggests that when a caregiver is consistently available and sensitive in response to an infant's attachment behaviors, the infant develops in return a sense of the caregivers as a secure base, in the knowledge that there is a safe haven to return to (Armstrong & Roth, 1989; Bowlby, 1969; Hazen & Shaver, 1987). Such experiences make it more likely that the growing child will develop a sense of emotional comfort and self-competence. However, those children lacking a secure foundation may be at risk for the development of negative outcomes. This theory may provide an important perspective for identifying factors that contribute to the development of BN. In particular, the capacity to establish intimate relationships, regulation of affect, and self-esteem may be highlighted. Attachment

disorders are in this context not limited to childhood: Whenever there is internal anxiety or external threat, the attachment system is likely to be activated and a desire for closeness and comfort from affectional figures can appear. Bowlby (1977) stated "attachment behavior is held to characterize human beings from the cradle to the grave" (p. 203).

Bowlby (1969/1982) describes his theory of attachment as a way to account for the tendency for individuals to form lasting affectional bonds to particular others. As the infant matures, increasingly complex working models of attachment are constructed, which are used by the child to interpret and guide responses to caregivers (Bretherton, 1987). Although Bowlby's work is mostly centred on the mother-child bond, he believed that components of attachment can extend to adulthood and to other significant others in the individual's life, influencing the feelings of security and the meaning given to particular experiences and significant relationships. This framework, therefore, offers a promising theoretical background for understanding why some individuals experience difficulties in forming and maintaining satisfying and secure bonds in their adult relationships and why others appear to avoid these seemingly natural inclinations.

In adults, a 4-group model of adult attachment has been identified (Bartholomew, 1990; Bartholomew & Horowitz, 1991). This model is based on Bowlby's (1969; 1973) contention that attachment patterns reflect models of the self and models of the attachment figure. Bartholomew (1990) posited that perceptions of the self could be dichotomised as either positive (the self is seen as either worthy of love and attention) or negative (the self is seen as unworthy). In a similar manner, models of the attachment figure can be positive (the other is seen as available and caring) or negative (the other is

seen as rejecting, distant, or uncaring). Bartholomew (1990) stipulates that the working models of the self (positive or negative) can be combined with the working model of the other to define four adult attachment styles. A description of these four models of attachment is presented in Figure 1. Bartholomew has called these four attachment styles secure, preoccupied, fearful, and dismissing.

In terms of the existing empirical evidence on attachment and BN, there are two general sets of literature examining this relationship: (a) the clinical literature that examines, for example, the link between eating disorders and disturbances in object relations (e.g., Sours, 1980) as well as separation-individuation difficulties (e.g., Bruch, 1973; Masterson, 1977), and (b) the literature that attempts to test empirically the extent and nature of the link between attachment and eating disorders. The former relies mostly on theoretical discussions, while the latter constitutes the current empirical literature about this relationship.

Separation problems as well as attachment difficulties have consistently been identified as a major factor in eating disorders (Friedlander & Siegel, 1990; Heesacker & Neimeyer, 1990). BN has often been viewed as a reflection of emotional hunger and neglect in families, and bulimics have been generally found to be less securely attached and less autonomous than controls (e.g., Humphrey & Stern, 1988; Ratti, Humphrey, & Lyons, 1996). It is assumed that they generally come from family backgrounds that are characterized by a lack of warmth and hostile control, that is unable to support separation and still remain connected and caring. In this respect, there have been some empirical attempts to link eating disturbances to insecure parental attachment. For example, Sharpe et al. (1998) found a significant association between insecure attachment and weight

concerns in preadolescent girls, suggesting that attachment styles may play an important role in the development of weight preoccupations, which have been shown to be associated with the onset of eating disorders. Additionally, Armstrong and Roth (1989) found that eating-disordered patients were characterized by intense sensitivity to separations and more anxious attachment than were control participants. Even mild separations induced feelings of distress and were interpreted as a sign of rejection resulting from feeling inadequate. Furthermore, there appears to be an association between leaving home, the loss of a relationship and the onset or recurrence of eating disorder symptomatology (Kalucy, Crisp, & Harding, 1977; Van der Brouke & Vandereycken, 1986; Wienstein & Richman, 1984). In addition, Kenny and Hart (1992) found that a group of eating disorder inpatients described themselves as less securely attached to their parents than did a group of normal college-aged women. The different theoretical approaches, whether stemming from systems theory (e.g., Minuchin, Roseman, & Baker, 1978), psychoanalytic theories (Bruch, 1973; Masterson, 1977) or developmental theory (Strober & Yager, 1984), all examine the impact of the distress caused by separation, abandonment, and loss.

In addition, it is noteworthy that the mean age of onset of BN is at the end of adolescence, the period during which the task of leaving home for the first time must be negotiated. Adolescents may find attachment figures inaccessible or unresponsive when they desperately need their support during this challenging life transition. They may resort to binging and purging as a means to self-soothe or as a way to escape focusing on the self, which is viewed negatively and evokes feelings of rejection and failure (Heatherton & Baumeister, 1991). A sense of security then arises from controlling needs

for food and nurturance, rather than from secure attachment relationships with significant others.

In terms of specific mother-child and father-child relationships, compared to control groups, bulimic individuals consistently rate their mothers on the Parental Bonding Instrument (PBI; Parker, Tupling, & Brown, 1979) as displaying less warmth, affection, and empathy and their fathers as less caring (e.g., Palmer, Oppenheimer, & Marshall, 1988; Rhodes & Kroger, 1992). In addition, Becker, Bell, and Billington (1987) reported greater fears of abandonment and a lack of autonomy in relationships in bulimic individuals compared with normal controls. Taken together, these findings indicate that attachment disturbances are evident in women with BN. They suggest that in anxious-insecure attachment, which is also called ambivalent or preoccupied attachment, fears of abandonment, and difficulties with autonomy differentiate eating-disordered women from non-eating disordered controls. In this type of attachment, the attachment figure who is a potential source of emotional security is both longed for and pushed away and mistrusted. Interestingly, bulimics repeat exactly this same strategy with food in the binge-purge cycle, which can be conceptualised as another form of nurturance. Finally, based on the notion that the development of the self-concept and concept of other are intertwined (Cooley, 1902; Sullivan, 1953), and that the opinions of others are central to the construction of one's self, Danis (1995) found that undergraduate students who exhibited bulimic symptoms endorsed the preoccupied attachment style compared with those who were characterized by anorexic symptoms who endorsed the dismissing attachment pattern. These findings, which need to be replicated with a clinical population, suggest that non-eating disordered women who manifest some bulimic

symptoms view relationships in ways that are consistent with the preoccupied attachment classification. Furthermore, insecurely attached individuals are often characterized by deficits in their self-worth and by a vulnerability to feeling rejected by others. These cognitions may make such individuals very sensitive to gaining the acceptance of others and to society's standards in general, making them more likely to internalise and value society's standards concerning weight and appearance. The depressive symptomatology that is often characteristic of bulimic individuals can also be conceptualised in terms of insecure attachment and as part of the process of separation distress.

Unfortunately, the studies that attempted to look at the links between attachment and BN are limited by several methodological shortcomings including the lack of appropriate comparison groups to determine if the findings are specific to eating disorders and not due to elevated levels of depression or marked interpersonal anxiety. Moreover, the applicability of the measures to attachment functioning (i.e., assessing if they are sensitive to attachment dynamics) and the limited range of sampling are limitations. In addition, very few studies on clinically diagnosed eating-disordered patients have employed attachment measures specifically developed for adults. However, studies examining attachment in clinical samples have demonstrated that most individuals are assigned to insecure attachment categories (Jones, 1996), and that it is difficult to identify systematic relationships between the type of adult insecurity and clinical diagnosis (van IJzendoorn & Bakermans-Kranenburg, 1996). Finally, the conceptualisation of the link between attachment and eating disorders is usually based on a single pathway model instead of considering the multiple environmental and genetic factors that may lead to the development of BN.

In summary, there is conceptual and empirical support that separation, autonomy, and attachment difficulties are associated with bulimic symptomatology. It appears that eating disordered patients show greater attachment difficulties than do normal adolescents or adults who undergo relationship crises. Furthermore, bulimics have a greater tendency to engage in substance abuse, sexual promiscuity, and self-mutilation (Dyckens & Gerrad, 1986; Fahy & Eisler, 1993) compared with restrictive anorexics and normal controls. These strategies have been found to be typical affect regulation strategies for insecurely attached individuals (Brennan & Shaver, 1995; 1998). However, attachment styles in siblings of bulimic individuals have not been specifically studied to assess within-family sources of differential parent-child bonds. In addition, specific attachment styles to mother and father have not been compared in adult bulimic individuals. It, therefore, appears necessary to study whether the attachment relationships to mother and father are important nonspecific nonshared risk factors increasing the vulnerability to develop BN.

Developmental Trauma and BN: Sexual and Physical Abuse

The question of whether or not developmental trauma such as childhood sexual and physical abuse (CSA, CPA) have a significant impact on the etiology and development of BN has received increasing attention in the past 15 years. Childhood abuse, whether subtle or dramatic, represents a form of boundary violation in which the separateness and integrity of the child's physical and/or psychological identity are profoundly hindered (Rorty & Yager, 1993; 1996). CSA has been consistently defined as (a) a forced or coerced sexual behavior imposed on a child, and (b) sexual activity between a child and a much older person, whether or not obvious coercion is employed.

A common definition of "much older" is five years. (Brown & Finkelhor, 1986, p. 66). CPA generally consists of physical assault with physical injury (Fink, Bernstein, Handelsman, Foote, & Lovejoy, 1995).

Since the mid-1980s, clinicians and researchers have seriously considered the possibility that childhood trauma was linked to the development of eating disorders. The incidence of sexual abuse history among women with eating disorders has varied widely, ranging from 6% to 66%, with a majority of studies finding an incidence between 30% and 50% (e.g., Calam & Slade, 1989; Hall, Tice, Beresford, Wooly, & Hall, 1989; Sloane & Leichner, 1986). Differences in prevalence rates of sexual abuse may be explained by the different populations and methodologies employed, as well as by the different definitions of traumatic experience (Connors & Morse, 1993). In general, the existing evidence suggests that sexually abused eating disordered individuals experience greater levels of psychiatric comorbidity than their nonsexually abused eating disordered counterparts (Wonderlich et al., 1996). However, findings concerning abused and nonabused eating-disordered individuals remain somewhat unclear. Some case-control studies report a significant relationship between BN and childhood sexual abuse (e.g., Stuart et al., 1990) while others failed to find such a relationship (e.g., Folsom et al., 1993). It has been suggested that the majority of investigations who failed to report a significant link between CSA and BN were flawed by methodological problems, such as the inclusion of mixed eating disorder diagnoses (Ross, Heber, Norton, & Anderson, 1989), a lack of adequate normal control groups (e.g., Folsom et al., 1993), the inclusion of individuals abused as adults (Finn, Hartman, Leon, & Lawson, 1986), thus failing to test the possibility that CSA is a developmental precursor of BN. However, relatively

recent studies, which have addressed the above-described methodological limitations, have found a significant relationship between self-report history of CSA and bulimic symptomatology (i.e., Dansky, Brewerton, Kilpatrick, & O'Neil, 1997; Wonderlich et al., 1996).

A number of reports compared the prevalence of CSA in eating disordered samples with that in other cohorts, both non-clinical and non-eating disordered psychiatric samples (e.g., Folsom et al., 1993; Welch & Fairburn, 1994). The majority of studies demonstrated that the rates of childhood trauma in eating disordered women did not differ considerably from the norms for women in the community or in psychiatric samples. This led to the speculation that the link between sexual abuse and eating pathology was not direct (Pope & Hudson, 1992), and that CSA may not be a specific risk factor in the development of eating disorders. However, it has been postulated that survivors of sexual abuse may be at greater risk for eating pathology because these individuals often lack the ability to regulate their affect (van der Kolk & Fisler, 1994; van der Kolk & van der Hart, 1989). It has been suggested that childhood trauma may have a profound impact on a child's cognitive, emotional, and biological functioning, which may in turn predispose them to eating pathology. Disturbed eating behaviors such as restricting food intake or binging and vomiting may therefore develop as a way to regulate or escape from painful emotions (Heatherton & Baumeister, 1991; Root, 1991), which may have been triggered by traumatic experiences. Supporting this theory, existing case studies suggest that victims of childhood trauma may experience marked body dissatisfaction (Golfarb, 1987), which is a cognitive characteristic often seen in BN. Additionally, Briere (1992) postulated that victims of trauma may develop maladaptive

behaviors (e.g., self-mutilation; suicidal gestures) in order to reduce tension as well as to escape painful affects.

In addition, clinical reports suggest that many eating disordered women interpret and experience their eating disorder as an intricately connected direct or indirect response to childhood trauma (e.g., Goldfarb, 1987; Sloan & Leichner, 1986). Bulimic women have described their disorders as an indirect expression of overwhelming anger at the perpetrator and consequently as a self-inflicted punishment or coping strategy. This disorder may develop as a means to diminish the guilt, self-hatred, powerlessness, and post-traumatic symptoms related to severe boundary violations, and as a way to make her feel sexually unappealing (Root, 1991; Root & Fallon, 1988; 1989). In addition, it has been hypothesized that compulsive overeating represents a way to feel armoured against assaults and express the anxiety and self-loathing associated with the abuse (e.g., Hall et al., 1989; Tice, Hall, Beresford, Quinones, & Hall, 1989). Thus, for many bulimic women, their eating disorder represents a metaphor for dealing with or symbolic reliving of the abuse experience (Root & Fallon, 1989; van der Kolk, 1989).

In contrast to CSA, far less attention has been paid to CPA in the eating disorder literature. However, recent empirical findings suggest that other forms of trauma such as CPA, which are often associated with CSA, may be related to eating disorders (e.g., Rorty, Yager, & Rossotto, 1995; van der Kolk, Perry, & Herman, 1991). Given this complexity of traumatic experiences, studying one form of trauma in isolation may in fact not reflect reality (Briere & Runtz, 1990). In some studies comparing the two forms of abuse, CPA was a stronger predictor of eating disturbances (e.g., McCallum, Lock, Kulla, Rorty, & Wetzel, 1992). However, the impact of the abusive experiences may be

additive, such that the greater the types of abuse experiences, the greater the impact (Rorty, Yager, & Rossotto, 1994). Furthermore, some studies examining the relationship of the overall level of traumatic experiences to eating pathology suggested that eating disturbances might in fact be part of a larger trauma response, which may be precipitated by experiencing several forms of abuse (e.g., Vanderlinden, Vanderecken, Van Dyke, & Vertommen, 1993).

In sum, repeated severe sexual and physical abuse, have been reported by bulimic individuals (Welch & Fairburn, 1996). The relationship between eating disorders and childhood trauma is very complex and divergent opinions exist about this matter. This complexity arises because of the multidimensional nature of different forms of abuse paired with the multifaceted nature of eating disorders. The literature suggests that experiences of abuse during childhood impact indirectly on the eating disordered sufferer, playing a role in the psychological processes that put her at risk for the development of eating pathology (Rorty, & Yager , 1993; Schmidt, Slone, Tiller, & Treasure, 1993). However, few studies have addressed these intervening processes in clinical populations and the majority have looked at the specific impact of CSA without addressing other forms of trauma (i.e., physical). Therefore, a more refined understanding of the role of abuse experiences in the etiology of BN may result from investigating a range of abusive experiences, rather than treating them as separate entities.

Furthermore, it is very rare that CSA or CPA occur in a vacuum; on the contrary, they often emerge within a context of broader family dysfunction and an aversive family background, which have often been specifically associated with BN; specifically, conflictual interactions, neglect, lack of expressive communication, lower perceived care

and warmth (Calam et al., 1990; Strober & Humphrey, 1987). The relationship between CSA or CPA and later psychological maladjustment may not be due to the sexual or physical abuse per se, but more to the confounding of the childhood trauma with family factors. Abramson and Lucido (1991) have examined the relationship between CSA and BN and found that BN was strongly associated with a lack of parental affection and overly negative, disengaged, and hostile patterns of family interaction, as well as with greater parental levels of impulsivity and familial alcoholism. Kinsl, Trawerger, Guenther, and Biebl (1994) also found that an adverse family background, but not eating pathology, differentiated a community sample of women who had been sexually abused from those who had not been abused. It is, therefore, important to consider family environment variables when assessing the importance of developmental trauma in the development of BN. Taking all of the above factors into consideration, it appears that sexual and/or physical abuse in childhood places adults at risk for developing BN, as well as other psychological crises or psychiatric conditions (e.g., affective disorders, anxiety disorders, sexual dysfunctions). It may, therefore, be helpful to conceptualise CSA and CPA as nonspecific shared environmental factors that increase the vulnerability to develop BN.

Developmental eating-related experiences. Several specific risk factors for body dissatisfaction and disturbances have been studied in regards to their association with the development of eating pathology. Body image development appears to be influenced by experiences and feedback related to physical appearance and weight. Attitudes toward physical appearance usually become more negative by early adolescence, at the time when physical and social development are peaking (Abramowitz, Petersen, &

Sculenberg, 1984; Pliner, Chaiken, & Flett, 1990). This trend appears to reverse itself by early adulthood, although some individuals continue to develop increasing body image disturbances after becoming adults. The question therefore arises, of which specific factors influence the development of body image or what experiences or individual characteristics are associated with the development of body image dissatisfaction. In particular, the role of past teasing experiences related to body shape and weight, as well as parental dieting behavior have been identified as being key risk factors in the development of negative body image and eating pathology.

One developmental approach that has received increasing support over the past years involves the specific appearance-related commentaries and remarks received during critical transition periods of childhood and adolescence (Thompson, 1996). Some experiences such as teasing have been reported consistently as important factors associated with the development of eating pathology, and with weight dissatisfaction over the life span (e.g., Cattarin & Thompson, 1994; Grilo, Wilfrey, Brownell, & Rodin, 1994; Oliver & Thelen, 1996;). For example, Brown, Cash and Lewis (1989) found that teenagers with eating disturbances reported a greater history of having been teased about their physical appearance in the past than non-eating disordered controls. Similarly, Thompson and Heinberg (1993) found that a history of having been teased about one's weight and body size was a significant predictor of both body dissatisfaction and eating disturbances.

In addition, specific sources of teasing have also been investigated. Peers were the most frequent teasers, while mothers and fathers were also reported to frequent sources of appearance-related teasing (Rieves & Cash, 1996). Levine, Smolack, and Hayden (1994)

and Schwartz, Phares, Tantleff-Dunn, and Thompson (1999) also reported that weight and shape-related teasing and criticism from one's parents and siblings predicted body dissatisfaction and disturbed eating behaviors in adolescent girls. In addition, teasing from both parents about weight was predictive of daughters' reports of negative body image.

Other critical familial factors are exposure to parents who themselves have important weight concerns and exhibit dieting behavior, as well as receiving specific advice from parents and friends to control body weight and perfect body appearance (e.g., Oliver & Thelen, 1996; Striegel-Moore & Kearney-Cooke, 1994). For example, adolescent girls diet more in families where mothers described them as overweight and made negative comments on their weights. In addition, daughters' weight dissatisfaction was associated with fathers' weight dissatisfaction and comments on daughters' weight (Keel, Heatherton, Harnden, & Hornig, 1997). Mothers of eating disordered participants reported more eating pathology and greater concerns with their own weights, although their BMI did not differ from the control mothers, and they rated their daughters as less attractive and in greater need of losing weight (Pike & Rodin, 1991). These mothers also placed direct pressure on their daughters to be thin and were even more critical of their daughters in this regard than of themselves. This suggests several links between mothers and daughters in terms of pressure to be thin, dieting history, and eating behavior. The daughters may have learned disturbed eating patterns and negative concerns about their weight as they modelled their mothers' behavior. The authors postulated that there might have been a level of specificity to the relation between maternal eating disturbance and the incidence of disordered eating among the daughters. To the extent that behavioral

manifestations of disordered eating constitute an attempt to manage anxiety and discomfort (Cattanach & Rodin, 1988; Heatherton & Baumeister, 1991), it may be that mothers are influential in terms of modelling this type of coping strategy for their daughters. They also may have been pressured into extreme dieting by their mothers' criticisms of their weight. In support of this hypothesis, Striegel-Moore and Kearny-Cooke (1994) found a strong relationship between mothers' dieting behavior and the extent to which they encourage their daughters to restrict their food intake. However, the impact of fathers' dieting on their daughters was not as clear (Moreno & Thelen, 1993). Keel et al. (1997) found that fathers' weight satisfaction and comments about their daughters' weight were related to their daughters' weight satisfaction. Therefore, it may be that different factors in mothers and fathers sensitize their daughters to different concerns with different aspects of their body image.

These critical experiences, namely being teased about one's appearance and weight in the familial and social contexts and being exposed to parents who diet, may set the stage for vulnerable individuals to devalue their body shape, be self-conscious, and exaggerate the meaning of flaws in their appearance. In addition, body image distress can be further triggered in vulnerable individuals well into adolescence and adulthood by specific events that resemble these negative early experiences. Although many adolescent and adult women are at risk for disturbed eating and body image difficulties, not all of these individuals develop clinical eating disorders. It is, therefore, very important to identify the specific elements related to developmental eating-related experiences that may predispose an individual to develop BN. By conceptualising experiences of teasing about body shape and weight as a nonshared specific risk factor and exposure to parental

dieting behavior as a shared specific risk factor (because both bulimics and their sisters may have been exposed in a similar manner to parents' dieting behaviors), we may gain further insight into the specific contributions of these factors in the development of BN.

The Influence of Personality Traits on BN.

Personality traits, which are thought to be influenced by nonshared environmental factors (e.g., differential parent-child relationships: Dunn & Plomin, 1990ab, Pike & Plomin, 1996), have been shown to have conceptually and etiologically meaningful ties to psychopathological disorders. These ties are either associated with their onset, or shape the processes by which vulnerability comes to be expressed in clinical symptoms, or reflect variable phenotypic manifestations of a common underlying tendency. BN is characterized by marked psychological distress, erratic consummatory patterns, in which restraint and dishinibition alternate, and by body image difficulties, suggesting some underlying characteristics of impulsiveness, affective instability, and identity disturbances (Vitousek & Manke, 1994). In fact, clinical observations often highlight the striking correspondence between the borderline personality disorder criteria and personality features theoretically implicated in vulnerability to BN (i.e., impulsivity, affective instability, and identity disturbance).

Although it is difficult to assess personality disorders reliably, they are generally considered significant in the etiology and maintenance of eating disorders (Vitousek & Manke, 1994; Wonderlich, 1995). Prevalence rates for personality disorders ranged from 21% to 77% for bulimics, and 35% to 70% for bulimic-anorexics when eating disordered individuals were interviewed for the presence of DSM personality disorders (see Wonderlich & Mitchell, 1997). Although there was marked variability across studies,

normal weight bulimics were characterized by DSM Axis II dramatic-erratic traits. In fact, a number of studies have shown that BN and anorexia nervosa binge-purge type often co-occurs with DSM-IV Cluster B spectrum personality disorders (e.g., Johnson & Wonderlich, 1992; Wonderlich & Swift, 1990). Specifically, BN co-occurs with borderline personality features, characterized by impulsivity, marked affective instability and identity disturbances whether or not low weight status has been attained (e.g., Rossiter, Agras, Telch, & Shneider, 1993; Zanarini et al.,1990). In fact, borderline personality disorder has been identified in 2% to 47% of bulimics (Vitousek & Manke, 1994) and is consistently the most common diagnosis in normal-weight bulimics followed by histrionic and dependent pathology. The wide variability found in these prevalence rates may be attributed to the various instruments used to estimate character pathology, the differences between the populations studied (i.e., clinical vs. non-clinical; inpatients vs. outpatients), problems in the definition of both criteria for eating disorders and character pathology; small sample sizes, the confounding presence of depression and anxiety, which may bias the judgment of the evaluators. In addition, the low to moderate concordance between assessment instruments, and a lack of correspondence between clinically and empirically derived symptom clusters may be important (Livesly, Jackson, & Shroeder, 1992). In view of these limitations, it is not surprising that investigations of Axis II pathology in bulimic individuals have yielded some inconsistent findings.

These personality disorders, which have been found to co-occur with eating disorders, can also be viewed as maladaptive aberrations of basic personality traits found, to a lesser degree, among all individuals (Widiger & Costa, 1994). Furthermore, an important amount of data indicates convincingly that efforts to investigate causality,

prognosis, as well as the efficacy of treatment methods are more powerful statistically, and provide more informative outcomes when personality disorder characteristics are defined as continuous rather than discrete categorical variables (see Widiger, 1992). This idea had been suggested by Eysenck (1957), who construed personality or temperamental traits as underlying dispositions to psychopathology.

In their multifactorial theory of the etiology of BN, Johnson and Maddi (1986) speculated that two personality factors predispose individuals to BN: (a) Affective instability (i.e., depressed and variable mood states, impulsive behavior, and low anxiety and frustration tolerances), as well as (b) low self-esteem. Johnson (1991) also suggested that eating disorders were characterized by two distinct character disorders: (a) borderline personality disorder, and (b) false-self narcissistic disorder. The latter is considered to have greater ego resources than the former. Johnson (1991) hypothesized that a false-self organization initially described by Winnicott (1965) may characterize bulimic individuals. This personality organization is thought to emerge when the primary caretaker is unresponsive to or overrides the infants, spontaneous gestures, thereby disrupting the growth of the capacity for interoceptive awareness, which in turn precludes the capacity for consolidating self-regulatory skills. These individuals respond to their caretaker's unavailability by affecting a pseudo-mature adaptation. They come to believe their affective needs as troublesome, a sign of being out-of-control and progressively feel they are in fact two people: One whom the world sees as competent and in control of things; the other who feels shamefully needy (Johnson, 1991). Food often therefore becomes the safest and most trusted ally for these individuals. They invest for example in eating the ability to regulate different tension states. Additionally, Boskind-Lodahl (1976)

hypothesized that the personality factors that co-occur in bulimic individuals such as low self-esteem, social incompetence, and excessive need for approval were important factors in the development of the disorder. Therefore, for individuals with particular vulnerabilities who live in a culture that promotes extreme body dissatisfaction in women, BN may become a pathway for the expression of their psychopathological potential.

It is important to note that very little information is available on premorbid personality features in normal-weight bulimic individuals and minimal data is available on the nature and extent of personality disturbance enduring beyond symptom control (Vitousek & Manke, 1994). Further investigations are therefore needed in this respect. Additionally, some investigators have speculated that at least two mechanisms of action in terms of personality features may underlie the development of BN (e.g., Cooper et al., 1988; Rossiter et al., 1993). The first type may be characterized by dishinibition, and affective instability, and may resort to binging and purging as means of regulating intolerable states of tension anger and identity fragmentation. The second type may develop BN through dietary restraint, repeatedly striving and failing to maintain culturally desirable weight and appearance through restriction. They overeat when their resolve weakens, then purge to diminish the guilt, anxiety, and control weight gain. Tentative support for this division into two types comes from the finding that bulimics with borderline features describe diminished anxiety and depression after completing a binge-purge episode, whereas others report a slight increase (Steinberg, Tobin, & Johnson, 1990). Studying the underlying personality traits of BN, rather than personality diagnosis categories, may be important in this respect, to take into account the

heterogeneity of personality features that are characteristic of bulimic individuals.

In terms of empirical evidence, patients with BN have been reported to have in general more difficulty than those with restricting anorexia nervosa with impulsivity and substance abuse (e.g., Fahy & Eisler, 1993; Holderness, Brooks-Gunn, & Warren, 1994; Johnson & Connors, 1987). Bulimics also appear to engage in sexual activity and drug and alcohol use more often and at an earlier age than repeat dieter and normal controls (Dyckens & Gerrad, 1986), suggesting marked underlying impulsive tendencies. Affective instability or poor affect modulation has also been shown to characterize bulimic patients (Strober, 1981). It has been postulated that the binge-purge cycle has the function of providing affect regulation (Johnson, Lewis, & Hagman, 1984) and of facilitating a temporary suppression of painful self-awareness (Heatherton & Baumeister, 1991). Additionally, high levels of weight preoccupation have been found to be significantly associated with borderline personality, and maladaptive narcissistic traits in non-clinical (Davis, Claridge, & Cerullo, 1997) and clinical populations (Dowson, 1992). This relationship appears to reflect the borderline personality structure characterized by poor self-esteem, weak impulse control, and emotional lability, and where behaviors aimed at regulating dysfunctional mood such as substance abuse are frequently found.

Finally, self-esteem problems and narcissism are other features that have been found to characterize patients suffering from BN. The idea that bulimia and other forms of eating disorders represent a disturbance of narcissism comes from the work of Kohut (1971) and other self-psychologists. The trait of pathological narcissism in BN is thought to result from a developmentally determined deficit in self-representation and includes low self-esteem, difficulties with self-soothing, and the use of specific defenses.

Accordingly, the binge-purge cycles are thought to represent an attempt to provide functions associated with self-esteem maintenance, which the self is unable to provide for itself. It has been argued that bulimics are deficient in their capacity to self-soothe and regulate tension. This inability to self-soothe in such individuals includes a difficulty to self-regulate adequately (i.e., manage chronic or recurrent tension states, maintain self-esteem, and self-cohesiveness) (Steinberg et al., 1990). In this sense, BN is characterized by the never-ending struggle to stabilize self-image through pursuit of physical perfection and need mastery, and through narcissistic overinvestment in body image and control of eating behaviors (Johnson, 1991; Sours, 1980). The pursuit of thinness may act as a way to bolster the patient's low self-esteem. Additionally, the trait of narcissism has been associated more strongly with binge eating sufferers than in psychiatric controls (Steiger, Jabalpurlawa, Champagne, & Stotland, 1997; Steinberg & Shaw, 1997). Finally, narcissism has also been identified as a persistent trait, even after remission of bulimic symptoms, suggesting that this dimension plays an etiological role in the development of bulimic eating syndromes (Lehoux, Steiger, & Jabalpurlawa, 2000). This view is compatible with several formulations that link binge eating with self-disturbances such as narcissism (Johnson, 1991; Johnson & Connors, 1987; Strober, 1991).

It is surprising that given the consistency with which heritable traits are implicated as the most plausible carriers of genetic risk for eating disorders, few investigations have studied the personality profiles of family members of bulimic patients. In fact, the only study that has investigated the personality profiles of siblings was conducted by Casper (1990) and involved only anorexic patients. Parents of bulimic individuals have however been studied to examine if they were characterized by specific

personality features. While Strober, Salkin, Burroughs and Morrell (1982) found some indication of hostility, impulsiveness, and a lack of control in the fathers of bulimic-anorexics, other investigations found only minimal evidence for personality pathology in the parents of normal weight bulimics (e.g., Carney, Yates, & Cizadlo, 1990). Some investigators have reported that women with BN, especially those who also report substance use disorders, have close relatives who report problems with substance use disorders, anxiety, impulsivity, and affective instability (Lilenfeld et al., 1997). These results suggest that a familial vulnerability for impulsivity, anxiety, and mood lability may facilitate a predisposition to both BN and substance abuse. Other studies do not, however, suggest consistent patterns between dysfunctional eating behavior and personality traits such as affective instability and narcissism in relatives of eating disordered individuals (Steiger, Stotland, Ghadirian, & Whitehead, 1995). As there has been as of yet no empirically sound investigations of personality traits in siblings of individuals suffering from BN, conclusions about consistent patterns of personality features in the former are very difficult to draw at the present time.

Finally, despite the fact that bulimic individuals are frequently considered to be of normal weight, they may actually maintain their weight below their genetically influenced ideal weight. Accordingly, the effects of starvation-induced states may influence personality traits, specifically the distressing experience of having an eating disorder and the distressing dysregulation of mood and impulse control. For example, self-esteem may be lowered with perceived failure to achieve one's own ideal weight and control eating behaviors, but increase when treatment enables patients to achieve symptom reduction/remission (Connors, Johnson, & Stuckey, 1984). However, the

psychological characteristics of the high risk groups with the greatest level of eating and psychological disturbance suggest that vulnerabilities linked to personality tendencies are important factors in the development of eating pathology. It is, therefore, likely that impulsivity, affective instability and narcissistic vulnerabilities are associated with, as well as result from, the development of BN (Garfinkel & Garner, 1982; Johnson & Connors, 1987; Striegel-Moore, Silberstein, & Rodin, 1986). Thus, these personality factors may, therefore, be conceptualised as nonspecific nonshared factors, increasing the risk of developing BN.

A Two-Component Model: Toward an Understanding of Specific Nonshared Environmental Factors in the Etiology of BN

The literature outlined above suggests that a variety of interpersonal disturbances and difficulties in affective/impulse regulations and identity/self-esteem occur in bulimic women and their families, which are significantly different from the families of control participants. Early studies focussing on differences between eating-disordered patients and normal controls, and between anorexic-bulimic patients, led researchers to postulate relatively specific types of psychopathology and familial contexts for BN (e.g., Humphrey, 1989; Johnson & Connors, 1987; Strober, 1981). In addition, the existing data on the comorbidity of BN with other Axis I and Axis II pathologies suggests that questions involving the etiology of eating disorders are extremely complex. For example, Kendler et al. (1991) reported that over three-quarters of the patients with BN in their sample had at least one other Axis I diagnosis, most commonly, major depression and anxiety disorder or substance abuse. Axis II pathology also appears to be very common among bulimic patients: Some studies report that one-half to three-quarters of their

sample had a comorbid personality disorder (e.g., Wonderlich & Swift, 1990). Borderline personality disorder may be found in one third or more of bulimic patients (e.g., Johnson, Tobin, & Enright, 1989; Wonderlich & Swift, 1990). It is therefore very likely that much of the psychopathology seen in eating disordered patients may not be specific to the eating disorder per se.

It may be important in this context to differentiate between shared and nonshared specific or nonspecific risk factors that may lead to the development of BN and shape the expression of this eating disorder. Factors that lead an individual to body dissatisfaction with subsequent eating disturbances (e.g., developmental teasing about shape and weight; parental dieting behaviors) are differentiated from nonspecific risk factors that predispose the individual to interpersonal and self-regulatory deficits (e.g., insecure parental attachment). As shown in Figure 2, both lines of development are hypothesized to be necessary for the diagnosis of BN. According to this Two-component model of eating disorders which was originally developed by Garner, Olmsted and Garfinkel (1983) and Garner Olmsted, Polivy, & Garfinkel (1984), and adapted by Connors (1996), body dissatisfaction, in the absence of general psychopathology may lead to normal dieting. Some of these individuals may have marked levels of weight preoccupation, and as their body dissatisfaction increases, they tend to be very comparable to the bulimic group. A subclinical or at-risk group for eating disorders may consist of those individuals with relatively high body dissatisfaction and some vulnerability for affective dysregulation when faced with challenging and stressful situations (Connors, 1996). On the other hand, psychological difficulties (e.g., affective or impulse regulation problems) without body image problems may be characteristic of such disorders as affective disorders or

personality disorders. As underlined by Connors (1996) these individuals may, for instance, struggle with deficits in their identity, painful affective states, and difficult interpersonal relationships. However, eating-related issues and body disturbance may not be very important for them. Specifically, they may not be conflicted about their eating and may be relatively satisfied with or not preoccupied with their body image and weight (Garner et al., 1983; 1984; Connors, 1996).

In contrast, individuals with marked body-image problems and body dissatisfaction paired with mood and impulse regulation problems may be the most likely to receive a diagnosis of eating disorder, as well as possible Axis I and Axis II diagnoses (Connors, 1996). Body dissatisfaction paired with affect and impulse dysregulation could lead in this context to more intense dieting behaviors than those adopted by individuals with no vulnerability to psychopathology in general. For example, the pursuit of thinness as a way to manage criticism from family or peers may be sought be women who have narcissistic vulnerabilities. Furthermore, in addition to the vulnerability to binge eating that is intensified by restrictive eating behaviors, these young women may also lack adequate self-regulation and self-soothing strategies. Therefore, the binging and purging that are characteristic of BN may be conceptualised as means of escaping painful affects, self-esteem injuries, and distancing from interpersonal relationships, which are often experienced as negative (Heatherton & Baumeister, 1991). It has been suggested that BN results from an interaction between body dissatisfaction and general emotional impairments (Garner et al., 1983; 1984; Connors, 1996). Those who have few risk factors for body dissatisfaction and dieting or general psychopathology may or may not have a clinical eating disorder, depending on several elements such as current weight status,

stress level, coping mechanisms, or social support (Connors, 1996). They might, therefore, be conceptualised as possessing a vulnerability to psychopathology (i.e., eating disorders or other Axis I or Axis II disorders) that could be expressed under specific conditions of sufficient stress.

In conclusion, a clear understanding of the impact of environmental and genetic factors (shared and nonshared) in the etiology of BN has not yet been achieved. In the absence of clear empirical data suggesting the existence of specific gene effects, it is proposed that the nonshared familial, developmental experiences, and personality features reviewed earlier may predispose individuals to a range of psychopathological outcomes including but not limited to those seen in BN. By using Rowe and Plomin's (1981) conceptual framework to study differential sibling experiences (i.e., parental treatment, sibling interactions, extrafamilial, and developmental experiences, personality traits), as well as the Two-component model of eating disorders developed by Garner et al., (1983; 1984), and adapted by Connors (1996), it may be possible to delineate important aspects of shared and nonshared environmental factors (whether specific or non-specific risk factors) that may play an important role in the development of BN. The purpose of the present study was, therefore, to address this question.

	MODEL OF SELF Positive	**MODEL OF SELF** Negative
MODEL OF OTHER Positive	**Secure** Comfortable with intimacy and autonomy	**Preoccupied** Overly dependent
MODEL OF OTHER Negative	**Dismissing** Denial of attachment Counter-dependent	**Fearful** Fear of attachment Avoidant Socially avoidant

Figure 1. Four-Group Model of Adult Attachment (Bartholomew & Horowitz, 1991)

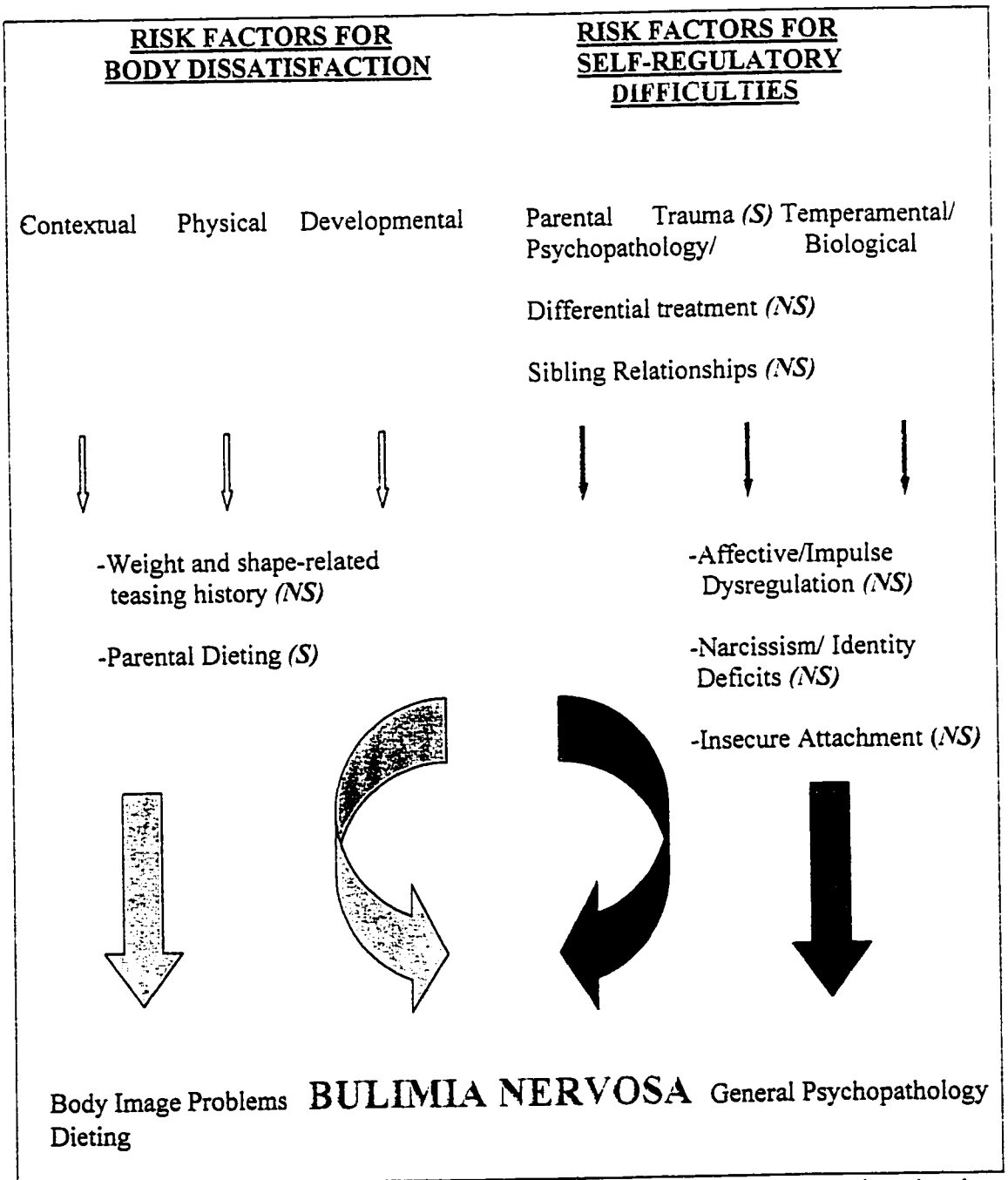

Figure 2. A Two-Component Model of Bulimia Nervosa: Hypothesized Nonshared and Shared Risk Factors.
Note. NS: Nonshared risk factor; S: Shared risk factors.

GENERAL OBJECTIVES AND HYPOTHESES

The present study was designed to examine perceived nonshared environmental influences associated with the development of BN. The present investigation can be distinguished from other studies on bulimic families in two important respects: (1) All bulimic participants were asked to compare their familial and nonfamilial experiences, providing indices of possible perceived nonshared environmental experiences; (2) their closest-in-age non-eating disordered sisters were also asked to compare their familial and nonfamilial experiences permitting within-family comparisons on key perceived nonshared environmental risk factors. In general, using a discordant sister pair comparison, the bulimic participants were expected to show a greater number of perceived nonshared environmental experiences that have been demonstrated to play an important role in the development of BN than their non-eating disordered sisters.

(1) Family relationships. Following the research that demonstrates a lack of nurturance, conflict, and enmeshment characteristic of the bulimic's perception of their families (Humphrey, 1986; 1987; Humphrey & Stern, 1988; Stern et al., 1989), it was hypothesized that bulimic participants would be more likely than their sisters to perceive their parents as less affectionate and more controlling with them than with their sisters. More specifically, it was also predicted, based on Wonderlich et al's. (1994) findings that the paternal relationship would be a more important source of nonshared environmental experience than the maternal relationship. Bulimic participants were also expected to endorse more insecure attachment styles with a negative model of the self (i.e., preoccupied and fearful attachment styles) to their mothers and fathers than their sisters, who were generally expected to endorse secure attachment styles to both parents.

The quality of the sibling relationship (i.e., warmth, conflict, and rivalry) was also explored in the present investigation. Due to the poorer psychological functioning and lower self-esteem that have been associated with poorer quality of the sibling relationship in both childhood (McHale & Gamble, 1989; Stocker, 1993) and adulthood (Stocker, Lanthier, & Furman, 1997), bulimic participants were expected to perceive their sisters as more antagonistic and jealous, as well as less close and engaging in caretaking than themselves while they were growing up. Furthermore, because of the fact that bulimics were experiencing psychological difficulties at the time of testing, they were expected to perceive their relationships as more negative than their sisters would, and to be unable to maintain positive relationships. Low levels of warmth, as well as high levels of conflict and rivalry were, therefore, expected to characterize the present sibling relationship of bulimic participants.

(2) Developmental history. The present study also examined how nonshared environmental experiences in the areas of developmental trauma (i.e., sexual and physical abuse before the age of 18), and history of eating-related experiences (e.g., history of teasing about shape and weight as well as perceptions of parental dieting behavior) were associated with the development of BN. It was predicted that bulimic participants, compared to their sisters, would have experienced: (a) Similar histories of developmental traumatic experiences (i.e., sexual and physical abuse) before the age of 18, (b) more frequent histories of having been teased about their shape and weight, and (c) similar perceptions of parental dieting behaviors during their development.

(3) Personality traits. Differences in personality traits among bulimic participants and their sisters were also expected based on the behavior genetic findings, which outline

the importance of nonshared environment in the development of personality (Dunn & Plomin, 1990; Pike & Plomin, 1996). More specifically, higher levels of impulsivity, affective instability, and narcissim were expected in bulimic participants compared with their sisters.

(4) Model: Etiology of BN. Using Rowe and Plomin's (1981) conceptual framework to study differential sibling experiences, the contribution of nonshared environmental factors (i.e., parental differential treatment, the quality of the sibling relationship, extrafamilial and developmental experiences) and personality traits to the development of BN was examined in the context of an etiological model of the disorder (see Figure 2). This model depicts the possible relationships between different types of nonshared environmental factors such as family relationships (e.g., perception of parental differential treatment, parental attachment, quality of the sibling relationship), developmental history (e.g., sexual and physical abuse), eating-related developmental experiences (e.g., being teased about weight and physical appearance, perceptions of parental dieting behavior) as well as personality traits (i.e., impulsivity, affective instability, and narcissism) and the development of BN. The different types of nonshared environmental factors and personality traits were evaluated in terms of their relative contribution to the risk (specific or non-specific) of developing BN in bulimic participants and their sisters. For instance, body dissatisfaction and having been exposed to parental dieting behavior in the absence of emotional disturbance may lead an individual to body dissatisfaction to subsequent dieting behavior. On the other hand, psychological impairments without body image problems may lead to diagnoses such as affective disorders or personality disorders. In contrast, individuals with marked body

dissatisfaction paired with affective disturbances, impulse regulation and identity deficits may be the most likely to receive a diagnosis of BN. As depicted in Figure 2, both lines of development are considered essential for the development of BN as this disorder has been suggested to result from an interaction between body dissatisfaction and general psychopathology (Garner et al., 1983; 1984; Connors, 1996),. Key nonshared environmental factors (specific and nonpecific) that have been identified in the literature as playing an important role in the etiology of BN were, therefore, examined to determine which ones specifically increased the risk of developing this eating disorder in bulimic participants compared with their sisters.

METHOD

Participants

Forty-two females, aged 18-38, meeting full criteria for BN, were recruited through outpatient services at the Eating Disorders Unit (EDU) of the Douglas Hospital, Montreal, Quebec, Canada, during a period of approximately 25 months, from May 1997 to July 1999. The participants were first screened for Bulimia Nervosa (DSM-IV criteria), excluding Anorexia Nervosa and Binge Eating Disorder (BED), by two experienced clinicians. The bulimic participants were then asked if they would agree to have their closest-in-age female sibling recruited as a participant. They were informed that their sibling would undergo exactly the same interviews as they did and would be asked to fill out the same pencil and paper questionnaires. Furthermore, the bulimic participants were informed that all of their answers as well as their sisters' would be kept confidential. If they agreed, the bulimic participants' sisters were contacted and asked if they would like to participate in the present study. If they agreed to do so, separate testing sessions were scheduled for both bulimic participants and their sisters.

In total, 62 bulimic patients who were known to have at least one female sibling were either approached after their initial phone interview (which is a pre-requisite for being placed on the waiting list of the EDU) or after their actual intake interview for treatment. Seven patients did not want their sister to participate as the latter were unaware of their eating disorder and the former did not feel comfortable divulging that information; one patient had a sister who resided in Europe, and was therefore unavailable for testing; five bulimic patients and one sister dropped-out before completion of the research protocol; time constraints and busy schedules were the most

common explanations; and two bulimic patients had only half-sisters. Therefore, 42 sibling pairs completed the entire research protocol. Two of those pairs had to be excluded because it was discovered during the interview that their supposedly non-affected sister also suffered from either a clinical or a sub-clinical form of BN. Thus, the final sample consisted of 40 bulimic participants and their closest-in-age non-eating-disordered female sibling. Although 45% of the bulimic participants were older than their sister, and 55% were younger, the bulimic participants' and their sisters' relative rank in their respective families were significantly different χ^2 (12, $\underline{n}$ = 40) = 51.94 , $\underline{p}$ <.001. More specifically, despite the fact that comparable proportions of bulimic participants and their sisters were first-born or second-born, a greater proportion of bulimics were fourth-born while more sisters were third-born. The siblings' family rank is depicted in Figure 3 (figures and tables are found at the end of the Method Section). Mean age difference between bulimic participants and their sisters was 3.54 years ($\underline{SD}$ = 2.64; range = 9 mos. - 11 years).

In terms of the eating disorder diagnosis of the bulimic participants, 72.5% fulfilled the criteria for BN purging type, 10% fulfilled the criteria for BN non-purging type while 17.5% met criteria for a sub-clinical BN purging type (they binged and purged more than once but less than twice a week over the past three months prior to being tested for the present study). The bulimic participants displayed significantly more eating symptomatology than their sisters. Specifically, they showed significantly more purging episodes (e.g., vomiting, laxative and diuretic abuse, fasting and exercising with the objective of losing weight) than their sisters. They did not, however, differ in terms of their Body Mass Index (BMI). The means and standard deviations of the eating

symptomatology and BMI for both groups are presented in Table 1.

In terms of their treatment history at the EDU, 29 of the bulimic participants were receiving outpatient treatment at the time of testing while 11 participants were on the waiting list. The mean duration of their BN was 88.08 months (SD = 62.25; range = 3 - 217 mos.). Those participants who were receiving treatment at the time of the testing had on average benefited from 46.69 days (SD = 37.25; range = 4 -127 days) of treatment (approximately a month and a half) at the Outpatient Program of the EDU. The treatment program comprised a combination of weekly psychoeducational group therapy as well as individual psychotherapy with a cognitive-behavioral and interpersonal orientation. Of those who were receiving treatment, 62% had been followed at the EDU for less than one month and a half. It is important to note that bulimic participants were recruited whenever possible at the beginning of their treatment in order to ensure that they were in an active bulimic state.

The bulimic participants and their sisters were compared with regard to their age and their educational level, as well as for their occupational and marital status. At the time of testing, the bulimic participants ranged in age from 18 to 38 years, while their sisters ranged in age from 16 to 40 years. The mean age of the bulimic participants was 25.51 years (SD = 5.31) and the mean age of their sisters was 26.06 years (SD = 5.66). No significant difference was found between bulimic participants and their sisters with regard to their age. In addition, the mean educational level of the bulimic participants was 13.63 years (the equivalent of having completed CEGEP diploma) with a range of 6 to 18 years, while the mean educational level of sisters was 13.10 years (also the equivalent of having completed a CEGEP diploma) with a range of 6 to 18 years. Again,

no significant difference was found between bulimic participants and their sisters with regard to their highest level of education completed. Specifically, 2.5% of the bulimic participants had completed a primary school certificate, 30% had a high school degree, 40% completed CEGEP, 22.5% had an undergraduate degree or university certificate, and 5% had a graduate degree. For their part, 2.5% of the sisters had a primary school certificate, 22.5% had completed high school, 37.5% completed CEGEP, 22.5% had an undergraduate degree or university certificate, and 12.5% completed graduate studies. The participants' highest educational level completed is depicted in Figure 4. Means, standard deviations, and paired comparisons for age and educational level are presented in Table 2.

Furthermore, at the time of testing, 32.5 % of the bulimic participants were working on a full-time basis, 45 % on a part-time basis, and 22.5 % were unemployed. With regard to their sisters, 45 % were working on a full-time basis, 27.5 % on a part-time basis and 27.5% were unemployed. No significant differences were found between the bulimic participants' and their siblings' occupational status. The marital status of these women at the time of testing was as follows: 62.5% of the bulimic participants were single; 15% were either married or living with a romantic partner, 17.5% were involved with a romantic partner without living with them, and 5% were separated. With regards to their sisters, 47.5% were single, 50% of them were either married or living with a romantic partner, and 2.5 % of them were separated. A greater proportion of sisters were married or living with their romantic partner compared to the bulimic participants who reported being generally single or involved in a relationship without living with their romantic partner. The participants' occupational and marital status are depicted in

Figures 5 and 6. Finally, 12.50% of the bulimic participants had at least one child, while 27.5% of their sisters had children.

Procedure

The bulimic participants as well as their closest-in-age female sibling were invited to attend a session of approximately 4 hours consisting of semi-structured interviews assessing eating disorders, developmental trauma, and completion of self-report questionnaires at the EDU of the Douglas Hospital. If the participants were not able to complete the self-report questionnaires at the clinic, they were authorized to bring them home and the questionnaires were picked-up by the researcher. The participants' mothers were also asked to complete a self-report questionnaire (i.e., The Sibling Inventory for Differential Experience (SIDE); Daniels & Plomin, 1985ab) to be returned via mail, in order to validate their daughters' perception of the nonshared family environment features. Eleven mothers returned questionnaires.

Measures

All of the measures for the present study were selected for their strong psychometric properties and were translated into French. In order to verify if the translations were equivalent to the original measures, they were all retranslated in English by a second translator and compared to the original version. No major changes had to be made.

Screening instruments. Two screening instruments were used to assess social and demographic information as well as specific pathology of eating disturbances.

(1) Demographic information. Along with consent forms (see Appendix A), a brief Social and Personal Information Questionnaire was administered to each subject to

gather social and personal information. The Social and Personal Information Questionnaire (SPIQ) (see Appendix B) elicits information concerning age, education, socio-economic status (SES), work status, marital status, Body Mass Index (BMI) (the ratio of kilograms weight per meter height), history of past psychiatric problems, self-report history of eating problems (addressing lifetime history of binge eating, purging, weight loss, etc), perceptions of parental dieting behavior, and family configuration. SES status was computed based on responses on the SPIQ using the highest educational level completed by the participants.

(2) Specific pathology of eating disorders. The Eating Disorders Examination (12th Edition) (EDE; Fairburn & Cooper, 1993) (see Appendix C) is a semi-structured clinical interview designed to assess the full range of the specific pathology of eating disorders, including the patients' concerns about their shape and weight. It was developed in order to overcome the limitations inherent in the use of self-report to assess this specific psychopathology. The EDE comprises 62 items and focuses on the present state of the patient. All of the questions refer to the preceding three months. For each item, there are probe questions as well as a number of optional subsidiary questions used to elicit enough information in order to make an adequate rating. The majority of the ratings are made on a 7-point scale, with at least four defined anchor points. The principal exceptions relate to the frequency of specific behaviors. Items are rated either in terms of their severity or in terms of their frequency of occurrence at a certain defined level of severity. Interrater reliability of each EDE item was determined using three raters and 12 subjects. The interrater reliability coefficient was determined by calculating Pearson product moment coefficients. For 27 items, the correlation coefficient for all three pairs

of raters was perfect. For the remaining items, the coefficients ranged from .69 to 1.00, only dropping below .90 for those items measuring "pursuit of thinness", "body composition", and "social eating". The EDE also exhibits strong validity as it is highly correlated with self-recording of both eating behavior and binge eating in both college students and in patients involved in treatment for BN (Loeb, Walsh, & Pike, 1992; Rosen, Vara, Wendt, & Leitenberg, 1990). Because of the fact that the EDE was essentially used to establish the presence of clinical BN in the participants, only the diagnostic items of this interview were employed in the present study.

The severity of eating pathology was assessed with the Eating Attitudes Test-26 (EAT-26; Garner, Olmstead, Bohr, & Garfinkel, 1982) (see Appendix D), which is an abbreviated version of the Eating Attitudes Test (EAT; Garner & Garfinkel, 1979) which consists of 26 6-point items (1 = never, 6 = always). This questionnaire includes three subscales (i.e., dieting, bulimia and food preoccupation, oral control), and a total index. The EAT-26 does not yield a specific diagnosis of an eating disorder, but it has been shown to be an efficient and useful global measure of eating concerns and pathology. Cronbach alpha is .83 (Garner et al., 1982) and test-retest reliability over a 2- to 3-week time period has been reported to be .54 (Carter & Moss, 1984). High EAT-26 scores imply higher levels of eating pathology.

Nonshared Environmental Measures. The following measures assessed four groupings of nonshared environmental factors.

(1) Siblings' perception of differential environment. The Sibling Inventory of Differential Experience (SIDE; Daniels & Plomin, 1985ab) (see Appendix E) is a self-report questionnaire, comprising 73 items designed to assess four domains: (1) perceived

differential sibling interaction; (2) perceived differential parental treatment; (3) perceived differential peer characteristics; as well as (4) events specific to each individual. Two-week test-retest reliability was substantial, ranging from .77 to .93, with a mean of .84 for a sample of 57 biological siblings (Daniels & Plomin, 1985b). Only the first two domains of nonshared environmental experiences were used in the present study, namely perceived differential parental treatment and perceived differential sibling interaction.

(2) Developmental trauma. The Childhood Trauma Interview (CTI; Fink, 1993; Fink et al., 1995) (see Appendix F) is a structured interview used to assess childhood trauma in several areas: physical, sexual, and emotional abuse, physical neglect, separation, and witnessing domestic violence. With the use of initial queries and follow-up probes, data on the nature, severity, frequency and duration of childhood trauma are gathered as well as other qualitative information (e.g., number and type of perpetrators, the age of the subject at the time of victimization). Each traumatic experience is rated on a 6-point scale for frequency and severity and scored objectively. Interrater reliability, evaluated by calculating intra-class correlations between two raters' scores for dimensions of each type of trauma obtained from rating the same raw handwritten interview data, ranged from .73 to 1.00 for all dimensions except two (i.e., witnessing of violence: number of victims and number of perpetrators) (Fink et al., 1995). Furthermore, 79% of the CTI items had reliability coefficients above .80 and 63% had coefficients at or above .90. It also exhibits high convergent validity with measures of childhood trauma such as the Childhood Trauma Questionnaire (Bernstein et al., 1994) (coefficients ranging from .43 to .57), measures of PTSD and personality disorders. For the present study, only the subscales assessing sexual abuse and physical abuse were

used.

(3) Parent-child attachment relationships. The Relationship Questionnaire (RQ) (Bartholomew & Horowitz, 1991) (see Appendix G) is a self-report forced-choice instrument adapted from Hazan and Shaver's (1987) measure of attachment. The RQ, which is designed to assess the quality of attachment in romantic relationships, has been adapted to assess parent-child attachment relationships as well. This measure consists of four small paragraphs describing four attachment patterns (i.e., secure, preoccupied, fearful, dismissing). The respondents are asked to rate the degree to which it corresponds to their relationship style to both mother and father on a 7-point scale (ranging from 1. "not at all like me", to 7, "very much like me"). Participants were also asked to choose the category that best described their general relationship styles with both their fathers and mothers. These attachment categories were used to classify individuals as secure, preoccupied, fearful, or dismissing. This questionnaire exhibits good test-retest reliability and is highly correlated with other measures of adult romantic attachment, such as the Attachment Questionnaire developed by Collins and Read (1990). For the present study, only the categorical ratings of parental attachment were used.

(4) Teasing history. The Perception of Teasing Scale (POTS; Thompson, Cattarin, Fowler, & Fisher, 1995) (see Appendix H) is a self-report instrument assessing the history of being teased about physical appearance. It consists of 22 items grouped into four subscales: weight-teasing frequency, competency-teasing frequency, weight-teasing effect, and competency teasing effect. This scale provides a measure of both teasing history and teasing effect (subjects are asked to rate how upset they were by the teasing on a 5-point likert scale ranging from 1 (not upset) to 5 (very upset). Internal consistency

was found to be .88 for the weight-related teasing scale and .75 for the competency teasing (Thompson et al., 1995). Test-retest reliability for the four scales was found to be adequate and ranged from .66 to .90. Furthermore, the measure shows adequate construct validity and correlates highly with other measures of body dissatisfaction, such as the Eating Disorders Inventory (EDI; Garner, Olmstead, & Polivy, 1983), body dissatisfaction, drive for thinness, and bulimia subscales, the Rosenberg Self-Esteem Scale (Rosenberg, 1965) as well as with the Physical Appearance State and Trait Anxiety Scale (Reed, Thompson, Brannick, & Sacco, 1991).

A few items were added to the POTS in the present study in order to assess more comprehensively the participants' shape and weight-related teasing history (e.g., "people stared at you when you went out in public", "someone suggested that you should go on a diet", "someone suggested that you should do more exercise"). An item analysis (Cronbach alpha) was performed in order to assess the internal consistency of the new weight-related teasing subscales separately for both bulimic participants and their siblings. Only the items that were significantly correlated with the total weight teasing frequency and weight teasing effect were kept for the final analyses. The final internal consistency coefficients for the two scales in the present study for both bulimic participants and their sisters were respectively .88 and .92 for the weight frequency subscale and .85 and .87 for the weight effect subscale. Only the weight-teasing frequency and the weight-teasing effect subscales were used in the present investigation.

General psychopathology. The following measures were used to assess general pathology levels in bulimic participants and their siblings.

(1) Depression. Self-report of depressive symptomatology was assessed using the

Beck Depression Inventory-13 (BDI-13; Beck & Beck, 1972) and the Centre for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) (see Appendix I). Initially, the present study employed the BDI-13. However, during a discussion with Dr. Beck's research coordinator, we were informed that the BDI-13 was no longer recommended for assessing depressive symptomatology. The CES-D was therefore chosen to replace the BDI-13 in the battery of questionnaires, because of its strong psychometric properties, similarities with the latter scale and because of the fact that it is widely used and easily accessible.

The BDI-13 is a 13-item scale that identifies symptoms related to cognitive. behavioral, affective, and somatic components of depression. Each item comprises four statements rated from 1 to 4 in terms of intensity and respondents are asked to report the one that most accurately describes their own feelings; the higher the score, the more intense the depressive symptoms. The BDI-13 is strongly correlated with the longer BDI form: Correlations range from .89 to .97. Internal consistency also exceeds .85.

The CES-D is a 20-item scale of depressive symptoms that was designed to measure current level of depressive symptomatology with an emphasis on depressed mood. The CES-D is partly derived from the BDI, but is more concise in its wording. A further difference between these two inventories is that the CES-D comprises four items on positive feelings (e.g., "I feel hopeful about the future"; "I was happy"), which are reversed when calculating the scale total score. The standard cut-off score for the CES-D is 16. However, Schulberg et al. (1985) found that for primary medical care clinic patients and psychiatric practice a cut-off score of 27 provided the optimal combination of sensitivity and specificity. Radloff and Rae (1979) reported that the scale significantly

discriminated depressed psychiatric in-patients from a community sample.

Because of the fact that not all participants filled out the same depression questionnaire, total scores resulting from the BDI-13 and the CES-D were transformed into z-scores in order to facilitate their comparisons on the same scale. Therefore, all depressive symptomatology scores obtained either with the BDI-13 or the CES-D in the present study are z-scores.

Personality measures. The following two measures were used to assess personality traits.

(1) Personality traits. The Dimensional Assessment of Personality Pathology-Basic Questionnaire (DAPP-BQ; Livesly et al., 1992) (see Appendix J) is a 290-item self-report questionnaire tapping various components of personality and temperament. The DAPP-BQ includes 18 sub-factors (12-16 items each), all achieving alpha coefficients ranging from .87 to .94. Four constructs were selected for the present study: (a) narcissism (i.e, need for attention, approval and admiration), (b) anxiety (i.e., long-standing trait anxiety, ruminativeness, indecisiveness, guilt-proneness), (c) self-harm (i.e., recurrent thoughts of self-harm and self-damaging acts), and (d) affective instability (i.e., affective over-reactivity, lability of affects). Higher scores on the DAPP always imply greater levels of the personality traits being examined.

(2) Impulsivity. The Barratt Impulsiveness Scale-10 (BSI-10; Barratt, 1985) (see Appendix K) is self-report scale comprising 34 items each assessed on a 4-point Likert scale measuring three components of impulsiveness: motor, cognitive, and non-planning impulsiveness. The BSI exhibits very good internal consistency (.82), adequate test-retest reliability, and is correlated with other behavioral measures of impulsivity such as the

Matching Familiar Figures Test-20 (Kagan, Rossman, Day, Albert, & Philipps, 1964) and with the Eysenck Impulsiveness Questionnaire (Luengo, Carrillo de la Pena, & Otero, 1991).

Quality of the sibling relationship. The Adult Sibling Relationship Questionnaire (ASRQ; Stocker, Lanthier, & Furman, 1997) (see Appendix L) is a 81-item self-report questionnaire that assesses adults' perception of their own behavior and feelings toward their sibling as well as their sibling's behavior and feelings toward them. The items are conceptually grouped in 14 subscales: intimacy, affection, knowledge, acceptance, similarity, admiration, emotional support, instrumental support, dominance, competition, antagonism, quarrelling, maternal rivalry, and paternal rivalry. Participants rate how characteristic each item is of themselves and of their sibling (except for the maternal and paternal rivalry items) on likert scales ranging from 1 = "hardly at all" to 5 = "extremely much". Maternal and paternal rivalry items are also rated on a 5-point Likert scale ranging from 1 = "participant is usually favoured" to 5 = "sibling is usually favoured". These items were recoded as absolute discrepancy scores (0 = neither child is favoured, 1 = parents sometimes favour one child over the other, and 2 = parents usually favour one child over the other). High levels of internal consistency are reported by the authors for all of the subscales, ranging from .74 (dominance subscale) to .92 (affection subscale). In addition, the scale shows adequate test-retest reliability over a 2-week period with coefficients ranging from .75 (dominance subscale) to .93 (affection subscale). The authors performed a principal component analysis with rotation in order to investigate the underlying structure of the ASRQ. A 3-factor solution was selected that accounts for 70% of the variance. The three factors were labelled warmth, conflict, and rivalry. Finally,

convergent validity indices were computed by correlating participants' reports with 118 siblings who also completed the ASRQ. The authors reported substantial agreement between the siblings and participants on the three factors resulting from the factor analysis ($r = .60$ $p < .01$ for warmth, $r = .54$ $p < .01$ for conflict, and $r = .33$ $p < .01$ for rivalry). Furthermore, discriminant validity was assessed by examining interrater correlations of different factors. The average of the six discriminant correlations was $r = .14$, which suggests considerable discriminant validity among the factors.

An item analysis was performed in the present study using the same three factors found by Stocker et al. (1997) in their factor analysis of the ASRQ. Internal consistency coefficients for bulimic participants and their sisters were respectively .98 and .98 for the warmth factor, .93 and .90 for the conflict factor and .88 and .87 for the rivalry factor. Because of constraints pertaining to the number of variables in the present study, only these three factors were used.

Table 1

Mean and Standard Deviation of Eating Symptomatology During Past Three Months and BMI

	Bulimics (N) Mean (SD)	Sisters (N) Mean (SD)	t	df	p
Average binge days	(40) 15.35 (7.57)	(0)			
Average episodes of vomiting	(36) 5.61 (4.11)	(0)			
Average episodes of laxative abuse	(13) 9.13 (8.12)	(1) 4.00			
Average episodes of diuretic abuse	(3) 11.11 (7.34)	(0)			
Average non-purging episodes (fasting and excessive exercise)	(31) 22.93 (15.64)	(16) 12.13 (11.02)	3.53	11	.005
Body mass index (BMI)	(40) 20.84 (2.42)	(40) 22.83 (3.54)	-1.98	39	ns

Table 2

Mean, Standard Deviation and Paired Comparisons for Age and Highest Educational Level Completed for Bulimics and Sisters

	Bulimics Mean (SD)	Sisters Mean (SD)	t	df	p
Age	25.13 (5.26)	26.32 (5.52)	-1.77	39	ns
Highest educational level completed	13.63 (2.62)	13.10 (2.37)	1.24	39	ns

Note. N = 40 for both bulimic participants and their sisters.

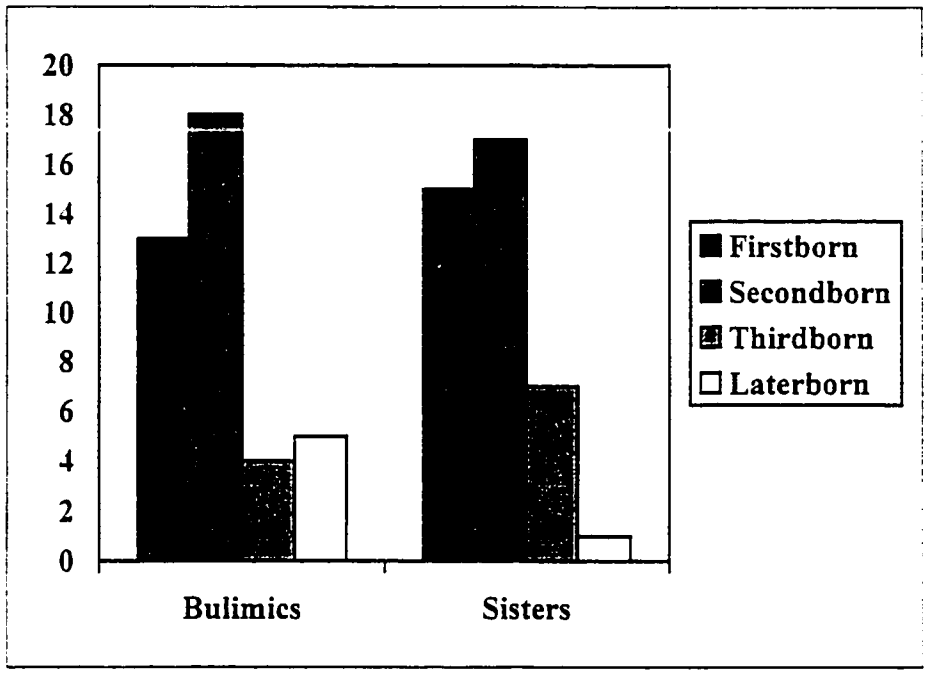

Figure 3. Participants' Family Rank

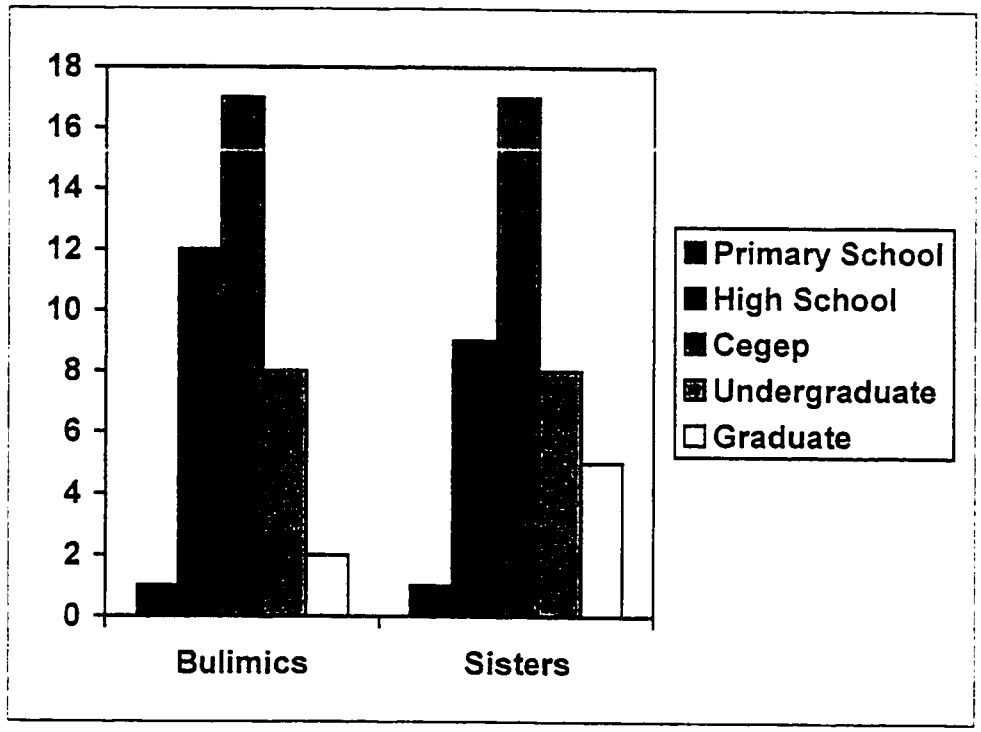

Figure 4. Participants' Highest Level of Education Completed.

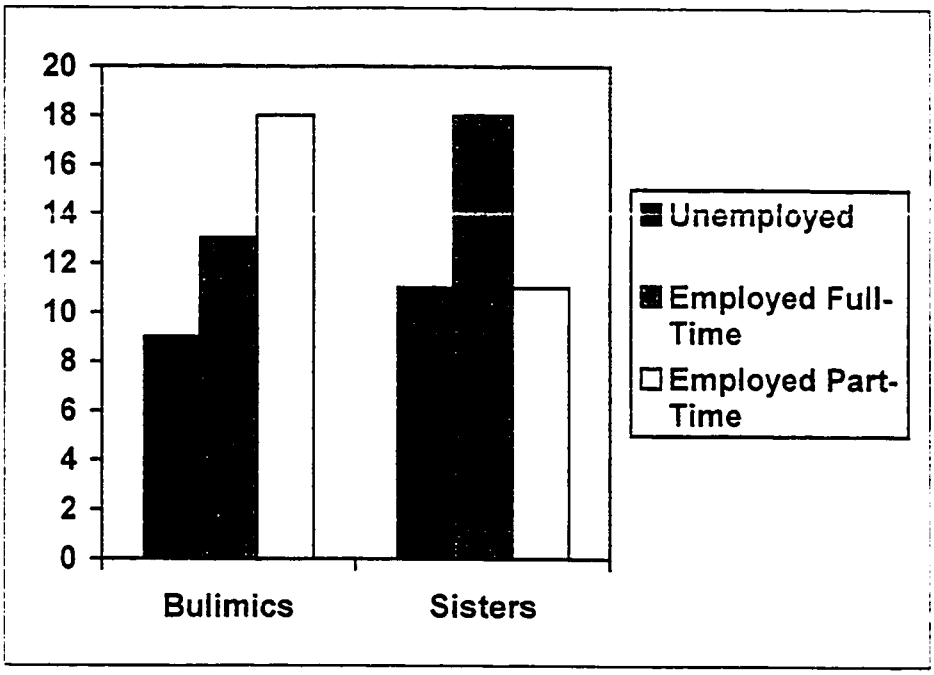

Figure 5. Participant's Occupational Status (χ^2=4.95, df = 4, p < .05).

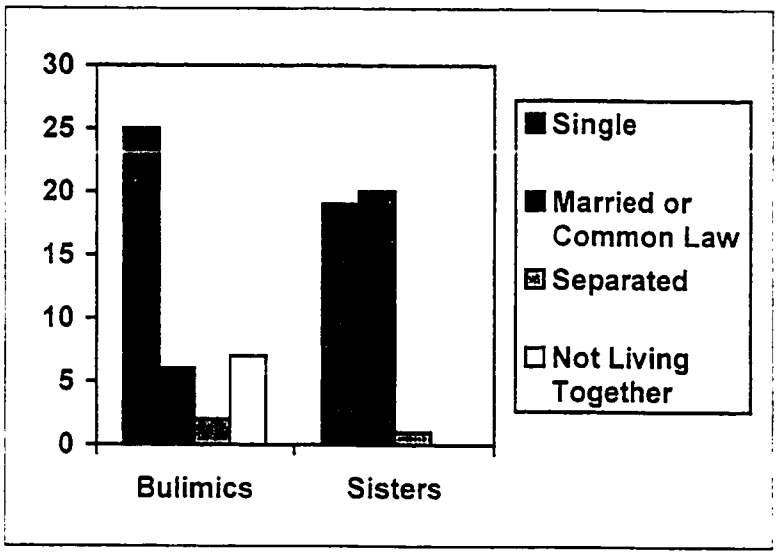

Figure 6. Participant's Marital Status (χ^2=26.47, df = 12, p< .01)

RESULTS

Preliminary Analyses and Descriptive Statistics

Prior to data analyses, all the variables in the present study were subjected to a close examination for accuracy of data entry, missing values, as well as goodness-of-fit between their distributions and the assumptions of multivariate analyses. Missing variables or subscales were replaced by the mean value of that particular variable or subscale with respect to the participant's group (bulimic or sister) whenever indicated in multivariate analyses, but not in the paired comparisons.

A descriptive analysis of the data was performed in order to determine if transformations were necessary to correct for skewness of distributions and/or outliers. Some participants were found to have an extremely high average of vomiting episodes over the three months prior to the testing (e.g., three bulimic participants reported an average of 120, 234, 300 vomiting episodes per month). Therefore, a square-root transformation was applied to correct for the skewness of the distribution. In addition, the duration of developmental trauma variables such as sexual and physical abuse experiences were all subjected to a logarithmic transformation as these variables were negatively skewed. This is often the case when duration of specific events is assessed (i.e., the majority of participants had a duration of developmental traumatic experiences of 0 while the minority of participants were above this value). The transformed variables were used in the paired comparisons.

Reduction of variables. Due to constraints stemming from the sample size, the total number of variables in the present study was reduced to test the models. In this

context, the choice of variables was carefully made according to their theoretical importance as well as to their relevance regarding the hypotheses being tested. This point is particularly important for the second part of the statistical analyses, which were aimed at testing the model presented in Figure 2.

Design

Two sets of analyses were conducted on the data. The central goal of the first series of analyses was to assess nonshared environmental dimensions in bulimic participants and their sisters. To achieve that objective, the analyses were designed to (a) perform important comparisons between the bulimic participants and their sisters with regard to key variables assessing eating pathology, nonshared environmental family variables, nonshared developmental experiences, shape and weight teasing history, as well as psychopathology and personality traits indices, and (b) assess the degree of association with Pearson correlations between bulimic participants and their sisters for each of the above variables. These two factors, namely the paired-comparisons and the correlations, are important to establish to determine if a variable is to be designated as a *perceived nonshared environmental variable*.

In the second set of analyses, which is exploratory in nature, logistic regression models were employed to assess the relative contribution of the identified (i.e., in the first section of the results) nonshared environmental factors (i.e., family relationships, developmental trauma, developmental history of teasing), and personality traits to the development of BN. Psychopathology indices (e.g., depression) were controlled for in the logistic regressions because they are thought to be associated with the active bulimic state

(Lehoux et al., 2000). The identification of the perceived nonshared environment variables was performed in the first set of analyses.

Comparisons Between Bulimics and their Sisters.

Several paired t-test were conducted separately for each group of nonshared environmental factors (i.e., eating pathology, perceived nonshared environmental family variables, perceived nonshared developmental experiences, teasing history, psychopathology indices, and personality traits) whenever appropriate in order to evaluate differences between bulimic participants and their siblings on potential perceived nonshared environmental factors. Paired-sample t-test was the statistical procedure of choice in order to compare bulimic participants and their sisters on key variables, because of the fact that these two groups were not independent. Bulimic participants and their respective sisters share approximately 50% of their genetic background, as well as another unknown percentage due to their shared environment. Furthermore, this statistical procedure has the key advantage of increasing the power to detect a significant difference, particularly in samples that are not very large (Diekhoff, 1992).

The results for each group of variables will be presented separately. A Bonferroni-type adjustment was applied to each group of paired t-tests to maintain the family-wise α at .15 which is a procedure recommended by Tabachnik and Fidell (1989) to maintain an adequate level of power when several tests are conducted and the sample size is small.

Eating pathology. The purpose of the following analysis was to test the hypothesis

that bulimic participants would have higher levels of eating pathology than their sisters. Means, standard deviations, and paired comparisons for eating symptomatology are presented in Table 3 (all tables and figures are found at the end of the Result Section and in Appendices M, N, and O). Separate paired sample t-tests were conducted for ratings of both bulimics and theirs sisters on several indices of eating pathology assessed by the EAT-26 and the EDE. The Bonferroni inequality was applied to the 5 paired t-tests to maintain the family-wise α at.15, resulting in an α level for each test of .018. As predicted, significant differences occurred with the total score of the EAT-26, which assessed severity of eating pathology. Specifically, when compared with their sisters, bulimic participants displayed significantly higher levels of severity of eating symptomatology (i.e., dieting, ritualistic eating and bulimic behaviors).

Next, weight and shape symptomatology as assessed with the EDE was investigated. As predicted, bulimic participants displayed higher levels of pathology. Specifically, they showed significantly higher levels of weight and shape concerns, a greater fear of gaining weight, as well as greater feelings of fatness. This analysis confirmed that the sisters, contrary to the bulimic participants, showed no clinical signs of eating pathology. Furthermore, as displayed in Table 4, all eating pathology dimensions were not found to covary in bulimic participants and their sisters: None of these dimensions was significantly correlated between bulimics and sisters.

Nonshared family environmental variables. The purpose of the following analyses was to test the hypothesis regarding bulimic participants and their sisters on the nonshared environment variables (i.e., family relationships, developmental trauma, and

teasing history).

Eight variables stemming from the SIDE assessed family nonshared environmental variables in the present study: Mother and father affection and control, as well as sibling antagonism, cartetaking, closeness, and jealousy. As a reminder, the SIDE scales are designed to assess the perception of differential sibling experiences in the parenting and sibling relationship domains. Scores vary from one to five. Scores around 3, indicate "no differential sibling experience". Scores of 4 and 5 indicate "self more than sister" and scores around 1 and 2 indicate "sister more than self". All sisters' scores were reversed in order for them to be interpreted in the same direction of the scores of the bulimic participants and thus to be accurately compared with the latter. The Bonferroni inequality procedure was again applied to the 8 paired t-tests to maintain the family-wise α at.15, resulting in an α level for each test of .018. Means, standard deviations and paired comparisons for these analyses are presented in Table 5 and Table 6.

(1) Ratings of perceptions of differential parental behaviors. It was hypothesized that bulimic participants would be more likely to perceive their parents as less affectionate and more controlling with them than with their sisters. The paternal relationship was expected to be in this context a more important source of nonshared environment than the maternal relationship. Contrary to the prediction regarding nonshared parent-child experiences, both bulimic participants and their sisters perceived their parents as having been equally affectionate with both themselves and their sister, as indicated by the comparisons for maternal and paternal affection. The only significant differences between bulimic participants and their sisters were found on both mother and

father control dimensions. That is, bulimic participants were more likely to rate their mothers and fathers as displaying equal controlling behaviors (discipline and attention) towards both themselves and their sisters (i.e., their mean scores on these dimensions were close to 3, which indicates "no sibling differential experience"). In contrast, sisters were more likely than the bulimic participants to rate both their mothers and fathers as having been more controlling towards themselves than towards their bulimic sister.

Interestingly, as depicted in Table 1 of Appendix M, both the bulimic participants' and the sisters' ratings of maternal and paternal control were significantly positively correlated. That is, the more the bulimic participants perceived both their parents as having been more controlling with themselves than with their sisters. the more their respective sisters endorsed the same perceptions. In addition, both bulimic participants' and sisters' perceptions of paternal affection were positively significantly correlated, while their perceptions of their mother's affection were not. Thus, the more the bulimic participants perceived their father as having been less affectionate towards them than with their sister, the more their sisters endorsed such a perception.

In order to validate the participants' perceptions of sibling relationship, Spearman rank-order correlations were computed between bulimic participants', sisters', and maternal ratings of maternal and paternal affection and control because only 11 mothers participated to the present study. As shown in Table 2 of Appendix M, bulimic participants' and mothers' perception of maternal control was the only variable that was significantly correlated. However, as indicated in Table 3 of Appendix M, sisters' and mothers' perception of paternal control was the only variable that was significantly

correlated. Because few mothers were recruited for the present study, nonsignificant correlations may be due to a lack of statistical power rather than to the absence of an effect.

(2) Ratings of the sibling relationship. With regards to the sibling relationship, it was hypothesized that bulimic participants would perceive themselves as displaying more antagonism, less caretaking and closeness, and more jealousy than their sisters. However, as indicated in Table 6, the only significant difference that was found was for the perception of sibling jealousy. Specifically, bulimic participants perceived themselves as being significantly more jealous than their sisters, while the latter perceived an equal degree of jealousy in the sibling relationship (i.e., scores for sisters on that dimension were close to 3, suggesting "no differential sibling experience"). No significant differences were found with regards to perceptions of antagonism, caretaking, and closeness in the sibling relationship. In sum, both bulimics and their sisters perceived an equal amount of these three dimensions in their relationship.

Correlations between bulimics' and sisters' perceptions of the sibling relationship on the SIDE are presented in Table 4 of Appendix M. Both bulimic participants' and their sisters' perceptions were significantly positively correlated on the four variables of antagonism, caretaking, closeness, and jealousy. These findings indicate that the more the bulimics perceived themselves as antagonistic, jealous, as caretaking and close to their sisters, the more the latter shared the same perceptions. Again, in order to validate the participants' perceptions of the sibling relationship, Spearman rank-order correlations were computed between bulimic participants', sisters', and maternal ratings of the sibling

relationship, because only 11 mothers participated in the present study. As shown in Table 5 of Appendix M, bulimic participants' and mothers' perceptions of sibling antagonism was the only significant variable. Additionally, as indicated in Table 6 of Appendix M, sisters' and mothers' perceptions of sibling antagonism, closeness, and jealousy were significantly correlated. Again, because few mothers were recruited for the present study, nonsignificant correlations may be due to a lack of statistical power rather than to the absence of an effect.

(3) Sibling ratings on the ASRQ. In order to test the hypothesis that bulimic participants would perceive a higher level of both conflict and rivalry, as well as a lower degree of warmth in their sibling relationship, paired-comparisons were conducted between bulimic participants and their sisters on the warmth, conflict and rivalry factors derived from the ASRQ. The rivalry factor measured the extent to which both parents favoured one sibling compared to the other. As a reminder, the ASRQ warmth and conflict factors are rated from 1 to 5, with a rating of 1 meaning that the dimension being assessed is "almost not present", a rating of 3 meaning "moderately present" and a rating of 5 meaning "extremely present". The rivalry factor was recoded on a scale varying from 0 to 2, with 0 meaning "the absence of perceived sibling rivalry", 1 meaning a "moderate perception of sibling rivalry", and 2 "marked perception of sibling rivalry". Means, standard deviations and paired comparisons are presented in Table 7. Again, the Bonferroni inequality procedure was applied to the three paired t-tests to maintain the family-wise α at.15, resulting in an α level for each test of .05. Contrary to what was predicted, no significant differences in perceptions were found between bulimic

participants and sisters on the conflict, rivalry, and warmth factors of the ASRQ, suggesting that they both had very similar perceptions of the quality of their sibling relationship.

Additionally, bulimics and their sisters perceived that there was a moderate degree of warmth (i.e., mean scores were around 3) and a low degree of conflict in their present sibling relationship (mean conflict scores were around 2). With regards to parental rivalry, both bulimics and their sisters perceived that their parents sometimes favoured one child over the other (mean scores were around 1). Furthermore, perceptions of warmth, conflict, and rivalry in bulimic participants and their sisters were all significantly positively correlated (see Table 8). That is, the more bulimic participants perceived warmth, conflict, and rivalry in the sibling relationship, the more their sisters corroborated these perceptions.

(4) Attachment relationships. Results regarding the attachment of both father and mother are respectively presented in Figures 7 and 8. Because of the categorical nature of the data, Chi Square analyses were employed to test the hypothesis that bulimic participants would display more insecure attachment styles with a negative model of the self (i.e., preoccupied and fearful) toward their fathers than their sisters. As predicted, bulimic participants displayed significantly more insecure attachment styles with a negative model of the self (i.e., preoccupied and fearful) to their father than their sisters who reported a secure attachment style to their father. The Goodman-Kruskal Index of Relationship was used to assess the degree of association between the bulimic participants' and the sisters' ratings of their attachment to father, because of the

categorical nature of this variable. It was non-significant (γ = -.06, p = ns). Therefore, it appears that an insecure attachment style of bulimics toward the father may constitute a nonshared environmental factor in families of bulimics.

However, contrary to the prediction, no significant differences were found between bulimics and their sisters with regards to their attachment to their mothers. Generally, both sisters reported a secure attachment style toward their mothers. The Goodman-Kruskal Index of Relationship was used again to assess the degree of association between the bulimic participants' and the sisters' ratings of their attachment to their mother, because of the categorical nature of this variable. It was non-significant (γ = –.19, p = ns). These findings suggest that the attachment to mothers does not constitute a nonshared environmental factor in bulimic families.

Developmental trauma: Sexual and physical abuse. Results regarding the abuse variables (i.e., relationship of perpetrator, number of perpetrators, occurrences of abuse, age at first abuse in years, total duration of abuse episodes) are presented in Tables 9 and 10 (sexual abuse) and in Tables 11, 12, and 13 (physical abuse). Details of both sexual and physical abuse variables are reported to facilitate comparisons with other studies in the literature and to provide a clearer picture of the range of shared and nonshared experiences of both bulimic participants and their sisters.

(1) Sexual abuse. Childhood sexual abuse was defined in the present study as interactions in which a child under the age 18 was being used for the sexual stimulation of the perpetrator (or another individual) where the perpetrator was either an adult or three or more years older than the victim. Consensual peer sexual relationships when the

peer was not more than three years older and that were not reported as being coercive were not rated as abuse. A peer was defined in the following manner: When the individual was under 13 of age, a peer was no more than three years older; when an individual was 13 to 15 years old, a peer was under 18 years of age; when the individual was 16-17 years of age, a peer was no more than five years older. Any sexual acts that were done against the person's will were considered abuse. In the present study, all experiences of sexual abuse were coded for severity according to the coding manual developed by Fink (1993). The primary dimensions considered when rating the severity of sexual abuse experiences include the following: (a) whether the experience included physical contact between the perpetrator and the victim; (b) the occurrence of oral sex or penetration; (c) the presence of coercion/force; (d) whether the perpetrator was a relative or a trusted caregiver (i.e., whether the experience involved betrayal). Further dimensions considered were (e) the age of the victim; (f) the difference in age between the victim and the perpetrator; and (g) the specific relationship between the victim and the perpetrator. Sexual abuse experiences were rated on a scale of 1 to 6 (from the least to the most traumatic experiences) ranging from: 1 = non-contact experiences (e.g., exhibitionism, being looked at in a sexual manner); 2 = more serious non-contact experiences (e.g., being shown pornography by an adult; being held in an adult's lap in a sexualized manner); 3 = more intrusive contact experiences (i.e., fondling of genitals or breasts, having to watch another victim being sexually abused); 4 = oral sex and or penetration that did not involve a relative or trusted caregiver, physical force or threats of injury (e.g., oral sex performed by the child, penetration of the child or perpetrator); 5 = oral sex or

penetration that involved a relative or trusted caregiver; and 6 = especially violent, sadistic, and/or ritualistic sexual abuse/assault. For the purpose of the present study, only sexual abuse experiences involving contact experiences (of a severity of 3 and above) were retained in analyses, in order to select serious experiences of trauma. Abuse experiences coded with a severity of 1 and 2 may in fact not have constituted severe traumatic experiences.

Forty-five percent of the bulimic participants and 37.5% of their sisters reported having been sexually abused before the age of 18 by contact abuse. The age range of the onset of abuse was 3-18 years with an average of 10.33 years (SD = 4.16) in bulimics and 9.07 years (SD = 3.67) with a range of 4 to 14 years in sisters. Forty-five percent of the bulimic participants were sexually abused once, while 73.3% of their sisters were only abused once. Most forms of sexual abuse were perpetrated by adults, and most were with familiar individuals. Seventy-two percent of the bulimics who were sexually abused and 46.7% of the sexually abused sisters reported sexual abuse by one or more family members, and all of the victims (except for one bulimic participant) knew the perpetrator.

The sexual abuse variables of interest were compared in bulimic participants and their sisters using paired t-tests. As predicted, there were no significant differences between bulimic participants and their sisters on the number of occurrences of severe contact sexual abuse t (39) = 1.27, ns, age at first sexual abuse experience t (12) = -.91, ns, and total duration of sexual abuse experiences (in years), t (38) = -.45, ns (means and percentages are reported in Tables 9 and 10). Although significant differences were not found between bulimic participants and their sisters on the sexual abuse variables some

of these variables (i.e., number of occurrences of sexual abuse experiences) were significantly positively correlated with one another (see Table 1 of Appendix N). That is, the more the bulimic participants reported sexual abuse experiences, the more their sisters endorsed the same experiences, which partly supported the hypothesis that childhood sexual abuse experiences are shared intra-familial experiences in families of bulimics.

(2) Physical abuse. Physical abuse, was defined as intra-familial and extra-familial experiences of physical assault on a child less than 18 years old involving experiences such as being hit, kicked, or thrown against walls, locked in closets, burnt, choked, cut, or shot. Again, each physical abuse experiences were coded for severity according to the manual developed by Fink (1993). The primary dimensions considered in the ratings of severity of physical abuse for hitting were the following: (a) whether the child was hit on clothing or bare skin; (b) the use of an opened hand versus the use of a fist or objects such as belts or cords; and (c) the absence or presence of bruises or marks. The primary dimensions considered in the severity ratings of other types of physical abuse were: (a) the degree of force used; (b) the types of objects used; (c) the degree to which the child's life was threatened; and (d) the severity of the injury. Additional criteria that may influence the severity of the ratings included: (e) the vulnerability of the body area; (f) extreme force or consequences; (g) invasive injury; (h) sexual intent; (i) tortuous or sadistic intent; (j) age of the child; and (k) unpredictability or volatility of the assault.

Furthermore, all physical abuse dimensions were rated on a severity scale ranging from 1 to 6 where 1 = hitting with hand through clothing leaving no marks; 2 = hitting

with hand on bare skin, leaving no marks, or with an object through clothing leaving no marks/bruises, or with a hand through clothing leaving a mark/bruise; 3 = hitting with an object on bare skin, or hitting with a hand on bare skin leaving marks/bruises (slapped in the face, leaving no marks; hit through clothing by a thrown object, leaving marks; pushed into a wall or furniture or hard enough to knock child down); 4 = hitting with an object on bare skin leaving marks welts, or bruises (e.g., whipped with a belt, leaving marks; punched in the face, leaving marks); 5 = extreme physical abuse including indiscriminate hitting with objects all over the body or including vulnerable areas, causing injury; and 6 = torture. Again, only the physical experiences with a severity of three and above were retained for statistical analyses in order to consider the most severe forms of abuse. It is not always clear if physical abuse experiences with a severity of 1 or 2 are really extended forms of abuse.

With regards to physical abuse, 52.5% of the bulimic participants and 45% of the sisters reported having been subjected to severe physical abuse experiences before the age of 18. The age range of the onset of physical abuse was 2-16 years with an average age of 7.33 years (SD = 5.00) in bulimics and an age range of 2-15 years in sisters with an average age of 8.39 years (SD = 3.31). Fifty-seven percent of the bulimics were physically abused once, while 55.6% of the sisters were abused on one occasion.

The physical abuse variables of interest were compared in bulimic participants and their sisters using paired sample t-tests. As predicted, there were no significant differences between bulimic participants and sisters on the number of occurrences of physical abuse experiences t (39) = 1.59, ns, the age at first physical abuse experience t

(39) = -.91, ns, and the total duration of physical abuse experiences t (39) = -.45, ns. (means and percentages are found in Tables 11,12, and 13). Although significant differences were not found between bulimic participants and their sisters on the physical abuse variables, some of these variables (i.e., number of occurrences of physical abuse experiences) were significantly positively correlated with one another (see Table 2 of Appendix N). That is, the more the bulimic participants reported physical abuse experiences (i.e., frequency of physical abuse experiences), the more their sisters reported similar experiences. These findings support the hypothesis that childhood physical abuse, like childhood sexual abuse, are shared intra-familial experiences in families of bulimics.

Past shape and weight teasing history (during childhood and adolescence). Dimensions of perceptions teasing during childhood and adolescence were assessed, including the frequency of teasing related to shape and weight, and the effect of teasing related to shape and weight. The means, standard deviations, and paired comparisons of the two shape and weight history of teasing subscales are reported in Table 14. As hypothesized, significant differences were found in the two areas of teasing assessed between bulimic participants and their sisters. The former reported higher levels of (a) frequency of weight-related teasing, and (b) effect of weight-related teasing. Furthermore, as presented in Table 15, none of these variables assessing developmental history of weight/shape teasing were correlated between bulimic participants and their sisters, suggesting that these dimensions are perceived nonshared environmental features that may distinguish bulimic participants from their sisters.

Parental dieting. Perceptions of both mothers' and fathers' dieting behaviors were

assessed in bulimic participants and their sisters. They were asked to rate on a likert scale the degree to which they perceived their mothers and fathers as restricting their own food intake during their development. The means, standard deviations, and paired comparisons for the perceptions of parental dieting behaviors are reported in Table 16. As hypothesized, no significant differences were found between bulimic participants and their sisters in terms of their perceptions of both maternal and paternal dieting behavior during their childhood and adolescence. Both perceived average levels of dieting behaviors in their mothers and their fathers. Furthermore, as presented in Table 17 and as expected, both perceptions of parental dieting behaviors were significantly correlated in bulimic participants and their sisters; that is the more the bulimic participants perceived their parents as restricting their food intake, the more their sisters tended to endorse similar perceptions. These results suggest that perceptions of both mothers' and fathers' dieting behaviors constitute perceived shared environmental features in families of bulimics. Additionally, as presented in Table 18, perceptions of mothers' dieting behaviors in sisters were significantly correlated with the severity of the bulimic participants' eating pathology as assessed by the total score of the EAT-26 whereas, no associations were found for sisters or with respect to fathers' dieting behavior. These results suggest that mothers' dieting behavior may constitute an important shared and specific risk factor in the development of BN.

General psychopathology and personality traits. Finally, several psychopathology and personality traits dimensions were assessed, including depression, anxiety, and self-harm, which are though to be associated with the active bulimic state (see Lehoux et al.,

2000), as well as narcissism, affective instability, and impulsivity which were hypothesized to be important etiological factors related to BN. Table 19 presents the means, standard deviations and paired comparisons for all of the above psychopathology and personality variables. The Bonferroni inequality procedure was applied to the six paired t-tests to maintain the family-wise α at.15, resulting in an α level for each test of .037. As hypothesized, significant differences were found between bulimic participants and their sisters on the three psychopathology variables. That is, bulimics displayed significantly higher levels of depression, anxiety, and self-harm than their sisters. Furthermore, as predicted, bulimic participants also displayed significantly higher levels of the three personality traits assessed in the present study when compared to their sisters: They consistently endorsed higher levels of narcissism, affective instability, and impulsivity. In addition, as shown in Table 1 of Appendix O, all three psychopathology dimensions and personality traits did not covary as these dimensions were not significantly correlated with each other when bulimic participants and their sisters were compared.

Testing the Contribution of the Nonshared Environment Factors and Personality Traits to the Development of BN : Exploratory Analyses

In this section, the testing of the model depicted in Figure 2 will be described. The central goal of this exercise was to determine which nonshared environmental risk factors (specific or non-specific) contribute to the risk of developing BN. Specifically, which factors best differentiate between bulimic participants and their non-eating disordered sisters (i.e., developmental history of shape and weight-related teasing, self-esteem based

on shape and weight, parental insensitivity, developmental trauma, affective and impulse dysregulation, narcissism, insecure attachment). Logistic regression analysis was employed because it is the analyses of choice for situations in which the prediction of the presence or absence of a characteristic or outcome, namely BN, is based on values of a set of predictor variables. In fact, logistic regression analysis is quite similar to linear regression, but better suited to models where the dependent variable is dichotomous (Falissard, 1998; SPSS, 1999), as in the present study. Furthermore, logistic regression coefficients can be used to estimate odds ratios for each of the predictor variables in the equation, which permits an analysis of the relative contribution of each predictor variable to the risk of developing BN. In addition, logistic regression analysis possesses greater advantages than a discriminant function analysis in the sense that it does not rely on the same distributional assumptions, although solutions are more stable when the predictor variables have a multivariate normal distribution (Falissard, 1998; SPSS, 1999).

The logistic regression analyses were conducted in three major stages. In first stage, special attention was devoted to the choice of the predictor variables of interest to be entered in the model. These choices were based on both theoretical and statistical considerations. In the second stage, the association between the predictor variables and the outcome variable (i.e., risk of developing BN) was computed using a direct entry logistic regression analysis. Estimates of the odds ratios of the chosen predictor variable were computed both (a) individually, that is by entering each predictor variable alone in the logistic regression model predicting the risk of developing BN, and (b) by taking into account the impact of all predictor variables on the risk of developing BN in a model

where all the predictor variables were entered at the same time. Finally, in the third stage of the analyses, the association between all predictor variables and the risk of developing BN was adjusted for potentially confounding effects of psychopathology on the predictor variables (i.e., the same variables used in stage 2) using a stepwise logistic regression analysis. As described above, estimates of the odds ratios of the chosen predictor variables were also computed both (a) individually, that is by entering each predictor variable alone in the logistic regression model predicting the risk of developing BN, and (b) by taking into account the impact of all predictor variables. A specific description of each of these three steps follows.

First stage: Choice and preparation of variables. As mentioned earlier, the choice of the predictor variables was based on theoretical and statistical considerations. Several variables that were specified in the prediction and hypotheses section were of interest because of their theoretical relevance as potential risk factors in the development of BN. For example, in the case of the relationship with the father, pertinent variables were a controlling and less affectionate father-daughter relationship, a past history of developmental trauma (i.e., sexual and physical abuse), a past history of weight and shape-related teasing, as well as affective and impulse dysregulation and identity problems (i.e., narcissism, affective instability, impulsivity). However, not all these dimensions were found to significantly distinguish bulimic participants and their sisters as outlined in the first section of the results, and thus to be nonshared environmental factors. In fact, the bulimic participants perceived both their parents as being equally affectionate and controlling with both themselves and their sisters. However, bulimics

endorsed a more insecure paternal attachment style (i.e., preoccupied and fearful), a greater developmental history of shape and weight-related teasing, and greater levels of narcissism, affective instability, and impulsivity than their sisters. These variables were found to be important dimensions distinguishing bulimics from their sisters, and could therefore be, as it was previously underlined, possible sources of perceived nonshared environmental experiences. However, both sexual and physical abuse appeared to have been equally experienced by both bulimic participants and their sisters and thus did not appear to be sources of perceived nonshared environmental experiences. Therefore, in the context of the logistic regression analyses, only the variables of theoretical relevance as well as the ones that significantly distinguished bulimic participants from their sisters (and could be perceived nonshared environment dimensions) in the first set of analyses were considered. As well, the rule of thumb of a ratio of 1 variable for approximately 10 subjects was maintained (Tabachnick & Fidell, 1989). The chosen predictor variables were the following: (a) Perception of differential paternal controlling behaviors, (b) paternal attachment style, (c) narcissism, (d) affective instability, (e) impulsivity, and (f) past history of shape and weight-related teasing

Furthermore, because of the nature of the logistic regression analyses, all variables had to be dichotomized in a dummy variable coding process in order to be entered in the model. The median-split procedure was chosen to dichotomize all continuous predictor variables in order to permit comparisons of high and low levels of each dimension underlying each variable. The variable assessing the attachment to father, which was already a categorical variable, comprising four categories was transformed

into two categories by collapsing the insecure forms attachment styles together: Secure or insecure attachment style to the father. The outcome variable, which is conceptualized as the risk of developing BN, was already dichotomized as bulimic versus non-bulimic.

Finally, because of the fact that logistic regression analyses are sensitive to multicollinearity between the predictor variables, correlations between dichotomized predictor variables were computed. Due to the categorical nature of these dimensions, the Goodman-Kruskal Index of Relationship (γ) was used to assess the degree of association between the bulimic participants' and the sisters' ratings on all predictor variables. These correlations are presented in Table 20.

Second stage: First logistic regression model predicting the risk of developing BN (not controlling for psychopathology variables). In this second stage of the analyses, the associations between the risk of developing BN and the predictor variables (i.e., perception of differential paternal controlling behavior, paternal attachment style, narcissism, affective instability, impulsivity and developmental history of shape and weight-related teasing) were assessed in a direct-entry logistic regression model. Furthermore, the odds ratios for each predictor variable were calculated both separately in distinct logistic regression models entering each predictor variable separately, and conjointly with all other predictor variables to estimate the relative odds ratios of each variable. As shown in Table 21, the model tested significantly predicts as a whole the risk of developing BN. However, not all predictor variables appeared to have the same weight in this prediction. If we first look at the odds ratios calculated by entering each variable separately in the logistic regression model, an insecure paternal attachment, narcissism,

affective instability, developmental history of shape and weight-related teasing, and to a lesser extent impulsivity significantly contribute to the prediction of the risk of developing BN. However, if we look at the relative odds ratios, we see that only an insecure paternal attachment style, a high level of narcissism, and a developmental history of weight and shape-related teasing significantly predict the risk of developing BN. Specifically, participants who reported an insecure paternal attachment style and who had a significant developmental shape and weight-related teasing history were almost eleven times more likely to have developed BN, while those who had a higher level of narcissism were four times more likely to have developed this eating disorder. The fact that the other predictor variables did not significantly predict the risk of developing BN when all the predictor variables were entered in the same regression model does not mean that they did not have an impact on the outcome variable as shown in the first odds ratios reported, but rather that their impact was of a lesser extent and that they were influenced by the inter-correlations between predictor variables.

In summary, this first logistic regression model significantly predicted the risk of developing BN, with the predictor variables of insecure paternal attachment, developmental history of shape and weight-related teasing, and narcissism having a greater impact on this prediction. Therefore, each variable significantly increased the risk of developing BN.

Third stage: Second logistic regression model predicting the risk of developing BN (controlling for psychopathology variables). In the second logistic regression model, the association between all the predictor variables used in the first model were adjusted

for the possible confounding effect of psychopathology variables. These variables have been often associated in the literature with the active bulimic state, namely depression, anxiety, and self-harm. Therefore, a hierarchical logistic regression model was employed to test the previously described model, entering in a first block the psychopathology variables (i.e., depression, anxiety, self-harm) in order to remove the share of the variance explained by these dimensions to control for their potentially confounding effects on the predictor variables. In a second block, the previously described predictor variables were entered. Again, the odds ratios for each psychopathology variable and for each predictor variable were calculated separately (i.e., by entering each variable in separate logistic regression models predicting the risk of developing BN) and conjointly with all the other psychopathology and predictor variables, which yielded relative odds ratios. As shown in Table 22, block one, in which the three psychopathology variables were entered, significantly predicted the risk of developing BN. Specifically, anxiety was the only significant variable associated with the risk of developing BN in this first step, while both depression and self-harm remained nonsignificant in this first step. Block two, in which the predictor variables were entered after controlling for the impact of depression, anxiety, and self-harm, as well as the model taken as a whole significantly predicted the risk of developing BN. If we look at the specific odds ratios of each variable, we see that taken separately, seven out of the nine predictor variables (from the most important to the less important) were significantly associated with the risk of developing BN. This means that each of these variables individually contributed to the risk of developing the eating disorder. In order of importance, from most to least

importance, the seven variables were: anxiety, narcissism, developmental history of shape and weight-related teasing, affective instability, insecure paternal attachment, depression, and impulsivity. However, when analysed together in the same logistic regression model, only five variables remained significant in the prediction of the risk of developing BN. More precisely, participants who had an insecure paternal attachment style were 29 times more likely to have developed BN; participants who had a significant developmental history of shape- and weight-related teasing were 16 times more likely to have developed BN; participants who had a high level of narcissism were almost eight times more likely to have developed BN, while those who had high levels of depression and anxiety were six times more likely to have developed BN. Again, the fact that some variables such as affective instability and impulsivity were characterized by odds ratios of respectively 11.86 and 3.44 when taken individually, but non-significant when analysed along with all other predictor variables does not mean that they did not contribute to the risk of developing BN. Rather, their contribution was of a lesser extent than the other variables and influenced by the inter-correlations between all predictor variables. By comparing the first logistic regression model to the second, note that some variables were very stable in the prediction of the risk of developing BN, such as a developmental history of shape and weight-related teasing. In contrast, other variables appeared to be greatly affected by the inter-correlations between predictor variables, for example, insecure paternal attachment style, narcissism, and affective instability.

In summary, this second and final hierarchical logistic regression model in which depression, anxiety and self-harm were controlled, significantly predicted the risk of

developing BN with both block one and two entered in the equation and the general model significantly contributing to the prediction of the risk to develop this eating disorder. The following predictor variables had a greater and significant impact on the prediction of the risk of developing BN: Insecure paternal attachment, developmental history of shape-and weight- related teasing, narcissism, as well as depression and anxiety. Each of these predictor variables therefore significantly increased the risk of developing BN. However, because of the fact that the relative risk ratio confidence intervals for certain predictor variables are large, results must be interpreted with caution, despite the fact that they all were significantly different from 1. This could be due to the sample size, the proportion of participants endorsing high or low levels of each predictor variable, as well as to the intercorrelations between variables. As displayed in Table 23, the final model correctly classified 90% of the cases. Specifically, 92.5% of the sisters and 87.5% of the bulimics were correctly classified using this hierarchical logistic regression model.

Table 3

Eating Symptomatology: Paired Comparisons

		Bulimics Mean (SD)	Sisters Mean (SD)	t	df	p
EAT-26 (total score)						
	Severity of eating pathology	1.88 (.69)	.11 (.27)	15.04	37	.001
EDE						
	Weight concerns	5.27 (.90)	2.51 (1.67)	8.80	39	.001
	Shape concerns	5.51 (.70)	2.86 (1.58)	9.91	39	.001
	Fear of gaining weight	5.30 (1.48)	1.49 (1.92)	9.43	39	.001
	Feelings of fatness	4.23 (2.05)	1.48 (1.98)	5.44	39	.001

Note. N = 38 on EAT-26 for both bulimic participants and their sisters; N = 40 on EDE for both bulimic participants and their sisters.

Table 4

Pearson Correlations Between Bulimic Participants and their Sisters on Eating Pathology Variables

	Sisters			
	Total EAT-26	Weight and shape concerns	Fear of gaining weight	Feelings of fatness
Bulimics				
Total EAT-26	.02	.09	-.13	-.03
Weight and shape concerns	.07	-.07	.01	-.20
Fear of gaining weight	.07	.13	-.12	-.12
Feelings of fatness	-.03	-.02	-.13	-.26

Table 5

Nonshared Family Environmental Factors: Means, Standard Deviations, Confidence Intervals, and Paired Comparisons on the SIDE (Differential Parental Treatment)

	Bulimics Mean SD CI[a]	Sisters Mean SD CI[a]	t	df	p
Maternal affection	2.9 (.75) (2.68; 3.16)	3.1 (.55) (2.97;3.38)	-1.87	38	ns
Maternal control	3.31 (.70) (2.99; 3.44)	2.66 (.68) (2.36;2.87)	5.53	38	.001
Paternal affection	3.01 (.75) (2.71; 3.21)	3.14 (.57) (2.95; 3.35)	-1.10	38	ns
Paternal control	3.14 (.66) (2.90; 3.38)	2.74 (.58) (2.56; 2.96)	3.64	38	.001

Note. N = 39 for both bulimics and sisters; [a] CI = Confidence Intervals.

Table 6
Nonshared Family Environmental Factors: Means, Standard Deviations, Confidence Intervals, and Paired Comparisons on the SIDE (Sibling Relationship)

	Bulimics	Sisters	t	df	p
	Mean	Mean			
	SD	SD			
	CI[a]	CI[a]			
Sibling antagonism	2.89	3.13	-2.29	38	ns
	(.78)	(.56)			
	(2.59; 3.18)	(2.96; 3.37)			
Sibling caretaking	3.05	2.89	1.54	38	ns
	(.75)	(.43)			
	(2.87; 3.34)	(2.78; 3.07)			
Sibling closeness	3.35	3.03	2.30	38	ns
	(.89)	(.76)			
	(3.03; 3.65)	(2.73; 3.26)			
Sibling jealousy	3.58	3.21	3.11	38	.004
	(.88)	(.61)			
	(3.20; 3.85)	(2.92; 3.35)			

Note. N = 39 for both bulimics and sisters; [a] CI = Confidence Intervals.

Table 7

Nonshared Family Environmental Factors: Means, Standard Deviations, and Paired Comparisons on the ASRQ Factors (Quality of the Adult Sibling Relationship)

	Bulimics Mean (SD)	Sisters Mean (SD)	t	df	p
Warmth	2.92 (.88)	3.07 (.89)	-1.15	36	ns
Conflict	2.09 (.78)	1.91 (.54)	1.82	36	ns
Parental rivalry	.78 (.55)	.89 (.54)	-1.16	36	ns

Note. n = 37 for both bulimics and sisters.

Table 8

Pearson Correlations Between Bulimic Participants and Sisters on the ASRQ Factors

		Sisters		
		Warmth	Conflict	Rivalry
	Warmth	.60***	-.34*	-.15
Bulimics	Conflict	-.38*	.63***	.01
	Rivalry	.01	-.07	.40*

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 9

Sexual Abuse Variables for Percentage of Victims

Variables	Bulimics % of Victims	Sisters % of Victims
Relationship of Perpetrator[a]		
Father, stepfather	22.2	20.0
Brother, sister	22.2	0.0
Surrogate male caretaker	11.1	46.7
Other male relative	50.0	26.7
Male aquaintance	61.1	20.0
Female aquaintance	0.0	6.7
Male stranger	5.6	0.0
Number of perpetrators		
1	38.9	73.3
2	50.0	26.7
3	5.6	0.0
4	5.6	0.0

Note. Bulimics n = 18, Sisters n = 15; [a] the percentages for the relationship of perpetrators do not add up to 100%, because each participant could endorse more than one perpetrator.

Table 10

Sexual Abuse Variables for Percentage of Victims

Variables	Bulimics		Sisters	
	Mean (SD)	% of Victims	Mean (SD)	% of Victims
Occurrences of SA	.79 (1.03)		.54 (.85)	
Once		44.4		73.3
Twice		44.4		20.0
3 times		5.6		0.0
4 times		5.6		6.7
Age at first SA (in years)	10.33 (4.16)		9.07 (3.67)	
2-6		16.8		40.0
6.1-9		27.9		13.3
9.1-12		16.7		26.7
12.1-15		27.8		20.0
15.1-18		11.2		0.0
Total duration of all SA[b]	.36 (.53)		.55 (.72)	
0.1-1.0 year		38.9		60.0
1.1-2.9 years		27.8		13.3
3.0-12.0 years		33.3		26.7

Note. Bulimics n = 18, Sisters n = 15; [a] a logarithmic transformation was applied to the duration of abuse experiences variable, because it was negatively skewed.

Table 11

Physical Abuse Variables for Percentage of Victims

Variables	Bulimics		Sisters	
	Mean (SD)	% of Victims	Mean (SD)	% of Victims
Relationship of perpetrator[a]				
Father, stepfather		66.6		44.4
Mother, stepmother		53.4		55.5
Brother, sister		23.8		27.7
Surrogate male caretaker		0.0		5.5
Surrogate female caretaker		4.8		0.0
Other male relative		4.8		0.0
Male aquaintance		4.3		0.0
Number of perpetrators				
1		66.7		66.7
2		19.0		27.8
3		4.8		5.6
4		4.8		0.0
5		4.8		0.0

Note. Bulimics n = 21, Sisters n = 18; [a] the percentages for the relationship of perpetrators do not add up to 100%, because each participant could endorse more than one perpetrator.

Table 12

Physical Abuse Variables for Percentage of Victims

Variables	Bulimics		Sisters	
	Mean (SD)	% of Victims	Mean (SD)	% of Victims
Occurrences of PA	2.27 (1.14)		1.61 (.81)	
Once		57.0		55.6
Twice		19.0		38.8
3-6 times		19.2		5.6
7-10 times		4.8		0.0
Age at first PA (in years)	7.33 (5.00)		8.39 (3.31)	
3-6		38.2		22.3
6.1-9		33.2		55.6
9.1-12		9.5		5.4
12.1-15		14.3		16.7
15.1-18		4.8		0.0

Note. Bulimics n = 21; Sisters n = 18.

Table 13

Physical Abuse Variables for Percentage of Victims

Variables	Bulimics		Sisters	
	Mean (SD)	% of Victims	Mean (SD)	% of Victims
Total duration of all PA[a]	0.55 (.72)		0.62 (.78)	
0.1-1.0 year		28.5		33.3
1.1-3.9 years		14.3		16.7
4.0-7.9 years		23.9		50.0
8.0-11.9 years		19.0		0.0
12-13.9 years		14.3		0.0

Note. Bulimics n = 21, Sisters n = 18; [a] a logarithmic transformation was applied to the duration of abuse variable, because it was negatively skewed.

Table 14

Teasing History: Means, Standard Deviations, and Paired Comparisons Between Bulimics and Sisters

	Bulimics Mean (SD)	Sisters Mean (SD)	t	df	p
Perception of Teasing Scale (POTS)					
Frequency of weight-related teasing	2.11 (0.78)	1.47 (.67)	3.77	38	.001
Effect of weight-related teasing	2.68 (1.03)	1.54 (.74)	5.35	38	.001

Note. N = 39 for both bulimics and sisters.

Table 15

Teasing History: Pearson Correlations Between Bulimics and Sisters

	Sisters	
	Frequency of weight-related teasing	Effect of weight-related teasing
Bulimics		
Frequency of weight-related teasing	-.06	-.05
Effect of weight-related teasing	-.09	-.11

Note. * $p < .05$.

Table 16

Paired Comparisons of Perceptions of Parental Dieting Behaviors

	Bulimics Mean (SD)	Sisters Mean (SD)	t	df	p
Average perceptions of mothers' dieting behavior	1.85 (.87)	1.82 (.91)	.18	39	ns
Average perceptions of fathers' dieting behavior	1.63 (.84)	1.53 (.85)	.70	39	ns

Note. N = 40 for both bulimic participants and sisters.

Table 17

Pearson Correlations Between Bulimic Participants and their Sisters on Perceptions of Parental Dieting Behavior

		Perceptions of mothers' dieting behavior		Perceptions of fathers' dieting behavior	
		Bulimics	Sisters	Bulimics	Sisters
Perceptions of mothers' dieting behavior	Bulimics	1.00	.49**	.17	.22
	Sisters		1.00	.03	.17
Perceptions of fathers' dieting behavior	Bulimics			1.00	.43**
	Sisters				1.00

Note. N = 40 for both bulimic participants and sisters; ** $p < .01$.

Table 18

Pearson Correlations Between Bulimic Participants' and Sisters' Severity of Eating Pathology and Perceptions of Parental Dieting Behavior

	Perceptions of mothers' dieting behavior		Perceptions of fathers' dieting behavior	
	Bulimics	Sisters	Bulimics	Sisters
Bulimics Total EAT-26 score	.15	.34*	.05	.30
Sisters Total EAT-26 score	.16	.28	.13	.12

Note. N = 38 for both bulimic participants and sister; * $p < .05$.

Table 19

Means, Standard Deviations and Paired Comparisons on Psychopathological Indices

	Bulimics Mean (SD)	Sisters Mean (SD)	t	df	p
Depression					
BDI-13 and CESD Z-scores	0.46 (0.93)	-.39 (.85)	-4.16	37	.001
Anxiety					
Anxiousness (DAPP-BQ)	3.92 (0.94)	2.78 (.91)	4.93	37	.001
Self-harm					
Self-harm (DAPP-BQ)	2.32 (1.13)	1.44 (0.72)	3.90	37	.001
Personality traits					
Narcissim (DAPP-BQ)	3.71 (0.81)	2.76 (0.72)	5.15	37	.001
Affective instability (DAPP-BQ)	3.77 (0.83)	2.78 (0.84)	5.16	37	.001
Impulsivity (BIS-10 total score)	2.38 (0.39)	2.11 (0.33)	3.90	37	.001

Note. N = 38 for both bulimics and their sisters.

Table 20

Inter-Correlations (Goodman-Kruskal Index of Relationship (γ)) Between Logistic Regression Analyses Predictor Variables

Depression	Anxiety	Self-harm	Insecure attachment to father	Differential paternal control	Narcissism	Affective instability	Impulsivity	Past teasing history
Depression	.67**	.72***	.25	.02	.55**	.73**	.59**	.51*
Anxiety		.69***	.51*	.28	.82***	.91***	.62**	.80***
Self-harm			.51*	.01	.72***	.74***	.69***	.74***
Insecure attachment to father				.54*	.48*	.66***	-.11	.32
Differential paternal control					.17	.54*	-.14	.14
Narcissism						.87***	.72***	.72***
Affective instability							.55*	.74***
Impulsivity								.38

Note. N = 80; * p < .05, ** p < .01,*** p < .001.

Table 21

Logistic Regression Model Predicting the Risk of Developing BN (Not Controlling for Depression, Anxiety and Self-Harm)

	Beta	Wald	OR[a,b]	Relative OR[c]	95 % CI
Insecure paternal attachment	2.38	7.58	6.92***	10.81**	1.99-58.87
Differential paternal treatment (control)	0.78	0.81	2.43	2.19	0.40-12.04
Narcissism	1.44	3.31	13.78***	4.23*	0.89-20.02
Affective instability	0.63	0.72	11.86***	1.89	0.44- 8.12
Impulsivity	1.05	1.57	3.44*	2.84	0.55-14.60
Past teasing history	2.37	9.73	11.86***	10.67***	2.41-47.25
			Block : $\chi^2 = 86.09$, df = 6, p = .0001		
			Model: $\chi^2 = 86.09$, df = 6, p = .0001		

Note. [a] An odds ratio (OR) >1.0 indicates that a higher values of the predictor variables are associated with a greater risk of developing BN. [b] These ORs were calculated by entering each predictor variable separately in the logistic regression model predicting the risk of developing BN. [c] Relative ORs were calculated by taking into account the individual weight of each predictor variable in the logistic equation model. CI = Confidence Interval; * $p < .05$ ** $p < .01$ *** $p < .001$.

Table 22

Final Logistic Regression Model Predicting the Risk of Developing BN (Controlling for Depression, Anxiety, and Self-Harm)

	Step1	Step2		OR[ab]	Relative OR[c]	95 % CI
	Beta	Beta	Wald			
Depression	0.72	1.91	3.93	5.00**	6.73*	1.02-44.46
Anxiety	2.38	1.81	3.73	16.00***	6.11*	0.97-38.37
Self-harm	0.83	-1.34	1.64	5.44***	0.26	0.03-2.03
Insecure paternal attachment		3.37	9.00	6.92***	29.21**	3.22-264.78
Differential paternal control		1.34	1.72	2.43	3.82	0.51-28.25
Narcissism		2.03	4.50	13.78***	7.60*	1.17-49.52
Affective instability		-0.66	0.39	11.86***	0.51	0.07-4.08
Impulsivity		1.13	1.31	3.44*	3.11	0.44-21.72
Past teasing history		2.80	8.71	11.86***	16.41**	2.55-105.31

Block 1 (Step1) : $\chi^2 = 35.70$, $df = 3$, $p = .0001$

Block 2 (Step2) : $\chi^2 = 27.76$, $df = 6$, $p = .0001$

Model : $\chi^2 = 63.46$, $df = 9$, $p = .00001$

Note. [a] An OR >1.0 indicates that a higher values of the predictor variables are associated with a greater risk of developing BN. [b] These ORs were calculated by entering each predictor variable separately in the model predicting the risk of developing BN.

[c] Relative ORs were calculated by taking into account the individual weight of each predictor variable in the model; CI=Confidence Interval; * $p<0.05$ **, $p<0.01$; ***$p<001$.

Table 23

Classification Table for the Final Logistic Regression Model Predicting the Risk of Developing BN Controlling for Depression, Anxiety, and Self-Harm

	Sisters	Bulimics	Total	%
Sisters	37	3	40	92.5%
Bulimics	5	35	40	87.5%
Total	40	40	80	90.0%

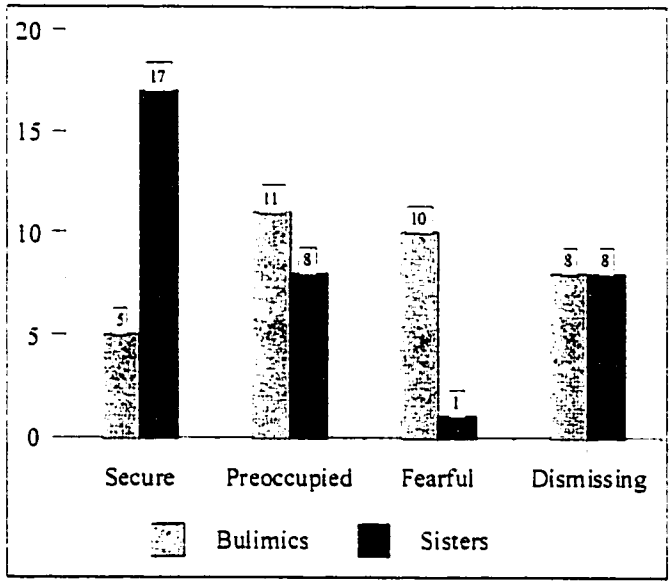

Figure 7. Attachment to Father χ^2 (9, N = 34) = 18.32, p < .01

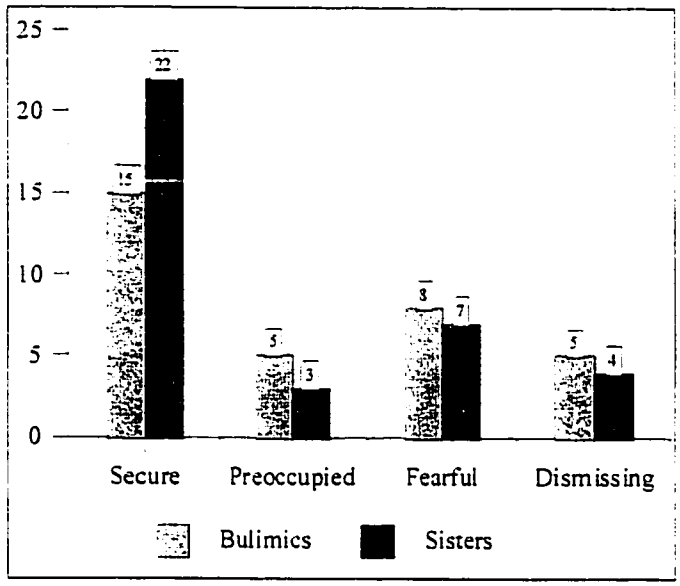

Figure 8. Attachment to Mother χ^2 (9, N = 36) = 5.80, p = ns

DISCUSSION

The present study was designed to examine the differential environments experienced by each sister in families of bulimics by identifying and assessing nonshared environmental features that may contribute to the development of BN. Specifically, Rowe and Plomin's (1981) conceptual framework, as well as an adaptation of a two-component model of risk factors thought to be involved in the development of BN (Garner et al., 1983; 1984; Connors, 1996), were employed to examine areas of sibling differential experience. In particular, differential parental treatment, quality of sibling interactions, extra-familial influences and experiences, developmental trauma and being teased about one's weight and physical appearance were examined. Special attention was also devoted to studying the influence of particular personality traits, namely impulsivity, affective instability and narcissism on the risk of developing BN: these dimensions have been identified as playing an important role in the etiology of this disorder. As outlined earlier, all of these areas were examined because there were very few leads as to which differential experiences were the most important sources of nonshared experiences in the etiology of BN. First, differences in perceived nonshared environment experiences between bulimic participants and their sisters will be discussed. Second, the implications of the model tested in the present study will be addressed. Third, limitations of the present investigation and suggestions for future research endeavours will be explored.

Nonshared Environmental Features

The perceptions of differential sibling experiences concerning differential parental treatment (i.e., affectionate and controlling behaviors), mother-daughter as well

as father-daughter attachment, the quality of the sibling relationship during childhood and adolescence (i.e., antagonism, caretaking, closeness, and jealousy), and the quality of adult sibling relationship (i.e., warmth, conflict, rivalry) were examined in bulimics and their sisters.

Differential parental treatment. Based on the research findings that underline that bulimics perceive their families as nonnurturing, conflictual, and enmeshed (Humphrey 1986; 1987; 1989), it was hypothesized that bulimics would be more likely than their sisters to perceive their parents as less affectionate and more controlling with them than with their sisters. However, contrary to the hypothesis, neither bulimics nor their sisters reported any differential treatment concerning either their mother's or father's display of affectionate behaviors while they were growing up. This finding was surprising because differential experiences of paternal affectionate behavior have been suggested to be an important source of nonshared environmental experience in bulimics. For example, Wonderlich et al. (1994) reported such individuals perceived their father as more hostilely enmeshed with them than toward their sibling when compared with psychiatric controls. Bulimics also perceived their fathers as nonnurturing, attacking, and neglectful (e.g., Humphrey, 1986). In fact, level of paternal care was the sole significant family environment variable predicting the risk of developing BN in the population-based study conducted by Kendler et al. (1995).

A few explanations can be advanced to explain the finding in the present study. First, the SIDE is a measure of social-affective differential experiences based on siblings' perceptions, offering no information about actual levels of affection displayed by the

father. Thus, bulimics and their sisters may have actually both experienced similarly few affectionate behaviors from their fathers. Another limitation of the SIDE is that it averages out differential experiences over many years while individuals were growing up. Thus, it is likely that crucial periods where actual differential parental treatment might have occurred were not detected with this measure. As outlined by Daniels and Plomin (1985b), this limitation makes it very difficult to investigate associations between developmental stages (i.e., adolescence, young adulthood) and sibling differential experiences. There was also very little variance on the SIDE as the scores endorsed by both bulimics and sisters indicated no perceptions of differential paternal treatment concerning affectionate behaviors, which may have contributed to the difficulty of identifying significant differences. It is noteworthy that the parental differential treatment scores in Daniels and Plomin's (1985b) initial study on the SIDE did not differ as much as sibling differential experiences. This suggests that parents may attempt to treat their children as equally as possible despite any existing differences in their children. Furthermore, parental treatment may be an experience that is more passively received than are other areas that allow siblings to differ more actively from each other (i.e., sibling and peer group interactions) (Scarr & McCartney, 1983).

Finally, the present study constitutes the first attempt to directly compare bulimics' perceptions of paternal caring and controlling behaviors to their sisters' perceptions. Therefore, it is possible that both bulimics and their sisters experienced the same level of affection from their fathers, but may have reacted differently to it because of nonshared genetic and environmental variables (e.g., temperament, coping

mechanisms, support from other family members). However, it is impossible to determine the impact of these features based on the present study's results. Future research is required to clarify the role of these genetic and environmental variables that may influence the way bulimics and their sisters respectively perceived and experienced their relationship with their father.

In addition, while bulimics perceived their mothers and fathers as having displayed equally controlling (disciplining) behaviors towards them than towards their sisters, the latter revealed significantly different perceptions of both maternal and paternal controlling behaviors. That is, bulimics reported perceiving their mother and father as engaging in equal disciplining with them and with their sisters. In contrast, the latter perceived their mother and father as being significantly more controlling (disciplining) towards them than towards their bulimic sister. Despite the fact that the retrospective nature of the SIDE does not allow inferences about the actual behavior of mothers and fathers, the simple perception of such differences may have been important in the development of the self-concept of the sisters (Hoffman, 1991). For example, Baker and Daniels (1990) found that paternal control was related to lower levels of depression and more positive well being. Similarly, Baumrind's (1967; 1991) research findings reveal that children of authoritative parents (i.e., high in demandingness and responsiveness) had children who were cognitively and socially competent. They were rated as having a happy mood, being self-confident in their mastery of new tasks, and self-controlled in their ability to engage in self-destructive acts. In the same vein, Denham, Renwick, and Holt (1991) found a positive association between authoritative parenting and emotional

and social skills during the preschool years. Furthermore, an association between authoritative parenting and high self-esteem, social and moral maturity has also been found during adolescence (Lamborn, Mounts, Steinberg, & Dornbusch, 1991; Steinberg, Lamborn, Darling, Mounts, & Dornbusch, 1994). Authoritative parents are characterized by making reasonable demands for maturity, and enforcing them by setting limits and expecting compliance. At the same time, they express warmth and affection to their children. These parents make demands that fit with their children's ability to take responsibility for their own behavior and constantly adapt to their children's growing competence. As a result, they reinforce in their children a sense of worth and competence, as well as high self-esteem, and also encourage mature and independent behaviors (Kuczynski, Kochanska, Radke-Yarroiw, & Girnius-Brown, 1987). Greater perceived controlling (disciplining) behaviors from parents toward one's sibling, may therefore have a considerable impact on the perception of self-worth and competence of a child, dimensions which have been shown to be impaired in bulimic individuals (Connors & Johnson, 1984; Johnson & Connors, 1987). Thus, parents in the present study may have adopted a somewhat more authoritative style with sisters than with bulimics, which may have impacted on the development of their self-worth and confidence. Clearly, this is a question for future study.

Attachment relationships. A finding in the present study which somewhat contrasts with the above results, concerns the attachment relationship developed by bulimics and their sisters with their parents. Contrary to what was expected, no significant differences were found between bulimics and sisters concerning their

attachment to their mothers: In general, both bulimics and their sisters were securely attached to the latter. However, as expected, bulimics endorsed significantly different attachment styles toward their fathers. Bulimics reported insecure attachment styles toward their fathers with a negative perception of the self (i.e., preoccupied and fearful), while sisters generally reported being securely attached to their fathers. This suggests that insecure attachment toward the father with a negative perception of the self may constitute a nonshared environmental factor that characterizes bulimic individuals.

The notion that maternal representations are more closely tied to personality development, dynamics, and risk for psychopathology than are the representations of the father is prevalent in the literature. However, present findings are in agreement with the literature suggesting that the father-daughter bond and affective relationship may constitute a risk for the development of BN (e.g., Kendler et al., 1995; Wonderlich et al., 1994). Moreover, there is a body of research suggesting that the father-child bond plays a significant role in the development of child and adolescent psychopathology (Phares & Compas, 1992; 1993). For example, paternal warmth has been found to be as important as maternal warmth in its advantageous effects on child psychosocial adjustment, achievement, and sex role development (Lamb, 1986). Fathers' sensitive caregiving, like that of mothers, has been found to predict secure attachment, an effect that seems to grow stronger as fathers spend more time with their children (Cox, Owen, Henderson, & Margand, 1992). In addition, low perceived parental care has been associated with a past history of depression (Duggan, Sham, Minne, Lee, & Murray, 1998) and borderline personality traits in bulimic patients (Wonderlich et al., 1994). In sum, insecure

attachment style toward fathers reported by bulimics may put them at risk for developing psychological and adjustment difficulties.

Furthermore, fathers have been identified as playing a crucial role in the separation-individuation processes of their children, which is central to development of their identity. Lamb (1975) emphasized the father's prime role in the link between the child and the outside world with the father often being conceptualized as the first representative of this world. In this sense, Zerbe (1995) underlined that BN is characterized by an inadequate paternal response, which fails to help the daughter develop a less symbiotic relationship with her mother. When she must separate on her own, she may take on the pathological coping strategies characteristic of eating disorders (i.e., binging, purging, restricting food intake). Zerbe (1995) also hypothesized that the father played an important role in his eating disordered daughter's life and identified the quality of the nurturance he provides for his daughter as being an important dimension. This suggests that the father may have a unique role in fostering and furthering autonomy in the child. Zerbe (1995) also underlined that the absence or unavailability of a father can have a profound impact on a woman's core feminine identity, social and sexual relationships. A woman may therefore feel less secure in her ability to compete with other woman, to be feminine, and to display age-appropriate interests in her appearance and body image. One of the greatest challenges for fathers is to convey to their daughters that their physical, emotional, and intellectual self is relished. Numerous studies have in fact shown over the past two decades that women who achieved the highest career attainments have had a multidimensional father-daughter relationship. For example,

greater participation of the father in his daughter's rearing has been associated with greater achievement levels and positive general adjustment, especially if he encourages performance and independence (Lamb, 1975). A father's appreciation of all aspects of his daughter may therefore keep her from turning to food and mastery over their weight and physical appearance for gratification and recognition.

In sum, as with other studies, a significant association was found between insecure attachment to the father and BN in the present study. Unfortunately, there have been very few attempts to empirically examine the specific mechanisms and dynamics by which fathers exert their influence on children and adolescents and put them at risk for subsequent maladjustment (Phares & Compas, 1993), and more specifically for BN. Future theoretically-driven research endeavours in this area are, therefore, required to clarify the nature of this association.

Sibling relationship. It was hypothesized that bulimics would perceive their sisters as more antagonistic and jealous, as well as less close and caring compared to themselves during childhood and adolescence. First, it was interesting that the dimensions characterizing the sibling relationship as rated by the bulimics and their sisters were significantly correlated, suggesting that both viewed their relationship in a similar manner. Contrary to what was expected, both bulimics and their sisters perceived each other as having been equally antagonistic, caring, and close. However, as outlined earlier, the SIDE does not offer any information about the actual levels of the dimensions of the quality of the sibling relationship. Therefore, no definite conclusions can be made about the actual quality of the sibling relationship, except that both bulimics and their sisters

perceived their relationship with each other in a similar fashion. The only significant difference concerned perceptions of jealousy; bulimics viewed themselves as having been significantly more jealous, while their sisters perceived equal levels of jealousy in their sibling relationship. This finding could be interpreted in light of the elevated levels of narcissism reported by bulimics (i.e., underlying feelings of vulnerability and low self-esteem), which have also been reported in other studies (Steiger, Stotland, Gadhirian & Whitehead, 1995; Steinberg & Shaw, 1997). Perhaps these interpersonal sensitivities may have rendered bulimics more sensitive to feelings of envy toward their sisters. Bulimics have been shown to be more self-critical following negative social interactions (Steiger, Gauvin, Jabalpurlawa, Seguin, & Stotland, 1999), therefore possibly showing hypersensitivity to interpersonal experiences, and a tendency to compare themselves to others in a critical manner.

The second hypothesis concerning the quality of the adult sibling relationship was that bulimics would experience their sibling relationship as more negative than their sisters, because their present psychological difficulties would make it more challenging to maintain positive relationships. Low levels of warmth, as well as high levels of conflict and rivalry were, therefore, expected to characterize the present sibling relationship of participants. This hypothesis was not supported in the present study. Moreover bulimics' and their sisters' perceptions were significantly correlated, indicating that they both viewed their relationship in a similar manner. These results corroborate the findings of Stocker et al. (1997) who reported that siblings' ratings on the ASRQ were significantly correlated. Interestingly, adult siblings in the present study endorsed similar perceptions

of warmth and conflict in their relationship as is often found among younger children (e.g., Furman, Jones, Burhmester, & Adler, 1989), but were less similar on their perceptions of rivalry. Rivalry may be a dimension of sibling relationships that is more covert than warmth and conflict, which are often apparent in an overt manner to both siblings. Therefore, rivalry for parental attention and affection may be, as suggested by Stocker et al. (1997), a sensitive subject that may be shared differently between siblings.

Additionally, both bulimics and their sisters perceived that there was a moderate degree of warmth and a low degree of conflict and rivalry in their present sibling relationship, indicating that they did not perceive their relationship negatively. In fact, their ratings of the quality of their sibling relationship on the ASRQ closely resembled the scores of normal college students on the same questionnaire (Stocker et al., 1997). This result was surprising because bulimics were expected to rate the quality of their sibling relationship as more negative in light of the psychological difficulties related to the eating disorder. Stocker et al. (1997) found that adults who reported higher scores on psychological functioning perceived lower levels of conflict in their sibling relationship than adults with lower mental health scores. This finding may be due to the fact that as adults, bulimics and their sisters limit the amount of contact they have with each other, thereby possibly limiting the amount of conflict in their relationship. This might be a question for future research.

In sum, the differential perception of the sibling relationship, whether during childhood, adolescence, or adulthood was not endorsed by bulimics as being a nonshared environmental experience: Both bulimics and sisters reported similar perceptions of their

sibling relationship. Furthermore, contrary to what was expected, they rated the quality of their adult sibling relationship in a similar manner. This finding suggests that each member of the sibling dyad in the present study did not provide a significantly different environment for each other. This may be due to the fact that unlike parental behavior, sibling interactions consistently show considerable shared environmental influences. Sibling relationships are more reciprocal than the parent-child relationship, which are by nature more complementary, perhaps leading siblings to treat each other similarly (Pike & Plomin, 1997). Consequently, despite the fact that marked dissimilarities have been found in sibling relationships (Dunn & Plomin, 1990ab), these relationships may vary more between than within families. It should also be highlighted that the present study focused exclusively on adults' perceptions of their sibling relationship. While it has been argued that perceptions are crucial features of sibling relationships, they do not, however, provide a complete picture of the quality of the relationship. Therefore, future research should include observations of adult bulimics interacting with their sisters in order to identify nonshared experiences. As underlined by Turkheimer and Waldron (2000), methodological differences have been reported in assessing nonshared environmental influences and direct observation methods are generally more sensitive in determining nonshared environment experiences than self-report measures.

Developmental trauma. The present study also examined how nonshared environmental experiences in the area of developmental trauma, namely childhood sexual and physical abuse may be associated with the development of BN. It was predicted that both bulimics and their sisters would experience similar developmental traumatic

experiences. This hypothesis was supported. In other words, both childhood sexual and physical abuse experiences constituted shared environmental features that were not specifically associated with the development of BN.

Both bulimics and sisters reported similar experiences of both sexual and physical abuse. Specifically, 45% of bulimics and 37.5% of sisters reported at least one experience of severe sexual abuse, while 52.5% of bulimics and 45% sisters reported at least one experience of severe physical abuse during their childhood. These rates are comparable to most studies on BN, which found between 30% and 50% of such traumatic experiences in bulimic individuals (e.g., Calam & Slade, 1989; Hall et al., 1989; Sloan & Leichner, 1986). As predicted, there were no significant differences between bulimics and sisters on the number of occurrences of severe sexual or physical abuse, the age of the first sexual or physical abuse, as well as the total duration of the sexual and physical abuse. Additionally, the number of severe occurrences was significantly correlated for sexual and physical abuse for both bulimics and their sisters. These findings suggest that the more bulimics were exposed to childhood trauma, the more their sisters also reported similar experiences. In addition, the age of first sexual and physical abuse experience appears to have been during prepubertal years for both bulimics and their sisters. This indicates that both sisters first experienced these traumatic events at similar periods during their development, possibly making the impact of such experiences even more similar. In general, these findings indicate that sexual and physical trauma before the age of 18 were shared environmental experiences for bulimics and their sisters. This finding is noteworthy because it also corroborates the literature indicating that sexual and

physical trauma are not risk factors specifically associated with the vulnerability of developing BN (see Pope & Hudson, 1992).

It is important to underline that while both sexual and physical abuse were found to be shared environmental factors experienced by both bulimics and their sisters, this finding should not be interpreted to mean that traumatic events may not have contributed to the development of BN. Many factors may, in fact, play an intervening role in the question of whether childhood abuse is a risk factor for BN, and whether or not it becomes a nonshared experience for bulimics and their sisters. According to Vanderlinden and Vandereycken (1996), important factors may include premorbid functioning, family dynamics, initial response to the trauma such as coping resources and parental reactions, the presence of triggering events later on in life, and personality development. In other words, the shared experience of having been subjected to childhood trauma may have interacted with other risk factors stemming from the genetic predispositions or environmental factors to which each participant in the present study has been exposed (e.g., personality dispositions, support from other caretakers).

As underlined above, other important factors to consider in this respect are the coping mechanisms evidenced by bulimics and their sisters after being exposed to sexual or physical trauma. Unfortunately, the present study did not assess how bulimics and their sisters specifically reacted to or coped with the traumatic experiences, and if they had a special and secure relationship with a significant caretaker that might have buffered them against the negative impact of these events. The literature suggests that the severity of the long-term effects of sexual abuse may be mediated by the support of the non-

abusive parent (e.g., Everson, Hunter, Runyon, Edelsohn, & Coulter, 1989). Therefore, it will be important in future studies to address this issue more specifically, because support from caretakers may be a source of nonshared experience. Given that sexual and physical abuse were not associated with a specific set of symptoms (e.g., Finkelhor, 1990), and that they invariably overlap with each other, as well as with other forms of abuse (Briere & Runtz, 1990), the long term effects of childhood trauma may be better understood in the context of the affective and attachment relationships concurrent with the abuse, as well as the coping mechanisms of each individual.

Additionally, future investigations should assess post-traumatic reactions in both bulimics and their sisters, with regards to the childhood trauma as some studies report a significant relationship between CSA, posttraumatic symptomatology, and eating pathology (Wonderlich et al., 1996; Dansky et al., 1997). Severe dieting and binging have been reported as reflecting attempts to manage emotional states associated with intrusive memories of CSA. In this context, we can speculate that those abused individuals who experience the most intense mood-dysregulation and anxiety associated with the childhood trauma experience, may be the most likely to exhibit distress-regulating behaviors, including binging and purging. This issue requires further investigation in order to be clarified.

Finally, another point to underline here is that while childhood sexual and physical abuse were studied separately, it is very difficult to distinguish the effects of one form of abuse from the other on the psychological well-being of the participants. Furthermore, the effects of these two forms of abuse are difficult to differentiate from

emotional abuse because they often coexist (Briere & Runtz, 1990). Unfortunately, emotional abuse was not specifically addressed in the present investigation. Therefore, future attempts to study the impact of abusive experiences during childhood should include a comprehensive examination of trauma experiences in bulimics and their sisters.

Eating-related experiences. As body image development may be influenced by experiences and feedback related to physical appearance and weight, it was hypothesized that bulimics would report significantly greater histories of having been teased about their shape and weight, as well as greater impact of these teasing experiences on their self-esteem. This prediction was confirmed. Furthermore, these perceptions and the impact of shape and weight teasing of bulimics and their sisters were not significantly associated, indicating that they may constitute perceived nonshared experiences unique to the bulimics. These findings corroborate the evidence suggesting that childhood teasing about appearance is associated with a negative body image and a tendency to develop an eating disorder (Fabian & Thompson, 1989). It may be therefore speculated that high degrees of shape and weight concerns may act as a trigger to the development of BN. Several elements may help to explain these findings.

First, the differences between bulimics and their sisters in developmental teasing experiences may be due to a genetic-environment correlation. That is, it may be that bulimics were heavier than their sisters during crucial years of development, thereby increasing the likelihood of being teased about their shape and weight. Numerous studies have shown that a high proportion of bulimics were overweight prior to the onset of their disorder, which suggests that they may have received negative feedback about their

appearance as children and adolescents (Ben-Tovim & Walker, 1992; Casper, 1992; Zakin, 1989). Although cultural factors by themselves cannot explain the development of a negative body-image in a person with an eating disorder, the cultural pressure to be thin and the negative feedback experienced when one is overweight may be predisposing factors for other difficulties. As normal eating/exercising patterns do not typically result in the desired body shape, many women may be engaging in disordered eating behaviors. Disordered eating attitudes and behaviors have been associated with poorer psychological health including lower self-esteem, and higher levels of depression and body dissatisfaction (Katzman & Wolchik; 1984; Mintz & Betz, 1988). Unfortunately, the present study did not include a measure of weight variations during participants' childhood and adolescence, which could have shed some light on the relationship between teasing history and weight in bulimics.

Following from this idea, several authors have underlined the importance of "social physique anxiety", which is defined as a subtype of social anxiety that occurs as a result of interpersonal evaluation involving one's physique (Heart, Leary, & Rejeski, 1989). This factor has been identified as playing a role in increasing concerns about body shape and weight (Crawford & Eklund, 1994) and was significantly associated with bulimic symptomatology and drive for thinness (Diehl, Johnson, Rogers, & Petrie, 1998). Thus, those with greater BMI may have experienced greater levels of teasing and social physique anxiety, stemming from the discrepancy between their own physical appearance and the societal norms. Individuals who either experienced greater levels of this discrepancy or who adopted these ideals may, therefore, be at greater risk of developing

body image dissatisfaction and disordered eating.

It may also be possible that bulimics, because of an underlying vulnerability to criticism and the importance they attribute to other's judgment in terms of their perceptions of themselves, may have been more sensitive to comments made about their shape and weight. However, in the present study, the results of the final regression model in which narcissism (which can be understood as a vulnerability to criticism and a need for approval and recognition from others) was entered, past history of developmental teasing experiences remained significant. This indicated that a vulnerability to be more sensitive to teasing experiences did not by itself explain the present findings. Additionally, because of the retrospective nature of the POTS, as well as because it covers a wide period of development (i.e., childhood and adolescence), it was impossible to determine crucial periods of vulnerability for the negative impact of teasing comments. Moreover, the POTS comprises general questions about teasing experiences, thus it was not possible to ascertain if teasing comments originating from different persons may have had a more powerful impact or not (e.g., family members versus peers; men versus women). As with other variables, present levels of depression and anxiety in bulimics may also have had an impact on perceptions of teasing during childhood and adolescence. However, the fact that this variable remained significant, even after the psychopathology dimensions were controlled for, indicates that perceptions of teasing during childhood and adolescence were not an artefact of present levels of depression and anxiety.

The higher levels of teasing-related experiences reported by bulimics may also be explained by the fact that these individuals may have attributed a greater importance to

their body appearance and weight than their sisters. Perhaps their sisters had a greater number of sources of validation, other than for their physical appearance or weight. It is important to note here that ideal shape and weight in Western societies are often associated with desirable personality characteristics and indicators of self-worth (Stice, 1994). It has been postulated that peers, family members and the media may be transmitters of these values; one channel of transmission may be through teasing. These socio-cultural ideals are thought in to interact with stable individual personality characteristics, such as perfectionism, asceticism, and affect regulation difficulties, possibly leading to the production of overvalued ideas about shape and weight (Vitousek, 1996). It has been hypothesized that when individuals place primacy on their body image, they have less energy for developing competence as a spouse, parent, friend, or professional. Additionally, this investment in the body may also mask a deeper fear of looking at the self (Zerbe, 1995). Such anxieties may, therefore, be diverted in the quest for a perfect body in a way that encapsulates the self in a protective shell that avoids personal development and interpersonal relationships.

Finally, it is important to emphasize that the retrospective nature of the POTS makes it difficult to evaluate the veracity of the participants' reports of childhood teasing. However, as outlined by Thompson, Cattarin, Powler, and Fisher (1995), there is strong evidence that this measure can provide important information concerning developmental precursors of adult eating disturbances. Only longitudinal data, can assess the differential impact of teasing for both bulimics and their sisters. Finally, future research should study a variety of childhood and adolescent experiences related to teasing that might affect the

development of body image disturbances and eating pathology. For example, the assessment of a comprehensive variety of verbal and nonverbal behaviors (e.g., direct comments, critical looks) within and outside families may clarify the association between past experiences related to teasing and the development of BN.

The second hypothesis concerning eating-related developmental experiences was that both bulimics and their sisters would have similar perceptions of their mothers' and fathers' dieting behavior. This hypothesis was verified. In addition, the perceptions of both participants were significantly associated, which indicates that perceptions of parental dieting behavior covaried within families. Additionally, sisters' perceptions of maternal dieting behavior were significantly associated with the bulimic's severity of eating pathology, whereas father's dieting behavior was not related to either participants' severity of eating pathology.

These findings indicate that mothers may serve as role models for their daughters in terms of appearance and dieting behaviors, possibly directly pressuring their daughters to conform themselves to the cultural ideals of thinness and attractiveness. Additionally, it is noteworthy that these same mothers did not appear to have a similar influence on the sisters, indicating that these shared environmental features may impact differently on bulimics and their sisters. Findings in the present study indicate that the latter may not share the same propensity to develop BN or they may also be protected by other nonshared environmental features (e.g., lower weight, fewer experiences with teasing). Furthermore, mothers may share for example the same risk of developing an eating disorder as their bulimic daughter. For instance, Pike and Rodin (1991) demonstrated that

mothers of eating disordered girls were concerned with dieting for a longer period of time and were more eating-disordered themselves than mothers of normal controls, indicating that they may share with their daughters a similar propensity to develop eating pathology. This explanation, however, requires future investigation

Furthermore, it may also be that the eating pathology present in the mothers influences whether or not their daughters manifest their emotional and psychological conflict through eating. To the extent that behavioral manifestations of eating pathology constitute an attempt to manage anxiety and dysphoria (Cattanach & Rodin, 1989; Katzman & Wolchik, 1984), mothers may have an impact on their bulimic daughter by modeling these types of coping behaviors. Therefore, bulimics may be pressured into dieting by modeling their mother's behavior and by also reacting to possible criticisms about their weight and body appearance. It was noteworthy that fathers' dieting behavior in the present study was not related to the bulimics' eating pathology. Although rarely investigated, contradictory findings have been reported for the role of fathers in the development of disordered eating and body image problems (e.g., Moreno & Thelen, 1993; Striegel-Moore & Kearny-Cooke, 1994). Different factors in fathers compared with mothers have been found to impact on daughters' weight pathology. For example, paternal weight satisfaction and comments about daughters' weight were found to have an impact on daughters' weight satisfaction (Keel, Hethearton, Hardnen, & Hornig, 1997). Overall, results suggest as in the present study, that mother's dieting may have a more direct influence on daughters' eating disordered behavior than fathers's dieting.

It would be useful for future studies to gather more precise information about

family members' weight history and coping mechanisms during key developmental periods (e.g., puberty) to better assess the impact of these variables on the risk of developing BN. In addition, it would also be helpful to assess differential attitudes concerning shape, weight, and dieting that both mothers and fathers have toward their daughters. Identifying key protective factors against both these critical comments and the impact of parental dieting behavior also becomes important in this context.

Personality traits. Based on the behavior-genetic finding emphasizing the importance of nonshared environment in the development of personality (Dunn & Plomin, 1990a; Pike & Plomin, 1996), bulimics were predicted to endorse significantly higher levels of impulsivity, affective instability (i.e., labile and overreactive affects), and narcissism (i.e., need for attention, approval and admiration; sensitivity to criticism) compared with their sisters. This hypothesis was confirmed and corroborates existing findings (e.g., Steiger et al., 1995). In addition, these personality traits of sisters were not significantly associated, indicating that these personality dimensions do not covary in families of bulimics. These results can be interpreted in several ways and may have different implications.

First, the significant differences between bulimics and sisters in levels of impulsivity and affective instability may be due to the fact that 50% of their genetic background is different. Following from this point, the observed differences may be due to genetic-environment interactions. For example, an individual who has a propensity to be impulsive or affectively labile may elicit specific types of parental reactions such as lower frequency of disciplining behaviors. This may reflect a dynamic by which parents

of bulimics may respond to extreme forms of temperamental expressions with fewer limiting and structuring behaviors, a process that will in turn shape the personality of their daughters. This process may reflect the parental underinvolvement hypothesized by Johnson and Connors (1987) to characterize families of bulimics. However, these parental reactions may not be directed to both sisters, which suggests that parents may react differently to each child's personality.

Second, impulsivity, affective instability, and narcissism could have been influenced by levels of depression and anxiety in bulimics. Partially supporting this interpretation, is the finding in the final regression model that impulsivity and affective instability were nonsignificant when levels of depression, anxiety and self-harm were controlled for. These results corroborate other findings showing that patterns of impulsivity are characteristic of bulimic women during the acute phase of their illness (Casper, Hedeker, McClough, 1992; Lehoux et al., 2000). These personality features may, therefore, be state-dependent, and related more to the bulimic clinical state.

Additionally, because impulsivity and affective instability were assessed using self-report questionnaires, these features may overlap with symptoms of comorbid disorders such as affective or impulse-control disorders that were not necessarily excluded from their definition. Rather than being intrinsically linked to BN per se, impulsivity and affective instability may also be related to the fact that bulimic women who seek treatment are more likely to have greater pathology than those who do not seek treatment (Berkson's bias: Berkson, 1946). Therefore, it may be important in future research endeavours to clarify this issue. Furthermore, the timing of the onset of

impulsivity and affective instability and other comorbid disorders associated with impulse-control problems may be critical. In this respect, the relationship between impulsivity, affective instability and BN must be further clarified before arguing that a failure of impulse control and affective regulation are fundamental processes underlying BN.

Although high levels of impulsivity and affective instability may be in part accounted for by levels of depression and anxiety, differences in narcissism could not be explained by the presence of greater depressive or anxiety symptoms. This suggests that narcissism constitutes an important dimension that significantly differentiates bulimics from their sisters. Furthermore, narcissism remained a significant risk factor even when past history of teasing about shape and weight, was kept in the analysis. Again, these findings indicate that this personality dimension may have a unique and important role in the development of BN. This result is in line with other findings suggesting that narcissism may constitute a risk factor, differentiating bulimics from controls (Lehoux et al., 2000), and with other research linking binge eating with self-disturbances such as narcissism (Johnson, 1991; Johnson & Connors, 1987). Perhaps bulimics attempt to inflate their self-esteem by pursuing weight and shape ideals, which may be perceived as easier to master than their own feelings of emptiness, worthlessness, interpersonal challenges and responsibilities posed by adult life. They may be characterized by a false self-organization such as described by Johnson (1991), which is associated with feelings of nonexistence, ineffectiveness and fraudulence, and self-regulation of tension states by investing in food. The body may, therefore, be perceived as an important source of self-

esteem for these individuals.

It is important to consider, however, the cross-sectional nature of the data, which limits the conclusions about causality. Although there is strong evidence that personality features predate the onset of BN (e.g., Brewerton et al., 1995), it is also known that several psychological disturbances including increases in depression, anxiety, and obsessionality, occur as a consequence of starvation (see Keys, 1950). Furthermore, as suggested earlier, self-esteem may be lowered by the perceived failure to achieve one's own ideal body image (Connors, Johnson, & Stuckey, 1984). Comparing recovered bulimics and their siblings may be a way to sidestep the distorting effects that ongoing illness may have on the psychological state of the bulimic participants.

Now that the factors differentiating bulimics from their sisters have been identified and discussed, let us turn to the two-component model that will be used to integrate these perceived nonshared environment factors and personality traits into a synthesized understanding of the etiology of BN.

An Integrated Two-Component Model of BN: Perceived Nonshared Environment Influences and Specific and Nonspefic Risk Factors

The findings described in the present study are important because they represent one of the first attempts to assess perceived nonshared environment features in both bulimics and their sisters. It is, in fact, the first study to include sisters of bulimic individuals and to compare them on several risk factors that have been identified in the literature as increasing the risk of developing BN. Specifically, the aim of this study was to further elucidate which nonshared environmental risk factors, specific or non-specific

to the development of BN, differentiate bulimics from their sisters. Rowe and Plomin's (1981) conceptual framework was used to study those systematic nonshared influences that make two siblings in a same family different from each other (i.e., parental treatment, sibling interactions, extra-familial network influences, and experiences that are likely to be specific to one individual in the family). Additionally, a two-component model of the etiology of eating disorders (Garner et al., 1983; 1984; Connors, 1996) was employed as described in Figure 2. In the group of factors associated with body-image dissatisfaction, the present study identified shape and weight-related teasing during childhood and adolescence as being a specific factor that differentiated bulimics from their sisters. Similarly, in the group of factors that have been suggested to predispose to general psychopathology, insecure attachment to father (with a negative model of the self), as well as narcissism, significantly differentiated bulimics from their sisters. It is important to note that both of these lines of development (i.e., risk factors predisposing to body image pathology and dieting as well as risk factors predisposing to general psychopathology) are considered necessary for the development of BN (e.g., Connors, 1996; Johnson & Connors, 1987; Garner et al., 1983; 1984). These perceived nonshared risk factors may be hypothesized to act as predisposing agents in the development of BN.

Specifically, in the present study, bulimics reported being exposed to higher levels of teasing experiences, compared to their sisters, which may have put them at higher risk for body dissatisfaction and increased their propensity to diet. It is noteworthy that the relative odds ratio for this risk factor was 16.41, indicating that high levels of this dimension significantly increased the risk of body image problems. Similarly, bulimic

participants also reported an insecure attachment style with their father, as well as high levels of narcissism; both are non-specific perceived nonshared risk factors that have been linked to an increased risk of developing general psychiatric problems. Relative odds ratios for these two factors were 29.21 and 7.60 respectively, indicating that exposure to these dimensions during childhood and adolescence may increase the risk of developing general psychopathology. Therefore, it is probable that the combination of these two sets of specific and non-specific nonshared risk factors may substantially increase the risk of developing BN. The model, which accurately classified 90% of the present study's participants, remained relatively stable after controlling for variables related to the bulimic clinical state (i.e., depression, anxiety, self-harm). Significant associations remained between the bulimic status and the three nonshared environmental factors described above (i.e., insecure paternal attachment. narcissism, past teasing history), with estimates of the relative odds ratios generally similar (e.g., history of shape and weight teasing) or higher (e.g., paternal attachment style) than the corresponding nonadjusted odds ratios. These differences in odds ratios may be due to the fact that several predictor variables were significantly correlated with each other, and that specific dimensions may have played the role of moderator in these associations. For example, the fact that such variables as affective instability and impulsivity were characterized by odds ratios of respectively of 11.86 and 3.44 when taken individually, but non-significant when analyzed in the final model indicates that their contribution to the risk of developing BN is inferior to other variables (i.e., narcissism) and that they were very sensitive to inter-correlations between predictor variables such as with depression for

example.

Clearly, these findings have implications for the understanding of the etiology of BN. They first raise several questions concerning the identification of individuals who are likely to be at greater risk for clinical BN. Among others (e.g., Fairburn et al., 1997), Garner and his colleagues posed that question at the beginning of the 1980's and proposed a two-component theory of the etiology of eating disorders (Garner et al., 1983; 1984); specifically that the co-existence of some general psychopathology and pathological concerns about body image and weight is of crucial importance. According to this model, the group from which the most vulnerable of the present study's participants (i.e., the bulimics) should come from, are the ones that show significantly greater history of having been teased about their shape and weight, which may significantly increase the risk for body image pathology and dieting. This feature, in combination with narcissistic pathology and insecure paternal attachment, may, therefore, tip the balance toward BN. It is interesting to note that both these non-specific nonshared environmental features may sensitize vulnerable individuals to shape and weight concerns and dieting behaviors. That is, individuals with high levels of narcissism may be more prone to turn to weight and shape control behaviors in order to inflate their vulnerable self-esteem (Johnson, 1991). Additionally, individuals with insecure attachment toward their fathers may have experienced difficulties with regards to the validation of their femininity and their self-identity. As outlined earlier, fathers have been suggested as playing an important role with regards to the development of these features in women.

It is possible that other shared perceived environmental factors (e.g., being exposed to sexual and physical trauma) may also act to increase the risk of developing BN, particularly in their interactions with the above-mentioned nonshared risk factors. For example, having been sexually and physically abused may increase concerns about body appearance and need for control and mastery, possibly making the individual more sensitive to perceptions of teasing about their shape and weight. Following from this, it may be these individuals will resort to dieting and weight control behaviors. However, given the sample size of the present study, it was not possible to test this hypothesis.

Additionally, for individuals at risk for BN, because of their constitution and exposure to environmental risk factors, it may be interesting to think about features which may act as buffers against the development of this eating disorder. In other words, an investigation of protective factors, which may have buffered sisters against developing BN, becomes pertinent. For example, a propensity toward slenderness has been suggested to be one of the most important protective factors (Striegel-Moore, 1993), and may therefore have acted as a protective agent against body dissatisfaction in sisters. Fairburn et al. (1997) found that early menarche was a significant risk factor associated with BN, possibly making it difficult for these individuals to accept the increase of body fat that often appears during that developmental period. Therefore, it may be possible that the risk for body dissatisfaction decreases with more pronounced thinness. Striegel-Moore (1993) found that being underweight appeared to be a mediating factor against body image dissatisfaction and dieting behavior. For example, having a slender socially validated body may reduce the risk of being criticized about weight and appearance and,

therefore, reduce the use of dieting in response to being teased about such issues. Although these individuals may not be protected against psychopathology in general, they may be less likely to develop BN. This is a question that should be investigated in future research studies.

On the other hand, narcissistic vulnerabilities, insecure attachment relationships, and difficulty managing affect may be difficult for many young women. Body dissatisfaction paired with narcissistic vulnerabilities may be associated with more intense restrictive behaviors than those exhibited by healthier individuals. The pursuit of thinness as a strategy to manage insecure paternal attachment relationships, criticisms from peers about one's own shape and weight, may be sought by women who base their self-esteem primarily on their appearance. In addition to the risk of developing binge eating, which is promoted by dieting, these individuals may also be searching for self-regulation and self-soothing strategies (Connors, 1996). Thus, the binging and purging characteristics of BN may provide them with a way to escape painful affects such as suggested by Heartherton and Baumeister (1991). Additionally, as underlined by Connors (1996), these behaviors distance such individuals from interpersonal relationships, which may have been experienced as negative and threatening. In sum, the results of the present study suggest that developmental shape-and weight-teasing experiences, which may promote body dissatisfaction and dieting behaviors, paired with narcissistic vulnerabilities and insecure paternal attachment, may be important perceived nonshared environment risk factors for the development of BN.

Limitations of the Present Study and Future Directions

It is important to acknowledge that the conclusions to be drawn from the present study are necessarily limited by several points. The findings confirm that there are nonshared risk factors (specific and nonspecific) that significantly differentiate bulimics from their sisters, and that may play an important role for the etiology of BN. However, how these risk factors operate is not clear. The present study needs to be replicated first with a psychiatric control group (including patients with affective and anxiety disorders) and their sisters, to differentiate which factors are specific to the etiology of BN from factors associated with psychiatric disorders or other eating disorders (i.e., anorexia nervosa, binge eating disorder, subclinical eating-disorders). Secondly twin data and siblings with different degrees of relatedness will help control for the genetic component of the variance, which may possibly explain some of the differences found in the present study.

Accordingly, because of the fact that twins (raised together and apart) were not assessed, it was impossible to disentangle the contribution of specific genetic factors from the experience of nonshared environmental factors per se. Put in other words, all of the shared and nonshared environmental factors identified in the present study may actually be in fact interactions or correlations between genetic and shared or nonshared environmental experiences, and as underlined by Plomin and Bergeman (1991), genetic differences between siblings are easily confounded with environmental differences. Only a genetic design can determine whether differences in sibling experiences are nonshared experiences rather than a reflection of nonshared genes (or an interaction between both)

(Turkheimer & Waldron, 2000). The findings of the present investigation, therefore, need to be interpreted with caution. As Rutter et al. (1997) emphasized, any researchers that ignore the genetic effects do so at their peril; but any researchers that ignore environmental differences also do so at their peril.

There is also a great need for prospective longitudinal studies, which may be further able to elucidate the causal processes that are likely to be involved in the development of BN. In particular, it is impossible to determine with any certainty the causal direction between the nonshared family variables, developmental experiences, eating-related experiences, personality factors and the development of BN. Despite general agreement that early experiences play an important role in the development of adult psychopathology, there is widespread scepticism about the validity of research participants' reports of childhood/adolescent experiences. As with all cross-sectional research, this study cannot disentangle cause and effect. That is, it is unclear whether for example differential parental treatment and attachment lead to the risk of developing BN, or whether the clinical state associated with BN leads to more insecure paternal attachment, or whether other factors lead to perceptions of family environment and BN simultaneously. The differentiation between these explanations becomes very difficult without longitudinal data.

Another advantage of longitudinal studies would be to recruit incident cases, whereas in the present study, the cases were already well established, possibly leading to biases introduced by the fact that the interviewer was not blind to the case status of the participants. Psychiatric symptoms should also be assessed more thoroughly with a

structured clinical interview because, in the present study, comorbid psychiatric diagnoses were not specifically evaluated. Additionally, these research endeavours would allow for an examination of the premorbid features of BN, with minimal confounds from prodromal symptoms (Leung, Geller, & Katzman, 1996).

A change of approach would also be refreshing in formulating the identification of risk factors to the study of risk mechanisms. As outlined by Ramey, Yeates, and MacPhee (1984), risk is fundamentally a "prediction" in want of an "explanation". Future studies on the role of nonshared environmental factors in the etiology of BN should therefore (a) be centred on the validation and the predictive validity of nonshared environment risk factors, and (b) employ sophisticated multivariate designs to adequately address the causal processes among nonshared environment features, moderator variables, and outcomes, in bulimics and their sisters. Investigations utilizing such designs would allow for the development of a better understanding of the complex interplay between shared and nonshared (specific or nonspecific) risk factors involved in the development of BN. As well, they may provide important avenues for the development of preventive efforts.

Furthermore, because bulimics and sisters in the present study may have been born at different points in the life cycle of the family, and because they are different in age at particular points, have different temperaments and physical appearance, both their objective and subjective environments may have been different. Following from this point, the participants may have interpreted events differently (e.g., being teased about their shape and weight; sexual or physical trauma). The same event (e.g., divorce) can be

interpreted and experienced differently, producing a different emotional response and self-attribution, and can have a different impact on personality development. For example, divorce may make a mother more like a peer for a teenager and an inconsistent disciplinarian to a preschool child (Hetherington & Camara, 1984). This approach views individuals as constantly coding and interpreting their environment and contrasting themselves to others; such an approach should be taken into consideration when interpreting the findings of the present study.

Additionally, perinatal or developmental events (e.g., birth complications, late development milestones, childhood illnesses) as well as stressful life events such as divorce, accidents, and the unemployment of parents were not assessed and could have impacted on the perception of nonshared environment in childhood and adolescence. These issues were not specifically addressed in the present study. for example examining if bulimics had more adverse life experiences and less social support from peers compared with their sisters; such questions clearly warrant further investigation. In addition, the family environment of an individual is not a global variable; rather it is multidimensional, and the effects on personality outcomes depend on combinations of variables, some of which may be objectively the same for sisters, some of which may be different. Furthermore, experiences outside of the family may also contribute to personality development, in an interactive fashion, and personality is not set in childhood and can be affected by subsequent life experiences (Hoffman, 1991) such as developing a secure relationship with a spouse, having a supportive peer support network, or being confronted with positive or negative life events in adult life, which may all impact on the

propensity of an individual to develop BN.

It should also be underlined here that as both perceptions of environment and mood were ascertained vis-à-vis bulimics' and their sisters' self-report, it is possible that participants' mood might have influenced their perceptions of their environment. These dimensions should also be assessed through structured clinical interviews in the future. However, because depression and anxiety were controlled for in the final regression model, we can assume that their effects on perceptions of nonshared environment were taken into consideration.

Although autobiographical memory is flawed to a certain extent, the evidence supports the view that adults asked to recall salient factual details of their own childhoods are generally accurate, especially concerning experiences that fulfil the criteria of having been "unique, consequential and unexpected" (Brewin, Andrews, & Gotlib, 1993). Specifically, there has been concern that depression may lead to selective recall of negative experiences and an exaggeration or misrepresentation of the presence of childhood adversity. However, based on their review, Brewin et al. (1993) concluded that it was not the case and that patients' memories are in as much agreement with external criteria as are controls, whether the criteria are siblings' memories or independent records. These authors suggest that the use of other informants to validate the reports as well as the use of semi-structured interviews, both employed in the present study, helps enhance the reliability of adult reports of past experiences. These authors emphasize that sibling reports are probably the most valid compared to other family members.

Furthermore, it becomes crucial in future studies to include multiple informants

and multiple forms of assessment (self-report and observational) so that both the objective and subjective nature of nonshared environments can be identified. Some studies have found disagreement among siblings and parents in terms of their perceptions of differential treatment (e.g., Dunn & McGuire, 1994; Reiss et al., 1994), which underlines the fact that these perceptions can differ within families. Despite the fact that both perceptions and actual behavior may be as equally important in the development of psychopathology (Dunn & McGuire, 1994), it is important to identify which nonshared environmental feature is specifically being examined.

Finally, much of the research linking parent-child relationships to children's adjustment has been phenotypic in nature, and results are often interpreted to mean that parents' behavior (e.g., differential parenting) causes their child's behavior (e.g., development of psychopathology). However, the behavior-genetic findings tend in general to suggest that the association are not uniquely driven by parents' behaviors. Instead, it appears that the child's personality features may also be reflected in both the parents' behaviors and his/her adjustment. In terms of process, it is probable that the child's genetic propensities interacting with his/her environment are associated with displays of negative parenting. This idea is consistent with the notion that socialization is a bidirectional process. That is, when parents interact with their children, these interactions are affected by both children and the parents (Bell, 1968; Parke & Buriel, 1998). In the present context, impulsive and affectively labile children with self-soothing deficits, which are characteristics that significantly differentiated bulimics from their sisters, may also elicit different responses from the parents than children with easier

temperaments.

Concluding Comments

Despite the above-mentioned limitations, the present study constitutes one of the first efforts to investigate possible sources of nonshared environment experiences that may play a role in the etiology of BN. In fact, it is the first study in the domain of BN designed to take into account sisters' reports of nonshared environmental features, therefore assessing "true" perceived within-family differences.

The present investigation's findings have several clinical implications. First, the identification of past teasing experiences about shape and weight issues as key factors that significantly differentiated bulimics from their sisters, may indicate the need to develop prevention programs aimed at making prepubertal children and adolescents more conscious of societal pressures to conform to an ideal of thinness. Such programs should offer these individuals the skills to counter environmental influences that promote dieting and overconcern with weight and body shape and that may increase the risk of developing eating pathology. Therefore, it may be useful to develop preventive programs aimed at helping adolescents acquire healthy physical activity regimens and weight regulation strategies in the place of dieting. In addition, these efforts could also be centred on offering social skills training to pre-pubertal children and adolescents with a special emphasis on reducing weight concerns and accepting differences in terms of body appearance and personality features. Future research should also consider the inclusion of family members in these preventive efforts. There is great interest in the influence of the family context in the etiology and course of BN because family members provide the first

context for the modelling, adoption and reinforcement of general forms of behaviors, as well as for the development of specific attitudes, values and expectations regarding food, eating, and the importance of physical appearance and weight.

Another clinical implication of the present study concerns the treatment of bulimic individuals. The identification of insecure paternal attachment and narcissistic vulnerabilities as being important non-specific nonshared environmental factors emphasize the need for a thorough assessment of those specific features in the treatment of these individuals. Therefore, specific attention should be paid to the bulimic's attachment to her father, during the course of assessment and therapy. Fathers have often been excluded in such treatment attempts, as they frequently are less available than mothers for inclusion in clinical interventions (Phares & Compas, 1992). Thus, it may be beneficial for bulimics to include their fathers in family therapy if they are adolescents. If they are older, bulimics should address the paternal relationship during the treatment process. Working models of relationship with the father begin to form early in life, and persist in influencing feelings of security and latter patterns of behavior (Weiss, 1994), and may then affect in a pervasive manner, the development and establishment of future secure relationships (romantic or friendships) with other individuals. A foundation of secure attachment fosters the confidence to move out, separate from the family of origin, develop a strong and stable identity as an adult, explore the world, and also to seek out and rely on others for comfort and relief when needed. As these abilities are often impaired and may be partly related to insecure paternal attachment in bulimics, it is suggested that they should constitute an important focus of the treatment of those

individuals.

In conclusion, the present study investigated the contribution of perceived nonshared environmental factors and personality traits in the etiology of BN. The results first suggest that bulimics and their sisters reported different perceptions of their environments. More specifically, bulimics reported being more insecurely attached to their fathers compared to their sisters, greater levels of past teasing experiences about their shape and weight, as well as significantly greater levels of impulsivity, affective instability and narcissism. However, differential parental treatment, the quality of the sibling relationship, childhood trauma, and perceptions of parental dieting behaviors were identified as being shared perceived environmental factors by both bulimics and theirs sisters. In terms of an etiological perspective on the understanding of BN, both specific nonshared risk factors (i.e., perceptions of weight and shape-related teasing during childhood and adolescence), and nonspecific nonshared risk factors (i.e., narcissism and insecure paternal attachment) significantly distinguished bulimic participants from their sisters, above and beyond the contribution of the features associated with the bulimic clinical state (i.e., depression and anxiety), and are possibly involved in the development of BN. The findings of the present study partly corroborate Garner et al.'s (1983, 1984) two-component model of eating disorders, which states that two different types of risk factors (i.e., specific and non-specific) are necessary to develop BN.

Despite the fact that the present study was cross-sectional, and therefore has limitations that pertain to this type of design (e.g., recall biases), it constitutes a fundamental first step at identifying nonshared environmental features that may play an

important role in the etiology of BN and it can be seen as a good approximation of longitudinal designs, which are very costly to develop and implement. These perceived nonshared environmental factors, which have been conceptualised as explaining why siblings in a same family are different rather than similar to each other (Dunn & Plomin, 1990a), may therefore help to explain why two sisters growing up in a same family can differ in terms of development of BN. The types of environmental influences that were assessed in the present investigation differ radically from those traditionally examined: Common or shared factors have been up to now the focus of most studies in the field of eating disorders.

These results underscore the need for future research aimed at further identifying and clarifying the role of perceived nonshared environmental factors and personality traits in the etiology of BN in order to identify both resiliency and risk factors that may play an important role in the development of this eating disorder. Because of the apparent predictive power of differential perceptions of nonshared environmental factors (i.e., past history of weight and shape teasing, insecure paternal attachment) and personality traits (i.e., narcissism), research is needed to identify the role that families, social influences, life experiences as well as constitutional factors play in helping individuals becoming resilient to these factors, and therefore increase their capacity to overcome their vulnerability to develop BN. These questions need, without doubt, to be more thoroughly addressed in future research efforts and will be of great pertinence for the understanding of the etiology of BN, as well as for the elaboration of comprehensive and efficient preventive and treatment plans.

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was found to be .88 for the weight-related teasing scale and .75 for the competency teasing (Thompson et al., 1995). Test-retest reliability for the four scales was found to be adequate and ranged from .66 to .90. Furthermore, the measure shows adequate construct validity and correlates highly with other measures of body dissatisfaction, such as the Eating Disorders Inventory (EDI; Garner, Olmstead, & Polivy, 1983), body dissatisfaction, drive for thinness, and bulimia subscales, the Rosenberg Self-Esteem Scale (Rosenberg, 1965) as well as with the Physical Appearance State and Trait Anxiety Scale (Reed, Thompson, Brannick, & Sacco, 1991).

A few items were added to the POTS in the present study in order to assess more comprehensively the participants' shape and weight-related teasing history (e.g., "people stared at you when you went out in public", "someone suggested that you should go on a diet", "someone suggested that you should do more exercise"). An item analysis (Cronbach alpha) was performed in order to assess the internal consistency of the new weight-related teasing subscales separately for both bulimic participants and their siblings. Only the items that were significantly correlated with the total weight teasing frequency and weight teasing effect were kept for the final analyses. The final internal consistency coefficients for the two scales in the present study for both bulimic participants and their sisters were respectively .88 and .92 for the weight frequency subscale and .85 and .87 for the weight effect subscale. Only the weight-teasing frequency and the weight-teasing effect subscales were used in the present investigation.

General psychopathology. The following measures were used to assess general pathology levels in bulimic participants and their siblings.

(1) Depression. Self-report of depressive symptomatology was assessed using the

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Appendix A

Consent Forms

Information and Consent Form (Proband)

The Research Project:

The Role of Nonshared Environmental Factors and Personality Traits in the Etiology of Bulimia Nervosa

is being conducted by Pascale M. Lehoux, Dr. Howard Steiger, Dr. Nina Howe, and Dr. Philippe Lageix at the Eating Disorders Unit of the Douglas Hospital. It explores the relationship between personal characteristics, life experience and bulimia nervosa. The present study may contribute to our understanding of bulimia nervosa. This study will involve the participation of individuals with bulimia nervosa and a comparison group with other problems and their siblings. Participation in this study involves one testing session of approximately 3 hours consisting of interviews and self-report questionnaires. Parents will also be asked to participate to the present study.

Participation in the present study is not likely to be of direct benefit to you. However, we are hoping that it will contribute to the understanding of eating disorders and can be of help for future individuals who will seek treatment for these problems. If you are presently in treatment, you may request that results of psychological assessments performed as part of this study be given to your primary therapist, so that he/she will be informed of results obtained. Otherwise, results of assessments conducted in the present study will remain strictly confidential, unless otherwise required by law.

The present study will include a wide range of interviews and tests. We are interested in your eating behaviors and attitudes, your moods and personality characteristics (e.g., anxiety), your current and childhood experiences with family and friends, and difficult life experiences (e.g., death, separation). A pre-screening is required to determine eligibility for this study (as we are interested in comparing people who show differences on specific psychological tendencies). The pre-screening eligibility involves a one-hour interview. Eligibility for the study will be based on results of the interview just-described. If you are not eligible for the study, no monetary compensation will be awarded. However, if you are to complete the remaining of the study, there will be an additionnel step. The testing session will involve a clinical interview conducted by one of the researchers, and several paper and pencil questionnaires. Responses to questionnaires remain at all times strictly confidential, and are recorded on sheets with code numbers, without your name, thus ensuring anonymity. Records will be kept at all times in locked filing cabinets. Your name will never appear on any record of your responses to the different questionnaires, and nor on any public presentation of group results.

We will be happy to answer any questions that you may wish to ask about the present study, in order for you to have all information you need to decide whether or not to participate. Your participation is completely voluntary, and if you decline, this will have no influence upon your subsequent treatment . Furthermore, if you decide to participate,

you remain free to withdraw from this study at any time. To compensate you for your time and any travel costs, we are able to offer you a 10$ compensation.
If you have further questions or comments on this study, or on any of the procedures involved, please do not hesitate to contact Pascale M. Lehoux, M.A. (principal investigator) at 761-6131 (22895) at any time. If you feel that participation in this study has violated any of your rights, you are encouraged to bring your concerns to the Principal Investigator or to contact the Hospital Ombudsman, at (514) 761-6131 (22255).

Consent: I have read the previously described information, and I fully understand the purpose and goals of this study as well as what it entails. With this understanding, I voluntarily consent to participate in the present study. I understand that if my sibling agrees to participate, she will be asked to answer the same questions as I have. Therefore, I also give consent for my closest in age female sibling named _____ (phone number: home: _____ work: _____) to be approached in order to participate in the present study. I understand that if my parents agree to participate, they will be asked to fill out exactly the same questionnaires as I will. Therefore, I also give consent for my mother named (Phone number: _____) and my father named _____ (Phone number: _____) to be approached in order to participate in the present study. I also understand that I remain absolutely free to withdraw from the study at any time.

Name: _____
(please print)

Signed: _____

Address: _____
_____
_____

Date: _____

Witness: _____

Information and Consent Form (Sibling)

The Research Project:

The Role of Nonshared Environmental Factors and Personality Traits in the Etiology of Bulimia Nervosa

is being conducted by Pascale M. Lehoux, Dr. Howard Steiger, Dr. Nina Howe, and Dr. Philippe Lageix at the Eating Disorders Unit of the Douglas Hospital. It explores the relationship between personal characteristics, life experience and bulimia nervosa. The present study may contribute to the advancement of the understanding of the processes involved in bulimia nervosa. This study will involve the participation of individuals suffering from bulimia nervosa and a comparison group suffering from other mental illness and their siblings as well as their parents. Participation in this study involves one testing session of approximately 3 hours consisting of semi-structured interviews and self-report questionnaires.

Participation in the present study is not likely to be of direct benefit to you. However, we are hoping that it will contribute to the understanding of eating disorders and can be of help for future individuals who will seek treatment for these problems. Results of assessments conducted in the present study will remain strictly confidential, unless otherwise required by law.

The present study will involve a comprehensive assessment of various eating behaviors and attitudes, psychological and behavioral traits, mood states, and life experiences. The testing session will involve a clinical interview conducted by one of the researchers, and several paper and pencil questionnaires. You will be requested to answer questions assessing your familial and social relationships, developmental experiences, traumatic experiences, psychological characteristics, and eating-related concerns. Responses to questionnaires remain at all times strictly confidential, and are recorded on sheets with code numbers, without your name, thus ensuring anonymity. Records will be kept at all times in locked filing cabinets. Your name will never appear on any record of your responses to the different questionnaires, and nor on any public presentation of group results.

We will be more than happy to answer any questions that you may wish to ask about the present study and its procedure, in order for you to have all information you need to decide whether or not to participate. Your participation is completely voluntary, and if you decline, this will have no influence upon your sister's subsequent treatment. Furthermore, if you decide to participate, you remain free to withdraw from this study at any time.

If you have further questions or comments on this study, or on any of the procedures involved, please do not hesitate to contact Pascale M. Lehoux, M.A. (principal investigator) at 761-6131 (22895) at any time. If you feel that participation in this study has violated any of your rights, you are encouraged to bring your concerns to the Principal Investigator or to contact the Hospital Ombudsman, at (514) 761-6131 (22895).

Consent: I have read the previously described information, and I fully understand the purpose and goals of this study as well as what it entails. With this understanding, I voluntarily consent to participate in the present study. I understand that my sister has been asked to answer the same questions and fill out the same questionnaires as I will. I understand that if my parents agree to participate, they will be asked to fill out excatly the same questionnaires as I will. I also understand that I remain absolutely free to withdraw from the study at any time.

Name: _____
(please print)

Signed: _____

Address: _____
_____
_____

Date: _____

Witness: _____

Appendix B

Social and Personal Information Questionnaire (SPIQ)

SOCIAL AND PERSONAL INFORMATION QUESTIONNAIRE

1) ID Number _____

2) Address: _____
_____
_____
_____

3) Telephone Number:(home)_____
(work) _____

4) Date of Birth: _____

5) Age: _____

6) Mother Tongue: _____

7) What country were you born in? _____
*If you were not born in Canada, how long have you been in Canada?*_____
(months/years)

8)What is your ethnic background? _____*Caucasian*
_____*African American*
_____*Asian*
_____*Hispanic*
_____*Native American*
_____*Other (please specify)*_____

Professional Status:

9) Employed?_____Yes _____No

If yes, -Full Time _____
-Part-Time _____

Type of employment? _____
_____

Hours per week? _____

10) Unemployed?_____Yes _____No
If yes, -primary occupation? _____Homemaker
_____Volunteer
_____Other, *please specify* _____

11) Student? _____Yes _____No
If yes, -Type of program? _____
-Hours per week? _____
-Date of completion ? _____
(day/month/year)

12) Marital Status:

_____Single _____Common-Law Spouse ____ Married_____Divorced _____Separated____Widow

13) How long have you been either *single, living together, married, divorced, separated,* or *widowed*? _____(in years)

14) Do you have any children?
If yes, How many children do you have? _____

Please write the sex and age of each children below.

Child 1	female or male_____	age___
Child 2	female or male_____	age___
Child 3	female or male_____	age___
Child 4	female or male_____	age___
Child 5	female or male_____	age___

Mother Demographics

15) Is your mother alive or deceased?_____

16) *If she is alive*, How old is she? _____

17) What is your relation to your mother?
_____*Biological Mother*
_____*Stepmother*
_____ *Adoptive Mother*

18) What is your mother's occupation? _____

19) Does (did) your mother have any medical problems? _____Yes _____No

If yes,

_____Sexually transmitted disease *(please specify)*_____
_____Immune system disease *(please specify)*_____
_____Dermatological problems *(please specify)*_____
_____Gastro-intestinal problems *(please specify)*_____
_____Cardiology problems *(please specify)*_____
_____ Endocrinology problems *(please specify)*_____
_____Musculo-skeletal problems *(please specify)*_____
_____Nervous-system problems *(please specify)*_____
_____Respiratory problems *(please specify)*_____
_____Kidney problems *(please specify)* _____
_____Diabetes *(please specify)*_____
_____Cancer *(please specify)*_____
_____Migraines *(please specify)*_____
_____Other *(please specify)*_____

20) Does (did) your mother have any psychological problems? ___Yes___No

If yes,

_____Depression *(please specify)* _____
_____Bipolar affective disorder *(please specify)*_____
_____Social phobia *(please specify)*_____
_____Specific phobia *(please specify)* _____
_____Agoraphobia *(please specify)* _____
_____Panic disorder *(please specify)* _____
_____ Post-traumatic stress disorder *(please specify)*_____
_____ Obsessive-compulsive disorder *(please specify)* _____
_____General anxiety disorder *(please specify)* _____
_____Alcohol abuse *(please specify)*_____
_____Drug abuse *(please specify)* _____
_____Dissociative disorder (hysteria) *(please specify)* _____
_____ Personality disorder *(please specify)* _____
_____ Schizophrenia *(please specify)*_____
_____Other *(please specify)* _____

21) Does (did) your mother suffer from any eating disorder?_____Yes _____No

If yes,

_____Bulimia nervosa
_____Anorexia Nervosa
_____Other *(please specify)*

22) Does (did) your mother suffer from any obesity problems? ___Yes___No

23) Does (did) your mother diet when you were growing up?

1	2	3
No	Sometimes	yes

For medical reasons? _____Yes _____No

24) Does (did) your mother worry about her weight? _____Yes___No___Slightly

Father demographics

25) Is your father alive or deceased? _____

26) *If he is alive*, How old is he? _____

27) What is your relation to your father?
_____*Biological father*
_____*Stepfather*
_____ *Adoptive father*

28) What is your father's occupation? _____

29) Does (did) your father have any medical problems? _____Yes _____No
If yes,
_____Sexually transmitted disease *(please specify)*_____
_____Immune system disease *(please specify)*_____
_____Dermatological problems *(please specify)*_____
_____Gastro-intestinal problems *(please specify)*_____
_____Cardiology problems *(please specify)*_____
_____ Endocrinology problems *(please specify)*_____
_____Musculo-skeletal problems *(please specify)*_____
_____Nervous-system problems *(please specify)*_____
_____Respiratory problems *(please specify)*_____
_____Kidney problems *(please specify)* _____
_____Diabetes *(please specify)*_____
_____Cancer *(please specify)*_____
_____Migraines *(please specify)*_____
_____Other *(please specify)*_____

30) Does (did) your father have any psychological problems? ____Yes___No
If yes,
_____Depression *(please specify)* _____
_____Bipolar affective disorder *(please specify)*_____
_____Social phobia *(please specify)*_____
_____Specific phobia *(please specify)* _____
_____Agoraphobia *(please specify)* _____
_____Panic disorder *(please specify)* _____
_____ Post-traumatic stress disorder *(please specify)*_____
_____ Obsessive-compulsive disorder *(please specify)* _____
_____General anxiety disorder *(please specify)* _____
_____Alcohol abuse *(please specify)*_____
_____Drug abuse *(please specify)* _____
_____Dissociative disorder (hysteria) *(please specify)* _____
_____ Personality disorder *(please specify)* _____
_____ Schizophrenia *(please specify)*_____
_____Other *(please specify)* _____

31) Does (did) your father suffer from any eating disorder? _____Yes _____No
If yes,
_____Bulimia nervosa
_____Anorexia Nervosa
_____Other *(please specify)*

32) Does (did) your father suffer from any obesity problems? ____Yes___No

33) Does (did) your father diet while you were growing up?

1	2	3
No	Sometimes	yes

For medical reasons? _____Yes _____No

34) Does (did) your father worry about his weight? _____Yes___No___Slightly

Sibling demographics

35) How many siblings do you have ? _____ *(including biological, half, step, adopted or deceased)*

Sibling 1

36) Is sibling 1 alive or deceased? _____

37) *If sibling 1 is alive*, how old is sibling 1?_____

38) What is (was) your relation to sibling 1?

_____Biological
_____ Half-sibling
_____Non-biological (step or adoptive)

39) What is (was) the gender of sibling 1? _____Female_____Male

40) What is sibling 1's occupation? _____

41) Does (did) sibling1 have any medical problems? _____Yes _____No

If yes,

_____Sexually transmitted disease *(please specify)*_____
_____Immune system disease *(please specify)*_____
_____Dermatological problems *(please specify)*_____
_____Gastro-intestinal problems *(please specify)*_____
_____Cardiology problems *(please specify)*_____
_____ Endocrinology problems *(please specify)*_____
_____Musculo-skeletal problems *(please specify)*_____
_____Nervous-system problems *(please specify)*_____
_____Respiratory problems *(please specify)*_____
_____Kidney problems *(please specify)* _____
_____Diabetes *(please specify)*_____
_____Cancer *(please specify)*_____
_____Migraines *(please specify)*_____
_____Other *(please specify)*_____

42) Does (did) sibling 1 have any psychological problems? _____Yes_____No

If yes,

_____Depression *(please specify)* _____
_____Bipolar affective disorder *(please specify)*_____
_____Social phobia *(please specify)*_____
_____Specific phobia *(please specify)* _____
_____Agoraphobia *(please specify)* _____
_____Panic disorder *(please specify)* _____
_____ Post-traumatic stress disorder *(please specify)*_____
_____ Obsessive-compulsive disorder *(please specify)* _____
_____General anxiety disorder *(please specify)* _____
_____Alcohol abuse *(please specify)*_____
_____Drug abuse *(please specify)* _____
_____Dissociative disorder (hysteria) *(please specify)* _____
_____ Personality disorder *(please specify)* _____
_____ Schizophrenia *(please specify)*_____
_____Other *(please specify)* _____

43) Does (did) sibling 1 suffer from any eating disorder? _____Yes _____No

If yes, _____Bulimia nervosa
_____Anorexia Nervosa
_____Other *(please specify)*

44) Does (did) sibling 1 suffer from any obesity problems? _____Yes_____No

45) Does (did) sibling 1 diet when you were growing up?

1	2	3
No	Sometimes	yes

For medical reasons? _____Yes _____No

46) Does (did) sibling 1 worry about her/his weight? _____Yes___No___Slightly

Sibling 2

47) Is sibling 2 alive or deceased? _____

48) *If sibling 2 is alive*, how old is sibling 2? _____

49) What is (was) your relation to sibling 2?
_____Biological
_____ Half-sibling
_____Non-biological (step or adoptive)

50) What is (was) the gender of sibling 2? _____Female_____Male

51) What is sibling 2's occupation? _____

52) Does (did) sibling 2 have any medical problems? _____Yes _____No

If yes,
_____Sexually transmitted disease *(please specify)*_____
_____Immune system disease *(please specify)*_____
_____Dermatological problems *(please specify)*_____
_____Gastro-intestinal problems *(please specify)*_____
_____Cardiology problems *(please specify)*_____
_____ Endocrinology problems *(please specify)*_____
_____Musculo-skeletal problems *(please specify)*_____
_____Nervous-system problems *(please specify)*_____
_____Respiratory problems *(please specify)*_____
_____Kidney problems *(please specify)* _____
_____Diabetes *(please specify)*_____
_____Cancer *(please specify)*_____
_____Migraines *(please specify)*_____
_____Other *(please specify)*_____

53) Does (did) sibling 2 have any psychological problems? _____Yes _____No
If yes,
_____Depression *(please specify)* _____
_____Bipolar affective disorder *(please specify)*_____
_____Social phobia *(please specify)*_____
_____Specific phobia *(please specify)* _____
_____Agoraphobia *(please specify)* _____
_____Panic disorder *(please specify)* _____
_____ Post-traumatic stress disorder *(please specify)*_____
_____ Obsessive-compulsive disorder *(please specify)* _____
_____General anxiety disorder *(please specify)* _____
_____Alcohol abuse *(please specify)*_____
_____Drug abuse *(please specify)* _____
_____Dissociative disorder (hysteria) *(please specify)* _____
_____ Personality disorder *(please specify)* _____
_____ Schizophrenia *(please specify)*_____
_____Other *(please specify)* _____

54) Does (did) sibling 2 suffer from any eating disorder? _____Yes _____No
If yes,
_____Bulimia nervosa
_____Anorexia Nervosa
_____Other *(please specify)*
55) Does (did) sibling 2 suffer from any obesity problems? _____Yes_____No

56) Does (did) sibling 2 diet when you were growing up? ?

1	2	3
No	Sometimes	yes

For medical reasons? _____Yes _____No

57) Does (did) sibling 2 worry about her/his weight? _____Yes___No___Slightly

Sibling 3
58) Is sibling 3 alive or deceased? _____

59) *If sibling 3 is alive*, how old is sibling 3?_____

60) What is (was) your relation to sibling 3?
_____Biological
_____ Half-sibling
_____Non-biological (step or adoptive)

61) What is (was) the gender of sibling 3? _____Female_____Male

62) What is sibling 3's occupation? _____

63) Does (did) sibling 3 have any medical problems? _____Yes _____No
If yes,
_____Sexually transmitted disease *(please specify)*_____
_____Immune system disease *(please specify)*_____
_____Dermatological problems *(please specify)*_____
_____Gastro-intestinal problems *(please specify)*_____
_____Cardiology problems *(please specify)*_____
_____ Endocrinology problems *(please specify)*_____
_____Musculo-skeletal problems *(please specify)*_____
_____Nervous-system problems *(please specify)*_____
_____Respiratory problems *(please specify)*_____
_____Kidney problems *(please specify)* _____
_____Diabetes *(please specify)*_____
_____Cancer *(please specify)*_____
_____Migraines *(please specify)*_____
_____Other *(please specify)*_____

64) Does (did) sibling 3 have any psychological problems? _____Yes_____No
If yes,
_____Depression *(please specify)* _____
_____Bipolar affective disorder *(please specify)*_____
_____Social phobia *(please specify)*_____
_____Specific phobia *(please specify)* _____
_____Agoraphobia *(please specify)* _____
_____Panic disorder *(please specify)* _____
_____Post-traumatic stress disorder *(please specify)*_____
_____Obsessive-compulsive disorder *(please specify)* _____
_____General anxiety disorder *(please specify)* _____
_____Alcohol abuse *(please specify)*_____
_____Drug abuse *(please specify)* _____
_____Dissociative disorder (hysteria) *(please specify)* _____
_____ Personality disorder *(please specify)* _____
_____ Schizophrenia *(please specify)*_____
_____Other *(please specify)* _____

65) Does (did) sibling 3 suffer from any eating disorder? _____Yes _____No
If yes,
_____Bulimia nervosa
_____Anorexia Nervosa
_____Other *(please specify)*

66) Does (did) sibling 3 suffer from any obesity problems? _____Yes_____No

67) Does (did) sibling 3 diet when you were growing up?

1	2	3
No	Sometimes	yes

For medical reasons? _____Yes _____No

68) Does (did) sibling 3 worry about her/his weight? _____Yes___No___Slightly

Sibling 4

69) Is sibling 4 alive or deceased? _____

70) *If sibling 4 is alive*, how old is sibling 4?_____

71) What is (was) your relation to sibling 4?
_____Biological
_____Half-sibling
_____Non-biological (step or adoptive)

72) What is (was) the gender of sibling 4? _____Female_____Male

73) What is sibling 4's occupation? _____

74) Does (did) sibling 4 have any medical problems? _____Yes _____No
If yes,
_____Sexually transmitted disease *(please specify)*_____
_____Immune system disease *(please specify)*_____
_____Dermatological problems *(please specify)*_____
_____Gastro-intestinal problems *(please specify)*_____
_____Cardiology problems *(please specify)*_____
_____ Endocrinology problems *(please specify)*_____
_____Musculo-skeletal problems *(please specify)*_____
_____Nervous-system problems *(please specify)*_____
_____Respiratory problems *(please specify)*_____
_____Kidney problems *(please specify)* _____
_____Diabetes *(please specify)*_____
_____Cancer *(please specify)*_____
_____Migraines *(please specify)*_____
_____Other *(please specify)*_____

75) Does (did) sibling 4 have any psychological problems? _____Yes_____No
If yes,
_____Depression *(please specify)* _____
_____Bipolar affective disorder *(please specify)*_____
_____Social phobia *(please specify)*_____

_____Specific phobia *(please specify)* _____
_____Agoraphobia *(please specify)* _____
_____Panic disorder *(please specify)* _____
_____ Post-traumatic stress disorder *(please specify)*_____
_____ Obsessive-compulsive disorder *(please specify)* _____
_____General anxiety disorder *(please specify)* _____
_____Alcohol abuse *(please specify)*_____
_____Drug abuse *(please specify)* _____
_____Dissociative disorder (hysteria) *(please specify)*_____
_____ Personality disorder *(please specify)* _____
_____ Schizophrenia *(please specify)*_____
_____Other *(please specify)* _____

76) Does (did) sibling 4 suffer from any eating disorder? _____Yes _____No
If yes, _____Bulimia nervosa
_____Anorexia Nervosa
_____Other *(please specify)*

77) Does (did) sibling 4 suffer from any obesity problems? _____Yes_____No

78) Does (did) sibling 4 diet when you were growing up?

1	2	3
No	Sometimes	yes

For medical reasons? _____Yes _____No

79) Does (did) sibling 4 worry about her/his weight? _____Yes___No___Slightly

Participant's medical history

80) Do you suffer from any medical condition? _____Yes _____No
If yes, _____Sexually transmitted disease *(please specify)*_____
_____Immune system disease *(please specify)*_____
_____Dermatological problems *(please specify)*_____
_____Gastro-intestinal problems *(please specify)*_____
_____Cardiology problems *(please specify)*_____
_____ Endocrinology problems *(please specify)*_____
_____Musculo-skeletal problems *(please specify)*_____
_____Nervous-system problems *(please specify)*_____
_____Respiratory problems *(please specify)*_____
_____Kidney problems *(please specify)* _____
_____Diabetes *(please specify)*_____
_____Cancer *(please specify)*_____

_____Migraines *(please specify)*_____
_____Other *(please specify)*_____

81) Are you taking any medication? _____Yes _____No
(prescribed or non-prescribed)
If yes, Type _____
Name _____
For which condition _____

82) Are you taking the birth-control pill? _____Yes _____No
If yes, Brand _____

83) Are you taking any street drugs? _____Yes _____No
If yes, Type _____
Consumption per week _____

84) Do you consume any alcohol? _____Yes _____No
If yes, Type _____
Drinks per week _____

85) Have you ever sought any psychological treatment?
If yes, How many times have you sought treatment? _____

First Treatment

_____Individual therapy
_____Group therapy
_____Day Program
_____Inpatient Program
_____Other *(please specify)*

Duration (in months): _____
Dates (begin/end) (day/month/year):_____
Name of therapist:_____
Name of institution:_____

Second Treatment

_____Individual therapy
_____Group therapy
_____Day Program
_____Inpatient Program
_____Other *(please specify)*

Duration (in months): _____
Dates (begin/end) (day/month/year):_____
Name of therapist:_____
Name of institution:_____

Third Treatment

_____Individual therapy
_____Group therapy
_____Day Program
_____Inpatient Program
_____Other *(please specify)*

Duration (in months): _____
Dates (begin/end) (day/month/year):_____
Name of therapist:_____
Name of institution:_____

Fourth Treatment

_____Individual therapy
_____Group therapy
_____Day Program
_____Inpatient Program
_____Other *(please specify)*

Duration (in months): _____
Dates (begin/end) (day/month/year):_____
Name of therapist:_____
Name of institution:_____

Fifth Treatment

_____Individual therapy
_____Group therapy
_____Day Program
_____Inpatient Program
_____Other *(please specify)*

Duration (in months): _____
Dates (begin/end) (day/month/year):_____
Name of therapist:_____
Name of institution:_____

86) Have you ever been hospitalised? _____Yes _____No
If yes, How many times have you been hospitalised?_____

First hospitalisation:
Reason? _____
Duration (in days)? _____
Dates (begin/end) (day/month/year)_____

Second hospitalisation:
Reason? _____
Duration (in days)? _____
Dates (begin/end) (day/month/year)_____

Third hospitalisation:
Reason? _____
Duration (in days)? _____
Dates (begin/end) (day/month/year)_____

Fourth hospitalisation:
Reason? _____
Duration (in days)? _____
Dates (begin/end) (day/month/year)_____

Fifth hospitalisation:
Reason? _____
Duration (in days)? _____
Dates (begin/end) (day/month/year)_____

87) Have any of your family members (aside from the ones mentioned above) experienced any medical or psychiatric problems? _____Yes _____No
If yes, Please specify (type of problem and family member) _____
_____
_____
_____

88) Have you experienced eating symptoms? _____Yes _____No
If yes,

A) Have you been concerned about your weight? _____Yes _____No
If yes, for how long? (in months) _____

B) Have you been
_____Dieting *If yes*, for how long (in months) _____
_____Vomiting *If yes*, for how long (in months) _____

_____Exercising *If yes*, for how long (in months) _____
_____Using laxatives *If yes*, for how long (in months) _____
_____Using diuretics *If yes*, for how long (in months) _____
_____Binging *If yes*, for how long (in months) _____

89) How much do you weight? _____90) How tall are you? _____
(BMI: _____)

91) Are you experiencing any major life event? ? _____Yes _____No
If yes, _____Moving
_____End of a relationship
_____Death
_____Illness
_____Marriage
_____ Other *(please specify)*

94) **Hobbies**	**Where?**	**Dates (begin/end) (year/month/day)**	**How often?**
Classical Ballet			
Modelling			
Jazz			
Gymnastics			
Swimming			
Skating			
Skiing			
Reading			
Movies			
Theatre			
Cycling			
Cooking			

Appendix C

Eating Disorders Examination (EDE) (Diagnostic Items) (Fairburn & Cooper, 1993)

------ID#_____

EATING DISORDER EXAMINATION

(Having oriented the subject to the specific time period being assessed, it is best to open the interview by asking a number of introductory questions designed to obtain a general picture of the subject's eating habits. Suitable questions are suggested below.)

To begin with, I should like to get a general picture of your eating habits over the last four weeks

Have your eating habits varied much from day to day?

Have weekdays differed from weekends?

Have there been any days where you haven't eaten anything?

What about the previous two months?

PATTERN OF EATING

1- I would like to ask about your pattern of eating. Over the past 4 weeks which of the following meals or snacks have you eaten on a regular basis?

Please rate each meal and snack separately, using the following scale:

-Breakfast (meals eaten shortly after waking) ( )
-Mid-morning snack ( )
-Lunch (mid-day meal) ( )
-Mid-afternoon snack ( )
-Evening meal ( )
-Evening snack ( )
-Nocturnal snack (i.e. a snack eaten after you have been to sleep) ( )

0-Meal or snack not eaten
1-
2-Meal or snack eaten on less than half the days
3-
4-Meal or snack eaten on more than half the days
5-
6-Meal or snack eaten every day

Rate each meal or each snack separately, usually accepting the subject's classification. Ask about weekdays and weekends separately. Meals or snacks should be rated even if the lead on into a "binge". Brunch should generally be classified as "lunch". With this item, rate up (i.e., give a higher rating) if is difficult to chose between two ratings. Rate 8 if meals or snacks are difficult to classify (e.g., due to shift work).

BULIMIC EPISODES AND OTHER EPISODES OF OVEREATING

Main probe questions

- **I would like to ask you about any episodes of overeating that you may have had over the past 4 weeks.**

- **Different people mean different things by overeating, I would like you to describe any times when you have felt that you have eaten too much in one go.**

- **Have there been any times when you have felt that you have eaten too much, but others might not agree?**

(If there have been no such times skip to "self-induced vomiting)

(N.B. For subjective bulimic episodes to be eligible, they must have been viewed as having eating an excessive amount of food)

Subsidiary probe questions

To assess the amount of food eaten:

- **What did you typically eat at these times?**
- **What were others eating at these times?**

To assess loss of control:

- **Did you have a sense of loss of control at the time?**

For chronic cases only:

- **Could you have stopped eating once you had started?**
- **Could you have prevented the episode from occurring?**

For objective bulimic episodes, subjective bulimic episodes,, episodes of objective overeating, make the following two ratings :

Number of days during the past 4 weeks? ( )
(rate 00 if none)
Number of episodes during the past 4 weeks? ( )
(rate 00 if none)

Were there any times when you felt that you had eaten too much, but others might not have agreed?

In general, it is best to calculate the number of days first and then the number of episodes.
Rate 777 if the number of episodes is so great that their frequency cannot be calculated. Episodes of subjective overeating are not calculated.

(Ask about the preceding two months)

For objective bulimic episodes, rate the number of episodes over the preceding two months and the number of days on which they occurred. (rate 0 if none and 9 if not asked).

Number of days 2 months ago? ( )
(rate 00 if none)
Number of episodes 2 month ago? ( )
(rate 00 if none)

Number of days 3 months ago? ( )
(rate 00 if none)
Number of episodes 3 month ago? ( )
(rate 00 if none)

Also rate the longest continuous period in weeks free (not due to force or circumstances) from objective bulimic episodes over the past three months, (rate 99 if not asked)

DIETARY RESTRICTION OUTSIDE BULIMIC EPISODES

(Only rate this item if there have been objective bulimic episodes over the past three months)
Outside the times when you lost control over your eating, *(refer to objective and subjective bulimic episodes)* **how much have you been restricting the amount of food you ate?**

- **Typically, what have you eaten?**

- **Has this been to influence your shape or your weight?**

(Ask about actual food intake outside the objective and subjective bulimic episodes. Rate the average degree of dietary restriction. This should have been intended to influence shape, weight, or body composition, although this may not have been the sole main reason. Rate each pf the past three months separately, whether or not it included a bulimic episode. Rate 9 if not asked.)

0- No extreme restriction outside objective bulimic episodes
1- Extreme restriction outside objective bulimic episodes (i.e., low energy intake (inferior to 1200 kcal) due to infrequent eating and/or consumption of low caloric foods)
2- No eating outside objective bulimic episodes

3 months ago ( )
2 months ago ( )
Past 4 weeks ( )

SELF-INDUCED VOMITING

Over the past 4 weeks have you made yourself sick as a means of controlling your shape or weight?

(Rate the number of days on which there has been one or more episodes of self-induced vomiting as a means of controlling shape, weight, or body composition. Rate 00 if no vomiting).

( )( )

(Rate the number of discrete episodes of self-induced vomiting as a means of controlling shape, weight, or body composition. Rate 00 if no vomiting)

( )( )( )

Ask about the preceding 2 months if practicing self-induced vomiting to influence shape, weight, or body composition).

(Rate the number of discrete episodes of self-induced vomiting over each of the 2 preceding months. Rate 999 if not asked)

3 months ago ( )( )( )
2 months ago ( )( )( )

LAXATIVE MISUSE

Over the past 4 weeks have you taken laxatives as a means of controlling your shape or weight?

(Rate the number of days on which laxatives have been taken as a means of controlling shape, weight, or body composition. This should have been the main reason, although it may not have been the sole reason. Rate 00 if there was no laxative use or there is doubt whether the laxative taking was primarily to influence shape, weight or body composition)

( )( )

(Rate the number of discrete episodes of laxative misuse (as defined above). Rate 777 if the number is so great that it cannot be calculated. Rate 000 if no such laxative misuse)

( )( )( )

(Rate the average number of laxatives taken on each occasion. Rate 999 if not applicable. Rate 777 if not quantifiable e.g., use of bran)

( )( )( )

Note the type of laxative taken.

Ask about the preceding 2 months if taking laxatives to influence shape, weight, or body composition.

(Rate the number of discrete episodes of laxative misuse over each of the 2 preceding months. Rate 000 if no such laxative misuse. Rate 999 if not asked)

3 months ago ( )( )( )
2 months ago ( )( )( )

DIURETIC MISUSE

Over the past 4 weeks have you taken diuretics as a means of controlling your shape or weight?

(Rate the number of days on which diuretics have been taken as a means of controlling shape, weight, or body composition. This should have been the main reason, although it may not have been the sole reason.

Rate 00 if there was no laxative use or there is doubt whether the diuretic taking was primarily to influence shape, weight or body composition)

( )( )

(Rate the number of discrete episodes of diuretic misuse (as defined above). Rate 777 if the number is so great that it cannot be calculated. Rate 000 if no such diuretic misuse)

( )( )( )

(Rate the average number of diuretic taken on each occasion. Rate 999 if not applicable. Rate 777 if not quantifiable)

( )( )( )

Note the type of diuretic taken.

Ask about the preceding 2 months if taking diuretics to influence shape, weight, or body composition.

(Rate the number of discrete episodes of diuretic misuse over each of the 2 preceding months. Rate 000 if no such laxative misuse. Rate 999 if not asked)

3 months ago ( )( )( )
2 months ago ( )( )( )

INTENSE EXERCISING TO CONTROL SHAPE OR WEIGHT

*** Over the past 4 weeks have you exercised as a means of controlling your weight, altering your shape or amount of fat, or burning off calories?**

- **Typically, what form of exercising have you taken?**

(Rate the number of days on which the subject has engaged in intense exercise that was predominantly intended to lose calories or change shape, weight, or body composition. The decision whether the exercising was "intense" should be made by the interviewer. In doubt, the exercising should not be classed as intense. Rate 00 if no such exercising.)

( )( )

(Rate the average amount of time (in minutes) per day spent exercising in this way. Only consider days on which the subject exercised. Rate 999 if no such exercising)

( )( )

Ask about the preceding two months if there has been exercising of this type.

(Rate the number of days on which the subject has exercised in this manner over each of the preceding two months. If not asked, rate 99)

3 months ago ( )( )( )
2 months ago ( )( )( )

ABSTINENCE FROM EXTREME WEIGHT-CONTROL BEHAVIOR

(Only ask this question if at least one of the key forms of weight-control behavior has been rated positively at the specified severity level over the past three months. See the section on "eating disorder diagnosis".)

The five forms of behaviors are as follows:
-Fasting
-Self-induced vomiting
-Laxative misuse
-Diuretic misuse
-Excessive exercise

Over the past 3 months, has there been a period of 2 or more weeks when you have not...
(Ask for individual items)

(Ascertain the number of consecutive weeks over the past 3 months "free" (i.e., not above threshold levels) from all five forms of extreme weight- control behavior). Do not rate abstinence due to force of circumstance. Rate 99 if not applicable)

( )( )

IMPORTANCE OF SHAPE

***Over the past 4 weeks has your shape been important in influencing how you feel about (judge, think, evaluate) yourself as a person?**

- **If you imagine the things that influence how you feel about (judge, think, evaluate) yourself –such as your performance at work, being a parent, your marriage, how you get on with other people) and put these things in order of importance, where does your shape fit in?**

- **If, over the past 4 weeks your shape had changed in any way, would this have affected how you feel about yourself?**

- **Is it important that your shape does not change?**

(Rate the degree of importance the subject has placed on body shape and its position in his/her scheme for self-evaluation (e.g., quality of relationships, being a parent, performance at work, leisure or activities). The rating should represent the average for the entire month. Do not prompt with the terms "some", "moderate",, or "supreme". If the subject has regarded both shape and weight as being of equivalent or supreme importance, rate 6 on this item and on the importance of weight.)

0- No importance
1-
2-Some importance (definitely an aspect of self-evaluation)
3-
4-Moderate importance (definitely one of the main aspects of self-evaluation
5-
6-Supreme importance (nothing is more important in the subject's scheme of evaluation)

	Past 4 weeks	( )
(Ask about the preceding two months) *(Rate preceding two months. Rate 9 if not asked)*		
	3 months ago	( )( )( )
	2 months ago	( )( )( )

IMPORTANCE OF WEIGHT

***Over the past 4 weeks has your weight been important in influencing how you feel about (judge, think, evaluate) yourself as a person?**

- **If you imagine the things that influence how you feel about (judge, think, evaluate) yourself –such as your performance at work, being a parent, your marriage, how you get on with other people) and put these things in order of importance, where does your weight fit in?**

- **If, over the past 4 weeks your weight had changed in any way, would this have affected how you feel about yourself?**

- **Is it important that your weight does not change?**

(Rate the degree of importance the subject has placed on weight and its position in his/her scheme for self-evaluation (e.g., quality of relationships, being a parent, performance at work, leisure or activities). The rating should represent the average for the entire month. Do not prompt with the terms "some", "moderate",, or "supreme". If the subject has regarded both shape and weight as being of equivalent or supreme importance, rate 6 on this item and on the importance of weight.)

0-No importance
1-
2-Some importance (definitely an aspect of self-evaluation)
3-
4-Moderate importance (definitely one of the main aspects of self-evaluation
5-
6-Supreme importance (nothing is more important in the subject's scheme of evaluation)

Past 4 weeks ( )

(Ask about the preceding two months)
(Rate preceding two months. Rate 9 if not asked)

3 months ago ( )( )( )
2 months ago ( )( )( )

FEAR OF WEIGHT GAIN

(Shorten the question if the subject is obviously overweight)

***Over the past 4 weeks have you been afraid that you might gain weight (or become fat)?**

*(Rate the number of days on which a **definite** fear has been present. Exclude reactions to actual weight gain)*

0- No definite fear of fatness or weight gain
1-
2- Definite fear of fatness or weight gain present on less than half of the days
3-
4- Definite fear of fatness or weight gain present on more than half of the days
5-
6- Definite fear of fatness or weight gain present every day

Past 4 weeks ( )

(Ask about the preceding two months)
(Rate preceding two months. Rate 9 if not asked)

3 months ago ( )( )( )
2 months ago ( )( )( )

FEELINGS OF FATNESS

(Omit this item if the subject is obviously overweight and rate 7)

***Over the past 4 weeks have you felt fat?**

(Rate the number of days on which the subject has "felt fat" accepting his/her use of this expression. Distinguish feeling fat from feeling bloated premenstrually, unless this is experienced as feeling fat.)

0-Has not feel fat
1-
2-Has felt fat on less than half the days
3-
4-Has felt fat on more than half the days
5-
6-Has felt fat everyday

Past 4 weeks ( )

(Ask about the preceding two months)
(Rate preceding two months. Rate 9 if not asked)

3 months ago ( )( )( )
2 months ago ( )( )( )

ATTEMPTS AT MAINTAINING LOW WEIGHT

(Rate for subjects who may be underweight)

*** Over the past 3 months have you been trying to lose weight?**

If no: **Have you been trying to make sure that you do not gain weight?**

(If weight is low, rate presence of attempts either to lose weight or to avoid weight gain. Rate 9 if not asked)

0-No attempts to either lose weight or to avoid weight gain over the past 3 months
1-Attempts to either lose weight or to avoid weight gain over the past 3 months for reasons concerning shape or weight
2- Attempts to either lose weight or to avoid weight gain over the past 3 months for other reasons

( )

MENSTRUATION

***Have you missed any menstrual periods over the past few months?**

***How many periods have you had over the past three months?** ( )

***Are you taking any oral contraceptive ("the pill")?**

***Are you pregnant or breast-feeding?**

(With post-menarcheal females, rate number of menstrual periods over the past 3 expected menstrual cycles. Rate 7 if the subject is pre-menarcheal, if she has been taking an oral contraceptive, or if she has been pregnant or breast-feeding)

Appendix D

Eating Attitudes Test-26 (EAT-26) (Garner et al., 1982)

EAT-26

ID: _____ Date: _____

Please circle the appropriate number that best applies to each of the statements.

	Always	Usually	Often	Sometimes	Rarely	Never
1. I am terrified about being overweight.....	1	2	3	4	5	6
2. I avoid eating when I am hungry.....	1	2	3	4	5	6
3. I find myself preoccupied with food.....	1	2	3	4	5	6
4. I have gone on eating binges where I feel that I may not be able to stop.....	1	2	3	4	5	6
5. I cut my food into small pieces.....	1	2	3	4	5	6
6. I am aware of the caloric content of foods that I eat.	1	2	3	4	5	6
7. I particularly avoid foods with a high carbohydrate content, e.g. bread, potatoes, rice, etc.....	1	2	3	4	5	6
8. I feel that others would prefer if I ate more...	1	2	3	4	5	6
9. I vomit after I have eaten.....	1	2	3	4	5	6
10. I feel extremely guilty after eating.	1	2	3	4	5	6
11. I am preoccupied with a desire to be thinner.....	1	2	3	4	5	6
12. I think about burning up calories when I exercise.....	1	2	3	4	5	6
13. I feel that other people think I am too thin...	1	2	3	4	5	6
14. I am preoccupied with the thought of having fat on my body.....	1	2	3	4	5	6
15. I take longer than others to eat my meals....	1	2	3	4	5	6

	Always	Usually	Often	Sometimes	Rarely	Never
16. I avoid foods with sugar in them.....	1	2	3	4	5	6
17. I eat diet foods.....	1	2	3	4	5	6
18. I feel that food controls my life.....	1	2	3	4	5	6
19. I display self-control around food.....	1	2	3	4	5	6
20. I feel that others pressure me to eat.....	1	2	3	4	5	6
21. I give too much time and thought to food....	1	2	3	4	5	6
22. I feel uncomfortable after eating sweets.....	1	2	3	4	5	6
23. I engage in dieting behaviour.....	1	2	3	4	5	6
24. I like my stomach to be empty.....	1	2	3	4	5	6
25. I enjoy trying new rich foods.....	1	2	3	4	5	6
26. I have the impulse to vomit after meals.....	1	2	3	4	5	6

Appendix E

Sibling Inventory for Differential Experience (SIDE) (Plomins & Daniels, 1985ab)

Date:_____ ID#_____

Sibling Inventory of Differential Experience (SIDE)

Parental Interactions with You and Your Sibling

This questionnaire is designed to ask how similarly your mother and father treated you and your sister. Compare yourself to your sister (or one of your sisters) when you were growing up and living at home. If your parents were divorced or if one died, answer the questions for the mother and father with whom you lived for the longest period of time.

1 = In general, this parent has been much more this way toward my sister than me.

2 = In general, this parent has been a bit more this way toward my sister than me.

3 = In general, this parent has been the same toward my sister and me

4 = In general, this parent has been a bit more this way toward me than my sister.

5 = In general, this parent has been much more this way toward me than my sister.

	Toward Sister Much More		*Same*		*Toward Me Much More*
Mother:					
1) Has been strict with us.	1	2	3	4	5
2) Has been proud of the things we have done.	1	2	3	4	5
3) Has enjoyed doing things with us.	1	2	3	4	5
4) Has been sensitive to what we think and feel.	1	2	3	4	5

	Toward Sister Much More		*Same*		*Toward Me Much More*
5) Has punished us for our misbehaviour	1	2	3	4	5
6) Has shown interest in the things we like to do.	1	2	3	4	5
7) Has blamed us for what another family member did.	1	2	3	4	5
8) Has tended to favour one of us over the other.	1	2	3	4	5
9) Has disciplined us.	1	2	3	4	5

Father:

1) Has been strict with us.	1	2	3	4	5
2) Has been proud of the things we have done.	1	2	3	4	5
3) Has enjoyed doing things with us.	1	2	3	4	5
4) Has been sensitive to what we think and feel.	1	2	3	4	5

	Toward Sister Much More		*Same*		*Toward Me Much More*
5) Has punished us for our misbehaviour	1	2	3	4	5
6) Has shown interest in the things we like to do.	1	2	3	4	5
7) Has blamed us for what another family member did.	1	2	3	4	5
8) Has tended to favour one of us over the other.	1	2	3	4	5
9) Has disciplined us.	1	2	3	4	5

This questionnaire is designed to ask about your interactions with your sister. Compare yourself to your sister (or one of your sisters) when you were growing up and living at home.

1 = My sister has been much more this way than I have.

2 = My sister has been a bit more this way than I have.

3 = My sister and I have been the same in this way.

4 = I have been a bit more this way than my sister.

5 = I have been much more this way than my sister.

	Sister Much More		*Same*		*Me Much More*
1) In general, who has started fights more often?	1	2	3	4	5
2) In general, who has shown more trust for the other?	1	2	3	4	5
3) In general, who has shown more concern and interest for the other?	1	2	3	4	5
4) In general, who has been more willing to help the other succeed?	1	2	3	4	5
5) In general, who has liked spending time with the other more?	1	2	3	4	5

	Sister Much More		*Same*		*Me Much More*
6) In general, who has been more likely to take responsibility for the other?	1	2	3	4	5
7) In general, who has been more stubborn with the other?	1	2	3	4	5
8) In general, who has shown more confidence in the other?	1	2	3	4	5
9) In general, who has acted more bitter toward the other?	1	2	3	4	5
10) In general, who has compared him/herself with the other more?	1	2	3	4	5
11) In general, who has been more likely to show feelings of anger to the other?	1	2	3	4	5
12) In general, who has been more likely to feel superior over the other?	1	2	3	4	5

	Sister Much More		*Same*		*Me Much More*
13) In general, who has shown more understanding for the other?	1	2	3	4	5
14) In general, who has been more likely to get jealous of the other?	1	2	3	4	5
15) In general, who has acted more kindly kindlytoward the other?	1	2	3	4	5
16) In general, who has been more likely to let the other down?	1	2	3	4	5
17) In general, who has shown more affection toward the other?	1	2	3	4	5
18) In general, who has been more likely to deceive the other?	1	2	3	4	5
19) In general, who has been more bossy bossy toward the other?	1	2	3	4	5
20) In general, who has been more likely to want to get along well with the other?	1	2	3	4	5

	Sister Much More		*Same*		*Me Much More*
21) In general, who has been more supportive of the other?	1	2	3	4	5
22) In general, who has tried to outdo the other more?	1	2	3	4	5
23) In general, who has admired the other more?	1	2	3	4	5
24) In general, who has felt like the inferior one most?	1	2	3	4	5

Think about each item as if your peer group (your main group of friends) has a personality of its own. Even though friends inside each peer group might be quite different, think about how the group is in general. Think about your experience and that of one of your sisters when your were growing up and living at home.

1 = My sister has had a peer group much more like this than my peer group.

2 = My sister has had a peer group a bit more like this than my peer group.

3 = My sister and I have had the same type of peer group in this way.

4 = I have had a peer group which is a bit more like this than my sister's peer group.

5 = I have had a peer group which is much more like this than my sister's peer group.

	Sister's Peers Much More		*Same*		*My Peers Much More*
1) Popular	1	2	3	4	5
2) Ambitious	1	2	3	4	5
3) Outgoing	1	2	3	4	5
4) Lazy	1	2	3	4	5
5) Hard-working	1	2	3	4	5
6) Intelligent	1	2	3	4	5
7) Mature	1	2	3	4	5
8) Extroverted	1	2	3	4	5
9) Delinquent	1	2	3	4	5
10) Responsible	1	2	3	4	5
11) Successful	1	2	3	4	5
12) Friendly	1	2	3	4	5

	Sister's Peers Much More		*Same*		*My Peers Much More*
13) Rebellious	1	2	3	4	5
14) Conforming	1	2	3	4	5
15) Well adjusted	1	2	3	4	5

Circle the appropriate number for each interest below. Friends inside peer groups may have had separate interests, but rate the activity that best describes what the group has liked to do in general.

	Sister's Peers Much More		*Same*		*My Peers Much More*
16) Going on to college	1	2	3	4	5
17) Achieving in school	1	2	3	4	5
18) Student government	1	2	3	4	5
19) "Partying" drinking, etc.	1	2	3	4	5
20) Illicit drugs (Such as marijuana)	1	2	3	4	5
21) Political and social issues	1	2	3	4	5
22) Achieving "status" in social situations	1	2	3	4	5

	Sister's Peers Much More		*Same*		*My Peers Much More*
23) Having a girlfriend or boyfriend	1	2	3	4	5
24) Likely to skip class	1	2	3	4	5
25) Likely to get along well	1	2	3	4	5
26) Likely to be called the "bad" crowd	1	2	3	4	5

Appendix F

Childhood Trauma Interview (CTI) (Fink, 1993)

CHILDHOOD TRAUMA INTERVIEW (CTI)

Subject ID#/inits/sex___/___/ M or F Date_____ Interview ID#/inits___/___/

Separation/Loss

Who did you live with right after you were born? (If the subject lived with someone other than parents, modify the following questions to refer to the relevant caregivers, and find out if the subject ever knew/lived with parents) While you were a child or teenager, did that change in any way? Did you ever live with just one parent, maybe because your parents separated, or either of them lived away from you for a while because they were working somewhere, or sick in the hospital, or in jail? Did you ever live away from your parents, like with another relative or in a foster home? Did you have a stepmother or stepfather?, or did your mother have a boyfriend living in the house? Did you ever spend the weekends or summers away from home while you were growing up?

Did either of your parents, or anyone else who took care of you die while you were growing up? (If secondary caregiver such as grandparents or sibling died, find out how close the subject was to that person?, how often had that person taken care of the subject?)

Did you ever run away from home? (For how long?, where did you stay?) Were you ever homeless as a child or teenager? How old were you when you left home?

----Who were you separated from, and why? Did you understand why at the time? Did you know how long it would be?

----Who did you live with during that time? How often did you see or talk to (individual subject was separated from) during that time?

----How old were you? (From age___ to ___, from each separation)

	Age range?	Lived with?	Separated from?	Reason separated?	Communication and/or contact?
1.					
2.					
3.					
4.					
5.					

Physical Neglect

When you were a child, did you spend time at home alone, or with other kids around, when there was no adult in the house? (If "no"--ask, what about when you got home from school?) Did you often have to babysit your younger sisters or brothers?

What about spending time out of the house when no adult knew you where you were or what you were doing?

----How old were you when this happened? (From age___ to___)

----How often did this happen? (If subject is not clear or says "not often," ask, as it more like everyday, once a week, once a month?)

----How long were you at home alone (or away from home), was it for a few hours, or all day? Was it ever overnight? Or for a few days or weeks?

Primary Caregiver(s)	Home-no adult?/ Away from home?	Age range?	How long?	How often?	Circumstances?
1.					
2.					
3.					
4.					
5.					

When you were a child or a teenager, did you always have enough food to eat? (If "yes" -- ask, Did you ever have to miss a meal or feel hungry, because it was hard to find something to eat?)

When you were a child or a teenager, did you always have clean clothes to wear? Did you always have shoes to wear, and winter coat? (If "yes" -- ask, Did your shoes always fit? Was there ever a time when the laundry wasn't getting done and you had to wear dirty clothes for a while?)

Did you ever have to sleep through the night in a wet bed?

When you growing up, did you usually go to the doctor if you were really sick, like with a bad fever or a earache? (If "no" -- ask, Did you ever go to a doctor? How sick would you have to be?) Do you remember any specific times when you were sick or injured and were not taken to a doctor?
---How old were you? (What was the youngest you were when that happened, what was the oldest you were when that happened?: age ___ to ___)
---How often did that happen? (Ask, -- was it more like every day, once a week, once a month?)

Primary Caregiver(s)	Age range?	Inadequate Food?/how often? (#meals, hungry?)	Inadequate clothing?/how often? (clean? shoes? coat?, wet bed?)	Inadequate medical?/how often?(types of illness?Dr.?)
1.				
2.				
3.				
4.				
5.				

Emotional Abuse/Assault (record information from following questions on chart below)

When you were a child or a teenager, did anyone in your family say mean or insulting things to you? Did anyone call you stupid or ugly or bad, or say that you couldn't do anything right? What about anyone telling you they wished you had never been born, or threatening to hurt you, or anything like that? Did anyone criticize you or laugh at you, maybe for being scared or for crying, or for your friends or what you liked to do?

When you were a child or a teenager, did anyone in your family yell or scream at you? (If "no" -- ask, Not even when they were mad?) Did anyone order you around or make you obey them? (If "yes" -- ask, What did you have to do, and did they explain why you had to?)

When you were growing up, did anyone older than you in your family ignore you or give you the "silent treatment" when they were mad? What about adults around you ever blaming you for problems they had, getting you caught in the middle of their arguments?

Did anyone in your family favor any or your brothers or sisters over you, or make comments comparing you to them?

----Who said (or did) those kinds of things to you? (Determine gender of perpetrator)

----What would they say (or do)?

----How old were you? (Over how many years did this occur: age ___ to ___)

----How often did they say (or do) these kinds of things? (If subject doesn't know, ask if it was more like every day, once a week, once a month?)

Perpetrator(s)	What they said/did?	Age range?	How often?
1.			
anyone else?			
2.			
anyone else?			
3.			
anyone else?			
4.			
anyone else?			
5.			

Did anyone else ever say insulting or critical things to you, like people outside the family, or teachers, or kids at school? **Did** anyone else ever yell at you, or threaten to hurt you, or make fun of you?

----Who said (or did) those things? (For kids at school, find out whether it was a few isolated kids or a whole group that bullied or ganged up on subject --- also, find out gender and age or perpetrators)
----What would they say?
----How old were you? (age ___ to ___)
----How often did this happen?

Perpetrator	What they said/did?	Age range?	How often?
1.			
anyone else?			
2.			
anyone else?			
3.			
anyone else?			
4.			
anyone else?			
5.			

Physical Abuse/Assault (record information from following questions on chart below)
When you were a child or a teenager, did you get hit or beaten by anyone in your family or anyone else older than you? (If "no" -- ask, No? No one ever hit you even for discipline?)

----Who hit you? (Determine gender of perpetrator) (Note: Find out the following information for each perpetrator, i.e. see chart below)
----What would they use? Their hand? a belt? a switch? or anything like that?
----Where on your body did you get hit? Was it on your bare skin?
----Did it leave marks, bruises or welts? Did you ever have to see a doctor or go to the hospital after you got a beating? (If "yes" -- ask, what kinds of injuries did you have?)
----How old were you?
----How often did this happen? (everyday?, once a month?)

Perpetrator?	Hit with?	Hit where? (bare skin?)	Marks or injuries?	Age range?	How often?
1.					
anyone else?					
2.					
anyone else?					
3.					
anyone else?					
4.					
anyone else?					
5.					

How else were you disciplined? Did anyone ever push or shove you? Did anyone ever throw things at you or throw you against the wall? Were you ever locked in a room or closet, or locked out of the house? Did anyone ever burn you, or cut you, or make you sit in hot or cold water? Did anyone ever kick you? Did anyone ever choke you or try to suffocate you? Did anyone make you kneel on rice or anything else like that?

Perpetrator?	What they did?	Effects/injuries?	Age range?	How often?
1.				
anyone else?				
2.				
anyone else?				
3.				
anyone else?				
4.				
anyone else?				
5.				

When you were growing up, did anyone else ever hit you or attack you physically, like someone at school or someone on the street? (If "no" -- ask, you were never mugged, stabbed or shot?) (Find out who did it, gender of perpetrator, what happened, and additional information as above)

Perpetrator	What they did?	Effects/injuries?	Age range?	How often?
1.				
2.				
3.				
4.				
5.				

Witnessing Violence (record information from following questions on chart below)

When you were a child or a teenager, did you ever see other people in your family get hit or beaten? (If "no" -- ask, No? You never saw anyone hit your sister or brother, or your mother?) Did you ever see anyone in your family get physically attacked in any other way, like kicked or thrown or cut or burned?

Did you ever see anyone else get beaten up, or shot, stabbed or killed, like in school or in a store or on the street?

----Who did you see getting hit (or attacked in another way)? Who was hitting them?

----What did they hit them with? (hand?, belt? etc.) Where were they hit?: on bare skin?

----How old were you? (Over how many years did subject see this happen: age ___ to ___)

----How often did this happen? (Was it more like every day, once a week, once a month?)

Victim	Perpetrator(s)	Hit with?	Hit where? (bare skin?)	Marks or injuries?	Age range?	How often?

--if the physical abuse/assault involved something other than hitting, record the nature of the incident, such as kicked or stabbed under the "hit with" column, and note other appropriate details in other columns--

1.

anyone else?

2.

anyone else?

3.

anyone else?

4.

anyone else?

5.

Sexual Abuse/Assault (record information from following questions on chart below)

When you were a child or a teenager, did anyone in your family, or anyone else older than you ever try to do something sexual to you or make you do something sexual with them? (If "no" -- ask, Nothing like that ever happened?, like someone trying to touch you or having you touch them?) (If still "no" -- ask, No one ever tried to rape you?) Did anyone ever make you watch them do something sexual with someone else? What about someone older showing you sexual pictures or movies?

Did anyone in your family or anyone else older than you ever grab you, hold you in a sexual way, or rub against you in a sexual way, or anything like that? Did anyone ever expose themselves to you or touch themselves in front of you? When you were growing up, did anyone in your family or anyone older than you watch you undress or shower, or help you wash or use the bathroom in a way that was uncomfortable? What about anyone older talking to you in a sexual or seductive way?

----Who did this? (Find out gender and age of perpetrator)

---What happened? (If relevant -- ask, Was penetration (vaginal or anal) part of what happened?) (Note: Find out information for each perpetrator, i.e. see chart below)

----How old were you? (age ___ to ___)

----How often did this happen? (Was it more like every day/once a week/once a month?)

----Did (perpetrator) threaten you or anyone else if you told someone? Did you tell?

Perpetrator	Event	Age range?	How often?	Threats?	Told?
-- find out exactly what happened -- did perpetrator try or succeed? -- which parts of perpetrator's body (or objects) touched which parts of victim's body? -- if relevant, clarify if oral sex (done to whom?), vaginal or anal penetration, injury?--					
1.					
anyone else?					
2.					
anyone else?					
3.					
anyone else?/-*					
4.					
anyone else?					
5.					

If the subject answered "no" to the above sexual abuse/assault questions -- ask,

How old were you the first time you did something sexual with someone?

or

If the subject answered "yes" to the above sexual abuse/assault questions and described any of the events as if they had been voluntary, --ask

Did you have any other sexual experiences with anyone else while you were a child or a teenager?

or

If subject answered "yes" to the above sexual abuse/assault questions and did not describe any of the events as if they had been voluntary, -- ask

Did you have any sexual experiences with anyone else while you were a child or a teenager that felt more like your choice?

----What did you do? (Was it intercourse?)

(If subject hesitates or has difficulty finding words to describe what happened -- ask specific yes/no questions such as, did she/he touch you on the chest or between your legs?, was it under your clothes?, did what happened involve oral sex? (Who did it to whom?), did it involve penetration?

----Who was it with? (Find out gender of the other person) How old was she/he?

----Whose idea was it? Did you feel any pressure from her/him to do that?

Subject's Age	With whom?	Age/ gender	What happened?	Whose idea?	Pressure
1.					
How old were you the next time?					
2.					
How old were you the next time?					
3.					
How old were you the next time?					
4.					
How old were you the next time?					
5.					

Appendix G

Relationship Questionnaire (RQ) (Bartholomew & Horowitz, 1991)

Relationships Questionnaire

RELATIONSHIP WITH FATHER

This questionnaire is concerned with your experiences in your relationship with your father. Take a moment to think about these experiences and answer the following questions with them in mind. Which of the following paragraphs best describes this relationship?

Check the **one** which is **most** like your relationship with your father.

_____It is easy for me to become emotionally close to my father. I am comfortable depending on my father and having my father depend on me. I don't worry about being alone or having my father not accept me.

_____I am comfortable not having a close emotional relationship with my father. It is very important to me to feel independent and self-sufficient, and I prefer not to depend on my father or have my father depend on me.

_____I want to be completely emotionally intimate with my father, but I often find that my father is reluctant to get as close as I would like. I am uncomfortable not having a close relationship with my father, but I sometimes worry that he doesn't value me as much as I value him.

_____I am uncomfortable getting close to my father. I want to be emotionally close to my father, but I find it difficult to trust him completely, or to depend on him. I worry that I will be hurt if I allow myself to become too close to my father.

RELATIONSHIP WITH MOTHER

This questionnaire is concerned with your experiences in your relationship with your mother. Take a moment to think about these experiences and answer the following questions with them in mind. Which of the following paragraphs best describes this relationship?

Check the **one** which is **most** like your relationship with your mother.

_____It is easy for me to become emotionally close to my mother. I am comfortable depending on my mother and having my mother depend on me. I don't worry about being alone or having my mother not accept me.

_____I am comfortable not having a close emotional relationship with my mother. It is very important to me to feel independent and self-sufficient, and I prefer not to depend on my mother or have my mother depend on me.

_____I want to be completely emotionally intimate with my mother, but I often find that my mother is reluctant to get as close as I would like. I am uncomfortable not having a close relationship with my mother, but I sometimes worry that she doesn't value me as much as I value her.

_____I am uncomfortable getting close to my mother. I want to be emotionally close to my mother, but I find it difficult to trust her completely, or to depend on her. I worry that I will be hurt if I allow myself to become too close to my mother.

Appendix H

Perception of Teasing Scale (POTS)

ID#_____
Date:_____

Perception of Teasing Scale (POTS)

Instructions: The following questions should be answered with respect to the period of time when you were growing up (ages 5-16).
First, rate how often you think you have been the object of the behaviors described below (using the scale provided, *never* to *very often*).
Second, rate how upset you were by the teasing (using the scale provided, *not upset* to *very upset*).

1.People made fun of your weight .	Never 1	2	Sometimes 3	4	Very often 5
1a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
2. People laughed at you because you were too skinny.	Never 1	2	Sometimes 3	4	Very often 5
2a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
3. People made jokes about you being too heavy.	Never 1	2	Sometimes 3	4	Very often 5
3a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
4. People made jokes about your thinness.	Never 1	2	Sometimes 3	4	Very often 5
4a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5

5.People laughed at you for trying out for sports because you were heavy.	Never 1	2	Sometimes 3	4	Very often 5
5a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
6. People called you names like "fatso."	Never 1	2	Sometimes 3	4	Very often 5
6a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
7. People called you names like "toothpick."	Never 1	2	Sometimes 3	4	Very often 5
7a.How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
8. People pointed at you because you were overweight.	Never 1	2	Sometimes 3	4	Very often 5
8a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
9.People pointed at you because you were too skinny.	Never 1	2	Sometimes 3	4	Very often 5
9a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5

10. People snickered about your heaviness when you walked into a room alone.	Never 1	2	Sometimes 3	4	Very often 5
10a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
11. People snickered about you being skinny when you walked into a room alone.	Never 1	2	Sometimes 3	4	Very often 5
11a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
12. People made fun of you by repeating something you said because they thought it was dumb.	Never 1	2	Sometimes 3	4	Very often 5
12a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
13. People made fun of you because you were afraid to do something.	Never 1	2	Sometimes 3	4	Very often 5
13a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
14. People said you acted dumb.	Never 1	2	Sometimes 3	4	Very often 5
14a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5

15. People laughed at you because you did not understand something.	Never 1	2	Sometimes 3	4	Very often 5
15a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
16. People teased you because you didn't get a joke.	Never 1	2	Sometimes 3	4	Very often 5
16a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
17. People stared at you when went out in public.	Never 1	2	Sometimes 3	4	Very often 5
17a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
18. Members of your family made nasty comments concerning your weight.	Never 1	2	Sometimes 3	4	Very often 5
18a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
19. Members of your family made insulting comments concerning your physical appearance.	Never 1	2	Sometimes 3	4	Very often 5
19a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5

20. Your friends made insulting comments concerning your weight.	Never 1	2	Sometimes 3	4	Very often 5
20a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
21. Your friends made insulting comments concerning your physical appearance.	Never 1	2	Sometimes 3	4	Very often 5
21a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
22. Someone once suggested that you should be on a diet.	Never 1	2	Sometimes 3	4	Very often 5
22a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
23. Someone once suggested that you should do more exercise.	Never 1	2	Sometimes 3	4	Very often 5
23a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5
24. People expected little of you because of your weight and/or physical appearance.	Never 1	2	Sometimes 3	4	Very often 5
24a. How upset were you?	Not upset 1	2	Sometimes upset 3	4	Very upset 5

Appendix I

Centre for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977)

CES-D SCALE: FORMAT FOR SELF-ADMINISTERED USE

Circle the number for each statement which best describes how often you felt or behaved this way

DURING THE PAST WEEK:	Rarely or None of the Time (less than 1 day)	Some or a Little of the time (1 or 2 days)	Occasionally or a Moderate Amount of Time (3-4 days)	Most or All of the Time (5-7 days)
1. I was bothered by things that usually don't bother me.....	0	1	2	3
2. I did not feel like eating; my appetite was poor.....	0	1	2	3
3. I felt that I could not shake off the blues even with help from my family or friends.....	0	1	2	3
4. I felt that I was just as good as other people.....	0	1	2	3
5. I had trouble keeping my mind on what I was doing.....	0	1	2	3
6. I felt depressed.....	0	1	2	3
7. I felt that everything I did was an effort.....	0	1	2	3
8. I felt hopeful about the future....	0	1	2	3
9. I thought my life had been a failure.....	0	1	2	3
10. I felt fearful.....	0	1	2	3
11. I talked less than usual.....	0	1	2	3
12. I felt lonely.....	0	1	2	3
13. People were unfriendly.....	0	1	2	3

DURING THE PAST WEEK:	**Rarely or None of the Time (less than 1 day)**	**Some or a Little of the time (1 or 2 days)**	**Occasionally or a Moderate Amount of Time (3-4 days)**	**Most or All of the Time (5-7 days)**
14. I enjoyed life.....	0	1	2	3
15. I had crying spells.....	0	1	2	3
16. I felt sad.....	0	1	2	3
17. I felt that people disliked me.....	0	1	2	3
18. I could not get "going".....	0	1	2	3
19. I felt that people disliked me.....	0	1	2	3
20. I could not get "going".....	0	1	2	3

Appendix J

Dimensional Assessment of Personality Pathology (DAPP) (Livesly et al., 1992)

DIMENSIONAL ASSESSMENT OF PERSONALITY QUESTIONNAIRE

ID: _____ SEX : M____F_____
AGE : ____

Directions

This questionnaire contains statements describing personal preferences and behaviours. You are asked to rate yourself on these statements by circling the number that best describes how characteristic or uncharacteristic each statement is of you.

1	2	3	4	5
Very unlike me	Moderately unlike me	Somewhat like and unlike me	Moderately like me	Very like me

Example :

1. At parties, I like to talk to everyone. - - - - - - - - 1 2 3 4 5

2. I like to spend most of my time alone. - - - - - - - - 1 2 3 4 5

In the above example, circle the number "5" for the first statement, if you think the item is very like you. If the second statement is moderately unlike you, circle the number "2".

For each statement in the questionnaire, circle the number that best describes you. Answer every statement, even if you are not completely sure of your response.

Note : Some of the questions may describe circumstances that are not familiar to you. Please try to imagine how you would react and answer accordingly. If you are a student, please consider school as employment in questions related to employment.

Below are statements describing personal preferences and behaviours. You are asked to rate yourself on these statements by circling the number that best describes how characteristic or uncharacteristic each statement is of you.

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
1. If I am pressured, I will usually give in. - - - - - -	1	2	3	4	5
2. I often feel as if I am not really there. - - - - - -	1	2	3	4	5
3. None of the things I do gives me much satisfaction.- -	1	2	3	4	5
4. I often feel as if I am on an emotional roller-coster.- -	1	2	3	4	5
5. When I take risks, I never worry about getting hurt.- -	1	2	3	4	5
6. I usually do jobs systematically step by step.- - - - -	1	2	3	4	5
7. I never really enjoy myself.- - - - - - - - - - -	1	2	3	4	5
8. I have difficulty expressing affection for others.- - - -	1	2	3	4	5
9. I do not feel guilty when I hurt someone's feelings. - -	1	2	3	4	5
10. I plan to do so many things in a day that I often don't get anything done.- - - - - - - - - - - - - -	1	2	3	4	5
11. I don't really enjoy sex.- - - - - - - - - - - -	1	2	3	4	5
12. I have no difficulty telling others what to do.- - - - -	1	2	3	4	5
13. I can feel extremely guilty even about something unimportant. - - - - - - - - - - - - - - - -	1	2	3	4	5
14. I do jobs thoroughly even if no one else will ever see them. - - - - - - - - - - - - - - -	1	2	3	4	5
15. If I had no one, I would yearn for an intimate relationship. - - - - - - - - - - - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
16. I usually go along with other peoples' suggestions.- - -	1	2	3	4	5
17. I sometimes wonder whether the things that go on around me are real or imaginary.- - - - - - -	1	2	3	4	5
18. I think that other people are always trying to cheat me.-	1	2	3	4	5
19. I show my feelings very intensely.- - - - - - - - -	1	2	3	4	5
20. I have felt that things around me have seemed unreal.-	1	2	3	4	5
21. I avoid talking about myself to others because it makes me uneasy.- - - - - - - - - - - - - - - - - -	1	2	3	4	5
22. I like to "throw caution to the wind" by acting without thinking if the consequences. - - - - - - - - - -	1	2	3	4	5
23. When I see things out of place, I have an almost uncontrollable urge to put them back. - - - -	1	2	3	4	5
24. I don't feel very sure of myself when I am with other people. . - - - - - - - - - -	1	2	3	4	5
25. I am always on my guard against the actions of others.	1	2	3	4	5
26. I keep away from situations where people are likely to show any affection for me. - - - - - - - - -	1	2	3	4	5
27. I have often drunk too much. - - - - - - - - - - -	1	2	3	4	5
28. I do not know what to say to people.- - - - - - - - -	1	2	3	4	5
29. I consider my life to be dull.- - - - - - - - - - -	1	2	3	4	5
30. I watch out for little things that will prove that my suspicion are true.- - - - - - - - - - - - - -	1	2	3	4	5
31. Ending my life sometimes seems to be the only way out. .- - - - - - - - - - - - - - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
32. I spend most my time alone.- - - - - - - - - - - -	1	2	3	4	5
33. I always tell the truth.- - - - - - - - - - - -	1	2	3	4	5
34. I am only really satisfied when people acknowledge how good I am. - - - - - - - - - - - - - - - -	1	2	3	4	5
35. I do everything to the best of my ability.- - - - - -	1	2	3	4	5
36. I try to keep everything in its proper place.- - - - -	1	2	3	4	5
37. I can usually find the faults with any opinion that is different than my own.- - - - - - - - - - - - -	1	2	3	4	5
38. When people do something nice for me, I often wonder what their real motives are.- - - - - - - - - - -	1	2	3	4	5
39. Being accepted by others is very important to me. - -	1	2	3	4	5
40. Sometimes I cannot think about anything else except how guilty I feel. - - - - - - - - - - - - - - -	1	2	3	4	5
41. At social events I tend to avoid people.- - - - - - -	1	2	3	4	5
42. I hate being separated from someone I love even for a few days.- - - - - - - - - - - - - - - - - -	1	2	3	4	5
43. Sex is not an important part of my life.- - - - - - -	1	2	3	4	5
44. I feel quite comfortable showing my feelings.- - - - -	1	2	3	4	5
45. I tend to think that my views are the only right ones.- -	1	2	3	4	5
46. I feel that I cannot love anyone.- - - - - - - - -	1	2	3	4	5
47. I tend to over-react to minor problems. - - - - - - -	1	2	3	4	5
48. I go along with what other people want even when it's not what I want.- - - - - - - - - - - - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
49. I feel that many people are just waiting to double-cross me.- - - - - - - - - - - - - - - - -	1	2	3	4	5
50. In a discussion I usually end up agreeing with the other person's point of view.- - - - - - - - - - - - -	1	2	3	4	5
51. I am usually the last one to be ready when I go out with others.- - - - - - - - - - - - - - - -	1	2	3	4	5
52. When I am stressed I seem to lose touch with reality for a short time.- - - - - - - - - - - - - - -	1	2	3	4	5
53. I hesitate to express opinions that I think others will disagree with.- - - - - - - - - - - - - -	1	2	3	4	5
54. I am a very shy person.- - - - - - - - - - - - -	1	2	3	4	5
55. My experiences are sometimes so strong they almost hurt.- - - - - - - - - - - - - - - - -	1	2	3	4	5
56. I don't react when someone makes me angry.- - - -	1	2	3	4	5
57. I lose my temper easily. - - - - - - - - - - - -	1	2	3	4	5
58. My problems always seem overwhelming. - - - - -	1	2	3	4	5
59. I really only feel safe when the person I am especially close to is right there beside me. - - - - - - - - -	1	2	3	4	5
60. Whenever I feel desperate, the idea of ending my life becomes very appealing.- - - - - - - - - - - - - - - - -	1	2	3	4	5
61. I really need to know that people approve of me. - - -	1	2	3	4	5
62. I think that life is fun.- - - - - - - - - - - -	1	2	3	4	5
63. I have never cheated anyone.- - - - - - - - - - -	1	2	3	4	5
64. At times my feelings take over and just pour out.- - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
65. I do everything thoroughly. - - - - - - - - - - -	1	2	3	4	5
66. I rarely share my problems with anyone.- - - - - - -	1	2	3	4	5
67. My mind is like a broken record, it keeps replaying the same worries.- - - - - - - - - - - - - - -	1	2	3	4	5
68. I have the most energy to do things after I have been admired by others. - - - - - - - - - - - - - -	1	2	3	4	5
69. If I met someone more interesting, I wouldn't hesitate to end my current relationship. - - - - - - - - - -	1	2	3	4	5
70. When I am very distressed, it's as if I hear voices shouting inside my head.- - - - - - - - - - - -	1	2	3	4	5
71. I am destined for greatness.- - - - - - - - - - -	1	2	3	4	5
72. When I am very distressed the only thing I can think about is killing myself. - - - - - - - - - - - -	1	2	3	4	5
73. My moods are very unpredictable. - - - - - - - - -	1	2	3	4	5
74. In any group of people, I worry that I will be shut out or rejected.- - - - - - - - - - - - - - - -	1	2	3	4	5
75. I sometimes pretend I am sick to get out of something.-	1	2	3	4	5
76. If I found someone's wallet, I would not feel guilty about keeping the money.- - - - - - - - - - - -	1	2	3	4	5
77. I try to get other people to make my decisions for me.-	1	2	3	4	5
78. I am upset when the person I am closest to is away for a few days.- - - - - - - - - - - - - - - - -	1	2	3	4	5
79. I don't enjoy things like other people do.- - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
80. I tend to follow around the person I am especially attached to when I am worried.- - - - - - - - - -	1	2	3	4	5
81. I stay away from close personal relationships.- - - - -	1	2	3	4	5
82. I try to get into positions of authority.- - - - - - -	1	2	3	4	5
83. I am not very well-organized.- - - - - - - - - - -	1	2	3	4	5
84. I put all of my efforts into every task I do.- - - - -	1	2	3	4	5
85. My own welfare is more important to me than that of others.-.- - - - - - - - - -	1	2	3	4	5
86. When things don't work out for me, ending my life seems to be the only answer.- - - - - - - - -	1	2	3	4	5
87. I find it hard to look at people's eyes when I am talking.	1	2	3	4	5
88. I work very slowly on jobs I dislike.- - - - - - - -	1	2	3	4	5
89. I am sure that someone has it in for me.- - - - - - -	1	2	3	4	5
90. I pay close attention to what I do and say so that no one gets to know too much about me. - - - - - - - - -	1	2	3	4	5
91. The idea of doing something like skydiving appeals to me. - - - - - - - - - - - -	1	2	3	4	5
92. I dream of being looked up to and admired. - - - - - -	1	2	3	4	5
93. It makes my blood boil to be kept waiting. - - - - - -	1	2	3	4	5
94. Because I like to do things spontaneously, I have a hard time making plans. - - - - - - - - - - - -	1	2	3	4	5
95. I find it hard to make a decision that I don't get things done.- - - - - - - - - - - - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
96. When rules are inconvenient I break them.- - - - - - -	1	2	3	4	5
97. I need to be the centre of attention.- - - - - - - -	1	2	3	4	5
98. I never lose my temper.- - - - - - - - - - - - -	1	2	3	4	5
99. I have taken an overdose when I was upset.- - - - - -	1	2	3	4	5
100. If people make me angry I quickly smother my feelings.- - - - - - - - - - - - - - -	1	2	3	4	5
101. If there is something I have to do but really don't want to do, I put it off in the hope that I won't have to do it.-	1	2	3	4	5
102. I sometimes feel confused for several days at a time.-	1	2	3	4	5
103. It is important to me to be noticed by other people.- -	1	2	3	4	5
104. I tend to put my own ideas first in almost everything I do.- - - - - - - - - - - - - - - -	1	2	3	4	5
105. I often do things on impulse even though I know I will regret it later. - - - - - - - - - - - - -	1	2	3	4	5
106. I feel happiest when all eyes are on me.- - - - - - -	1	2	3	4	5
107. I spend a lot of time talking about how much work I have to do without ever starting it.- - - - - - - - - -	1	2	3	4	5
108. I don't often show my feelings.- - - - - - - - - -	1	2	3	4	5
109. I have consumed so much alcohol at times that I could not remember what happened.- - - - - - - - - - -	1	2	3	4	5
110. I go over and over minor incidents in my mind. - - -	1	2	3	4	5
111. I have tried to commit suicide.- - - - - - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
112. I am only really comfortable when I have someone to keep me company. - - - - - - - - - - - - - - - -	1	2	3	4	5
113. I cannot tell someone directly that I am angry with them.- - - - - - - - - - - - - - - - -	1	2	3	4	5
114. If I really need something, I don't mind using someone to get it.- - - - - - - - - - - - - - - - -	1	2	3	4	5
115. I spend a lot of time thinking about how to kill myself.	1	2	3	4	5
116. I am the happiest when my time is carefully organized.	1	2	3	4	5
117. I change my mind a lot. - - - - - - - - - - - - -	1	2	3	4	5
118. I have to continually remind myself of the main point of the conversation when talking to others.- - - - - -	1	2	3	4	5
119. When people ask for my opinion I am always honest.-	1	2	3	4	5
120. Even when someone else is in charge, I have a difficult time not taking over.- - - - - - - - - - - - -	1	2	3	4	5
121. I often act on impulse.- - - - - - - - - - - - -	1	2	3	4	5
122. I spend a lot of time making sure that everything is exactly the way it should be.- - - - - - - - - - - - -	1	2	3	4	5
123. I know there are a lot of people out there waiting to trick me.- - - - - - - - - - - - - - - - -	1	2	3	4	5
124. I need people to tell me what to do.- - - - - - - -	1	2	3	4	5
125. People sometimes tell me that I am not making sense.-	1	2	3	4	5
126. I enjoy being sexually stimulated.- - - - - - - - -	1	2	3	4	5
127. I sometimes try to get even, rather than forgive and forget. - - - - - - - - - - - - - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
128. I think you have to be ruthless to get on in life.- - - -	1	2	3	4	5
129. I only talk to people when I absolutely have to.- - - -	1	2	3	4	5
130. I like to help people by correcting them.- - - - - - -	1	2	3	4	5
131. I almost always feel guilty about something.- - - - -	1	2	3	4	5
132. I rarely set objectives for myself.- - - - - - - - -	1	2	3	4	5
133. I doubt my own ability to do the right thing without advice from other people.- - - - - - - - - - - -	1	2	3	4	5
134. I have hit myself with an object on purpose.- - - - -	1	2	3	4	5
135. I feel as if there is a large void inside me.- - - - - -	1	2	3	4	5
136. Intimate relationships are very important in my life.- -	1	2	3	4	5
137. I believe most people would cheat to get ahead.- - -	1	2	3	4	5
138. I often don't do things that I am supposed to do. - -	1	2	3	4	5
139. I have a duty to point out other people's mistakes. -	1	2	3	4	5
140. My worst fear is being rejected by someone.- - - - -	1	2	3	4	5
141. Alcohol has got me into trouble on a number of occasions.- - - - - - - - - - - - -	1	2	3	4	5
142. When I think of having fun, I think of exciting rather than quiet activities. - - - - - - - - - - - - -	1	2	3	4	5
143. I get very anxious if I think someone does not like me.	1	2	3	4	5
144. I like a lot of variety in my daily life.- - - - - -	1	2	3	4	5
145. In team sports, I think it's all right to hurt your opponents.- - - - - - - - - - - - - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
146. I imagine accomplishing greater things than anyone in the world.-	1	2	3	4	5
147. I experience many things so strongly that they almost overpower me.-	1	2	3	4	5
148. I don't feel that things will ever work out for me.-	1	2	3	4	5
149. I do exhilarating things every chance I get.	1	2	3	4	5
150. If people offer to help me, I become suspicious.	1	2	3	4	5
151. Part of me craves the admiration of others.	1	2	3	4	5
152. I tend to follow other people's wishes.-	1	2	3	4	5
153. I enjoy close relationships.	1	2	3	4	5
154. I do risky things that I know are beyond my capabilities.	1	2	3	4	5
155. I tend to believe what people say without question.-	1	2	3	4	5
156. When I disagree with someone, I sometime threaten them with violence.-	1	2	3	4	5
157. I spend hours trying to make everything as exact as possible.	1	2	3	4	5
158. I like to flirt with danger.-	1	2	3	4	5
159. I just drift through life.-	1	2	3	4	5
160. I am exceptionally good at daydreaming about being powerful and successful.	1	2	3	4	5
161. When things go wrong, I need to be with the person who I am especially attached to.-	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
162. I am always worrying about something. - - - - - - -	1	2	3	4	5
163. I measure everything precisely, never relying on estimates. - - - - - - - - - - - - - - - - - -	1	2	3	4	5
164. I continually search for thrills. - - - - - - - - -	1	2	3	4	5
165. I rarely do anything to help someone who has a problem.- - - - - - - - - - -	1	2	3	4	5
166. I am always watching for people that may try to slip one by me.- - - - - - - - - - - - - - - - -	1	2	3	4	5
167. I worry about having made the right decision.- - - - -1		2	3	4	5
168. I would do something against the law if I knew I would not get caught. - - - - - - - - - - - - -	1	2	3	4	5
169. I need people to reassure me that they think well of me. - - - - - - - - - - - - -	1	2	3	4	5
170. I am always watching for possible threats.- - - - - - 1		2	3	4	5
171. The feeling of being bored is always with me.- - - - 1		2	3	4	5
172. I do my best even if others do not expect it. - - - - - 1		2	3	4	5
173. I can't force myself to stop thinking about my problems. - - - - - - - - - - - - - -	1	2	3	4	5
174. I let others know if I am angry.- - - - - - - - - -	1	2	3	4	5
175. I avoid people whenever possible.- - - - - - - - - - 1		2	3	4	5
176. Familiar things sometimes seem "foggy" or far away to me.- -	1	2	3	4	5
177. I find it hard to resist persuasive people.- - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
178. When things are a mess I have to tidy them up straight.	1	2	3	4	5
179. There have been many times in my life when I have repeatedly used alcohol to excess.- - - - - - - - -	1	2	3	4	5
180. When someone I am very close to is away, I count the hours until their return.- - - - - - - - - - -	1	2	3	4	5
181. I seem to take longer than other people to think of the answer to simple questions.- - - - - - - - - -	1	2	3	4	5
182. I try to avoid conversations about my warm feelings for other people.- - - - - - - - - - - - - - - -	1	2	3	4	5
183. I enjoy telling others "I told you so".- - - - - - - -	1	2	3	4	5
184. I threaten to hit people when I get angry.- - - - - -	1	2	3	4	5
185. I often feel that people are out to get me.- - - - - -	1	2	3	4	5
186. I have found different ways in which I can intentionally hurt myself.- - - - - - - - - - - - - - - -	1	2	3	4	5
187. I become anxious when I have to be alone for any length of time.- - - - - - - - - - - - - - - - - -	1	2	3	4	5
188. I am almost always emotional.- - - - - - - - - - -	1	2	3	4	5
189. I have to force myself to keep going when the person I am very attached to is away.- - - - - - - - - - -	1	2	3	4	5
190. I have always worried a lot about little things. - - - -	1	2	3	4	5
191. I fantasize about becoming a great success. - - - - - -	1	2	3	4	5
192. I am irritated a great deal more than people know.- - -	1	2	3	4	5
193. Little things change my emotions. - - - - - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
194. It doesn't bother me if my actions cause problems for someone else. - - - - - - - - - - - - - - - -	1	2	3	4	5
195. Even when things are going well for me I tend to think the worst.- - - - - - - - - - - - - - - - - -	1	2	3	4	5
196. I don't need someone to love.- - - - - - - - - - -	1	2	3	4	5
197. I seem to experience anger more intensely than other people. - - - - - - - - - - - - - - - - - -	1	2	3	4	5
198. I try to have people around me all of the time.- - -	1	2	3	4	5
199. I have a clear sense of my own identity.- - - - - - -	1	2	3	4	5
200. I resent it when the person I am especially close to spends time away from me.- - - - - - - - - - - -	1	2	3	4	5
201. I don't seem to have the drive to get things accomplished.- - - - - - - - - - - -	1	2	3	4	5
202. I worry about people not liking me.- - - - - - - - -	1	2	3	4	5
203. I am sometimes irritated by people who ask favours of me. - - - - - - - - - - - -	1	2	3	4	5
204. I get great pleasure from making love.- - - - - - - -	1	2	3	4	5
205. People often take advantage of me.- - - - - - - - -	1	2	3	4	5
206. I try to make friends with people who can be useful.-	1	2	3	4	5
207. The things I enjoy doing most are done on the spur of the moment. - - - - - - - - - - - - - - - -	1	2	3	4	5
208. My moods change suddenly. - - - - - - - - - - - - -	1	2	3	4	5
209. Even though I've made a decision, I often feel that it's not really settled.- - - - - - - - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
210. I have been involved in several fights since my teenage years.-	1	2	3	4	5
211. As a child I started fires that damaged property.	1	2	3	4	5
212. I avoid taking unnecessary chances.-	1	2	3	4	5
213. I am easily fooled by others.	1	2	3	4	5
214. I rarely, if ever, become sexually excited.-	1	2	3	4	5
215. All my life I have been a worrier.	1	2	3	4	5
216. I envy people who have many friends and acquaintance.-	1	2	3	4	5
217. I usually insist that my point of view is heard.	1	2	3	4	5
218. I need intimate relationships.-	1	2	3	4	5
219. Sometimes I enjoy watching other people get embarrassed.	1	2	3	4	5
220. I am not very good at being assertive with others.-	1	2	3	4	5
221. The very thought that the person who I am closest to may leave me fills me with panic.-	1	2	3	4	5
222. I wish I found it easier to make friends.-	1	2	3	4	5
223. As a child and young teenager, I often stole things.-	1	2	3	4	5
224. I let people walk all over me.-	1	2	3	4	5
225. A lot of pressure makes it difficult for me to think clearly.-	1	2	3	4	5
226. I avoid getting attached to anyone.-	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
227. I have always been a little irritable. - - - - - - -	1	2	3	4	5
228. There are days where I don't do anything at all because I can't seem to get going.- - - - - - - - - - - -	1	2	3	4	5
229. I feel panicky when I am separated from those I love.-	1	2	3	4	5
230. I am too sensitive; I feel things very acutely. - - - -	1	2	3	4	5
231. When I was younger, I often picked on smaller children.- - - - - - - - - - - -	1	2	3	4	5
232. I am cautious about what I say about myself even among close friends.- - - - - - - - - - - - - - - -	1	2	3	4	5
233. I like to do things very methodically. - - - - - - -	1	2	3	4	5
234. Others find it hard to tell what I'm feeling.- - - - -	1	2	3	4	5
235. I can't be bothered to do much of anything.- - - - - -	1	2	3	4	5
236. It's more important to get what I want than to be sincere. - - - - - - - - - - - - - - - -	1	2	3	4	5
237. I have taken things that were not mine.- - - - - - -	1	2	3	4	5
238. I find it difficult to think clearly when I have a lot of problems.- - - - - - - - - - - - - - -	1	2	3	4	5
239. I often fail to get things done on time.- - - - - - -	1	2	3	4	5
240. I find it difficult to turn to other people for help.- - -	1	2	3	4	5
241. I don't hesitate to tell someone off when they deserve it.- - - - - - - - - - - - - - -	1	2	3	4	5
242. I like to dramatize things. - - - - - - - - - - -	1	2	3	4	5
243. In groups I tend to take the lead in organizing things.-	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
244. I like attending to small details. - - - - - - - -	1	2	3	4	5
245. The world sometimes seems unreal to me.- - - - -	1	2	3	4	5
246. I feel contempt for people who are soft-hearted. - - -	1	2	3	4	5
247. The idea of killing myself has been on my mind for many years.- - - - - - - - - - - - - - - - - -	1	2	3	4	5
248. I occasionally feel people brush past me when there is really no one there.- - - - - - - - - - -	1	2	3	4	5
249. I like to challenge people.- - - - - - - - - - - -	1	2	3	4	5
250. I take chances that other people regard as foolhardy.-	1	2	3	4	5
251. I don't mind asking others for support.- - - - - - -	1	2	3	4	5
252. Worry tends to make me cling to those I am closest to.	1	2	3	4	5
253. People make me feel nervous.- - - - - - - - - - -	1	2	3	4	5
254. Once I have made up my mind I find it hard to believe that I could be wrong.- - - - - - - - - - - - -	1	2	3	4	5
255. I brood a lot about my past mistakes. - - - - - - -	1	2	3	4	5
256. I feel unsure about my decisions until I check them out with others.- - - - - - - - - - - - - - - -	1	2	3	4	5
257. I sometimes mistake noises for people's voices.- - - -	1	2	3	4	5
258. I cannot tolerate a mess. - - - - - - - - - - -	1	2	3	4	5
259. I have tried to end my life more than once.- - - - - -	1	2	3	4	5
260. I don't hesitate to point out when others are in the wrong.- - - - - - - - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
261. I am aware of every little change occurring around me.	1	2	3	4	5
262. I worry that I will lose a sense of who I am.- - - - -	1	2	3	4	5
263. When I take sick leave from work or school, I am always as I say I am.- - - - - - - - - - - - - - -	1	2	3	4	5
264. I feel that my life is full of interesting things.- - - -	1	2	3	4	5
265. If there was no one in my life I would find myself wishing I had someone to be close to.- - - - - - - - - - - - -	1	2	3	4	5
266. The idea of suicide is always at the back of my mind.-	1	2	3	4	5
267. I often feel that I have very little to look forward to.- -	1	2	3	4	5
268. I feel nothing when friends tell me about their troubles.	1	2	3	4	5
269. When I am separated from those I love I imagine all sorts of dreadful things happening.- - - - - - - - -	1	2	3	4	5
270. I continually watch for signs of danger.- - - - - - -	1	2	3	4	5
271. When I look back on each day, I usually have to admit that I have not done much. - - - - - - - - - - -	1	2	3	4	5
272. I often feel guilty even though I don't know what I have done wrong.- - - - - - - - - - - - - -	1	2	3	4	5
273. When I was young, I deliberately damaged property that didn't belong to me.- - - - - - - - - - - -	1	2	3	4	5
274. I often "forget" to do things that require a lot of effort.	1	2	3	4	5
275. I argue a lot.- - - - - - - - - - - - - - - - -	1	2	3	4	5
276. Once I have reached a conclusion, I dislike it when others try to convince me it is wrong.- - - - - - - -	1	2	3	4	5

	1 Very unlike me	2 Moderately unlike me	3 Somewhat like and unlike me	4 Moderately like me	5 Very like me
277. I usually act first and think about the consequences later. -	1	2	3	4	5
278. I never know how to act when there are people around.	1	2	3	4	5
279. I worry about being abandoned by the person I love.-	1	2	3	4	5
280. I wish I was better at socializing.- - - - - - - - -	1	2	3	4	5
281. I like people to be afraid of me.- - - - - - - - -	1	2	3	4	5
282. When doing a task I don't want to, I get sidetracked easily. - - - - - - - - - -	1	2	3	4	5
283. I feel there is hostility all around directed toward me.	1	2	3	4	5
284. I often have moments when I feel very empty.	1	2	3	4	5
285. Even when things appear to be going well, I know that they will change for the worst.- - - - - - - - - - - - - -	1	2	3	4	5
286. My violence frightens people.- - - - - - - - - - - -	1	2	3	4	5
287. I have sometimes felt that things were not really happening to me.- - - - - - - - - - - - - - - -	1	2	3	4	5
288. I want to share my life with someone.- - - - - -	1	2	3	4	5
289. I feel uncomfortable in close relationships.- - - - - -	1	2	3	4	5
290. I am unsure of what kind of person I really am.- -	1	2	3	4	5

Appendix K

Barratt Scale of Impulsivity (BSI) (Barratt, 1985)

PERSONAL EVALUATION- BIS-11

*ID:*_____ *Date:*

Directions: People differ in the ways they act and think in different situations. This is a test to measure some of the ways in which you act and think. Read each statement and darken the appropriate circle on the right side of the page. Do not spend too much time on any statement. Answer quickly and honestly.

	Rarely/ Never	Occasionally	Often	Almost Always/ Always
1. I plan tasks carefully	O	O	O	O
2. I do things without thinking	O	O	O	O
3. I am happy-go-lucky	O	O	O	O
4. I have "racing" thoughts	O	O	O	O
5. I plan trips well ahead of time	O	O	O	O
6. I am self-controlled	O	O	O	O
7. I concentrate easily	O	O	O	O
8. I save regularly	O	O	O	O
9. I find it hard to stay still for long periods of time	O	O	O	O
10. I am a careful thinker	O	O	O	O
11. I plan for job security	O	O	O	O
12. I say things without thinking	O	O	O	O
13. I like to think about complex problems	O	O	O	O
14. I change jobs	O	O	O	O
15. I act "on impulse"	O	O	O	O
16. I get easily bored when solving thought problems	O	O	O	O
17. I have regular medical/dental checkups	O	O	O	O
18. I act on the spur of the moment	O	O	O	O
19. I am a steady thinker	O	O	O	O
20. I change where I live	O	O	O	O
21. I buy things on impulse	O	O	O	O
22. I finish what I start	O	O	O	O
23. I walk and move fast	O	O	O	O
24. I solve problems by trial-and-error	O	O	O	O
25. I spend or charge more than I earn	O	O	O	O
26. I talk fast	O	O	O	O
27. I have outside thoughts when thinking	O	O	O	O
28. I am more interested in the present than the future	O	O	O	O
29. I am restless at lectures or talks	O	O	O	O
30. I plan for the future				

Appendix L

Adult Sibling Relationship Questionnaire (ASRQ) (Stocker et al..1997)

ADULT SIBLING RELATIONSHIP QUESTIONNAIRE

Instructions and basic information

This questionnaire is concerned with your relationship with one of your siblings. Each question asks you to rate how much different behaviors and feelings occur in your relationship. Try to answer each question as quickly and accurately as you can. Try and answer the questions as your relationship is now, not how it was in the past nor how you think it might be in the future. In the remainder of the questionnaire, whenever you see THIS SIBLING or YOUR SIBLING we are talking about the specific sibling you are completing the study about. We begin by asking you some general questions about your sibling and yourself. Please fill in or circle the correct response.

1a) Your age_____ 1b) This sibling's age_____

2a) Your gender Male Female 2b) This sibling's gender Male Female

3a) Your birthorder: 1 =firstborn, 2 = secondborn, 3 = thirdborn, 4 = fourthborn, 5 = laterborn

3b) This sibling's birthorder: 1 =firstborn, 2 = secondborn, 3 = thirdborn, 4 = fourthborn, 5 = laterborn

---

How far does your sibling live from you?

1) The same city
2) Different city,less than 100 miles
3) Between 100 and 200 miles
4) Between 200 and 500 miles
5) Between 500 and 1000 miles
6) More than 1000 miles

How much do you and this sibling see eachother?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

How much does this sibling phone you?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

How much do you phone this sibling?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

How much do you and this siblingsee each other for holidays and family gatherings?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

What is your relationship with this sibling?

1) Biological sibling 2) Twin 3) Step sibling
4) Half sibling 5) other (please explain)_____

Now we would like some information about your other siblings
DO NOT INCLUDE THIS SIBLING HERE

	Age	Gender		Relationship (Bio, step, twin)
Sib#1	_____	M	F	_____
Sib#2	_____	M	F	_____
Sib#3	_____	M	F	_____
Sib#4	_____	M	F	_____
Sib#5	_____	M	F	_____
Sib#6	_____	M	F	_____
Sib#7	_____	M	F	_____
Sib#8	_____	M	F	_____

Now begin the *Adult Relationship Questionnaire*

1) How much do you and this sibling have in common?
☐ 1 **Hardly anything** ☐ 2 **A little** ☐ 3 **Somewhat** ☐ 4 **Very much** ☐ 5 **Extremely much**

2) How much do you talk to this sibling about things that are important to you?
☐ 1 **Hardly at all** ☐ 2 **A little** ☐ 3 **Somewhat** ☐ 4 **Very much** ☐ 5 **Extremely much**

3) How much does this sibling talk to you about things that are important to him/her?
☐ 1 **Hardly at all** ☐ 2 **A little** ☐ 3 **Somewhat** ☐ 4 **Very much** ☐ 5 **Extremely much**

4) How much do you and this sibling argue with each other?
☐ 1 **Hardly at all** ☐ 2 **A little** ☐ 3 **Somewhat** ☐ 4 **Very much** ☐ 5 **Extremely much**

5) How much does this sibling thinks of you as a good friend?
☐ 1 **Hardly at all** ☐ 2 **A little** ☐ 3 **Somewhat** ☐ 4 **Very much** ☐ 5 **Extremely much**

6) How much do you think of this sibling as a good friend?
☐ 1 **Hardly at all** ☐ 2 **A little** ☐ 3 **Somewhat** ☐ 4 **Very much** ☐ 5 **Extremely much**

7) How much do you irritate this sibling?
☐ 1 **Hardly at all** ☐ 2 **A little** ☐ 3 **Somewhat** ☐ 4 **Very much** ☐ 5 **Extremely much**

8) How much does this sibling irritate you?
☐ 1 **Hardly at all** ☐ 2 **A little** ☐ 3 **Somewhat** ☐ 4 **Very much** ☐ 5 **Extremely much**

9) How much does this sibling admire you?
☐ 1 **Hardly at all** ☐ 2 **A little** ☐ 3 **Somewhat** ☐ 4 **Very much** ☐ 5 **Extremely much**

10) How much do you admire this sibling?
☐ 1 **Hardly at all** ☐ 2 **A little** ☐ 3 **Somewhat** ☐ 4 **Very much** ☐ 5 **Extremely much**

11) Do you think your mother favors this sibling or you more?

- ❑ **1) I am usually favoured**
- ❑ **2) I am sometimes favoured**
- ❑ **3) Neither of us is favoured**
- ❑ **4) This sibling is sometimes favoured**
- ❑ **5) This sibling is usually favoured**

12) Does this sibling think your mother usually favours him/her or you more?

- ❑ **1) I am usually favoured**
- ❑ **2) I am sometimes favoured**
- ❑ **3) Neither of us is favoured**
- ❑ **4) This sibling is sometimes favoured**
- ❑ **5) This sibling is usually favoured**

13) How much does this sibling tries to cheer you up when you are feeling down?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

14) How much do you try to cheer this sibling up when you are feeling down?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

15) How competitive are you with this sibling?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

16) How competitive is this sibling with you?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

17) How much does this sibling go to you for help with non-personal problems?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

18) How much do you go to this sibling for help with non-personal problems?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

19) How much do you dominate this sibling?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

20) How much does this sibling dominate you?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

21) How much does this sibling accept your personality?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

22) How much do you accept this sibling's personality?

❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

23) Do you think your father favors you or this sibling more?

- ❑ **1) I am usually favoured**
- ❑ **2) I am sometimes favoured**
- ❑ **3) Neither of us is favoured**
- ❑ **4) This sibling is sometimes favoured**
- ❑ **5) This sibling is usually favoured**

24) Does this sibling think your father favors him/her or you more?

- ❑ **1) I am usually favoured**
- ❑ **2) I am sometimes favoured**
- ❑ **3) Neither of us is favoured**

❑ **4) This sibling is sometimes favoured**
❑ **5) This sibling is usually favoured**

25) How much does this sibling know about you?
❑ **1 Hardly anything** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
26) How much do you know about this sibling?
❑ **1 Hardly anything** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
27) How much do you and this sibling have similar personalities?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
28) How much do you discuss your feelings and your personal issues with this sibling?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
29) How much does this sibling discuss his or her feelings or personal issues with you?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
30) How often does this sibling criticize you?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
31) How often do you criticize this sibling?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
32) How close do you feel to this sibling?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
33) How close does this sibling feel to you?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
34) How often does this sibling do things to make you mad?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
35) How often do you do things to make this sibling mad ?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
36) How much do you think this sibling has accomplished a great deal in life?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
37) How much does this sibling thinks you have accomplished a great deal in life?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**
38) Does this sibling think your mother supported him/her or you more?

❑ **1) I usually get more support**
❑ **2) I sometimes get more support**
❑ **3) We are supported equally**
❑ **4) This sibling sometimes gets more support**
❑ **5) This sibling usually gets more support**

39) Do you think your mother supports you or this sibling more?

❑ **1) I usually get more support**
❑ **2) I sometimes get more support**
❑ **3) We are supported equally**
❑ **4) This sibling sometimes gets more support**
❑ **5) This sibling usually gets more support**

40) How much can you count on this sibling to be supportive when you are feeling stressed?

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

41) How much can this sibling can count on you to be supportive when when he or she is feeling stressed?

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

42) How much does this sibling feel jealous of you?

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

43) How much do you feel jealous of this sibling?

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

44) How much do you give this sibling practical advice? (e.g., household or car advice)

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

45) How much does this sibling give you practical advice? (e.g., Household or car advice)

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

46) How much is this sibling bossy with you?

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

47) How much are you bossy with this sibling?

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

48) How much do you accept this sibling's lifestyle?

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

49) How much does this sibling accepts your lifestyle?

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

50) Does this sibling think your father supports him/her more?

- ❑ **1) I usually get more support**
- ❑ **2) I sometimes get more support**
- ❑ **3) We are supported equally**
- ❑ **4) This sibling sometimes gets more support**
- ❑ **5) This sibling usually gets more support**

51) Do you think your father supports you or this sibling more?

- ❑ **1) I usually get more support**
- ❑ **2) I sometimes get more support**
- ❑ **3) We are supported equally**
- ❑ **4) This sibling sometimes gets more support**
- ❑ **5) This sibling usually gets more support**

52) How much do you know about this sibling's relationships?

❑ 1 **Hardly anything** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

53) How much does this sibling know about your relationships?

❑ 1 **Hardly anything** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

54) How much do you and this sibling think alike?

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

55) How much do you really understand this sibling?

❑ 1 **Hardly at all** ❑ 2 **A little** ❑ 3 **Somewhat** ❑ 4 **Very much** ❑ 5 **Extremely much**

56) How much does this sibling really understand you?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

57) How much does this sibling disagree with you about things?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

58) How much do you disagree with this sibling about things?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

59) How much do you let this sibling know you care about him?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

60) How much does this sibling let you know that he or she cares about you?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

61) How much does this sibling put you down?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

62) How much do you put this sibling down?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

63) How much do you feel proud of this sibling?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

64) How much does this sibling feel proud about you?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

65) Does this sibling think your mother is closer to him/her or you?

- ❑ **1) Our mother is usually closer to me**
- ❑ **2) Our mother is sometimes closer to me**
- ❑ **3) Our mother is equally close to both of us**
- ❑ **4) Our mother is sometimes closer to this sibling**
- ❑ **5) Our mother is usually closer to this sibling**

66) Do you think your mother is closer to you or to this sibling?

- ❑ **1) Our mother is usually closer to me**
- ❑ **2) Our mother is sometimes closer to me**
- ❑ **3) Our mother is equally close to both of us**
- ❑ **4) Our mother is sometimes closer to this sibling**
- ❑ **5) Our mother is usually closer to this sibling**

67) How much do you discuss important personal decisions with this sibling?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

68) How much does this sibling discuss important personal decisions with you?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

69) How much does this sibling try to perform better than you?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

70) How much do you try to perform better than this sibling?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

71) How likely is it that you would go to this sibling if you needed any financial assistance?
❑ **1 Hardly at all** ❑ **2 A little** ❑ **3 Somewhat** ❑ **4 Very much** ❑ **5 Extremely much**

72) How likely is it that this sibling would go to you if he or she needed any financial assistance?

1 Hardly at all 2 A little 3 Somewhat 4 Very much 5 Extremely much

73) How much does this sibling act in superior ways to you?

1 Hardly at all 2 A little 3 Somewhat 4 Very much 5 Extremely much

74) How much do you act in superior ways to this sibling?

1 Hardly at all 2 A little 3 Somewhat 4 Very much 5 Extremely much

75) How much do you accept this sibling's ideas?

1 Hardly at all 2 A little 3 Somewhat 4 Very much 5 Extremely much

76) How much does this sibling accept your ideas?

1 Hardly at all 2 A little 3 Somewhat 4 Very much 5 Extremely much

77) Does this sibling think your father is closer to him /her or you?

- **1) Our father is usually closer to me**
- **2) Our father is sometimes closer to me**
- **3) Our father is equally close to both of us**
- **4) Our father is sometimes closer to this sibling**
- **5) Our father is usually closer to this sibling**

78)Do you think your father is closer to you or this sibling?

- **1) Our father is usually closer to me**
- **2) Our father is sometimes closer to me**
- **3) Our father is equally close to both of us**
- **4) Our father is sometimes closer to this sibling**
- **5) Our father is usually closer to this sibling**

79) How much do you know about this sibling's ideas?

1 Hardly at all 2 A little 3 Somewhat 4 Very much 5 Extremely much

80) How much does this sibling know about your ideas?

1 Hardly at all 2 A little 3 Somewhat 4 Very much 5 Extremely much

81)How much do you and this sibling lead similar lifestyles?

1 Hardly at all 2 A little 3 Somewhat 4 Very much 5 Extremely much

Appendix M

Pearson and Spearman Correlations Between Bulimic Participants', Sisters', and Mothers'

SIDE Subscales: Parent Child and Sibling Relationships

Table 1

Pearson Correlations Between Bulimic Participants' and Sisters' SIDE Subscales: Parent-Child Relationship

		Sisters			
		Mother affection	Mother control	Father affection	Father control
Bulimics	Mother affection	.12	-.25	-.02	.14
	Mother control	-.07	.43**	-.48**	.39**
	Father affection	-.27	.01	.39*	-.08
	Father control	-.32	.43**	-.17	.45**

Note. * $p < .05$, ** $p < .01$.

Table 2

Spearman Correlations Between Mothers' and Bulimic Participants' SIDE Subscales: Parent-Child Relationship

		Mothers			
		Mother affection	Mother control	Father affection	Father control
Bulimics	Mother affection	.52	.22	-.24	.28
	Mother control	.05	.75**	-.30	.26
	Father affection	.16	.49	.20	.12
	Father control	-.05	-.13	-.47	.40

Note. n = 11; * p < .05, ** p < .01.

Table 3

Spearman Correlations Between Mothers' and Sisters' SIDE Subscales: Parent-Child Relationship

		Mothers			
		Mother affection	Mother control	Father affection	Father control
Sisters	Mother affection	.23	-.03	.10	-.17
	Mother control	.07	.05	.15	.06
	Father affection	.15	-.35	.45	.19
	Father control	.64*	.34	.49	.23

Note. $n = 11$; * $p < .05$, ** $p < .01$.

Table 4

Correlations Between Bulimic Participants' and Sisters' SIDE Subscales: Sibling Relationship

		Sisters			
		Sibling antagonism	Sibling caretaking	Sibling closeness	Sibling jealousy
Bulimics	Sibling antagonism	.52**	.02	-.312	.11
	Sibling caretaking	-.15	.46**	-.02	-.35*
	Sibling closeness	-.49**	-.19	.47**	.14
	Sibling jealousy	-.22	.06	.24	.54***

Note. * $p < .05$, ** $p < .01$,*** $p < .001$.

Table 5

Spearman Correlations Between Mothers' and Bulimic Participants' SIDE Subscales: Sibling Relationship

		Mothers			
		Sibling antagonism	Sibling caretaking	Sibling closeness	Sibling jealousy
Bulimics	Sibling antagonism	.70*	-.36	-.24	-.29
	Sibling caretaking	.05	.45	-.05	-.35
	Sibling closeness	.16	.44	.22	.41
	Sibling jealousy	-.05	-.19	.13	.37

Note. n = 11; * p < .05,** p < .01.

Table 6

Spearman Correlations Between Mothers' and Sisters' SIDE Subscales: Sibling Relationship

		Mothers			
		Sibling antagonism	Sibling caretaking	Sibling closeness	Sibling jealousy
	Sibling antagonism	.74**	.24	-.54	-.36
	Sibling caretaking	.16	.01	-.23	-.35
Sisters	Sibling closeness	-.45	-.02	.68*	.54
	Sibling jealousy	-.19	-.04	.40	.59*

Note. $n = 11$; * $p < .05$, ** $p < .01$.

Appendix N

Pearson Correlations Between Bulimic Participants and Sisters on the Sexual and Physical Abuse Variables

Table 1

Pearson Correlations Between Bulimic Participants and Sisters on the Sexual Abuse Variables

	Sisters		
	Number of occurrences	Age at first abuse experience	Total duration
Bulimics			
Number of occurrences	.37*	.26	.18
Age at first abuse	-.42*	.31	-.24
Total duration	.10	.25	.02

Note. * $p < .05$, ** $p < .01$.

Table 2

Pearson Correlations Between Bulimic Participants and Sisters on the Physical Abuse Variables

	Sisters		
	Number of occurrences	Age at first abuse experience	Total duration
Bulimics			
Number of occurrences	.36*	.21	.11
Age at first abuse	-.25	.31	-.29
Total duration	.46**	.11	.28

Note. * $p < .05$, ** $p < .01$.

Appendix O

Correlations Between Bulimics Participants and Sisters on the Psychopathology and Personality Variables

Table 1

Correlations Between Both Bulimic Participants and Sisters on the Psychopathology and Personality Variables

	Sisters					
	Depression	Anxiety	Self-harm	Narcissism	Affective instability	Impulsivity
Bulimics						
Depression	.01	-.13	-.18	-.11	-.08	.17
Anxiety	.19	-.18	-.08	-.13	-.04	-.01
Self-harm	.26	.02	-.07	-.13	.13	.21
Narcissism	-.05	-.25	-.22	-.10	.04	-.08
Affective instability	.16	-.20	-.01	-.05	.01	-.01
Impulsivity	-.01	-.14	-.11	-.16	-.04	.19

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The Association Between Peer Relations, Eating Behaviors, and Body Esteem in Adolescent Girls

Melissa Lieberman

A Thesis
in
The Department
of
Psychology

Presented in Partial Fulfilment of the Requirements
for the Degree of Doctor of Philosophy at
Concordia University
Montreal, Quebec, Canada

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Signed by the final examining committee:

Dr. Bhupinder Mangat — Chair

Dr. Josie Geller — External Examiner

Dr. Ellen Jacobs — External to Program

Dr. William Bukowski — Examiner

Dr. Anna-Beth Doyle — Examiner

Dr. Donna White — Thesis Supervisor

Dr. Lise Gauvin — Thesis Supervisor

Approved by _____
Chair of Department or Graduate Program Director

October 6 2000

_____
Dean of Faculty

ABSTRACT

The Association Between Peer Relations, Body Esteem, and Eating Behaviors in Adolescent Girls

Melissa Lieberman, Ph.D.
Concordia University, 2000

This study was designed to investigate the association between peer relations, eating behaviors, and body esteem in a sample of 876 adolescent girls (M age = 14 years). Participants completed questionnaires assessing peer pressure about weight and appearance (i.e., social reinforcement & peer modeling), body esteem, dieting and bulimia, weight and appearance related teasing, self esteem, and peer nominations of social rejection, popularity and teasing. Weight and height measurements were taken to calculate BMI. The Composite Social Map (CSM) procedure was used to determine clique membership and status.

Data were analyzed at the level of the clique, the friendship pair, and the individual. For cliques, results indicated that nuclear cliques were characterized by higher mean levels of peer pressure than secondary and peripheral cliques. Girls in cliques with higher social reinforcement, higher peer modeling, and an earlier average age of menarche, reported higher dietary restraint. For bulimia, higher reports of social reinforcement were associated with higher levels of bulimic behavior. Girls in high pressure cliques with low general self esteem, low body esteem, and high body-shape teasing were more likely to report problematic eating behaviors.

For best friend pairs, high between-pair associations were found for average popularity, social rejection, and age of first date, followed by perceptions of peer pressure. Further, dieting was a more common shared characteristic among best friend pairs than bulimic behavior. At the level of the individual, involvement in a close friendship, high

opposite-sex relational esteem, severe weight and body-shape teasing, peer pressure about weight and appearance, externalized self-perceptions, and peer attributions about the importance of weight and appearance for popularity and dating were important predictors of problematic eating behaviors. A more complete relational model should also include family variables.

These data point to the need for developing and implementing multilevel interventions. Prevention should focus on decreasing pressure by peers to be thin, increasing self and body esteem, and combating weight and body-shape related teasing within the school system.

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The Association Between Peer Relations, Eating Behaviors, and Body Esteem in Adolescent Girls

Adolescence is an important developmental period for the emergence of body dissatisfaction, dieting, and eating problems (Crisp, 1980; Rosen & Gross, 1987). Studies indicate that dieting occurs in approximately 50%-70% of North American adolescent high school girls, with even greater numbers reporting body dissatisfaction and expressing a desire to be thin (Wardle & Marsland, 1990). Due to the possibility that early eating and weight preoccupation might lead to later eating disorders, adolescent concern about weight and dieting has elicited the attention of both researchers and clinicians (Attie & Brooks-Gunn, 1989; Patton, Johnson-Sabine, Wood, Mann, & Wakeling, 1990; Thompson, Coovert, Richards, Johnson, & Cattarin, 1995). For example, in a prospective study examining a group of mid-adolescent schoolgirls, Patton et al. (1990) found that girls who dieted were eight times more likely to develop an eating disorder than non-dieters. Although it is well-accepted that not all dieters will necessarily develop an eating disorder, restrained eating in combination with a variety of predisposing biological, psychological, and social variables could increase an individual's risk (Cooper, 1995). In addition, restricting food intake can lead to a variety of health problems including retardation of growth, development, mental functioning and reproductive capacity (Mallick, 1983). Given the high prevalence of dieting and weight concerns during adolescence, and their potential influence on the development of eating disorders and health problems, it is important to examine the mechanisms through which these attitudes and behaviors are formed.

Although researchers have investigated the influence of both socio-cultural (e.g., Szmukler & Patton, 1995) and familial (e.g., Pike & Rodin, 1991) variables on the development of eating disorders, studies have only recently begun to examine the influence of peers (e.g., Paxton, Schutz, Wertheim, & Muir, 1999). Since peer relations and peer pressure become increasingly salient during adolescence (Sullivan, 1953), it is reasonable to propose that peers may have a significant influence on the development of eating behaviors and body satisfaction in adolescent girls, especially in environments where weight and appearance are emphasized. Also, given that girls rely strongly on social experiences to define their self-concept (Gilligan, Lyons, & Hammer, 1990), and that thinness and attractiveness have been associated with popularity (e.g., Lerner & Lerner, 1977), adolescent girls may become increasingly compliant with peer expectations and norms regarding appearance and weight in order to gain acceptance or approval, and/or to be popular. Unfortunately, the specific means through which peers influence the onset and maintenance of weight loss behaviors and the development of body esteem have not been thoroughly investigated. Thus, the purpose of this study is to explore some of the ways in which peers influence eating behaviors and body satisfaction in adolescent girls.

Eating Disorders: An Overview

It is generally agreed that the incidences of both anorexia nervosa and bulimia nervosa have increased over the past few decades (e.g., Polivy, Garner, & Garfinkel, 1986). These disorders occur predominately among young women, and usually emerge in adolescence. *Anorexia nervosa* is a syndrome characterized by self-starvation, fear of gaining weight, body image disturbance, amenorrhea, and a refusal to maintain body

weight (APA, 1994). *Bulimia nervosa* is an eating disorder characterized by recurrent episodes of uncontrollable and excessive overeating, inappropriate compensatory behaviors such as vomiting, purging, and/or exercising to counteract the effects of the binge, and body image disturbance (APA, 1994). The etiology of eating disorders is multifaceted and depends on one's vulnerability to risk factors and on protective mechanisms (Cooper, 1995). Vulnerability for the development of eating disorders may result from predisposing biological (e.g., heritable aspects of mood, lability and appetite), psychological (e.g., personality traits, perfectionism and impulsivity), and cultural variables (e.g., societal emphasis on thinness), compounded by the surrounding social environment (e.g., enmeshed, disorganized families) (see Steiger & Seguin, 1999 for a review). Studies have also shown that dieting may precede both anorexia and bulimia, although overeating, rather than dieting occurs as a precursor in a small proportion of women who develop bulimia (Cooper, 1995).

The prevalence of anorexia nervosa in Western school-aged girls and adolescents falls between 0.5% and 1%, (West, 1994). It has also been established that women are at higher risk than men (i.e., 10:1 ratio), particularly those in higher social classes (Yates, 1989). Though the prevalence of bulimia in women varies widely across subgroups, bulimia tends to be much more prevalent than anorexia. The incidence of bulimia in adolescents and young adult women in Western society is estimated at approximately 1% to 2% (Fairburn & Beglin, 1990). Research has also demonstrated that the prevalence of clinically significant bulimia may be higher in student populations, with estimates varying from 4% to19% (Hoek, 1991). Given that eating disorders occur within particular ages,

genders, classes, and populations, it seems likely that both social and cultural factors are significantly linked to their emergence.

Socio-Cultural Influences on Eating Disorders

There is some evidence that pressure on women to diet and to be thin may contribute, in part, to the increasing incidence of eating disorders. Research has demonstrated a shift toward a thinner ideal for female beauty in Western societies over the last few decades (Polivy et al., 1986). For example, Garner, Garfinkel, Schwartz, and Thompson (1980) demonstrated a decline in the average weights of Miss America contestants and Playboy centerfolds over a 20-year period (1959-1978), accompanied by a sixfold increase in the number of dieting articles in women's popular magazines. At the same time, the average body weight of women under the age of 30 was actually increasing (Metropolitan Life Foundation, 1983, cited in Striegel-Moore, Silberstein, & Rodin, 1986). The impact of this thin idealized shape is evident in the pervasiveness of dieting and body dissatisfaction, and an increased incidence of bulimia and anorexia nervosa in young women (Polivy et al., 1986). Although an obsession with weight and body dissatisfaction seem to be normative among young women, it is thought that those at the extreme end of the continuum are at significant risk for the development of eating disorders (Rodin, Silberstein, & Striegel-Moore, 1985). In addition to society's strong emphasis on thinness, it has been argued that the changing (more masculine) social role of women, greater health consciousness, and the wish to emulate upper social classes have also played important roles in shaping women's attitudes toward their body weight and shape (Polivy et al., 1986; Striegel-Moore et al., 1986). Although these values may filter

down to children and adolescents through the media and the mass-market weight control industry, they may also be transmitted by parents and peers.

Researchers have suggested that family members, especially mothers, may foster cultural ideals of thinness and beauty in their daughters. Striegel-Moore et al. (1986) suggest that mothers may model for their daughters both attitudes and behaviors concerning weight and eating, they may place heavy emphasis on thinness and appearance, they may evaluate their daughters critically with regard to weight, and they may reinforce their daughters' weight loss efforts. For example, in a recent study, Pike and Rodin (1991) demonstrated that mothers of eating disordered girls were more likely to have an eating disorder themselves and reported that their daughters needed to lose significantly more weight than mothers of non-eating disordered girls. Hill, Weaver, and Blundell (1990) found a strong correlation between dietary restraint in 10-year-old girls and their mothers (r=.68). In a sample of 236 mothers and daughters in grades 7-11, Buchholz (1996) demonstrated that mothers with strong beliefs about the link between success and thinness had daughters who were more uncomfortable with their own body image. In addition, mothers' perceptions of their own bodies and their dieting behaviors significantly contributed to how their daughters perceived their own appearance and to their global self esteem. In a Japanese sample, higher levels of eating disturbance were found in students who were encouraged to diet by their mothers and those who engaged in frequent conversations with their mothers about food and dieting (Mukai, Crago, & Shisslak, 1994). Thus, it seems likely that mothers play an important role in transmitting societal values regarding weight and appearance to their daughters. The role of fathers in the

development and maintenance of eating disorders remains relatively unexplored, though it has been suggested that the influence of fathers may not be as strong (e.g., Smolak, Levine, & Schermer, 1999).

Although researchers have investigated the influence of both the media, and more recently mothers, on the development of eating disorders, fewer studies have examined the influence of peers. Given the importance of peer acceptance during adolescence, in conjunction with the strong messages these girls receive from the socio-cultural milieu regarding beauty and thinness, one would expect peers to have an important influence on the development of eating attitudes and behaviors. Research has shown that attitudes toward thinness, obesity, and attractiveness are established from an early age (i.e., kindergarten; Lerner, 1969), with a consistent bias in favor of an ectomorphic or idealized body build over an endomorphic or fat body build. These biases are thought to become more pervasive, strong and negative in adolescence, particularly for females, due to the greater proportion of fat on the developing female body, and the importance of dating and popularity with boys (Polivy et al., 1986).

The transition into puberty can be extremely stressful for the young adolescent girl (Alsaker,1995a). In addition to physical transformations of the body (including a significant increase in body fat), young adolescents are faced with the challenge of establishing a new identity. During the rapid physical changes of puberty, perceptions of the body are strongly linked to overall self-perceptions, with stronger associations for females than males (Lerner & Karabenick, 1974). The challenge of puberty is thought to be especially difficult for girls who may experience more self-consciousness, insecurity,

and anxiety than boys (Hsu, 1989). In addition, researchers have found a consistent association between body dissatisfaction and poor self esteem in overweight female adolescents (Cash, & Green, 1986; Cash, Counts, & Huffine, 1990), but not in overweight children (Mendelson & White, 1982), suggesting that pressure to be thin may increase during this developmental period.

Further, as their abstract thinking and capacity for self-reflection develop, adolescents may become uniquely preoccupied with their maturing bodies, and the response of others, such as their peers, to this maturation. Research has shown that in women, physical attractiveness and body-shape is linked to peer evaluations, the quality of peer relationships, and social acceptance (Lerner, 1969; Langlois & Stephan, 1977). The link between popularity and thinness has been demonstrated, with overweight children, especially girls, considered less likeable by their peers (Lerner & Lerner, 1977; Lerner & Schroeder, 1971; Straus, Smith, Frame, & Forehand, 1985). Given that attractive girls are more successful interpersonally, especially in cross-gender interactions, the wish to be popular and to pursue thinness may become synonymous for the adolescent girl (Striegel-Moore et al., 1986). Research has shown that a woman's appearance is more important for dating than a man's appearance (Bercheid, Dion, Walster, & Walster, 1971). In addition, Rodin et al. (1985) demonstrated a higher prevalence of bulimia in schools where dating is heavily emphasized in comparison to schools where the emphasis on dating is less prominent.

Finally, since girls tend to develop their sense of self in the context of relationships (e.g., Gilligan et al., 1990), they are more likely to be dependent on and vulnerable to

external influences that impact their sense of identity. For example, in a large scale study of more than 1800 boys and girls, Simmons and Rosenberg (1975) found that 12- to 14-year-old girls seemed to worry more about what others thought of them, cared more about being liked, and tried to avoid negative reactions from others in comparison to boys. Thus, in response to feelings of insecurity, and in order to avoid negative evaluations by others, it has been suggested that adolescent girls may become increasingly sensitive to and compliant with social demands (i.e., peer influence) and sex-role appropriate stereotypes (i.e., regarding thinness; Hill & Lynch, 1983). In a recent study by Buchholz and White (1996), it was demonstrated that adolescent girls who had a higher "externalized" self-perception (i.e., viewed selves in eyes of others) had significantly lower appearance-esteem. Further, high externalized self-perceptions coupled with low appearance-esteem were significant risk factors for disordered eating. Thus, it seems likely that peers and peer relations may have an important role in shaping and/or maintaining adolescents' attitudes about their body weight and shape, which may be related to the development of eating disorders.

The Role of Peers

Peer relations contribute substantially to adolescent social and emotional development. Research has shown that peers play an important role in the development of emotion regulation, self understanding, self esteem, and in the formation and functioning of later relationships (Hartup,1983; Bukowski, Newcomb, & Hoza, 1987). Early social difficulties may place children at risk for later psychological adjustment problems (e.g., depression, loneliness, psychiatric illness) and academic difficulties (e.g., school drop out,

underachievement; Parker, Rubin, Price, & DeRosier, 1995; Parker & Asher, 1987). Peers also play an important role in socialization. For example, studies of peer reinforcement indicate that children's behaviors, personality dispositions, and attitudes are influenced by the reactions they receive from peers. Research has also demonstrated that children learn a variety of social behaviors (e.g., prosocial and aggressive acts, sex-roles) by observing peer behavior (Ladd, 1988).

The study of *peer relations* has generally been limited to the individual or the dyadic level (i.e., emphasizing popularity and friendship), with minimal attention devoted to the study of social networks or social groups (Cairns, Xie, & Leung, 1998). Alternatively, the study of *social influence or conformity* has focused primarily on group pressures, while social influence among friends as mutual, dyadic entities remains relatively unexplored (Hartup, 1993). Nonetheless, both dyadic mutual friendships (e.g., best friendships), and social networks (e.g., cliques), are salient features of the adolescent social world (Brown, 1989).

Although best friend dyads tend to be highly embedded within a social network (e.g., Urberg, Degirmencioglu, Tolson, & Halliday-Scher, 1995), it has been suggested that dyads and social networks may differ in their patterns of peer interactions and peer influence. For example, adolescents may respond to pressures from a best friend in order to maintain the dyadic relationship, while conformity to group norms may result from an interest in maintaining one's image or identity among peers as a whole (Brown, 1989). Best friends may have a stronger influence on attitudes and behaviors than the larger social group as a result of their greater amount of contact and interaction (Berndt & Keefe,

1995; Urberg, 1992). Alternatively, Brown (1989) suggests that social networks play an important role in identity formation, and therefore, may have a more powerful influence on the adolescent. In a recent study, Urberg, Degirmencioglu, and Pilgrim (1997) found that both the social group and best friends independently contributed to the prediction of adolescents' drinking to intoxication. However, only best friends were influential in the initiation of cigarette and alcohol use. Therefore, in the study of peer influence, both an investigation of pressures deriving from the social network as a whole, in addition to pressures deriving from same-sexed dyadic friendships, would be beneficial (Hartup,1993; Urberg et al., 1997).

Friendships

Although friendships exist in toddlerhood (Howes, 1989) and in middle childhood (Ladd, 1988), it is well-accepted that friendships become particularly salient in early adolescence (Berndt, 1982; Sullivan, 1953). Unlike earlier friendships, adolescent friendships are characterized by high degrees of intimacy, loyalty, trust, and closeness (Sullivan, 1953). Research has consistently shown that girls' friendships are more intimate than boys (Buhrmester, 1990; Hartup, 1993), with girls reporting more frequent occurrences of self-disclosure and spending more time with their friends on average than boys (Wong & Csikszentmihalyi, 1991). Therefore, girls may have more opportunities than boys to model "acceptable" behaviors for one another. In addition, adolescent friendships tend to be more stable than friendships in childhood (Hallinan, 1979), which would also increase the likelihood of peer influence. Research has also shown that *mutual* or *reciprocated* friends tend to exert more influence on one another than *unilateral*

friends, since they spend more time together and have a more intense relationship, allowing for more opportunity to influence one another (Epstein, 1983).

Friends are similar to one another in many domains. For example, friends tend to be similar on a variety of demographic variables (e.g., gender, race, age, social class), most likely due to increased opportunities for interaction with adolescents who are similar on these dimensions (Kandel, 1978a; Hartup, 1983; Eiser, Morgan, Gammage, Brooks, & Kirby, 1991). In terms of behavioral concordances, research has shown that adolescents are most similar to their friends in school-related attitudes, aspirations, and achievements, in addition to attitudes and behaviors that are relevant to the contemporary teen culture (e.g., smoking, drinking, drug use, dating; Epstein, 1983; Kandel, 1978a; Eiser et al., 1991). These similarities are thought to stem from homophily, a tendency to "select" partners who resemble one self (Bercheid & Walster, 1969). Hartup (1993) explains that socializing with similar individuals tends to be more stimulating and rewarding, increasing the likelihood of emotional support and consensual validation, and decreasing the likelihood of conflict. Nonetheless, it is unclear if adolescents select one another on the basis of an initial similarity, or whether they become more similar over time as a result of mutual socialization. In general, evidence from longitudinal studies has shown that similarities among friends derive from both sources (e.g., Kandel, 1978b; Epstein, 1983). For example, in a large study of children in grades 9-12, Kandel (1978b) found changes in drug use, educational aspirations, and involvement in delinquency over one school year, resulting from both selection and socialization, in approximately equal amounts. Therefore, it seems likely that adolescents may "select" one another as friends due to

initial similarities, but may also become more similar over time as a result of mutual socialization.

Similarity of best friend dyads in terms of eating behaviors and attitudes toward weight and shape has not been explored. However, it seems likely that adolescent girls who place a high value on appearance and thinness may "select" one another as friends. Research has shown that individuals similar in attractiveness tend to affiliate with each other (Bercheid et al.,1971), and attractiveness has been linked to thinness in several studies (e.g., Lerner, 1969). However, it is also possible that similarity among best friends regarding eating behaviors and body esteem may derive from mutual socialization. For example, given that self-concept in young women is strongly linked to interpersonal relations, adolescent girls may be influenced by their friends' beliefs and values (i.e., concerning thinness and appearance) in order to maintain their close relationships. Therefore, an important goal of the present study is to examine associations of eating behaviors and body esteem in best friend pairs.

Social Networks

In addition to participation in a "best" friendship, adolescents are usually part of a clique or social network. Cliques are described as interaction-based peer groups comprising a small number of individuals who hang around together (approximately 5-10) and develop close relationships (Brown, 1989). Like dyadic friendships, cliques tend to be same-sexed, at least through late adolescence, with girls forming smaller, more cohesive and exclusive groups than boys (Cairns, Gariepy, & Kindermann, 1989). Recent research by Cairns and his colleagues has demonstrated reasonably high stability in the composition

of social groups, especially over the short-term (3-6 weeks; Cairns, Leung, Buchanan, & Cairns, 1995), and in schools where children are kept together as a class from one year to another (e.g., private schools; Cairns, Perrin, & Cairns, 1985). Similar to friendships, social networks form on the basis of demographic similarities (e.g., gender, age, and race), behavioral characteristics (e.g., aggressiveness, popularity, substance use, smoking, and academic achievement) and biosocial variables (e.g., physical maturation, appearance or attractiveness) (Cairns et al., 1989; Ennett & Bauman, 1994).

Both selection and socialization have been implicated in peer group similarity (Bauman & Ennett, 1996; Ennett & Bauman, 1994; Wills & Cleary 1999; Patterson & Bank, 1989). For example, research has shown that antisocial behaviors of network members who are attracted to one another because of an initially shared interest in antisocial activity tend to increase over time due to mutual reinforcement (Patterson & Bank, 1989). Also, in a longitudinal study using social network analysis, Ennett and Bauman (1994) found that selection and socialization contributed equally to peer group smoking homogeneity. Although social networks exist and exert influence in students' lives before adolescence, Brown (1989) suggests that both the importance and influence of peer groups are much greater in adolescence than in childhood. Research has shown that the importance attached to belonging to a peer group peaks in early adolescence, diminishing steadily through the end of high school (Brown, Eicher, & Petrie, 1986). This is consistent with susceptibility to peer pressure, which tends to reach its height in early adolescence and then steadily diminishes to levels more characteristic of childhood (Costanzo & Shaw, 1966; Berndt, 1979).

Anecdotal evidence has suggested that eating disorders tend to run in social groups including cheerleading squads (Squire, 1983), athletic teams (Crago, Yates, Beutler, & Arizmendi, 1985), and dance camps (Garner & Garfinkel, 1980). In an empirical examination of social influence on binge behavior in two college sororities, Crandall (1988) demonstrated that women became more like their friends over time in terms of their binge behaviors. In addition, binge eating was significantly linked to popularity, and groups that binged were the most prestigious. This study provides some preliminary evidence that problematic eating behaviors (i.e., bingeing) may develop in close-knit social groups, especially where weight and appearance are central to group members. However, the ways in which these behaviors are transferred from friend to friend merits further investigation.

Given the salience of the developmental changes which occur in early adolescence (i.e., pubertal development, identity formation), it would be interesting to investigate if all female cliques are concerned with body weight and shape during this phase, or if these values predominate in specific cliques. Only one known study has investigated clique norms regarding weight, shape, and appearance during adolescence (Paxton et al., 1999). In a sample of grade 10 girls, Paxton et al. (1999) found greater similarity within than between friendship cliques for body image concerns, dietary restraint, and extreme weight loss behaviors, but not for binge eating, after controlling for BMI, depression, self esteem, and anxiety. Given that this is the only published study of this nature, it would be important to replicate these findings.

Peer Pressure

Peer pressure has been described as the primary mechanism for transmitting group norms. It has been suggested that social networks exert influence by offering desirable rewards to those who conform to group norms and/or undesirable consequences to those who resist them (Brown, 1989; Kandal, 1980). Nonetheless, questions remain regarding the exact processes or mechanisms through which peer group pressure is exerted. Ethnographic studies have provided evidence to suggest that pressure or influence can be direct or overt (i.e., group members persuade the individual to do or not to do something) and is sometimes much more subtle or indirect (i.e., ostracism of a member who does not conform to the group norm). In addition, group members may exert influence through modeling group appropriate norms and behaviors (Brown, 1989). Kandal's (1980) work on socialization of substance abuse differentiates between *social reinforcement* and *imitation* as mechanisms for influencing behavior.

Social reinforcement and imitation (i.e., modeling) could also be applied to a socio-cultural model of eating disorders. For example, Stice (1998) defines *social reinforcement* as comments or actions of others that serve to support and perpetuate the thin ideal body image for women, such as criticism regarding weight (e.g., teasing) and encouragement to diet. He suggests that social reinforcement promotes an internalization of the thin ideal and body dissatisfaction, resulting in eating pathology. On the other hand, *modeling* occurs when individuals copy behaviors they see others perform. From an eating disorders perspective, peers could model excess dietary restraint, binge behavior, preoccupation with body dimensions, and vomiting for weight control. It seems likely that

both mechanisms play an important role in influencing eating attitudes and behaviors. Thus, in the current study, both social reinforcement and peer modeling were examined in relation to eating behaviors and body esteem.

A few recent studies have examined the mechanisms through which peers influence eating attitudes and behaviors in elementary, high school, and college-aged samples. For example, Levine, Smolak, Moody, Shuman, and Hessen (1994) looked at indirect influences of peers on eating behaviors in girls in grades 6 to 8. These authors demonstrated that peer investment in dieting (e.g., how many of your friends would like to be thinner?) was a significant predictor of disturbed eating in adolescent girls, while exposure to peer dieting techniques (i.e., modeling) was predictive of non-pathological dieting. Nonetheless, peer investment in dieting was assessed using adolescent self-report, and was based on the summation of only three items. Given the low number of items, the validity of this measure is questionable. Also, the assessment of "how many" friends engage in a particular behavior may not accurately reflect peer investment in dieting, especially without any information about their total number of friends. Peer modeling was assessed by summing across a yes-no checklist of weight management techniques that the subject reported her *girlfriends* to be using. Whether or not these girls accurately reported their friends' eating behavior is questionable. Although researchers often measure peer influence using the adolescents' perception of their friends' attitudes and behavior, evidence has shown that adolescents tend to perceive their friends as much more similar to themselves than they really are (Urberg, Shyu, & Liang, 1990; Berndt & Keefe,

1995). It is therefore important to attain information directly from the friend, rather than only from the subject.

Over the last five years, similar investigations with elementary and middle school girls have been conducted. For example, in a sample of elementary and middle school girls, Shisslak et al. (1998) reported that the frequency and severity of weight control behaviors were associated with sensitivity to peers' weight-related pressures. Barr Taylor et al. (1998) found that perceptions of the importance peers placed on weight and eating was most strongly related to weight concerns in elementary and middle school girls. Oliver & Thelen (1996) found that in 3rd to 5th grade children, peer likability (e.g., the belief that being thin will increase how much peers like them), and peer messages (e.g., being teased about weight) were major contributors in predicting eating and body concerns, with likability having the most significant effects.

Studies examining peer influence on eating behavior in high school samples have also increased over the past five years. In an interview study of grade 10 girls, Wertheim, Paxton, Schutz, and Muir (1997) found that indirect pressures to be thin were more common than direct pressures, including social comparison, joint dieting, avoidance of social disapproval, and other girls' verbalized concerns. Lattimore & Butterworth (1999) found that perceived peer investment in dieting significantly predicted dietary restraint in a sample of high school girls. In a sample of girls in grades 9-12, Pike (1995) found that difficulty expressing conflict in friendship was a modest predictor of bulimic patterns, after controlling for psychological distress. Also, degree of bulimic symptoms reported by participants was associated with perceptions of occurrence of anorexia and bulimia among

friends, bulimic symptoms in the social clique, direct social pressure to diet, social anxiety, and public self-consciousness, after controlling for social desirability and psychological distress. Finally, Paxton et al. (1999) found that the frequency with which friends talked about dieting, friends as a source of influence (re: perfect body, diet products used, exercise), and body comparisons, significantly predicted body image concern, dietary restraint, binge eating, and extreme weight loss behaviors in a sample of grade 10 girls. It is important to note that the items used in these studies did not clearly differentiate social reinforcement and peer modeling, and did not examine peer processes from a developmental perspective. Also, most items used in these studies reflect perceptions of peer behavior, rather than peer reports of their own behavior.

Studies have also examined peer influences on disordered eating in college-aged women. For example, in one college sample, Irving (1990) demonstrated that perceived pressure from peers to be thin, (in addition to parents and the media), was positively related to bulimic symptoms. In a case series study, Mitchell, Hatsukami, Pyle, and Eckert (1986) found that 45% of bulimics reported that they initiated bingeing and purging following pressure from a friend to lose weight, whereas Pyle, Mitchell, and Eckert (1981) found that suggestions to lose weight by friends were often followed by dieting episodes associated with the onset of bulimia. Nonetheless, in all of these studies, reports were retrospective in nature, limiting the reliability of these findings. In terms of peer modeling or peer instruction, Chiodo and Latimer (1983) found that 37% of college-aged bulimics retrospectively reported learning to vomit from a friend, while Schwartz, Thompson, and Johnson (1982) reported that most college-aged women who purged had another self-

induced vomiter as her closest friend. Again, these studies were conducted in college-aged students, limiting their generalizability to an adolescent population.

Peers may also influence eating behaviors and attitudes through weight-related teasing. Studies have shown that high levels of perceived teasing are associated with negative effects in both obese and non-obese individuals, particularly body image disturbance (Cash, Winstead, & Janda, 1986; Fabian & Thompson, 1989; Thompson & Psaltis, 1988; Stormer & Thompson, 1995). For example, in a large-scale study, Cash et al. (1986) demonstrated that women who were teased about their weight in childhood, were more dissatisfied with their appearance during adulthood. In a more recent college-aged study, Cash (1995) found that teasing/criticism focused primarily on weight and facial features, and peers were reported to be the worst perpetrators of appearance teasing /criticism. Nonetheless, most of these studies have used self-reports of college students about their childhood, and are therefore subject to retrospection bias.

Few studies have focused on teasing in adolescent populations. Fabian and Thompson (1989) examined if retrospective accounts of having been teased about one's weight predicted current levels of body esteem and eating disturbance in a small sample of pre and post-menarcheal females. Results showed that in pre-menarcheal girls, low body esteem was associated with greater frequency and reported negative emotional consequences of weight-related teasing, while in post-menarcheal girls, body esteem was correlated with teasing frequency only. Thompson et al. (1995), in a longitudinal study of 10- to 15-year-old girls, found that teasing history had a directional effect on body image and eating disturbance. Also, being overweight was a risk factor for being teased about

weight, size, and overall appearance. More recently, Paxton et al. (1999) found that teasing about weight contributed to dietary restraint and body image concern in a sample of grade 10 girls.

Although these studies provide some preliminary evidence demonstrating that peers may have a significant influence on eating behaviors and body dissatisfaction, methodological flaws (e.g., small number of self-report items) highlight the necessity for more extensive work in this area. Therefore, another goal of this study is to explore some of the processes through which peers influence eating attitudes and behaviors. It is expected that peers may model both attitudes and behaviors regarding weight and eating, they may directly teach their friends "acceptable" weight loss behaviors (i.e., dieting, vomiting after eating), they may place heavy emphasis on thinness and appearance (which may be internalized by their friends), they may evaluate their friends critically with regard to weight, or they may reinforce their friends' weight loss efforts and thin appearance (social reinforcement). The current study improved on past research by using both subjective (self) and objective (peer) ratings of teasing, by assessing current teasing experiences, and by differentiating different types of teasing (re; appearance, weight, body-shape, general) in predicting body esteem and eating behaviors. Also, the differential effects of social reinforcement and peer modeling on eating behaviors and body esteem were evaluated.

Susceptibility to Peer Influence

Peer pressure is only influential if adolescents are willing to respond to it. In other words, in order for pressures to influence behavior, they must be internalized. Urberg

(1992) proposes that adolescents who are higher on *conformity* may be more easily influenced by their peers. She bases this assumption on the behavioral intention model of Ajzen and Fishbein (1970), which states that an individual's intention to engage in a behavior varies as a function of the individual's beliefs about what others think of the behavior, weighted by the individual's motivation to comply with these others. That is, those who care most about doing what others want should be most easily influenced by others. To test her hypothesis, Urberg (1992) conducted a study examining peer influence on the development of cigarette smoking in grade eleven students. Results showed that subjects who rated doing what their best friend wants them to do as important (i.e., conformity), were more likely to be influenced by their best friends. However, she did not examine what leads adolescents to believe that it is important to do what their friends want them to do.

Many authors suggest that patients with eating disorders are particularly vulnerable to the influence of external standards such as those portrayed in the media, especially with regard to appearance (Crisp, 1980; Garner & Garfinkel, 1982). However, at this point it is unclear whether a heightened susceptibility to social pressures is a predisposing factor for the development of an eating disorder, or whether the effects of these social pressures are amplified as a result of having the disorder. Crandall (1988) suggests that many of the personality characteristics that clinicians have found as correlates of eating disorders (e.g., low self esteem, depression, impulsivity, poor family environment, poorly developed sense of self) may be better characterized as indicators of susceptibility to social influence. In addition, research with both adults and adolescents has indicated that bulimics may

experience greater social anxiety, poorer social relationships, and a strong need for social approval (Becker, Bell, & Billington, 1987; Gross & Rosen, 1988; Striegel-Moore et al., 1986), which may also influence their susceptibility to social pressure. In a longitudinal study of self esteem in an adolescent population, Zimmerman, Copeland, Shope, and Dielman (1997) found that susceptibility to peer pressure was highest in adolescents with low self esteem, and the greatest rise in susceptibility occurred in the consistently low self esteem group. Thus, another goal of this study is to examine if adolescent girls with social difficulties (both weight and non-weight specific) and a poor sense of self, perceive more pressure from their friends to achieve the thin ideal, are dissatisfied with their bodies, and engage in disordered eating behaviors.

Summary

Young adolescent girls are growing up in a socio-cultural environment that glorifies thinness. The mass media promotes unrealistic beliefs that thinness is healthy, easily achieved, and a sign of success. Thus, young adolescent girls are being exposed to unhealthy messages about the importance of body-shape, dieting, and attractiveness (McVey, 1996). Family members, especially mothers, may also reinforce cultural ideals regarding thinness and beauty, which may further contribute to the development of eating problems. Nonetheless, just as the media and family members play important roles in the transmission of socio-cultural pressures, peers may also have an important part in this process. Given the salience of peer relations during early adolescence, and the high prevalence of dieting and body dissatisfaction which emerge at this age, it seems likely that peers will significantly influence attitudes about body weight and shape, and the

development of eating behaviors more directly. The purpose of this study was to explore some of the mechanisms through which peers exert this influence. Although eating problems can develop at any point throughout the life span, they tend to emerge when an individual is exposed to several changes at once, such as during early adolescence (Levine et al., 1994). Adjusting to the physical changes of puberty, paired with the establishment of intimate peer relations and relations with members of the opposite sex, may heighten a young girl's concern with appearance and body-shape. Thus, the sample for the current study represents an early to mid-adolescent age group. Research in this area has implications for the design and implementation of prevention programs as well as intervention approaches. Also, this research extends the empirical examination of recent theories regarding socio-cultural influences on eating attitudes and behaviors. More specifically, this research will add to our knowledge base regarding the means through which young girls acquire negative attitudes toward their bodies and problematic eating behaviors, which are both important risk factors for the development of eating disorders.

Objectives and Hypotheses

The primary objective of this study was to examine associations between peer relations, eating behaviors, and body esteem at three levels: the group level (i.e., clique data), the pair level (i.e., friendship pairs), and the individual level.

Clique and Friendship Pair Analyses

Objective 1:

To examine the associations (ICCs) between clique members and best friend pairs for perceptions of peer pressure about weight and appearance, eating behaviors, body esteem,

self esteem, popularity/social rejection, physical attractiveness, average age of menarche, and social self-perceptions.

Hypotheses:

a) It is hypothesized that higher between-clique/between-pair variability will be found for perceptions of peer pressure about weight and appearance, eating behaviors, and average age of menarche than for body esteem and self-perceptions.

b) It is hypothesized that different patterns will emerge for cliques and friendship pairs.

Objective 2:

To explore group characteristics associated with individual perceptions of peer pressure in cliques, including clique status (nuclear, secondary, or peripheral), average age of menarche, and number of group members.

Hypothesis:

a) It is hypothesized that girls in nuclear, early maturing, and smaller cliques will experience more peer pressure than girls in secondary/peripheral, later maturing, and larger cliques.

Objective 3:

To explore group characteristics associated with dieting behavior, bulimic behavior and body esteem. Clique status (nuclear, secondary, and peripheral), average clique peer pressure (social reinforcement and peer modeling), average age of menarche, and number of group members will be examined as group level variables.

Hypothesis:

a) It is hypothesized that girls in nuclear, high pressure, early maturing, and smaller

cliques will report more dieting and bulimic behavior and lower body esteem.

Objective 4:

To examine the extent to which peer relations and self-perceptions moderate the relationship between being in a high peer pressure group and eating behaviors.

Hypothesis:

a) It is hypothesized that girls with lower general and relational self esteem, more negative peer relations, higher reports of severe teasing, and greater appearance preoccupation will be more likely to report disordered eating when in high peer pressure cliques.

Level of the Individual

Objective 5:

To explore social and relational characteristics linked to perceptions of peer pressure, body esteem, and disordered eating in adolescent girls.

Hypotheses:

a) It is hypothesized that girls who are more popular, leaders, and are involved in close friendships will have higher body esteem, and will report less problematic eating behaviors.

b) It is hypothesized that girls who are reported by peers to be teased about their weight, and those who are socially rejected, will have lower body esteem and will be more likely to engage in problematic eating behaviors.

c) It is hypothesized that girls who report more weight, appearance, and body-shape related teasing will have lower body esteem and engage in problematic eating behaviors.

d) It is hypothesized that girls with higher external selves, lower same and opposite-sex

relational esteem, and higher attributions about the importance of weight and appearance for popularity and dating will have lower body esteem and engage in more problematic eating behaviors.

e) After controlling for maturational, general peer, and social-self variables, it is hypothesized that peer pressure will contribute to body esteem and problematic eating behaviors above and beyond these constructs.

Method

Participants

A total of 876 adolescent girls (M age =14.08, SD=1.23) in grades 7 through 10 were recruited from four English private schools in greater Montreal, Canada. Two of the schools were relatively small (n=68 & n=118 participants), while the other two schools were relatively large (n = 333 & n = 357 participants). The sample of girls represents a middle-upper socioeconomic and multi-cultural group. 61% of fathers and 54% of mothers were reported by their children to have a B.A. or graduate level university degree. The majority of students were from two-parent families; 83% of parents were married, 14% were divorced or separated, and 3% were from "other" family situations (e.g., death of a parent). In three schools, more than 90% of the students attending class participated in the study, while in the smallest school the rate of participation was 82%. In three of the four schools, consent to participate was obtained from both the student and a parent. This was done at the principals' request. In the fourth school (n=357), subjects fourteen years and over were allowed to participate without parental consent.

Procedure

Principals were contacted directly by phone, and were given a brief description of the study. Once approval was attained from the principals, a description of the study was provided to students during class time. Students were asked to bring home a brief letter describing the project, including a consent form to be signed by their parents. Only students with signed parental consent and/or their own consent (see above), were permitted to participate. Subjects who did not wish to participate worked quietly at their desks during the data collection (see Appendix A for letters to principal and parents and consent forms).

The project took place in two phases. The first session took approximately 45 minutes of class time. During the first session, students who agreed to participate completed sociometric nominations (Bukowski & Hoza, 1989), the social network procedure (Cairns et al., 1989), a modified version of the Revised Class Play/Peer Nomination Inventory (Masten, Morison, & Pellegrini,1985; Perry, Kusel, & Perry, 1988), a modified version of the Silencing the Self Scale (Jack & Dill, 1992; Sippola & Bukowski, in prep.), and a general information form, which included self-reported teasing (adapted version of POTS, Thompson et al., 1995). At the end of this session, students' height and weight were measured by the examiner in a private area of the school. During the second session, students completed the remainder of the measures, including the children's version of the Eating Attitudes Test (Maloney, McGuire, & Daniels, 1988), the Revised Body Esteem Scale (Mendelson, Mendelson, & White, in press), the Peer Pressure and Eating Scale (Lieberman & White, unpublished), and the Self-Description

Questionnaire-II (Marsh, 1990). At the end of this session, students were debriefed on the purpose of the study. Subjects were also provided with a phone number in order to speak to an upper level graduate student if they had any concerns about the questionnaires or about their own eating behavior. Verbatim instructions to students are presented in Appendix B.

Measures

Sociometric Measures

1. *Mutual Reciprocated Friendships and Popularity (Bukowski & Hoza, 1989)* (see Appendix C)

In order to assess mutual reciprocated friendships and popularity, participants were asked to indicate the first name and last initial of their best friends in order of preference. Students were permitted to list up to eight friends, and were strongly encouraged to choose friends from within the school. Reciprocated friendship nominations were used to determine friendship closeness based on Bukowski and Hoza's (1989) methodology. Having a best or close friend was defined as a reciprocated nomination within one's top two choices (i.e., 1-1, 1-2, 2-1, 2-2; n=579), having only a distant friend was defined as having a reciprocated nomination greater than one's third choice (i.e., 1-3, 4-7, 3-6; n=239), and friendless was defined as no reciprocated nominations at any level (n=22). *Friendship closeness* was re-coded on a three-point ordinal scale. Participants with a best friend were rated as 2, participants with no best friend who had a distant reciprocated friendship were rated as 1, and participants with no reciprocated friend at either level were rated as 0.

For the friendship pairs analysis (using hierarchical linear modeling), reciprocated friendships were re-computed, allowing for the maximization of first choice (i.e., 1-1) nominations. Since we were interested in examining peer similarity or influence, we felt that the closer the friendship pair, the stronger the influence (Kandal, 1978a). Given the assumption of independence for the statistical analyses used in this study (i.e., HLM), participants were assigned to only one friendship pair. Based on these restrictions, 208 participants were involved in 1-1 reciprocated friendship pairs, 58 pairs were involved in 1-2 or 2-2 reciprocations, and 75 pairs were involved in reciprocations greater than their third choice (total n=341 pairs). Since we were interested in similarity among close friendship pairs, only reciprocations within the top 2 choices were used for the friendship pair analysis (n=266 pairs).

Evidence has been provided to suggest that a reciprocated friendship nomination is a valid measure of friendship. For example, research has demonstrated that reciprocated friendships in adolescence are more stable and are of higher quality than unreciprocated friendships (Bukowski & Newcomb, 1984; Bukowski et al., 1987). Also, correlational evidence has demonstrated that children who have reciprocated friendships are more socially competent than are children who do not (Howes, 1989).

Friendship nominations were also used to calculate average popularity, based on the average number of positive nominations each child received from their classmates, standardized within class and school. This methodology is also a valid measure of popularity (see Bukowski & Hoza, 1989 for a review)

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2. *Social Networks (Cairns et al., 1989)* (see Appendix C)

Social networks were determined using the composite social-cognitive map (SCM) procedure designed by Cairns et al. (1989). This measure has two purposes; it provides an efficient and flexible method for identifying clusters of individuals and connections among persons, and it defines the centrality or peripherality of persons and groups in the social network that is *not* dependent on popularity. Cairns et al., (1989) suggest that most sociometric methods are limited because they require a high participation rate (e.g., >90%), they often impose limits on the minimal network size (e.g., >20), they are usually two-dimensional representations of multi-dimensional clusters, and they usually ignore the distance between participants. The SCM procedure resolves some of these issues by allowing a small number of participants to define the groups, by allowing groups to range in size from 2-25, by examining multi-dimensional clusters, and by computing the centrality of members within each group and the centrality of groups within the network. Further, since SCM requires participants to describe the network as a whole, it allows the researcher to examine *actual* social configurations, rather than children's friendship *preferences* or *desires* (which is the basis of many sociometric procedures; e.g., see Bukowski & Hoza, 1989 for review) (Kindermann, 1998).

In the current sample, social networks were identified using a free recall task where participants were asked about the students in a definable network unit (i.e., their grade). Participants were given a complete grade list and were asked to list the students who hang around together a lot. Subsequently, they were asked to list any students who do not hang around with a particular group. Participants were also asked to place

themselves in all of the groups that they hang out with (if they were in a group at all). Although this procedure has generally been conducted in a face-to-face individual interview, it has also been used effectively in a small group administration (4-12 girls per group, 9-15 years of age) (see Edwards, 1990, cited in Cairns et al., 1989). It is important to note that not all students have the same social knowledge, social attributions, or recall/memory, which may lead to omissions of cliques and omissions of individuals within cliques. However, since *all* participants completed this measure (rather than a small group of girls), it is likely that the descriptions of the cliques within each grade are accurate and complete.

A specially designed computer program (MORENO, developed by H.K. Juliusson) was used to create cliques based on co-occurrence matrices (the frequencies with which participants are reported to belong to the same group), which provide the source for further analyses (i.e., based on conditional probabilities). The MORENO program a) displays the raw recall matrix, b) computes the co-occurrence and correlation matrices, and c) reorganizes the participant-by-participant correlation matrix to provide an approximation of individual membership into cliques (based on least squares) (Cairns et al., 1989). In the current sample, 122 cliques were created ranging in size from 2-19. One clique was dropped because only one of four members had sufficient data, leaving a total of 121 cliques. In addition, 22 girls were identified as isolates and were removed from all clique analyses (see Appendix C for frequency of cliques of different member size).

The MORENO program was also used to calculate the centrality and peripherality of both members and cliques. Frequency of nomination was used to calculate centrality based on the assumption that participants and cliques that are named most often are more central in the network. Participants were identified as nuclear (high status), secondary (medium status) or peripheral (low status) members of the clique to which they belonged. and cliques were identified as having nuclear, secondary or peripheral status within the network.

In order to operationalize group status, two dummy variables were created. The first dummy variable compared secondary status groups to all other groups (i.e., nuclear and peripheral). In this case, secondary status was assigned a value of 1 and all other cases had a value of 0. The second dummy variable compared peripheral groups to all other groups (i.e., nuclear & secondary). In this case, peripheral status was assigned a value of 1 and all other cases had a value of 0. Thus, the reference category was nuclear. In the current sample, 49 cliques were classified as nuclear, 45 cliques were classified as secondary and 27 cliques were classified as peripheral.

In order to operationalize individual status, two other dummy variables were computed. The first dummy variable compared secondary status members to all other members (i.e., nuclear and peripheral). In this case, secondary status was assigned a value of 1 and all other cases had a value of 0. The second dummy variable compared peripheral members to all other members (i.e., nuclear & secondary). In this case, peripheral status was assigned a value of 1 and all other cases had a value of 0. Thus, the reference

category was nuclear. In the current sample, 604 girls were classified as nuclear, 183 girls were classified as secondary and 67 girls were classified as peripheral members.

Because the statistical procedures used in this study required independence of groups, no participant was assigned to more than one clique. Individuals identified as members in more than one clique were assigned to the clique in which they had the highest individual status (i.e., nuclear, followed by secondary, followed by peripheral). If they had equal individual status in both cliques, clique status was used as a criterion. That is, participants were assigned to the highest status clique (i.e., nuclear, followed by secondary, followed by peripheral). If clique and individual status were parallel, it was decided that participants would be assigned to the smaller of the two groups. These criteria were based on the assumption that more central groups and participants are more cohesive, and thus may have a greater influence on their peers. In the current sample, eighty participants were members in multiple groups (9%). Using the criteria listed above, 25 cliques lost one member, 10 cliques lost two members, 4 cliques lost three members, 3 cliques lost five members, and 1 clique lost eight members. In addition, participants were provided with a complete grade list and were asked to assign *all* grade members into cliques, whether or not they were participants in the study. Therefore, non-participants ($\underline{n}$=62) were dropped from their respective cliques ($\underline{n}$=38) leaving a total of 854 (from 916) clique members (93%). Twenty-three cliques lost one member, 10 cliques lost two members, 1 clique lost three members, and 4 cliques lost four members.

It is important to note that when "number of group members" was used as a variable in the analyses, the original number of members (i.e., including the non-

participants) was used. We felt that this was more reflective of the actual clique size, even though some of the members did not participate. Also, Paxton et al. (1999) removed all dyads from their clique analyses since they felt that dyads functioned differently from groups of three or more. However, in the current study, "number of group members" was not a significant predictor variable in any of the analyses, and therefore, dyadic cliques (n=5) were not removed.

Cairns et al. (1998) provide a summary of ten studies which have used this procedure, in addition to information regarding its reliability and validity. In general, this measure has been shown to demonstrate concurrent, predictive, and construct validity. For example, research has demonstrated that adolescent composite social cognitive maps are linked with independent measures of social organization, affiliation (e.g., by gender, race) and network centrality (e.g., leadership, popularity). In addition, longitudinal evidence has demonstrated high predictive validity of social clusters over time. Research has also indicated that this measure is reliable. First, the proportion of agreement on the inclusion of members in social networks is quite high. Second, there seems to be moderate stability in cluster composition over a 3-12 week period, with centrality and peripherality remaining stable over longer periods. Thus, this measure is useful for the assessment of social clusters in adolescence.

Eating Behavior and Body Satisfaction Measures

1. *General Information and BMI* (see Appendix D)

Subjects completed a general information form regarding their current dieting status, dieting history, perception of their weight status, their parents' and peers'

perceptions of their weight status, and their parents' highest level of education. In addition, subjects were asked their age of menarche and age of first date (scores ranged from 1 {<10 years} to 10 {>14 years}). Research has shown that adolescent girls report their age of menarche accurately (e.g., Brooks-Gunn, Warren, Rosso, & Gargiulo, 1987). Height and weight measurements were taken with subjects fully clothed with their shoes off. Each subject was weighed on an electronic scale with a digital read out. Standard wall-height measurements were taken with a measuring tape.

Body Mass Index (BMI), a weight/height ratio (kilogram/metres^2), was calculated as an indirect measure of adiposity recognized in the obesity and eating disorders literature. BMI values ranged from 14.01 to 42.24 ($\underline{M}$ = 21.14, $\underline{SD}$ = 3.63), which represents a wide range of weight status, from very underweight to obese. In the current study, the mean BMIs for each age group were comparable with those presented by Rosner, Prineas, Loggie, and Daniels (1998) for American adolescent girls between the ages of 12 and 17. Their research was based on nine large epidemiologic studies, and included 66,722 children between the ages of 5 to 17. The distribution tables for BMI outlined in their paper are used by pediatricians and hospital settings within the Montreal area (personal contact, MCH nutritionist).

2. *Children's Version of the Eating Attitude Test; (CHEAT) (Maloney et al., 1988)* (see Appendix E)

Eating behaviors were assessed using the children's version of the Eating Attitudes Test (CHEAT). This is a modified version of the Eating Attitudes Test (EAT-26, Garner & Garfinkel, 1979), a 26-item self-report inventory that measures dieting behaviors, food

behaviors, food preoccupation, anorexia, bulimia and concerns about being overweight. Respondents are asked to rate the frequency of each item on a 6-point scale ranging from always to never. For each item, the most symptomatic response receives a score of 3, the next most symptomatic receives a score of 2, and the next 1. The remaining 3 choices receive a score of 0. The EAT-26 measures disordered eating on a continuous scale with scores (EAT-total) ranging from 0-78. Higher scores reflect more disordered eating. This measure is also used categorically; adult patients with scores greater than 30 are considered to be anorexic (Garner and Garfinkel, 1979), whereas for children (ages 8 to 13), a cut off of 20 is used (Maloney et al., 1988). Items on the EAT-26 cluster into 3 subscales including; *Dieting* (e.g., I am scared about being overweight), *Bulimia/Food Preoccupation* (e.g., I have gone on eating binges where I feel that I might not be able to stop), and *Oral Control* (e.g., I cut my food into small pieces). In the current study, when the subscales were analyzed separately, the 6-point scoring system was retained in order to allow for greater variability. When examining the group level variable (i.e., anorexic vs. normal), the 0-3 scoring system was used, with a cutoff of 25 (i.e., between the adult and child cutoff). The EAT-26 has demonstrated predictive validity as well as reliability (Garner, Garfinkel, & Olmstead, 1983). For example, the EAT-26 is able to discriminate between normal dieters and individuals with obesity, anorexia and bulimia (Garner, Garfinkel, & O'Shaughnessy, 1985). Also, Garner, Olmstead, Bohr, and Garfinkel (1982) found high reliability (internal consistency) of the EAT-26 (α= .90) in a sample of anorexics.

The youngest age group on which the EAT has been used in a published study was a sample of 12-year-old girls (Wells, Coop, Gabb, & Pears, 1985). However, some authors argue that the EAT-26 may be difficult for younger children to understand (Maloney et al., 1988). Given the difficult terminology, the EAT-26 was modified for children by substituting difficult words with simpler synonyms. The children's version of the EAT also consists of 26 items, is administered in the same format, and includes the same three subscales. In a sample of 318 students between the ages of 8-13, Maloney et al. (1988) demonstrated a test-retest correlation of .81 ($\underline{n}$ = 68) on the CHEAT, with a consistent pattern across grades. The measure was also found to be quite reliable in this age group, with a Chronbach's alpha of .76 ($\underline{N}$ = 318), again with a consistent pattern across ages. In addition, 7% of children scored in the anorexic range, which is comparable to rates found for the EAT in adult populations (Garner & Garfinkel, 1979). In the present sample, the Chronbach's alphas for dieting, bulimia ,and oral control were .91, .76, & .61, respectively.

3. Revised Body Esteem Scale (Mendelson, Mendelson, & White, in press) (see Appendix F)

Adolescents' attitudes about their appearance and body was assessed using the Revised Body Esteem Scale (BES). This 23-item measure conceptualizes body esteem as a multi-dimensional construct consisting of three subscales including, *Appearance* (e.g., I am pretty happy about the way I look), *Weight* (e.g., I really like what I weigh), and *Attributions* (e.g., Other people make fun of the way I look). Subjects are asked to rate how often they agree with each item on a 5-point Likert scale, ranging from never to

always. This scale has been validated on both child and adolescent samples, and has shown good reliability and validity (Mendelson, White, & Mendelson, 1996). For example, the Body Esteem Scale has demonstrated good internal consistency (α = .74 - .77 for weight esteem, α = .85 - .87 for appearance esteem) in two large samples, and has shown moderate stability over a 2-year period (Mendelson et al., 1996). In addition, the appearance esteem scale has been linked with self esteem appearance on the Harter Self Perception Profile (r=.73), indicating good construct validity. Finally, Mendelson et al., 1996 found that overweight children and adolescents had lower scores on both body esteem subscales, particularly on weight esteem, and only weight esteem was related to actual weight. Because in the current study a more extensive attribution scale was employed, only the appearance and weight esteem subscales of the BES were included. Both subscales were found to be reliable with Chronbach's alphas of .93 & .95, respectively. However, given the high correlation between appearance and weight esteem (r=.74), these variables were combined for the majority of the analyses.

4. The Peer Pressure and Eating Scale (Lieberman & White, unpublished measure) (see Appendix G)

Given the paucity of measures examining the association between peer relations and eating behavior, the author of this study developed a measure to examine the influence of peers on eating behaviors and eating attitudes in adolescence. This 36-item measure was developed from an extensive review of the theoretical literature in this area, and through informal interviews with young adolescent girls in the Montreal area. Subjects rated items on a 6-point Likert scale ranging from never true to always true. The measure

comprises three subscales including; 1. *Peer Modeling* (8 items; Chronbach's alpha = .64), 2. *Social reinforcement* (11 items; Chronbach's alpha = .76) and 5. *Peer Attributions* (8 items; Chronbach's alpha = .90), in addition to several filler items (see Appendix G for subscale items and correlations). It is important to note that when the peer modeling and the social reinforcement subscales are combined, the Chronbach's alpha increases to .78 (r=.51). However, since we conceptualized social reinforcement and peer modeling as two different mechanisms, and we were interested in their differential predictions, the subscales were left separate for all analyses. This measure was pilot tested on several adolescent girls before it was administered for our study, and modifications in wording and items were made based on their suggestions.

5. *Self-Reported Teasing (adapted version of Thompson et al., 1995)* (see Appendix D)

Self-reported teasing was assessed using four YES/NO questions about the presence of teasing (i.e., weight, body-shape, appearance, and general teasing), in addition to the impact of the teasing on the subject's feelings using a four-point rating scale ranging from "really upset me" to "did not upset me at all." This measure is based on questions used by Fabian & Thompson (1989). However, unlike Fabian & Thompson (1989), our questions focused on teasing by peers, rather than teasing in general, and we assessed teasing related to weight, body-shape, appearance and general competence, rather than just weight. Also, these authors ask about the frequency of teasing that occurred in the past, while we are asking if they have *ever* been teased, allowing for the assessment of both current and past teasing. Although Thompson, Fabian, Moulton, Dunn, and Altabe (1991) have created an 18-item self-report measure (PARTS; Physical Appearance

Related Teasing Scale) to examine Weight/Size teasing and General Appearance teasing, the measure was primarily designed for overweight adults who are asked to retrospectively report about the way they were teased in their childhood (e.g., "When you were a child did people make jokes about you being too big?") This measure seemed inappropriate for our sample.

In order to maintain our entire sample in the teasing analyses (i.e., rather than *only* those who were teased), self-reported teasing was re-coded into two dummy variables for each type of teasing. The first dummy variable compared girls who were *teased* and *upset* by the teasing, to girls who were *teased* and *not upset*, and girls who were *not teased* and *not upset*. In this case being teased and upset was assigned a value of 1 and all other cases had a value of 0. The second dummy variable compared girls who were *teased* and *not upset*, to girls who were *not teased* and *not upset* and girls who were *teased* and *upset*. In this case, being teased and not upset was assigned a value of 1 and all other cases were assigned a value of 0. Thus, the reference category was girls who were *not* teased and *not* upset by the teasing. Upset by the teasing was defined as those who reported that the teasing "really or somewhat upset them," and not upset by the teasing was defined as girls who reported that the teasing "upset them a little or not at all."

6. *Teasing: Peer Report (Masten et al., 1985; Perry et al., 1988; Crick, 1991)* (see Appendix H)

Peer-reported teasing was assessed using a modified version of the Revised Class Play (Masten et al., 1985). This technique requires participants to circle the name of one student in their grade who fits a particular behavioral descriptor. This measure consists of

three subscales including, *Leadership* (e.g., someone who everyone likes to be with), *Social Isolation* (e.g., someone who is often left out), and *Aggression* (e.g., someone who is too bossy). Only the leadership and social isolation subscales were used in the present study. The Class Play has demonstrated high internal consistency and has shown moderate stability over a 17-month period, despite changes in grade and peer group composition (Masten et al., 1985). In the present study, the Chronbach's alphas for the leadership and isolation subscales were .82 and .78, respectively. In order to assess general teasing, several items from Perry et al.'s (1988) victimization subscale (e.g., someone who people make fun of, gets called names by others, people do mean things to), and a modification of Crick's (1991) relational aggression subscale (e.g., people talk behind their back, is ignored by others, is often chosen last for sports) were included. In the present study, the Chronbach's alpha for the general teasing subscale was .87. In addition, several items were added by the author (e.g., someone who is teased because of the way they look, is overly concerned with their appearance, feels that looks are really important, is really good looking, is teased about being overweight, is teased about being too thin), in order to assess weight and appearance related teasing. Due to their relatively high inter-correlation, teasing about appearance, general teasing, and social isolation were combined to form a social rejection subscale (α = .84).

Other Measures

1. Self Esteem; Self-Description Questionnaire-II (Marsh, 1990) (see Appendix I)

Self esteem was assessed using the SDQ-II. This measure was specifically designed for use with students in grades 7-10, based on Shavelson, Hubner, and Stanton's

(1976) theoretical model which conceptualizes self esteem as a multi-dimensional construct. Although the measure consists of 102 items and 11 scales, only 4 subscales were administered to our sample. These included *Opposite-sex relations* (e.g., "I get a lot of attention from members of the opposite sex"), *Same-sex relations* (e.g., "I make friends easily with members of my own sex"), *General Self* (e.g., "Most things I do. I do well"), and *Physical Ability* (e.g., "I can run a long way without stopping"). The Parental Relations, Physical Appearance, General School, Emotional Stability, Honesty-Trustworthiness, Math and Verbal self-concept subscales were *not* used for this study. Items were rated on a 6-point Likert scale ranging from false to true. Scores are based on the adolescents' self-ratings on 8-10 items, half of which are negatively worded to disrupt positive response biases. The SDQ-II measure shows high reliability, with Chronbach's alphas for the subscales ranging from .83 to .91, and a modest average correlation between them ($\underline{r}$=.18). In terms of construct validity, research has shown that responses to the SDQ-II are related to other variables including sex, age, academic achievement in particular subject areas, and responses on other self-concept measures (Marsh, 1990). Also, the subscales have good face validity. In the present sample, Chronbach's alphas ranged from .86 to .93, indicating good reliability.

1. *Silencing the Self Scale (Jack & Dill, 1992, adapted for adolescents by Sippola & Bukowski, in preparation)* (see Appendix J)

The Silencing the Self Scale (STSS) was originally developed by Jack & Dill (1992) to assess gender-specific cognitive schemas associated with depression in women. The scale is derived from a model of female depression which suggests that in order to

create and maintain safe, intimate relationships, women often silence certain thoughts, feelings, and actions, contributing to a "loss of self." This measure was recently adapted by Sippola and Bukowski (in preparation) for a pre-adolescent population. These authors re-worded the items to assess relationships with friends, rather than with significant partners. This adapted 26-item measure consists of four subscales assessing adolescents' cognitive schemas of their relationships with peers. These include; a) *Externalized self perception;* judging the self by external standards (e.g., "I tend to judge myself by how I think my friends see me") b) *Silencing the self* ; inhibiting self-expression and action to avoid conflict and possible loss of friendship (e.g., "I think its better to keep my feelings to myself when they conflict with my friends") and c) *Divided self* ; presenting an outer compliant self while the inner self grows angry and hostile (e.g., "In order for my friends to like me, I cannot reveal certain things about myself") and d) *Care as self-sacrifice;* securing friendships by putting the needs of others before the needs of the self (e.g., "Caring means putting the other person's needs in front of my own.") The care as self-sacrifice subscale was as not administered to our sample. Items were rated on a 5-point Likert scale ranging from strongly disagree to strongly agree. For the purpose of this study, we were most interested in the "externalized self-perception" subscale because we felt that it was most relevant to peer influence. However, the "silent-self" and "divided-self" subscales were thought to reflect social anxiety, and therefore, were analyzed as risk factors for the development of problematic eating behavior in high peer pressure groups. Based on results from a preliminary study in a sample of 12- and 13-year-old girls and boys, Sippola & Bukowski (in preparation) demonstrated that the STSS was positively

correlated with self esteem for girls, but not for boys. Also, Chronbach's alphas for the STSS subscales ranged from .79-.83. In the present study, Chronbach's alphas were .73 for the external self subscale, .82 for the divided self subscale, and .79 for the silent self subscale.

Data Preparation

The raw data from the questionnaires were entered twice, each entry by a different person. The two files were compared using a Word Perfect comparison program and all discrepancies were corrected. Seven participants completed the first part, but were unable to complete the second part. These participants were included in the study. Listwise deletion occurred for missing data.

In general, most of the measures were significantly positively or negatively skewed (see Table 1 for means, SD, and skewness). All significantly skewed variables (i.e., skew >5 in large samples) were transformed (square root) and analyses were performed on both the transformed and untransformed scores. Results were comparable and thus the raw scores are presented. The assumptions of normality and homogeneity of variance were verified for all analyses. There were no multivariate outliers identified through inspection of the Mahalanobis distances. Bivariate scatterplots of residuals suggested normality and linear relations among variables. No multicollinearity was found for any pair of variables in the analyses as indicated by the correlation matrixes. For the regression analyses, predictors demonstrated small to moderate correlations with the criterion.

Results

Approach to Data Analysis

Data analyses for this study are presented in four sections: (1) descriptive data and control comparisons across schools, age groups, and weight groups (2) an evaluation of peer group processes (i.e., clique data) and their association with eating behaviors and body esteem (3) an evaluation of associations between eating behaviors, peer nominations, and self perceptions in best friendship pairs (4) an exploration of social factors which are associated with eating behaviors, body esteem, and disordered eating at the level of the individual. For each component, different statistical methodologies were used as described below.

Descriptive Data and Control Comparisons

The descriptive data consist of a summary of the self-reported general information data, and are presented in the form of percentages. According to data obtained from the background information sheet, 10% (n=86) of the sample reported that they are currently on a diet to lose weight, 4% (n=37) reported that they are currently eating less to maintain a recent weight loss, 51% (n=441) reported that they watch what they eat but are not currently on a diet, and 34% (n=294) reported that they are not dieting. Thus, although only 14% of girls reported dieting, half of the girls in our sample are concerned with what they eat. For dieting history, 45% (n=389) of the sample reported that they have never dieted, 29% (n=244) of the sample reported that they have attempted to lose weight through dieting once or twice, 19% (n=161) of the sample reported that they have tried to lose weight more than once or twice over the past year, while 7% (n=62) reported that

they are chronically dieting to lose weight. Sixty-five percent of older girls and 54% of younger girls reported that they had begun dating, and 98% of older girls and 78% of younger girls reported that they had their first period.

In regard to perception of current weight by self, peers, and parents, the percentages of underweight. overweight and average weight are shown in Table 2. It is interesting to note that few of the girls perceived themselves as underweight, but more reported that their parents and friends perceived them as underweight. Conversely, more girls perceived themselves as overweight than reported perceptions of being overweight by peers and parents. In the present sample, approximately 14.2% (n=124) of girls would be considered underweight and 14.2% (n=124) of girls would be considered overweight, based on 15th and 85th percentile cutoff scores for each age group. Thus, it seems that girls' perceptions of their parents views may be the most accurate for being overweight and underweight.

Mean comparisons across schools. In order to ascertain whether there was a relatively homogenous sample selection across schools, between-school univariate and multivariate analyses of variance were conducted on the constructs measured. Given the large sample size and the exploratory nature of the descriptive statistics, a stringent significance criterion was used (i.e., $p<.005$). The means and standard deviations for the four schools are presented in Appendix K.

Results indicated that there were no differences between schools on BMI (F (3, 861) = 3.92, $p>.005$), silencing the self (Wilks's $\lambda = .98$, F (9, 2098) = 2.28, $p>.005$),

Table 1

Means, Standard Deviations, and Skewness for Variables Included in the Current Study

Variables and Measures	Mean	SD	Skewness (Skew/SE Skew)
SELF-DESCRIPTION QUESTIONNAIRE-II			
Same Sex Relational Esteem	5.12	0.75	-17.8
Opposite-sex Relational Esteem	4.24	1.09	-5.84
Physical Ability Esteem	4.72	0.95	-11.1
General Self Esteem	4.95	0.85	-16.1
PEER PRESSURE AND EATING SCALE			
Social Reinforcement	2.03	0.62	11.8
Peer Modeling	3.56	0.77	-0.04
Peer Attributions	2.59	1.17	7.66
EATING ATTITUDES TEST			
Dieting	2.64	1.03	7.86
Bulimia/Food Preoccupation	1.86	0.74	20.3
Oral Control	2.46	0.72	12.1

SILENCING THE SELF			
Silent Self	2.62	0.73	4.66
Divided Self	2.03	0.88	10.4
External Self	2.31	0.75	5.47
BODY ESTEEM SCALE			
Weight Esteem	2.18	1.10	-2.72
Appearance Esteem	2.11	0.90	-3.10
Weight and Appearance	2.14	0.85	-3.76
GENERAL			
Average Popularity	4.88	2.56	6.02
Body Mass Index	21.14	3.63	14.70

Table 2

Perceptions of Weight for Self, Parents, and Peers

	Underweight		Overweight		Average Weight	
Self	6%	(n=54)	32%	(n=272)	62%	(n=532)
Parents	12%	(n=105)	14%	(n=120)	74%	(n=635)
Peers	17%	(n=146)	5%	(n=43)	78%	(n=671)

body esteem (Wilks's λ = .98, $F(6, 1726) = 2.62$, $p > .005$), and self-reported teasing (Wilks's λ = .98, $F(12, 2246) = 1.21$, $p > .005$). On the other hand, significant between-school differences were found for the following measures: age of menarche ($F(3, 761) = 4.36$, $p < .005$), age of first date ($F(3, 511) = 10.38$, $p < .0001$), self esteem (Wilks's λ = .95, $F(12, 2278) = 3.83$, $p < .0001$, $R^2 = 0.02$), eating behaviors (Wilks's λ = .97, $F(9, 2100) = 3.27$, $p < .001$, $R^2 = .01$), and peer pressure (Wilks's λ = .94, $F(9, 2100) = 5.98$, $p < .0001$, $R^2 = 0.03$). However, as indicated above, the index of redundancy (or the estimated eta-squared) was found to be less than 3% of the explained variance. Given that this represents 'small' effect size according to Keppel (1982), these differences were not further interpreted. Also, the pattern of differences shifted according to the variable measured, indicating that no one school was systematically different from the others on all variables.

Developmental comparisons between younger and older adolescent girls. In order to examine mean differences between younger and older adolescent girls, one-way (between grade) univariate (ANOVA) and multivariate analyses of variance (MANOVA) were conducted. Age was categorized into younger (grades 7 & 8; M age=13.05, SD=0.74; n=420) and older (grades 9 & 10; M age=15.05 , SD=.70, n= 456) in order to explore developmental differences. Again, a strict significance criteria of $p < .005$ was used. The means and standard deviations for each age group are presented in Appendix K.

Both age of menarche ($F(1, 763) = 20.46$, $p < .0001$) and age of first date ($F(1, 513) = 67.17$, $p < .0001$) differed as a function of age, with younger girls reporting an

earlier average age of first date and average age of menarche than older girls. For measures of self-perception, significant age differences were found for self esteem (Wilks's λ =.97, $\underline{F}$ (4, 863) = 7.29, $\underline{p}$<.0001), with only physical ability esteem (univariate $\underline{F}$ (1, 866) = 21.53, $\underline{p}$<.0001, $\underline{R^2}$ = .02) contributing uniquely. Physical ability esteem was reported to be higher in younger girls than in older girls. It is interesting to note that in the current study, same and opposite-sex relational esteem, in addition to general self esteem were consistent across age. Significant grade differences were also reported for silencing the self (Wilks's λ =.97, $\underline{F}$ (3, 864) = 10.42, $\underline{p}$<.001), with younger adolescent girls scoring higher on the silent self subscale (univariate $\underline{F}$ (1, 866) = 12.64, $\underline{p}$<.001, $\underline{R^2}$ =.01) than older girls. No unique grade differences were found for external self or divided self.

For the weight and appearance related variables, significant age differences were found for eating behaviors (Wilks's λ =.97, $\underline{F}$ (3, 865) = 10.34, $\underline{p}$<.0001), with unique variance for bulimia (univariate $\underline{F}$ (1, 867) = 19.22, $\underline{p}$<.0001, $\underline{R^2}$ = .02), but not for dieting and oral control. The results suggest that girls as young as 11 and 12 years of age are reporting the same degree of dieting and food restriction as their older peers. The increase of bulimic behavior with age is consistent with previous reports (Attie, Brooks-Gunn, & Petersen, 1990). The multivariate analysis for grade differences in body esteem was not significant, indicating that younger girls are just as likely as older girls to be unhappy with their appearance and their weight.

Finally, for the peer related variables, there were no significant multivariate grade differences found for self-reported teasing about weight and appearance. Nonetheless,

significant multivariate age differences were found for the peer pressure measure (Wilks's λ =.98, F (3, 865) = 6.70, p<.0001), though none of the individual subscales contributed uniquely. Using our stricter criteria, social reinforcement, peer modeling, and peer attributions did not differ across the age groups, accounting for less than 1% of variance. Class play nominations and average popularity were not analyzed because variables were standardized within class and school.

Mean comparison of variables across weight groups. In order to examine differences among related variables as a function of weight group, one-way between-subjects univariate (ANOVA) and multivariate analyses of variance (MANOVA) were conducted on the constructs measured, using a p<.005 significance level. For the descriptive analyses, BMI was divided into three weight groups; average weight (n=628), underweight (<15th percentile; n=124), and overweight (>85th percentile; n=124) as a function of age. These figures were based on data from the first National Health and Nutrition survey (Must, Dallal, & Dietz, 1991) where a BMI index over the 85th percentile is considered to represent increased risk of overweight and obesity. Thus, in order to examine variables associated with extreme obesity and extreme thinness, weight was analyzed categorically. For all other analyses in this study BMI is used as a control variable, and therefore is examined as a continuous measure. Post hoc Tukey HSD tests were used to ascertain the exact nature of the weight group differences. The means and standard deviations for the three weight groups are presented in Appendix K.

For age of menarche, results indicated that age of first period differed significantly as a function of weight group (F (2, 762) = 22.98, p<.0001), with Tukey HSD tests

indicating that underweight girls reported a later age of menarche than both overweight ($p<.0001$) and average weight ($p<.0001$) girls. Age of first date did not differ as a function of weight group. Also, for self-perception measures, neither self esteem nor silencing the self differed as a function of weight.

For eating behaviors, significant weight group differences were found (Wilks's λ = .80, F (6, 1728) = 35.00, $p<.001$), with unique variance for dieting (univariate F (2, 866) = 40.78, $p<.001$, $R^2 = 0.09$), and oral control (univariate F (2, 866) = 24.32, $p<.001$, R^2 = 0.05). Post hoc Tukey HSD tests indicated that overweight girls reported more dieting than underweight ($p<.001$) and average weight ($p<.001$) girls, and average weight girls reported more dieting than underweight girls ($p<.001$). Further, underweight girls scored higher in oral control than both average ($p<.001$) and overweight girls ($p<.001$), and average weight girls scored higher in oral control than overweight girls ($p<.001$). Bulimia did not differ as a function of weight group, which is consistent with literature suggesting that the weight of bulimic individuals is variable, ranging from underweight to overweight (Yates, 1989).

Significant weight group differences were also found for body esteem (Wilks's λ = .81, F (4, 1728) = 47.80, $p<.0001$), with unique variance for weight esteem (univariate F (2, 865) = 75.25, $p<.0001$, $R^2 = 0.15$) and appearance esteem (univariate F (2, 865) = 10.09, $p<.0001$, $R^2 = 0.02$). Post hoc Tukey HSD tests indicated that overweight girls reported significantly lower appearance esteem and weight esteem than average ($p<.0001$) and underweight girls ($p<.0001$), and average weight girls reported lower weight esteem than underweight girls ($p<.0001$).

For the peer related variables, significant weight group differences were found for self-reported teasing (Wilks's λ =.93, F (8, 1700) = 8.42, p<.0001), with Tukey HSD post-hoc analyses indicating that overweight girls reported more weight-related teasing than both average and underweight girls (univariate F (2,853) = 29.75, p<.001, R^2 = 0.07). No unique weight group differences were found for self-reported appearance teasing, body-shape teasing, and general teasing.

Significant weight group differences were also found on the class play peer nomination measure (Wilks's λ =.58, F (12, 1556) = 39.96, p<.0001), with unique variance for social rejection (univariate F (2, 783) =18.22, p<.0001, R^2 = 0.04), overweight teasing (univariate F (2, 783) = 147.52, p<.0001, R^2 = 0.27), underweight teasing (univariate F (2, 783) = 92.34, p<.0001, R^2 = 0.19), and good looks (univariate F (2, 783) = 6.37, p<.005, R^2 = .02). Post hoc Tukey HSD tests indicated that overweight girls scored higher on peer rejection than average (p<.0001) and underweight (p<.0001) girls, were teased more about being overweight than average (p<.0001) and underweight (p<.0001) girls, and received less "good looking" nominations than average weight girls (p<.001). Underweight girls were teased more about being underweight than both overweight (p<.0001) and average weight (p<.0001) girls. It is interesting to note that no significant weight group differences were found for involvement in a reciprocated friendship, popularity, and leadership.

Weight group differences were also found for peer pressure (Wilks's λ =.93, F (6, 1728) = 11.19, p<.0001), with unique variance for peer attributions about the importance of weight and appearance for popularity and dating (univariate F (2, 866) = 30.34,

$p<.0001$, $R^2 = 0.07$). Post hoc Tukey HSD analyses showed that girls in the overweight group scored higher on peer attributions than both average ($p<.0001$) and underweight ($p<.0001$) girls, and average weight girls had higher attributions than underweight ($p<.001$) girls. Peer modeling and social reinforcement did not contribute uniquely.

Clique and Friendship Pair Analyses.

General introduction to hierarchical linear modeling. Given the hierarchical nature of the current data set (e.g., nesting of individuals within cliques & pairs), peer group processes and relationships among friendship pairs were examined using hierarchical linear modeling procedures (HLM). In this data set, 854 girls were nested within121 cliques (range = 2-19), and 532 girls were nested within 266 close friendship pairs. Using HLM, we were able to decompose the variance in the outcome measure that was ascribed to between-group variation and within-group variation. In turn, we were able to look at the utility of specific predictor variables in explaining variance at each level.

In extant research, the structure of the data set is often ignored, contributing to problems with standard errors. For example, most of the widely used statistical methodologies (e.g., multiple regression analysis, MANOVA, etc.) tend to ignore the group or pair and focus on the level of the individual, or ignore the individual and focus only on the level of the group or pair. This leads to the loss of valuable information, and at the same time, ignores possible cross-level interactions. While some methodologies suggest the creation of multiple dummy variables to incorporate the nesting of individuals within groups, this strategy does not allow the researcher to take clustering into account and does not allow for the specification of random effects. In the current data set, this

approach would be quite cumbersome (i.e., 121 cliques would require the creation of 120 dummy variables), and again, would not allow for appropriate estimates of standard errors. HLM provides a good alternative to begin to resolve some the difficulties inherent in previous statistical methods.

Hierarchical linear modeling is an extension of the general linear model used in traditional multiple regression analysis which allows for the analysis of hierarchically structured, unbalanced data (i.e., lower level observations are nested within higher levels; e.g., students nested within schools, schools nested within school boards). These models are thought to be more accurate for hierarchically nested data since they are based on more realistic assumptions that allow for intra-class correlation and random coefficients (Kreft, 1996). The assumption of independence of observations is not made, and the relationships in the data are not fixed over contexts, but allowed to differ. That is, unlike traditional statistical methodologies, hierarchical linear modeling allows assumptions of constant slopes and intercepts to be relaxed. Therefore, multilevel modeling allows researchers to test the adequacy of a variety of models that include "fixed effects" (constant slopes and intercepts across persons) "random effects" (random slopes and intercepts across persons), and "non-randomly varying effects" (systematic variations in intercepts and/or slopes explained by fixed predictor variables; Steiger, Gauvin, Jabalpurwala, Seguin, & Stotland, 1999). Further, in traditional regression analysis, standard errors tend to be estimated as too low if intra-class correlation is present (i.e., the higher the intra-class correlation, the higher the underestimation of standard errors).

Hierarchical linear models allow for larger standard errors, and are thus more conservative.

Bryk and Raudenbush (1992) outline several advantages of hierarchical linear models (HLM) over other statistical methodologies. First, they report that HLM helps to reduce *aggregation bias*; when a variable has different meanings and effects depending on the organizational level at which it is observed at (e.g., average dieting of clique may have an effect on body esteem above and beyond the individual's own level of dieting). HLM allows the user to observe relationships between variables at two different levels (Level-1 and Level-2) which helps to resolve this bias (Bryk & Raudenbush, 1992). Second, it helps to reduce *misestimated standard errors* which occur when we fail to take into account the dependence among individual responses within the same group (i.e., because of shared experiences within the group or because of the reasons that individuals initially joined the group). HLM solves this problem by incorporating a unique random effect for each organizational unit (Bryk & Raudenbush, 1992). Finally, HLM helps to reduce *heterogeneity of regression*; when relationships between individual characteristics and outcomes vary across groups. HLM resolves this issue by allowing the researcher to estimate a separate set of regression coefficients for each group, and then to model variation among the groups in their sets of coefficients as multivariate outcomes explained by group factors (Bryk & Raudenbush, 1992). In the current application, we used the HLM/2L, version 4.01 software (Bryk, Raudenbush, & Congdon, 1996) and associated model nomenclature (Bryk & Raudenbush, 1992) to test our hypotheses and models.

Statistical model. In hierarchical data sets, the variability in the outcome measure can be attributed to both within (Level-1) and between (Level-2) group variations. In the current sample, Level-1 represents the individual. At Level-1, the predictors represent the characteristics of the individual (e.g., age, BMI). Level-2 represents the group. At Level-2, the regression coefficients for each group are seen as outcome variables that are hypothesized to depend on specific group characteristics. In statistical terms, this is represented by a Level-1 (within-group) and a Level-2 (between-group) model (Bryk & Raudenbush, 1992):

Level-1 model: $Y_{ij} = \beta_{0j} + \beta_{1j} \mathbf{X}_{ij} + e_{ij}$

Level-2 model: $\beta_{0j} = \gamma_{00} + \gamma_{01} \mathbf{W}_j + \mu_{0j}$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} \mathbf{W}_j + \mu_{1j}$$

As outlined by authors such as Gauvin, Rejeski, and Reboussin (in press), Duncan, Jones, and Moon (1998), Steiger et al. (1999), Goldstein (1987), and Bryk and Raudenbush (1992), in the Level-1 model, the outcome measure recorded for subject i in group j is represented as Y_{ij} and is related to a set of subject specific predictors X_{ij} by the coefficients β_{0j} and β_{1j}. The random effect for the Level-1 model is defined as e_{ij}. It is assumed to be normally distributed with a mean of 0 and variance σ^2. The regression coefficient at Level-1 may be fixed or may vary randomly across participants. Any between-group variation in the regression coefficients is modeled at Level-2 as a function of individual level predictors W_j and random effects μ_{0j} and μ_{1j}. These random effects are assumed to be normally distributed with means of 0 and variances of τ_{00} and τ_{11}. For a model with only randomly varying intercepts, the percentage of the residual variance

attributed to between-group variation (i.e., intra-class correlation, ρ) is given by $\tau_{00}/(\tau_{00} + \sigma^2)$. This is also referred to as the variance component ratio, where σ^2 is the within-group variance component and τ_{00} is the between-group variance component. The fixed effects (γ_{00}, γ_{01}) are the average intercepts and slopes across all participants or the contribution of a Level-2 predictor. In HLM, continuous predictor variables can be centered, giving 0 a specific meaning. Group mean centering involves centering around the mean of a specific Level-2 cluster, and grand mean centering involves centering around the mean of all groups combined. In the current analysis, grand mean centering was used for both Level-1 and Level-2 predictors.

General approach to HLM data analysis. In order to compute hierarchical linear models, Bryk and Raudenbush (1992) suggest a "step-up" model building strategy (pp.197-229), starting at the bottom of the hierarchy and moving to the top. Using this strategy, the proportion of total variance between and within groups is first computed for each outcome variable (i.e., intra-class correlations) without entering any Level-1 or Level-2 predictors. This allows for the decomposition of variance. Next, Level-1 variables of interest are entered into the model as either random or as fixed. Since Level-1 variables serve as covariates or control variables, failure to specify a Level-1 variable can lead to bias in the estimation of Level-2 predictors of the intercept. Only significant Level-1 variables are retained for the final model. Finally, Level-2 variables are entered into the model as moderators of the intercept, or as moderators of the Level-1 variables, depending on the question of interest. Only statistically significant variables are retained

for the final model. In the current study, restricted maximum likelihood was used for all analyses.

Approach to current data analysis. The first question addressed the association of eating behaviors, body esteem, and variables related to these constructs (e.g., peer pressure, BMI) among clique members and close friendship pairs. In order to answer this question, we computed the proportion of total variance between cliques/pairs compared with the proportion of variance within cliques/pairs (i.e., intra-class correlations) for all variables of interest using HLM. As mentioned previously, to compute intra-class correlations, hierarchical linear models are run with *only* the random intercept (i.e., the outcome variable) entered into the equation. The percentage of variance attributed to between-group variation (i.e., intra-class correlation, ρ) is defined as $\tau_{00}/(\tau_{00} + \sigma^2)$, where σ^2 is the within-group variance component and τ_{00} is the between-group variance component. This also allows us to determine the significance of the random variability by examining the p value of the χ^2.

Associations among clique members. In the current sample, results indicate that approximately 1/4 of the total variability in social reinforcement, peer modeling, age of first date, and social rejection is at the clique (group) level, whereas the remainder is at the level of the individual. Moderate intra-class correlations were found for age of menarche, popularity, and self esteem (ICCs > .10 and < .20), while lower intra-class correlations were found for eating behaviors, body esteem, peer attributions, peer nominations of appearance preoccupation, good looks and leadership, self-reported severe general teasing, and silencing the self (ICCs <.10). It is particularly interesting that non-significant

intra-class correlations were found for weight and appearance-related teasing (both self-report and peer nominations). Table 3 summarizes the within-group variance (σ^2), between-group variance (τ_{00}), and the intra-class correlations(ρ).

Associations among friendship pairs. Results indicate that a high proportion (>25%) of the total variability in social reinforcement, peer modeling, popularity, social rejection, and age of first date is between friendship pairs, while the remainder is within pairs. Moderate-high proportions of total between-pair variability (ICCs >.15 and < .25) were found for BMI, age of menarche, dieting behavior, self esteem, weight esteem, appearance nominations, and self-reported severe body-shape teasing. Results indicated moderate intra-class correlations (ICCs >.10 and < .15) for peer attributions about the importance of weight and appearance for popularity and dating, appearance-esteem, peer nominations of appearance preoccupation and leadership, severe appearance-related teasing, divided self, external self and bulimia. Non-significant ICCs were found for teasing about weight (both peer and self-report), self-reported general teasing (severe and non-severe), less severe body-shape teasing, silent self, and oral control. Table 4 presents within-group variance (σ^2), between-group variance (τ_{00}), and the intra-class correlations (ρ). Also, see Appendix L for comparison of clique and friendship pair intra-class correlations.

Group characteristics associated with peer pressure. The second question addressed what group level characteristics are associated with perceived social reinforcement and peer modeling, after controlling for individual characteristics. More specifically, the interest was in the association of clique size, clique status (secondary &

Table 3

Intra-class Correlations for Cliques

Variable	Sigma^2 (σ^2)	Tau (τ_{00})	ICC (ρ)
General Information			
Body mass index*	12.4	0.73	0.06
Age of menarche*	3.59	0.48	0.12
Age of first date*	5.12	1.39	0.21
Peer Pressure and Eating Scale			
Social reinforcement*	0.30	0.10	0.24
Peer modeling*	0.44	0.16	0.26
Peer attributions*	1.26	0.11	0.08
Self esteem			
Same sex relations esteem*	0.49	0.06	0.11
Opposite-sex relations esteem*	1.03	0.15	0.13
Physical ability esteem*	0.81	0.10	0.11
General self esteem*	0.64	0.07	0.10
Silencing the Self			
External self*	0.53	0.03	0.05
Divided self *	0.73	0.05	0.06
Silent self*	0.50	0.02	0.04
Body Esteem Scale			
Weight esteem*	1.13	0.09	0.07

Variable	Sigma^2 (σ^2)	Tau (τ_{00})	ICC (ρ)
Appearance esteem*	0.74	0.07	0.08
Children's Eating Attitudes Test			
Dieting*	0.97	0.09	0.08
Bulimia and food preoccupation*	0.52	0.04	0.06
Oral control	0.52	0.01	0.02
Peer Nominations			
Average popularity*	0.84	0.12	0.13
Peer nominated leadership*	0.87	0.09	0.09
Peer nominated rejection*	0.55	0.15	0.21
Peer nominated appearance preoccupation*	0.88	0.06	0.07
Peer nominated good looking*	0.90	0.04	0.04
Peer nominated overweight tease	0.98	0	0
Peer nominated underweight tease	0.98	0	0
Self-Reported Teasing			
Self reported severe weight tease	0.19	0	0.02
Less severe weight related teasing	0.13	0	0.01
Self reported severe body tease	0.20	0	0.02
Less severe body related teasing	0.20	0	0
Self reported severe appearance tease	0.19	0.01	0.03
Less severe appearance related tease	0.13	0	0
Self-reported severe general tease*	0.16	0.01	0.04
Less severe general teasing	0.14	0	0.02

* χ^2 test examining the presence of random variability

Table 4

Intra-class Correlations for Friendship Pairs

Variable	Sigma^2 (σ^2)	Tau (τ_{00})	ICC (ρ)
General Information			
Body mass index*	9.12	2.92	0.24
Average age of menarche*	3.24	0.71	0.18
Age of first date*	3.94	2.68	0.40
Peer Pressure and Eating Scale			
Social reinforcement*	0.27	0.10	0.27
Peer modeling*	0.39	0.21	0.35
Peer attributions*	1.23	0.15	0.11
Self esteem			
Same sex relations esteem*	0.39	0.09	0.18
Opposite-sex relations esteem*	0.95	0.25	0.21
Physical ability esteem*	0.69	0.22	0.24
General self esteem*	0.58	0.13	0.22
Silencing the Self			
External self*	0.51	0.06	0.10
Divided self*	0.71	0.07	0.10
Silent self	0.50	0.04	0.07
Body Esteem			
Weight esteem*	0.99	0.24	0.20

Variable	Sigma^2 (σ^2)	Tau (τ_{00})	ICC (ρ)
Appearance esteem*	0.70	0.11	0.13
Children's Eating Attitudes Test			
Dieting*	0.88	0.24	0.22
Bulimia and food preoccupation*	0.51	0.04	0.10
Oral control	0.51	0.01	0
Peer Nominations			
Average popularity*	0.41	0.39	0.49
Peer nominated leadership*	0.97	0.15	0.13
Peer nominated rejection*	0.19	0.11	0.37
Peer nominated appearance preoccupation*	0.92	0.15	0.14
Peer nominated good looking*	0.95	0.22	0.19
Peer nominated overweight tease	0.58	0.02	0.03
Peer nominated underweight tease	0.93	0.01	0.02
Self Reported Teasing			
Self reported severe weight tease	0.19	0	0.01
Less severe weight related teasing	0.12	0.01	0.04
Self reported severe body teasing*	0.16	0.04	0.21
Less severe body related teasing	0.20	0.01	0.03
Self reported severe appearance tease*	0.17	0.02	0.12
Less severe appearance related tease*	0.11	0.01	0.08
Self reported severe general tease	0.16	0	0.01
Less severe general teasing	0.14	0	0.02

* χ^2 test examining the presence of random variability

peripheral vs. nuclear), and clique maturational level (i.e., early vs. late development) with perceptions of social reinforcement and peer modeling (Level-2). We were also interested in the relation of individual status (secondary & peripheral vs. nuclear) with perceptions of social reinforcement and peer modeling (Level-1). Given the significant age and BMI effects reported previously, age and BMI were entered into the model as Level-1 control variables.

Social reinforcement. Following the "step-up" procedure (Bryk & Raudenbush, 1992), in the first model, no Level-1 or Level-2 predictor variables were included. In this model, the Level-1 intercept (i.e., social reinforcement) was allowed to vary randomly. Results of this first model showed that the average level of perceived social reinforcement for all subjects was 2.04 (range = 1 to 6), indicating a low-moderate level. The chi-square value associated with the variance component suggested significant between-clique variation in average level of social reinforcement, χ^2 (119) = 311.11, $p<.0001$. Again, computation of the intra-class correlation suggested that 24% of the variance in social reinforcement was between cliques.

Next, BMI and age (control variables) were entered into the model separately at Level-1 as fixed variables. Examination of the fixed effects indicated that BMI was statistically significant ($\gamma_{10} = 0.01$, $p<.05$), while age was not significant. BMI accounted for 1% of within-group variance in social reinforcement, with participants who had higher BMIs reporting higher levels of perceived social reinforcement. Next, the individual status dummy variables were entered into the model as fixed effects but were not significant. Thus, only BMI was retained in the model at Level-1.

Subsequently, the Level-2 variables of interest were entered into the model. First, the group status dummy variables were entered as moderators of the intercept. Results indicated that both secondary (γ_{01} = -0.18, $p<.05$) and peripheral (γ_{02} = -0.27, $p<.01$) cliques differed from nuclear cliques in their perceptions of social reinforcement, with girls in nuclear cliques reporting higher social reinforcement than the two comparison groups. These variables accounted for 9.4% of between-group variance in individual perceptions of social reinforcement. Hypothesis testing was conducted to see if peripheral and secondary cliques differed from each other. Results were not significant, indicating that although both secondary and peripheral cliques differ from nuclear cliques in perceptions of social reinforcement, they do not differ significantly from one another. Number of group members and average age of menarche were not significant predictors, and therefore, were not included in the model. The final model included BMI at Level-1 and group status at Level-2 (see Table 5 for estimated parameters and Figure 1 for visual display).

Peer modeling. For perceptions of peer modeling, a parallel "step-up" procedure was used. The average level of peer modeling for all subjects was 3.54, slightly higher than the social reinforcement variable. The chi-square value associated with the between-group variance component was statistically significant, χ^2 (119) = 363.16, $p<.0001$. Again, computation of the intra-class correlation suggested that 26% of the variance in peer modeling is between cliques.

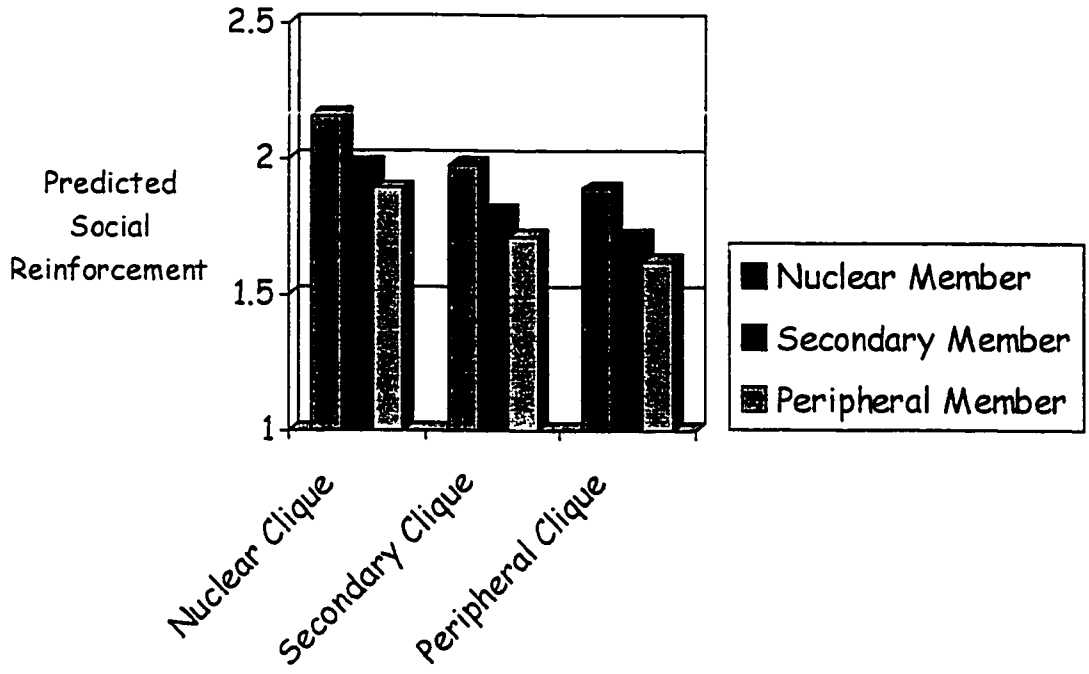
Next, the Level-1 control variables were entered into the model separately (i.e., BMI & age) as fixed variables. Examination of the fixed effects indicated that neither

Table 5

Results of Final Model for BMI (Level-1) and Group Status (Level-2) for Social Reinforcement

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept	μ_{0j}	0.08	0.28	296.43	.000
	r_{ij}	0.29	0.54		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.16	0.05	42.07	.000
Secondary Status	γ_{01}	-0.18	0.08	-2.34	.05
Peripheral Status	γ_{02}	-0.27	0.09	-2.90	.01
BMI slope	γ_{10}	0.02	0.01	2.57	.01

Figure 1. Predicted social reinforcement as a function of group status (illustrated for a person with average BMI).


Predicted
Social
Reinforcement
2.5
2
1.5
1
Nuclear Clique
Secondary Clique
Peripheral Clique
Nuclear Member
Secondary Member
Peripheral Member

BMI nor age were significant predictors of perceived peer modeling. Next, the individual status dummy variables were entered into the model as fixed effects. The secondary status dummy variable was found to be significant ($\gamma_{10} = -0.15$, $p<.05$), indicating that nuclear status girls reported higher levels of peer modeling than secondary status girls. Peripheral status girls did not differ significantly from nuclear status girls. Individual status accounted for 1% of within-group variance in peer modeling.

Subsequently, the clique status dummy variables were entered into the model. As with social reinforcement, results indicated that both secondary ($\gamma_{01} = -0.26$, $p<.01$) and peripheral ($\gamma_{02} = -0.35$, $p<.01$) clique status significantly predicted individual perceptions of peer modeling. Results showed that in higher status cliques, reports of peer modeling were higher. The secondary and peripheral status dummy variables accounted for 12.1% of between-clique variance, after controlling for individual status. Post-hoc hypothesis testing did not reveal significant differences between secondary and peripheral cliques. Number of group members and average age of menarche did not significantly predict individual perceptions of peer modeling, and thus were not included in the model. The final model included dummy coded individual status at Level-1 and dummy coded group status at Level-2 (see Table 6 for estimated parameters and Figure 2 for a visual display).

Group Characteristics Associated with Eating Behaviors and Body Esteem

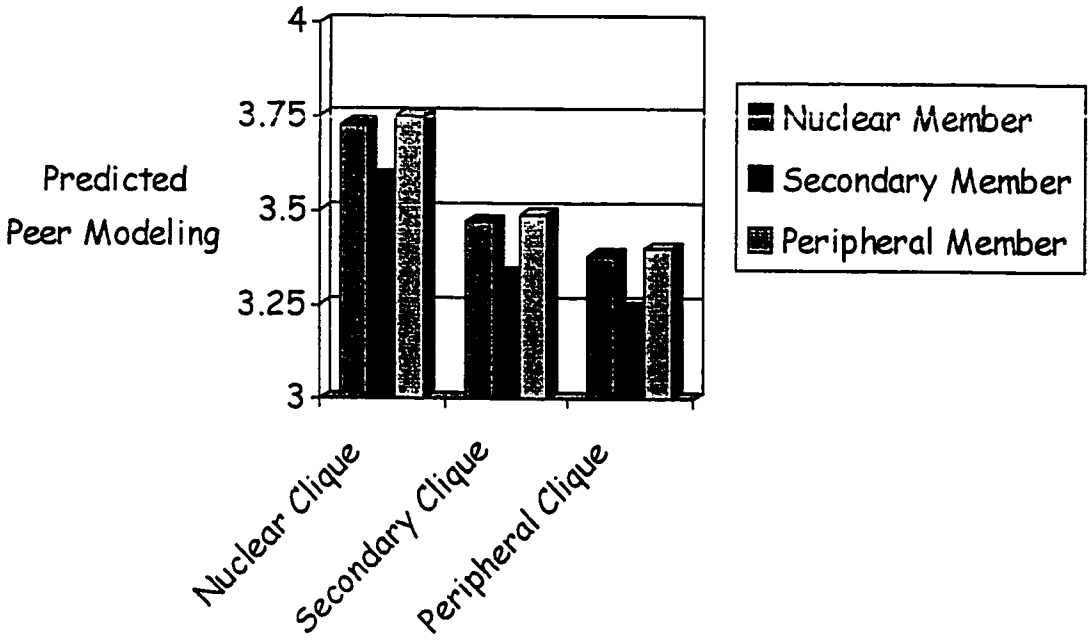
The third question addressed what group level characteristics are associated with dieting, bulimia, and body esteem, after controlling for individual characteristics. Again, we were interested in the association of clique size, clique status, and level of maturation in relation to eating behaviors and body esteem. In addition, the influence of

Table 6

Results of Final Model for Individual Status (Level-1) and Group Status (Level-2) for Peer Modeling

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept	μ_{0j}	0.13	0.37	325.32	.000
	r_{ij}	0.45	0.67		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	3.73	0.07	55.03	.000
Secondary Clique	γ_{01}	-0.26	0.10	-2.68	.01
Peripheral Clique	γ_{02}	-0.35	0.12	-2.98	.01
Secondary Individual	γ_{10}	-0.14	0.07	-2.10	.05
Peripheral Individual	γ_{20}	0.02	0.10	0.26	.80

Figure 2. Predicted peer modeling as a function of group status.


Predicted
Peer Modeling
4
3.75
3.5
3.25
3
Nuclear Clique
Secondary Clique
Peripheral Clique
Nuclear Member
Secondary Member
Peripheral Member

average clique perceptions of social reinforcement and peer modeling on eating behaviors and body esteem were also of interest.

Dieting. Following the "step-up" procedure, in the first model, no Level-1 or Level-2 predictor variables were included. In this model, the Level-1 intercept (i.e., dieting) was allowed to vary randomly. Results of this first model showed that the average level of dieting for all subjects was 2.67 (range 1-6), indicating a low-moderate level of dieting. The chi-square value associated with the variance component suggested significant between-clique variation in average level of dieting, χ^2 (119) = 165.49, $p<.01$. Again, computation of the intra-class correlation suggested that 8% of the variance in dieting was between cliques.

Next, the Level-1 control variables (i.e., BMI & age) were entered into the model as fixed effects. Results showed that BMI was statistically significant ($\gamma_{10} = 0.09$, $p<.0001$), while age was not. BMI accounted for 13.25% of the within-group variance in dieting. Next, the individual status dummy variables were entered into the model as fixed effects. Secondary status individuals were significantly different from nuclear status individuals ($\gamma_{20} = -0.25$, $p<.01$), with nuclear status girls reporting more dieting than secondary status girls. The secondary status dummy variable accounted for an additional 1% of within-subject variance after controlling for BMI. Peripheral status did not differ significantly from nuclear status. Thus, BMI and individual status were retained in the model at Level-1.

Subsequently, the Level-2 variables were entered into the model. Results indicated that average social reinforcement ($\gamma_{03} = 0.59$, $p<.0001$), average peer modeling ($\gamma_{02} = 0.31$,

p<.01), and average age of menarche (γ_{01} = -0.08 p<.05) were significant predictors of dieting after controlling for individual status and BMI. These three variables accounted for 95.5% of between-group variance in dieting (controlling for Level-1 variables) and eliminated all significant random variance. Post-hoc hypothesis testing revealed that the effects of social reinforcement and peer modeling were of equal strength. Thus, cliques of early maturing girls, and cliques that report higher social reinforcement and higher peer modeling were more likely to have members that reported higher dieting. Clique status and number of clique members were not significant, and therefore, were not included in the model. The final model included BMI and individual status at Level-1, and average age of menarche, average clique social reinforcement and average clique peer modeling at Level-2 (see Table 7 for estimated parameters and Figure 3 for a visual display).

Bulimic behavior and food preoccupation. In the first model, no Level-1 or Level-2 predictor variables were included. As in previous models, the Level-1 intercept (i.e., bulimic behavior) was allowed to vary randomly. Results showed that the average level of bulimia for all subjects was 1.86 (range=1-6), indicating a low level of bulimic behavior within the sample. The chi-square value associated with the variance component suggested significant between-group variation in average level of bulimic behavior, χ^2 (119) = 153.21, p<.05. Again, computation of the intra-class correlation suggested that 6% of the variance in bulimic behavior was between cliques.

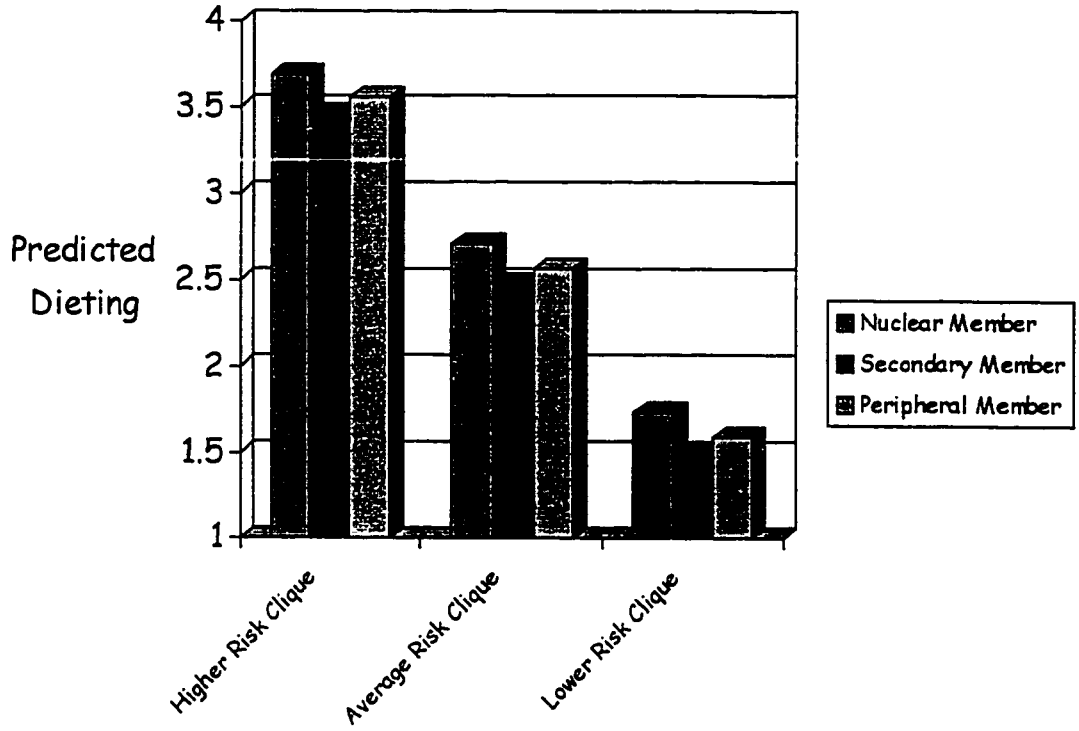
Next, age and BMI were entered into the model separately as fixed variables. Examination of the fixed effects indicated that BMI (γ_{20} = 0.02, p<.05) and age (γ_{10} = 0.06,

Table 7

Results of Final Model for BMI and Individual Status (Level-1) and Age of Menarche and Peer Pressure (Level-2) for Dieting

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept	μ_{0j}	0.01	0.07	100.15	>.5
	r_{ij}	0.82	0.91		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.71	0.04	65.25	.00
Average Menarche	γ_{01}	-0.08	0.03	-2.19	.05
Peer Modeling	γ_{02}	0.31	0.10	2.98	.01
Social Reinforcement	γ_{03}	0.59	0.14	4.34	.00
BMI Slope	γ_{10}	0.09	0.01	9.98	.00
Secondary Individual	γ_{20}	-0.23	0.08	-2.77	.01
Peripheral Individual	γ_{30}	-0.14	0.12	-1.12	.27

Figure 3. Predicted dieting in higher, average, and lower risk cliques (illustrated for nuclear member of a clique with average BMI).



Higher Risk Group: Cliques with early maturation, high social reinforcement, high peer modeling

Average Risk Group: Cliques with average age of maturation, average social reinforcement, average peer modeling

Lower Risk Group: Cliques with late maturation, low social reinforcement, low peer modeling

$p<.05$) were statistically significant, with overweight girls and older girls reporting higher levels of bulimic behavior than underweight and younger girls. These control variables accounted for 1% of within-group variance in bulimic behavior. Following the control variables, the individual status dummy variables were entered into the model as fixed effects. These variables did not contribute significantly to bulimic behavior. Thus, only BMI and age were retained in the model at Level-1.

Subsequently, the Level-2 variables were entered into the model as moderators of the intercept. Results indicated that average clique social reinforcement ($\gamma_{01} = 0.50$, $p<.0001$), but not average clique peer modeling, predicted the intercept. Girls in high social reinforcement cliques reported more bulimic behavior than girls in low social reinforcement cliques. Social reinforcement accounted for 83.2% of between-group variance in bulimic behavior (after controlling for BMI and age), again eliminating all significant random variation. Clique status, number of clique members, and average age of menarche were entered into the model and were not significant. The final model included BMI and age at Level-1 and social reinforcement at Level-2 (see Table 8 for estimated parameters and Figure 4 for visual display).

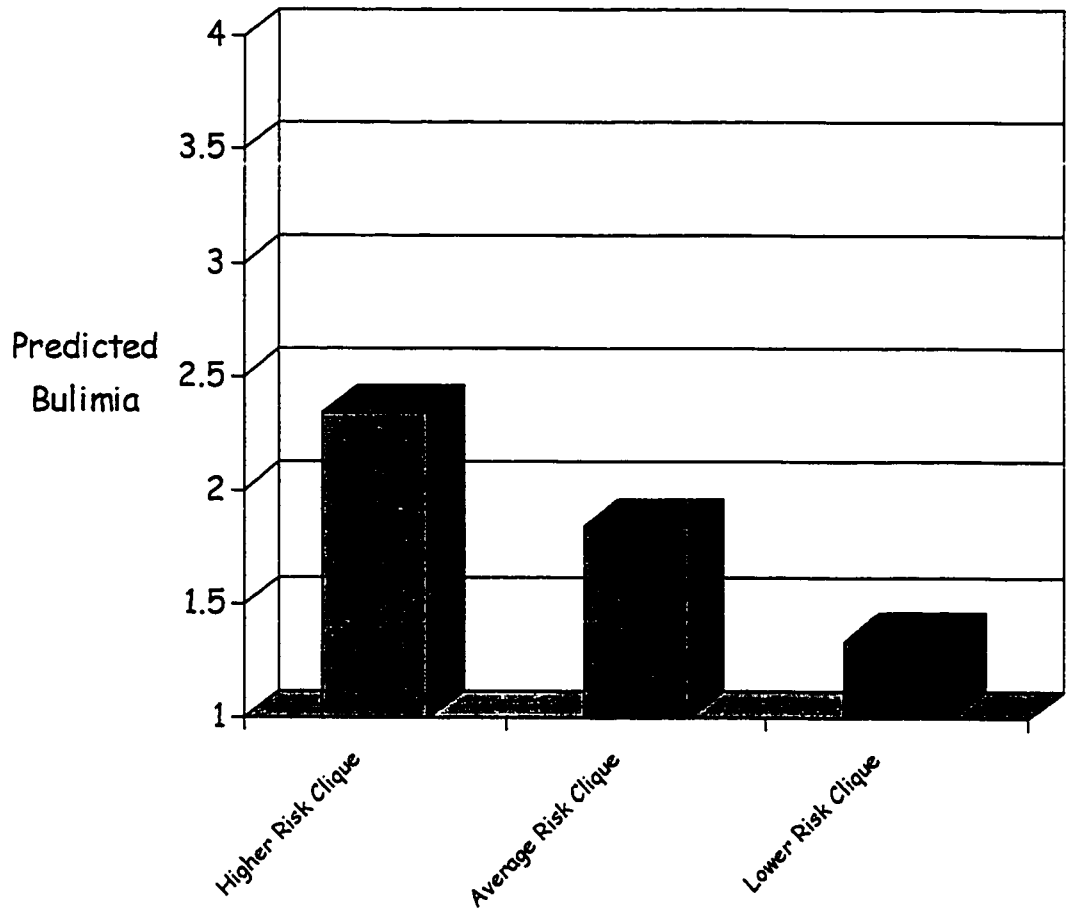
Body esteem. For body esteem, a parallel "step-up" procedure was used. With no Level-1 or Level-2 variables in the model, the average level of body esteem was 2.12. The chi-square value associated with the between-group variance component was statistically significant, χ^2 (119) = 182.89, $p<.0001$. Again, computation of the intra-class correlation suggested that 8% of the variance in body esteem was between cliques.

Table 8

Results of Final Model for BMI and Age (Level-1) and Social Reinforcement (Level-2) for Bulimia

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept	μ_{0j}	0.07	0.01	105.79	>.5
	r_{ij}	0.72	0.51		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	1.84	0.03	65.99	.00
Social Reinforcement	γ_{01}	0.50	0.08	6.48	.00
Age Slope	γ_{10}	0.06	0.02	2.39	.05
BMI Slope	γ_{20}	0.02	0.01	2.31	.05

Figure 4. Predicted bulimia in higher, average and lower social reinforcement cliques (illustrated for nuclear member of a clique with average BMI and average age).


Predicted Bulimia
4
3.5
3
2.5
2
1.5
1
Higher Risk Clique
Average Risk Clique
Lower Risk Clique

Next, the Level-1 control variables were entered into the model separately (i.e., BMI & age) as fixed variables. Examination of the fixed effects indicated that BMI was a significant predictor of body esteem (γ_{01} = -0.08, p<.0001), while age was not. As expected, girls with higher BMIs had lower body-esteem, accounting for 2% of the variance. Next, the individual status dummy variables were entered into the model as fixed effects and were found to be non-significant. Thus, only BMI was entered into the model at Level-1.

Subsequently, Level-2 variables were entered into the model separately. Results indicated that only average clique social reinforcement significantly predicted body esteem at Level-2 (γ_{01} = -0.68, p<.0001), accounting for 74.5% of between-group variance in body esteem, and eliminating all significant random variance. Average peer modeling, average age of menarche, number of clique members, and clique status did not significantly predict body esteem at Level-2. Thus, BMI was retained for the model at Level-1, and perceived social reinforcement was retained for the model at Level-2 (see Table 9 for estimated parameters).

Individual Level Risk Factors for Problematic Eating Behaviors in High Pressure Groups

The next question explored individual difference variables (Level-1) as potential moderators, or risk factors, for problematic eating behaviors. Specifically, we examined whether girls in high peer pressure groups (i.e., social reinforcement and peer modeling) who had lower self esteem, lower body esteem, were less popular and more isolated, had higher silencing the self scores, and were teased by their peers were at greater risk for disordered eating (i.e., dieting and bulimia). Thus, sets of related Level-1 constructs

Table 9

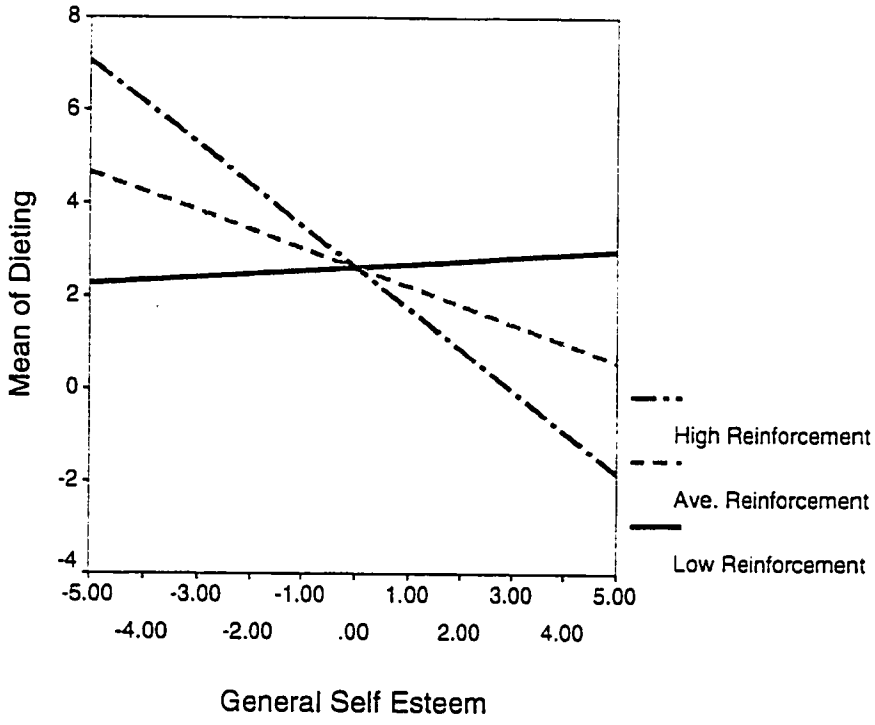
Results of Final Model for BMI (Level-1) and Social Reinforcement (Level-2) for Body Esteem

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept	μ_{0j}	0.12	0.01	137.99	.10
	r_{ij}	0.75	0.56		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.15	0.03	70.12	.000
Social Reinforcement	γ_{01}	-0.68	0.08	-8.03	.000
BMI Slope	γ_{10}	-0.08	0.01	-10.52	.000

were analyzed using five hierarchical linear models, separately for social reinforcement and peer modeling. The following Level-1 variables were entered as fixed effects, after controlling for body mass index; a) self esteem (same and opposite-sex relational, physical ability esteem & general self esteem) b) silencing the self (silent self, divided self, external self) c) body esteem (weight and appearance combined) d) peer nominations (leadership, over and underweight teasing, appearance preoccupation, good looking, social rejection) e) self-reported teasing and associated affect (severe and non-severe weight, body-shape, appearance and general teasing). Perceived social reinforcement and peer modeling were entered into the model at Level-2 as moderators of the Level-1 variables on dieting and bulimia. Again, only significant variables were retained for the final model. In each analysis, the Level-1 intercepts were allowed to vary randomly.

Self esteem. For dieting, results indicated that physical ability esteem ($\gamma_{20} = 0.09$, $p<.05$) and general self esteem ($\gamma_{30} = -0.42$, $p<.0001$) were significant predictors of dieting after controlling for BMI. That is, girls who had higher physical ability esteem and lower general self esteem reported more dieting. Same and opposite-sex relational esteem were not significant predictors of dieting and were dropped from the model. In addition, social reinforcement (but not peer modeling) moderated the effect on dieting for general self esteem ($\gamma_{31} = -0.24$, $p<.05$). That is, in high social reinforcement cliques, girls with lower self esteem reported more dieting. This effect was not apparent in the low reinforcement groups (see Figure 5). For bulimia, only general self esteem significantly predicted bulimic behavior ($\gamma_{20} = -0.30$, $p<.0001$), with girls who had lower self esteem reporting more

Figure 5. Social reinforcement as a moderator of general self esteem in predicting dieting.


8
6
4
2
0
-2
-4
Mean of Dieting
-5.00
-3.00
-1.00
1.00
3.00
5.00
-4.00
-2.00
.00
2.00
4.00
General Self Esteem
High Reinforcement
Ave. Reinforcement
Low Reinforcement

bulimic behavior. All other self esteem variables were dropped from the model. In addition, results showed that general self esteem was moderated by social reinforcement ($\gamma_{21} = -0.19$, $p<.05$) and peer modeling ($\gamma_{21} = -0.12$, $p<.05$) in predicting bulimic behavior. That is, in high social reinforcement cliques, girls who had low general self esteem reported more bulimic behavior. This effect was not apparent in low social reinforcement cliques (see Figure 6). Similarly, for peer modeling, girls in high peer modeling groups with lower general self esteem indicated more bulimic behavior. Again, this effect was not apparent in low peer modeling groups (see Figure 7). Table of final model and estimated parameters are presented in Appendix M.

Silencing the self. Results indicated that only external self significantly predicted dieting behavior ($\gamma_{30} = 0.46$, $p<.0001$), after controlling for BMI. Girls with higher external selves were more likely to diet. In addition, divided self was significantly moderated by peer modeling ($\gamma_{21} = -0.21$, $p<.05$) in predicting dieting behavior, though it did not predict dieting directly. That is, in high peer modeling groups, the higher the divided self, the lower the dieting. In low peer modeling groups, the higher the divided self, the higher the dieting (see Figure 8). No significant moderator effects were found for social reinforcement. For bulimia, silent self ($\gamma_{20} = -0.09$, $p<.05$), divided self ($\gamma_{30} = 0.13$, $p<.0001$), and external self ($\gamma_{40} = 0.28$, $p<.0001$) were significant predictors of bulimic behavior, with girls lower in silent self, higher in divided self, and higher in external self reporting higher levels of bulimic behavior. However, none of these variables were moderated by peer modeling or by social reinforcement. Table of final model including estimated parameters is presented in Appendix M.

Figure 6. Social reinforcement as a moderator of general self esteem in predicting bulimia.

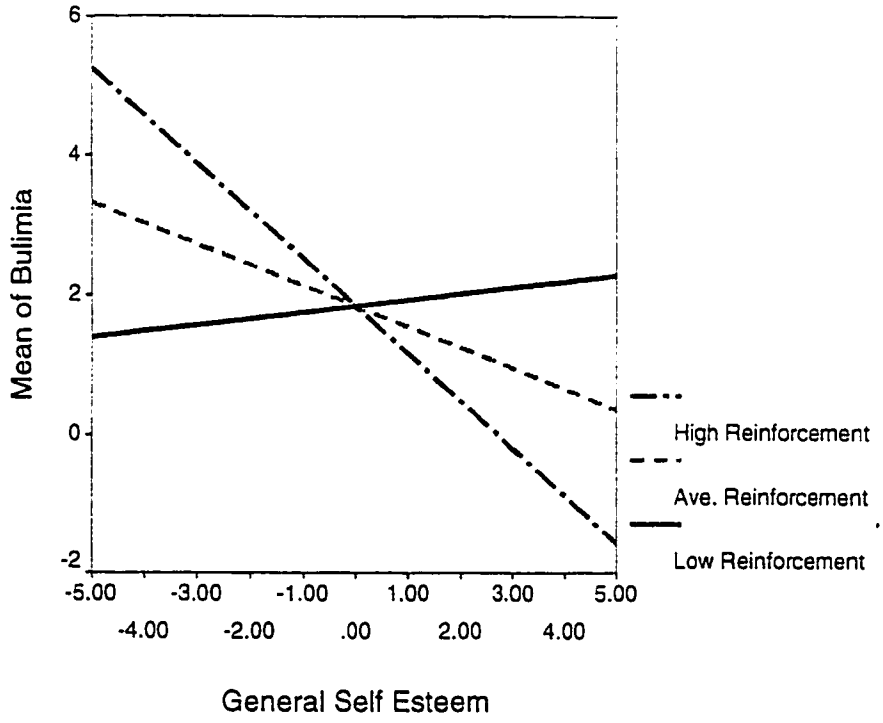

6
4
2
0
-2
Mean of Bulimia
-5.00
-4.00
-3.00
-2.00
-1.00
.00
1.00
2.00
3.00
4.00
5.00
General Self Esteem
High Reinforcement
Ave. Reinforcement
Low Reinforcement

Figure 7. Peer modeling as a moderator of general self esteem in predicting bulimia.

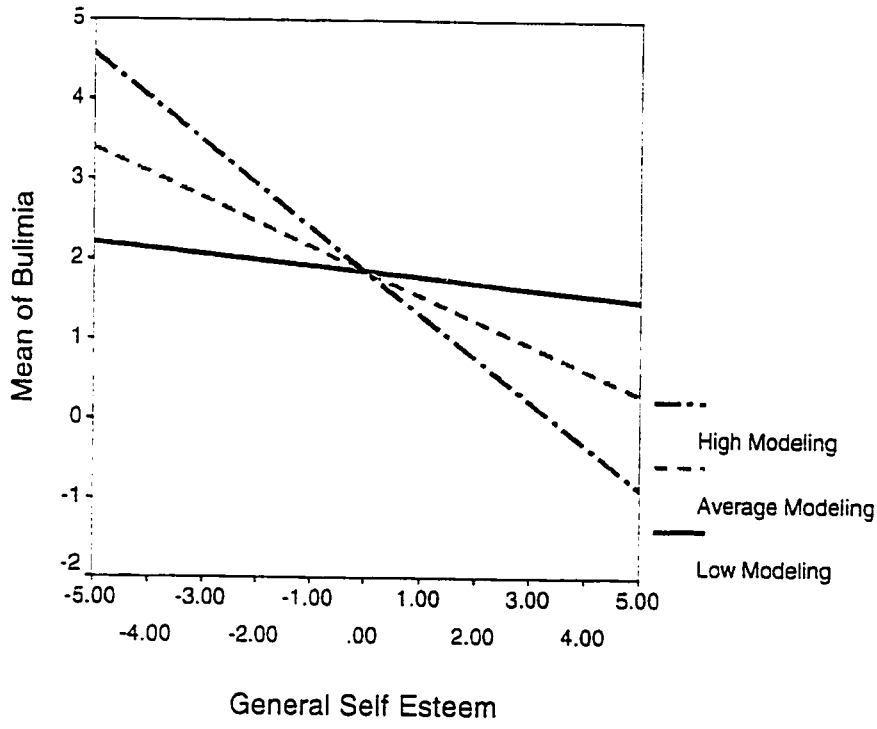
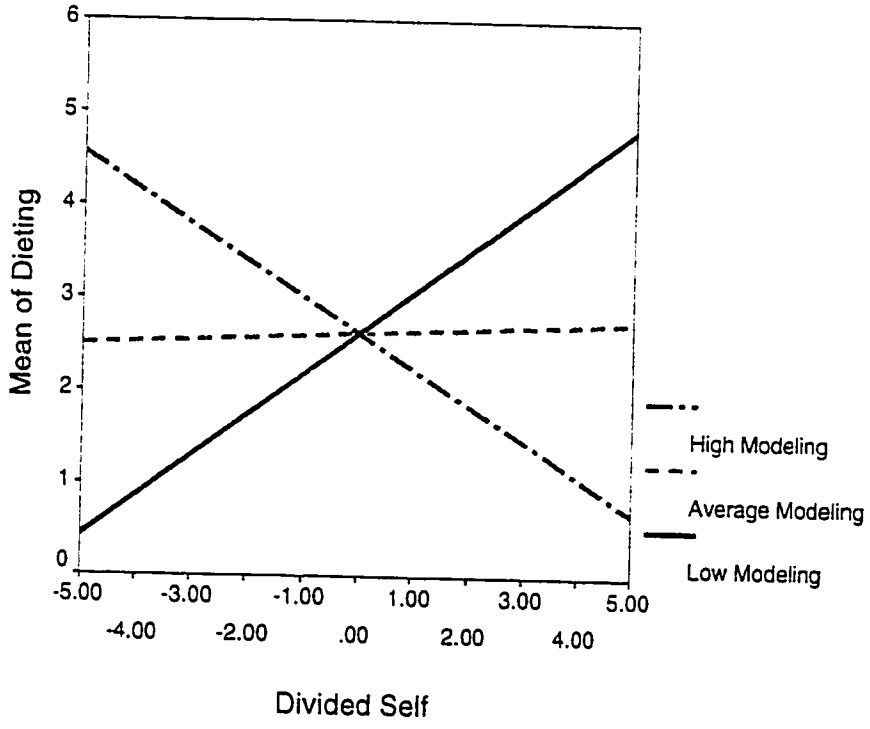

Mean of Bulimia
5
4
3
2
1
0
-1
-2
-5.00
-4.00
-3.00
-2.00
-1.00
.00
1.00
2.00
3.00
4.00
5.00
General Self Esteem
High Modeling
Average Modeling
Low Modeling

Figure 8. Peer modeling as a moderator of divided self in predicting dieting.


Mean of Dieting
6
5
4
3
2
1
0
-5.00
-4.00
-3.00
-2.00
-1.00
.00
1.00
2.00
3.00
4.00
5.00
Divided Self
High Modeling
Average Modeling
Low Modeling

Body esteem. Body esteem was a significant predictor of dieting (γ_{20} = -0.82, p<.0001), with girls with lower body esteem reporting more dieting behavior. In addition, perceptions of peer modeling (γ_{21} =-0.18, p<.01) and social reinforcement (γ_{21} = -0.30, p<.001) were significant moderators of body esteem in predicting dieting behavior. That is, in high social reinforcement cliques, girls with lower body esteem reported more dieting. This interaction was not apparent in the low social reinforcement cliques (see Figure 9). For peer modeling, in all cliques, girls with lower body esteem reported higher levels of dieting. However, this effect was strongest in high modeling cliques and weakest in low modeling cliques (see Figure 10). For bulimia, parallel results were found. Body esteem was a significant predictor of bulimic behavior (γ_{20} = -0.47, p<.0001), and both peer modeling (γ_{21} = -0.22, p<.0001) and social reinforcement (γ_{21} = -0.29, p<.0001) were significant moderators of body esteem in predicting bulimic behavior. In high reinforcement and modeling cliques, girls with lower body esteem reported higher levels of bulimic behavior. Again, these effects were not apparent in the low social reinforcement and modeling cliques (see Figures 11 & 12). The table of the final model including estimated parameters is presented in Appendix M.

Peer nominations. Peer nominations of appearance preoccupation was the only significant predictor of dieting after controlling for BMI, indicating that girls who were nominated by peers as being preoccupied with appearance reported more dieting (γ_{20} = 0.19, p<.0001). All other peer nomination variables were dropped from the model. In addition, appearance preoccupation was moderated by both peer modeling (γ_{21} = 0.16, p<.05) and social reinforcement (γ_{21} = 0.19, p<.001) in predicting dieting behavior.

Figure 9. Social reinforcement as a moderator of body esteem in predicting dieting.

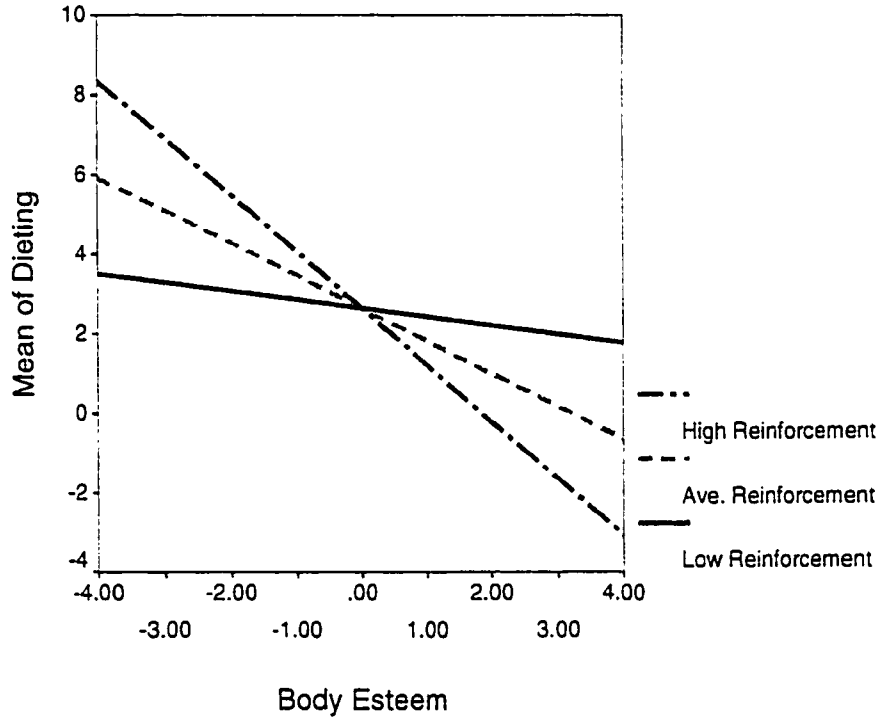

10
8
6
4
2
0
-2
-4
Mean of Dieting
-4.00
-3.00
-2.00
-1.00
.00
1.00
2.00
3.00
4.00
Body Esteem
High Reinforcement
Ave. Reinforcement
Low Reinforcement

Figure 10. Peer modeling as a moderator of body esteem in predicting dieting.

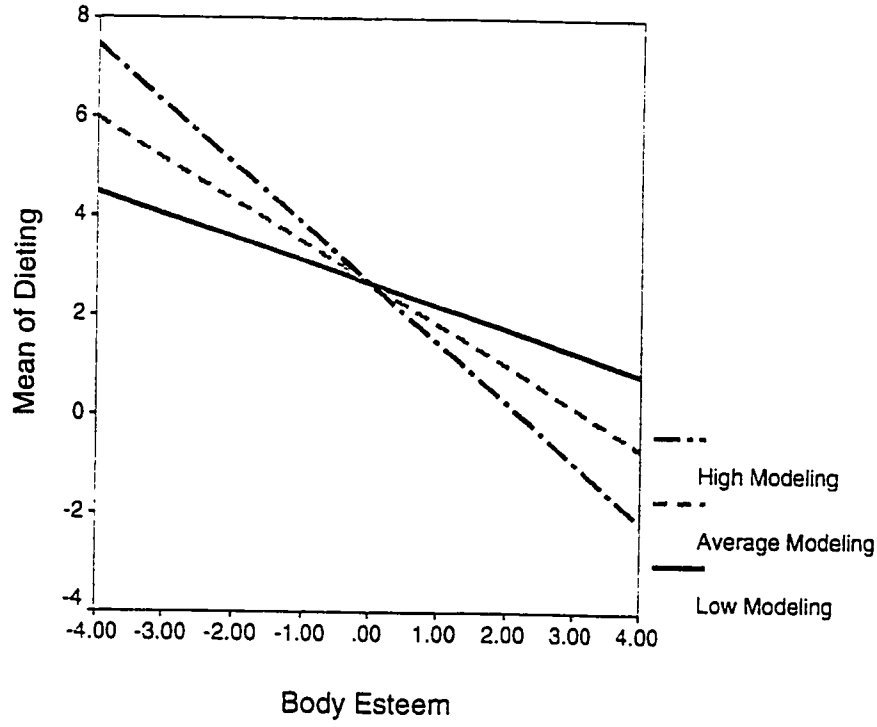

8
6
4
2
0
-2
-4
Mean of Dieting
-4.00
-3.00
-2.00
-1.00
.00
1.00
2.00
3.00
4.00
Body Esteem
High Modeling
Average Modeling
Low Modeling

Figure 11. Social reinforcement as a moderator of body esteem in predicting bulimia.

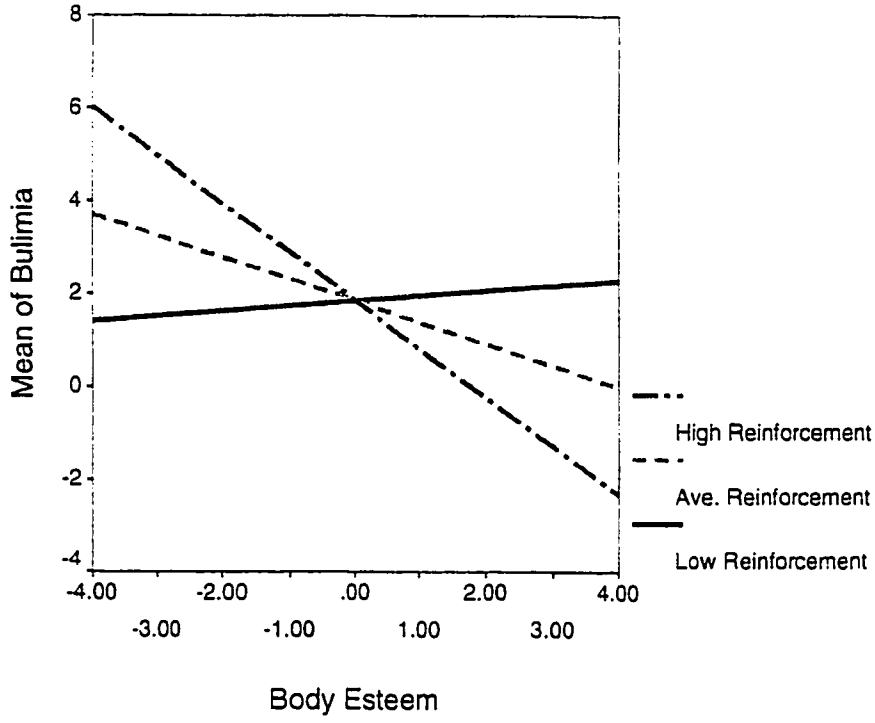
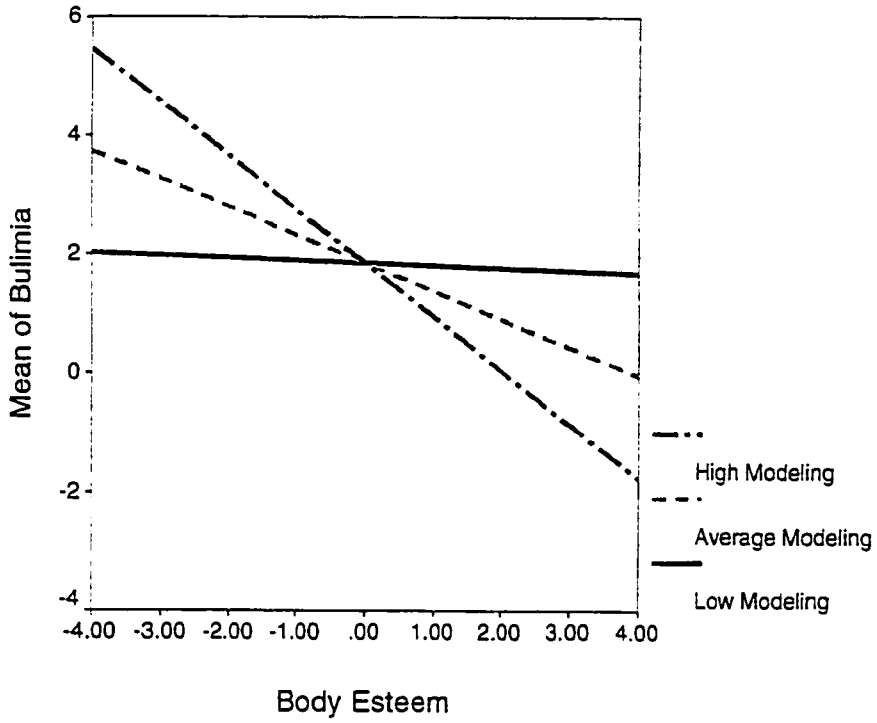

8
6
4
2
0
-2
-4
Mean of Bulimia
-4.00
-3.00
-2.00
-1.00
.00
1.00
2.00
3.00
4.00
Body Esteem
High Reinforcement
Ave. Reinforcement
Low Reinforcement

Figure 12. Peer modeling as a moderator of body esteem in predicting bulimia.


6
4
2
0
-2
-4
Mean of Bulimia
-4.00
-3.00
-2.00
-1.00
.00
1.00
2.00
3.00
4.00
Body Esteem
High Modeling
Average Modeling
Low Modeling

That is, for high peer modeling and social reinforcement cliques, girls who were preoccupied with their appearance reported more dieting. These effects were not apparent in low reinforcement/modeling groups (see Figures 13 & 14).

For bulimia, none of the peer-related nor the appearance-related variables were direct predictors of bulimic behavior. However, peer nominated overweight teasing was moderated by social reinforcement ($\gamma_{21} = 0.35$, $p<.0001$) and peer modeling ($\gamma_{21} = 0.20$, $p<.01$) in predicting bulimic behavior. That is, for both social reinforcement and peer modeling, girls in high reinforcement/modeling cliques who were teased about being overweight reported more bulimic behavior. In low reinforcement/modeling cliques, higher overweight teasing was associated with lower scores (see Figures 15 & 16). The table of the final model including estimated parameters is presented in Appendix M.

Self-reported teasing. For dieting, severe weight ($\gamma_{20} = 0.39$, $p<.0001$) and body-shape ($\gamma_{40} = 0.25$, $p<.01$) teasing and less severe appearance-related teasing ($\gamma_{21} = -0.19$, $p<.05$) were significant predictors of dieting. Further, both social reinforcement ($\gamma_{41} = 0.91$, $p<.0001$, $\gamma_{51} = 0.53$, $p<.01$) and peer modeling ($\gamma_{41} = 0.66$, $p<.0001$, $\gamma_{51} = 0.48$, $p<.01$) moderated the relationship between *severe* and *less severe* body-shape teasing and dieting. The same pattern of results was found for social reinforcement and peer modeling after controlling for severe weight-related teasing. That is, for girls in high reinforcement and high peer modeling cliques, severe body-shape teasing resulted in higher reports of dieting. The opposite effect was found in low reinforcement/modeling cliques where girls who were teased about their body-shape reported the lowest levels of dieting (see Figures 17 a, b, & c and Figures 18 a, b, & c).

Figure 13. Social reinforcement as a moderator of appearance preoccupation in predicting dieting.

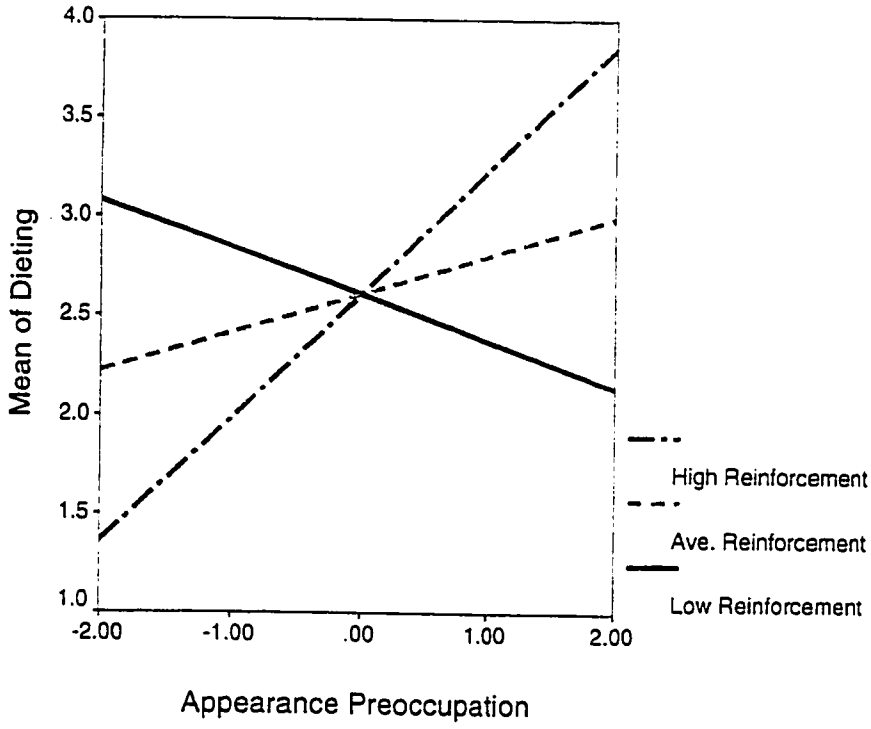

4.0
3.5
3.0
2.5
2.0
1.5
1.0
Mean of Dieting
-2.00
-1.00
.00
1.00
2.00
Appearance Preoccupation
High Reinforcement
Ave. Reinforcement
Low Reinforcement

Figure 14. Peer modeling as a moderator of appearance preoccupation in predicting dieting.

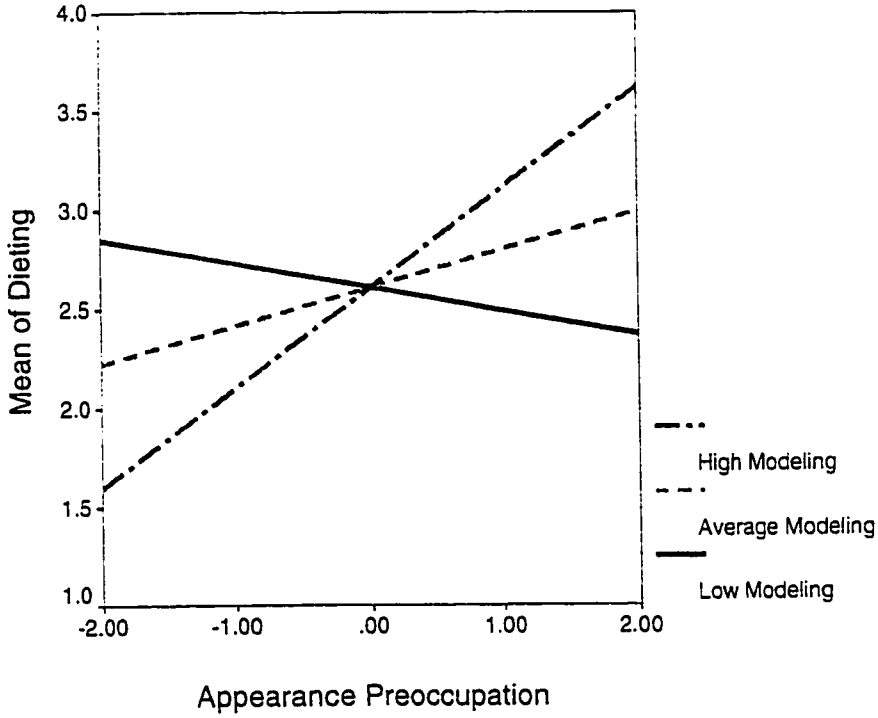

4.0
3.5
3.0
2.5
2.0
1.5
1.0
Mean of Dieting
-2.00
-1.00
.00
1.00
2.00
Appearance Preoccupation
High Modeling
Average Modeling
Low Modeling

Figure 15. Social reinforcement as a moderator of overweight teasing in predicting bulimia.

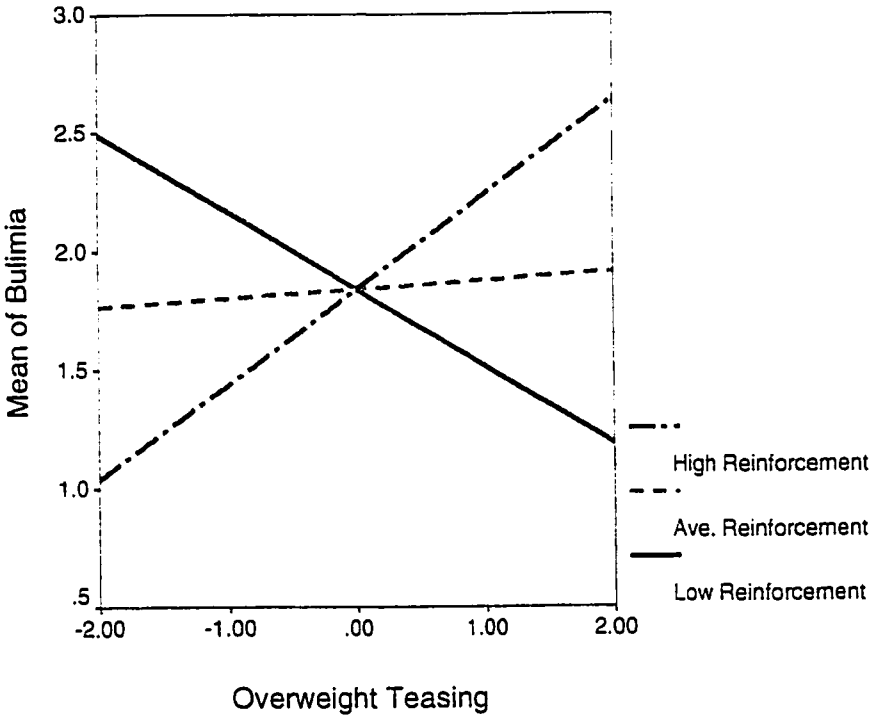
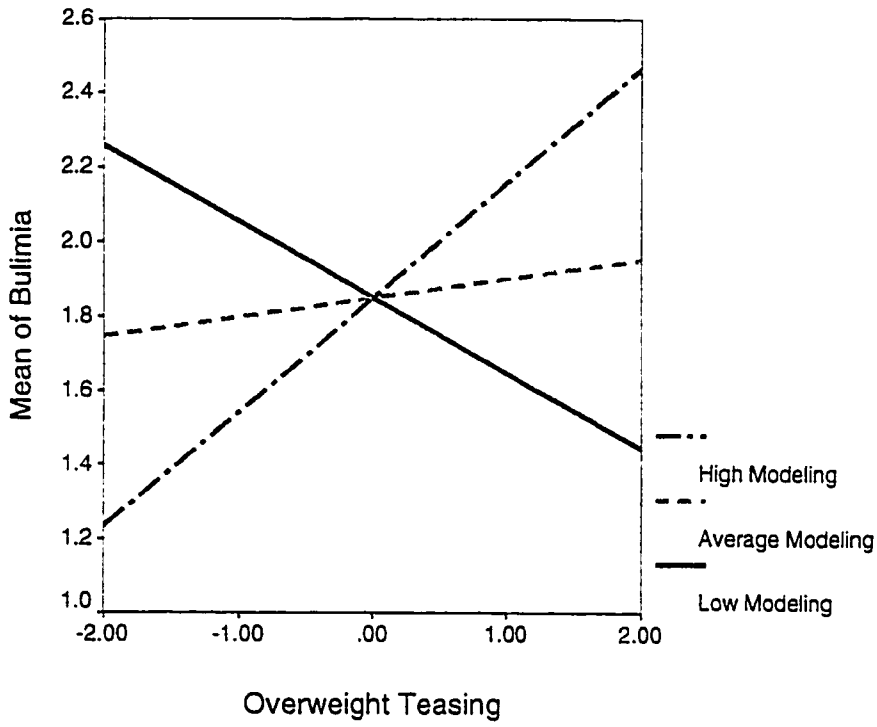
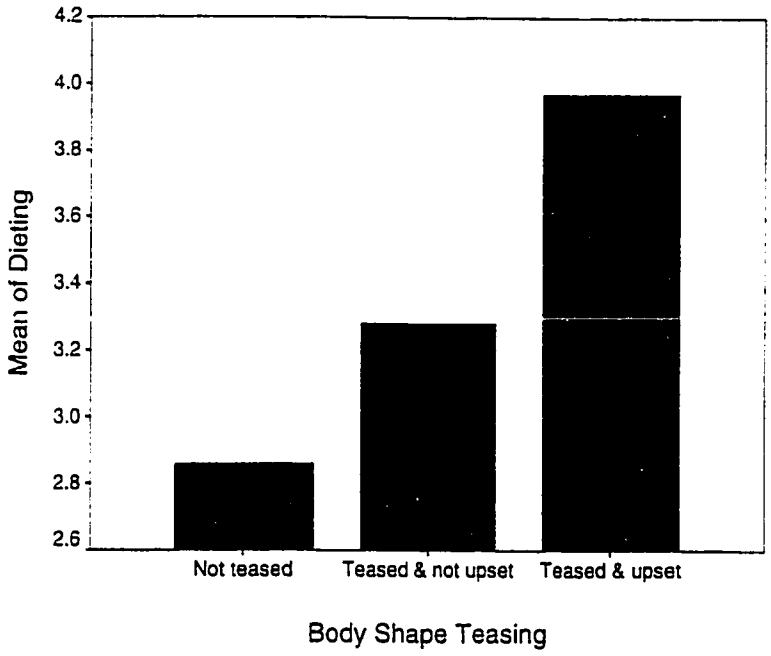

3.0
2.5
2.0
1.5
1.0
.5
Mean of Bulimia
-2.00
-1.00
.00
1.00
2.00
Overweight Teasing
High Reinforcement
Ave. Reinforcement
Low Reinforcement

Figure 16. Peer modeling as a moderator of overweight teasing in predicting bulimia.

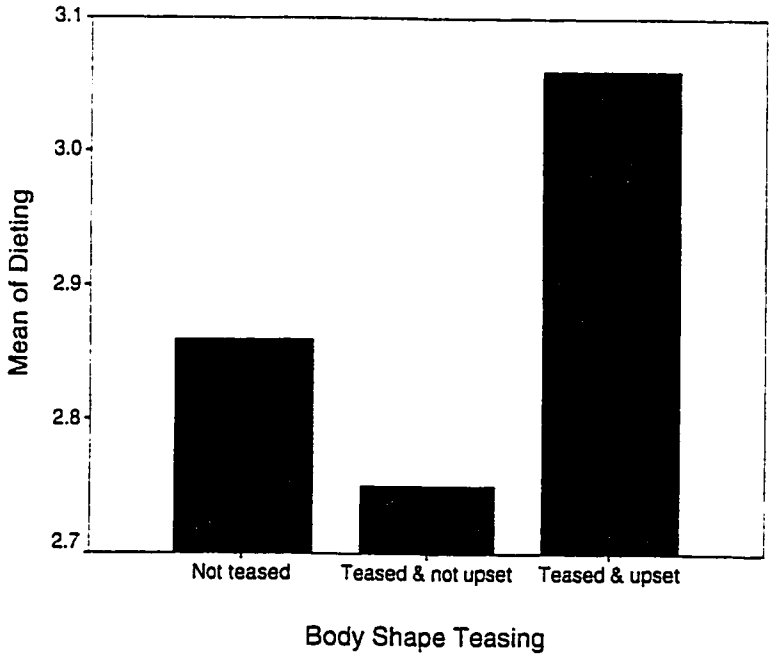

2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
Mean of Bulimia
-2.00
-1.00
.00
1.00
2.00
Overweight Teasing
High Modeling
Average Modeling
Low Modeling

Figures 17 a, b. & c. High, average, and low social reinforcement as moderators of body-shape teasing in predicting dieting behavior (with severe weight-related teasing).

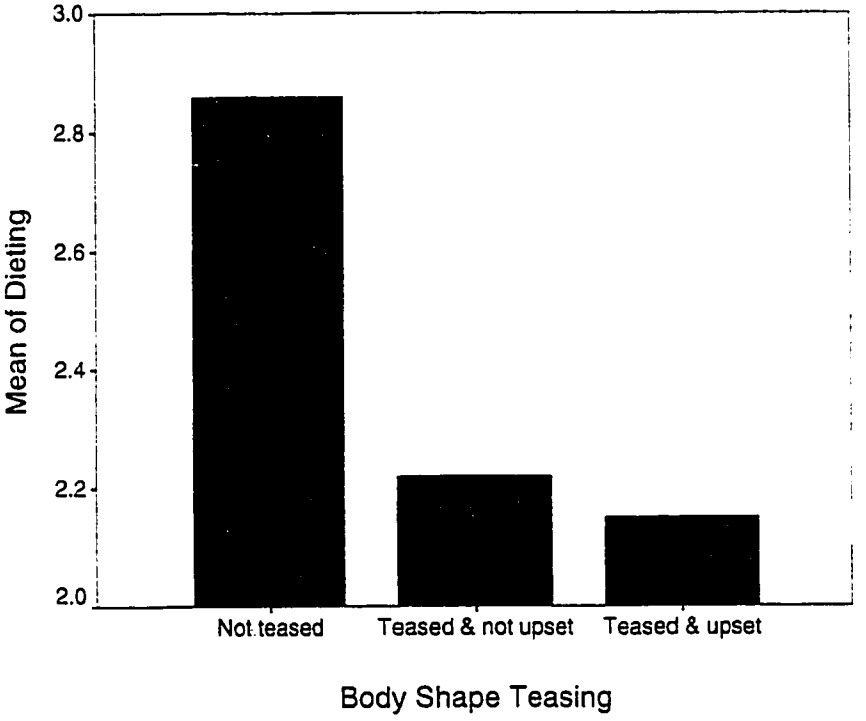
High Social Reinforcement



Average Social Reinforcement

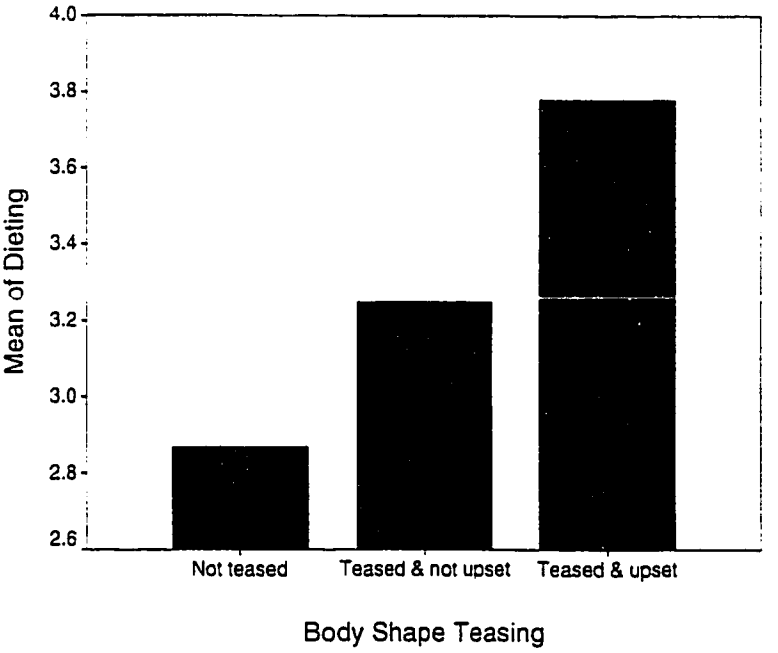


Low Social Reinforcement

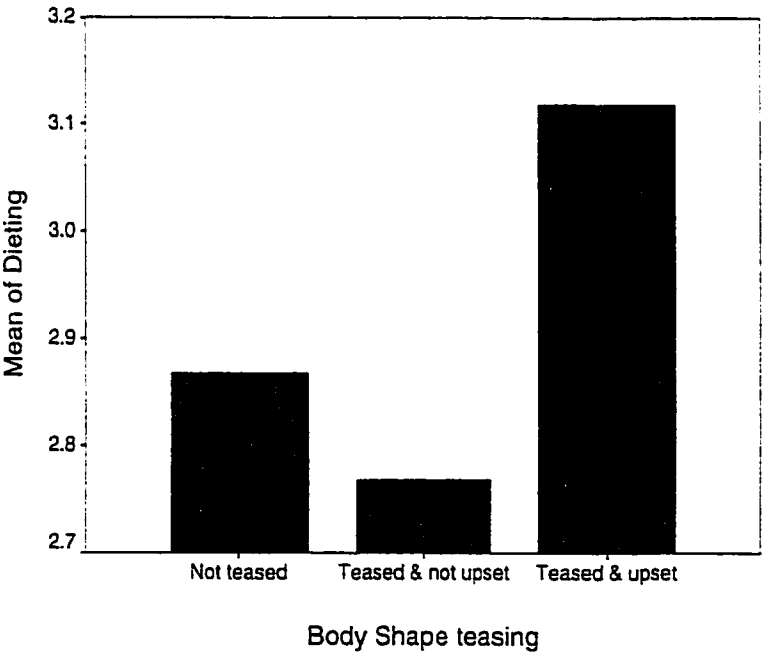


Figures 18 a, b, & c. High, average, and low peer modeling as moderators of body-shape teasing in predicting dieting behavior (with severe weight-related teasing).

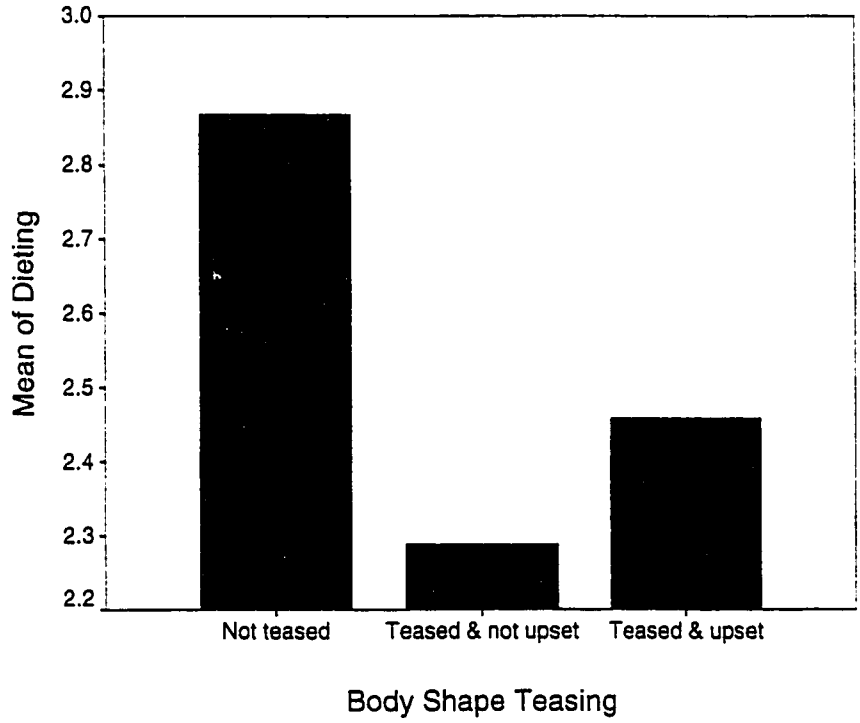
High Peer Modeling



Average Peer Modeling

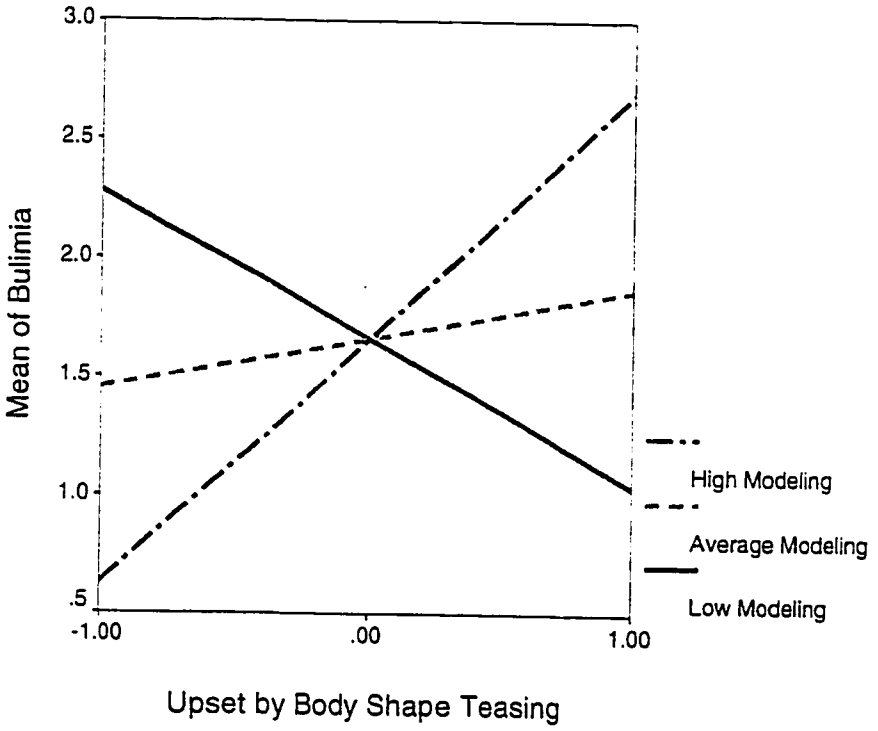


Low Peer Modeling



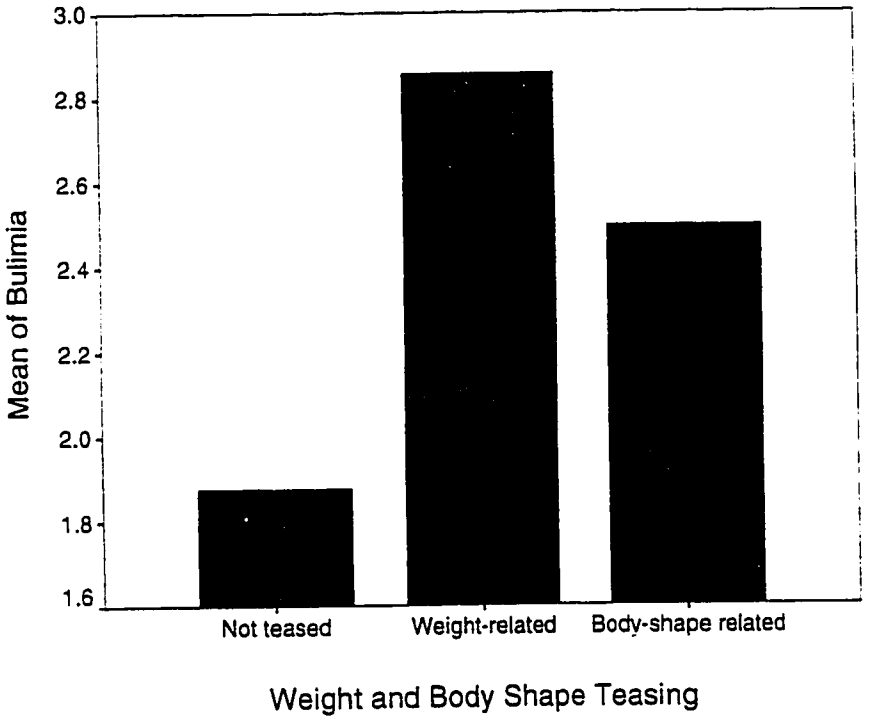
For bulimic behavior, severe weight ($\gamma_{20} = 0.22$, $p<.01$), body-shape ($\gamma_{40} = 0.20$, $p<.01$), and appearance-related ($\gamma_{60} = 0.22$, $p<.001$) teasing were statistically significant. That is, girls who were teased about their weight, body-shape, and appearance and were upset by this teasing were more likely than girls who were not upset, and those who were not teased, to engage in bulimic behavior. In addition, peer modeling was a significant moderator of severe body-shape teasing ($\gamma_{41} = 0.41$, $p<.01$) in predicting bulimic behavior. Results indicate that girls in high peer modeling cliques who were upset by body-shape teasing were more likely than girls who were not upset by the teasing, and not teased at all, to engage in bulimic behavior (see Figure 19). Social reinforcement was a significant moderator of both severe weight teasing ($\gamma_{21} = 0.42$, $p<.05$) and severe body-shape teasing ($\gamma_{41} = 0.81$, $p<.0001$) in predicting bulimic behavior, after controlling for appearance-related teasing. Results indicated that girls in high reinforcement cliques who report being upset by weight-related teasing, followed by body-shape teasing, were more likely than girls who are not teased to report bulimic behavior. In the average reinforcement group, girls who were upset about body-shape teasing, followed by weight-related teasing, were more likely than girls who were not teased to report bulimic behavior. Finally, in low reinforcement cliques, the level of reported bulimic behavior was much lower than in the other two groups, with girls who were not teased reporting higher levels of bulimic behavior (see Figures 20 a, b, & c). The table of the final model including estimated parameters is presented in Appendix M.

Figure 19. Peer modeling as a moderator of severe body-shape teasing in predicting bulimia.

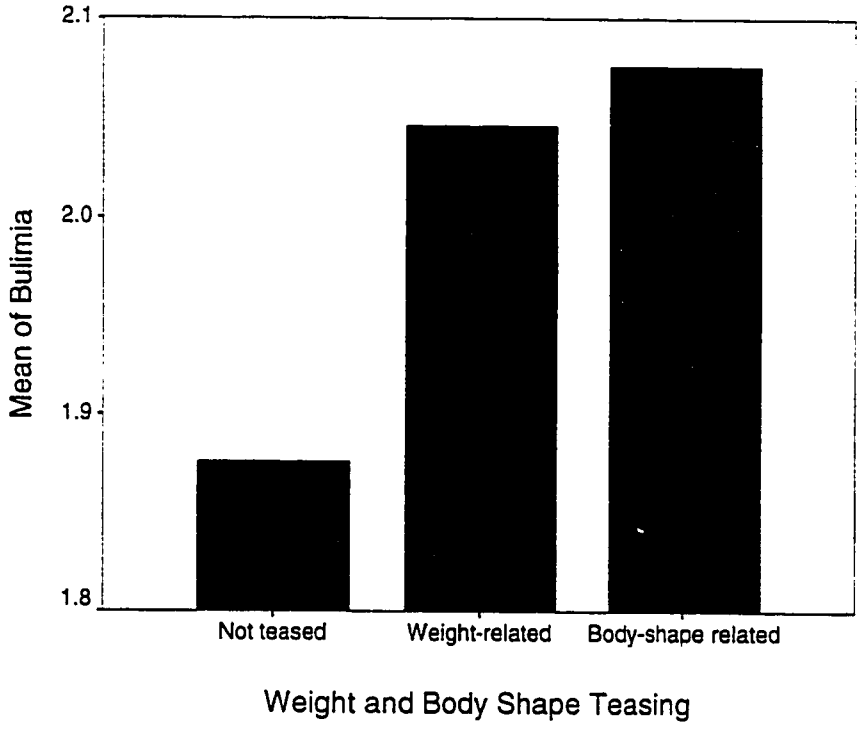

3.0
2.5
2.0
1.5
1.0
.5
Mean of Bulimia
-1.00
.00
1.00
Upset by Body Shape Teasing
High Modeling
Average Modeling
Low Modeling

Figures 20 a, b, & c. High, average, and low social reinforcement as a moderator of weight and body-shape teasing (with severe appearance teasing).

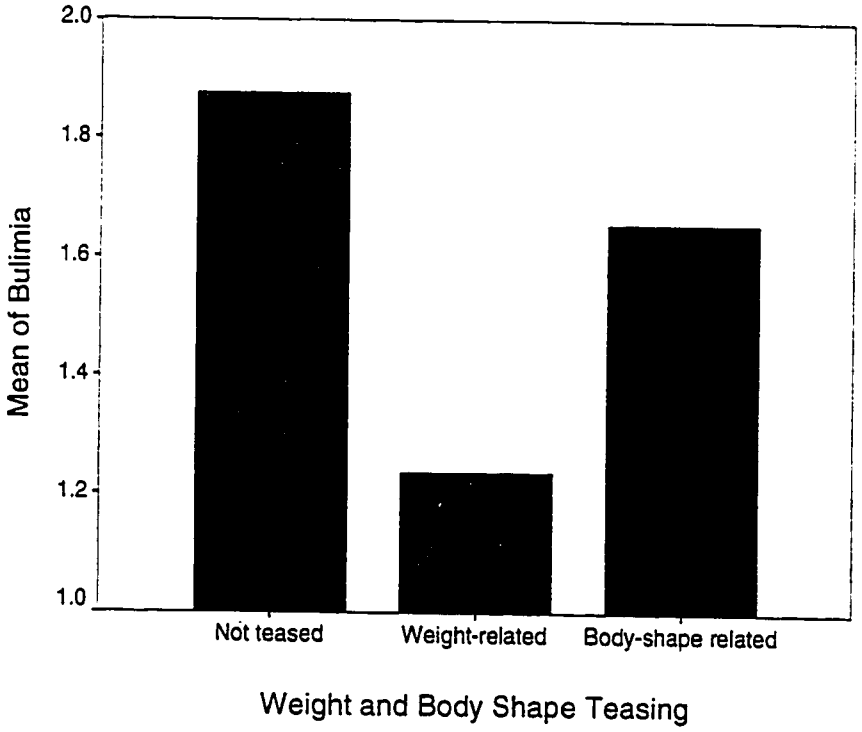
High Social Reinforcement



Average Social Reinforcement



Low Social Reinforcement



Individual Level Analysis

Approach to current data analysis. In order to investigate the influence of social/relational characteristics on eating behaviors and body esteem at the level of the individual, hierarchical multiple regression analyses were conducted. Order of entry for variables was based on theoretical knowledge, from most distal to most proximal relations to the outcome measures. *Social characteristics* of subject (e.g., popularity, leadership skills) were entered first, followed by *negative peer behaviors* (e.g., weight-related teasing, social rejection). These were followed by *self-reported teasing* and *individual perceptions of the social self* (e.g., both weight specific and non-weight specific), which are presumably influenced by relations or experiences within the peer group. Finally, after all of the peer relations and social self variables were entered, we were interested in examining the strength of *peer pressure* in influencing eating behaviors and body esteem.

For each regression, BMI, age, and age of first period served as control variables, and were entered into the model on the first step. *Social characteristics* were entered on the second step and included friendship closeness, average popularity, and leadership (based on peer nominations). *Negative peer behaviors*, including peer nominations of overweight and underweight teasing, in addition to the social rejection composite (i.e., teasing about appearance, general teasing & social isolation), were entered on the third step. *Self-reported teasing* about weight, body-shape, appearance, and general teasing were entered on the fourth step. *Social self* variables were entered on the fifth step, including external self, same and opposite-sex relational esteem, and peer attributions (i.e., importance of weight and appearance for popularity and dating). The sixth step included

peer pressure, both social reinforcement and peer modeling. *Interactions* with BMI, age of menarche, and age were included on the final step. Given the large sample size and the exploratory nature of the analyses, only interactions higher than $p<.005$ were interpreted. The unstandardized regression coefficients (B) and intercept (for each step), the standardized regression coefficients β (for each step), the semipartial correlations (sr^2), and R, R^2, R^2 change, and adjusted R^2 are presented for each regression analysis.

Dieting. For dieting, all steps in the regression analysis were significant with the exception of step 3 (see Table 10). Step 1 showed statistical significance, $R^2 = .11$, $F(3, 625) = 25.06$, $p<.0001$, with unique predictions for BMI ($p<.0001$) and average age of menarche ($p<.01$). Results indicated that girls with higher BMIs and an earlier age of menarche reported more dieting. Step 2 was also statistically significant, $R^2 = .12$, $F_{inc}(3, 622) = 2.77$, $p<.05$, with girls involved in closer friendships ($p<.05$) reporting higher levels of dieting. Average popularity and leadership did not contribute uniquely. After controlling for bio-maturational variables and social characteristics, negative peer behaviors (step 3) were not significant. Self-reported teasing (step 4) was statistically significant, $R^2 = .253$, $F_{inc} = (8, 611) = 13.09$, $p<.0001$, with unique prediction for severe weight ($p<.0001$) and body-shape ($p<.001$) teasing, and both severe ($p<.05$) and non-severe ($p<.05$) appearance teasing. Results indicated that girls who were upset about weight, body-shape and appearance-related teasing reported more dieting than girls who were not upset by the teasing and those who were not teased at all. The social self variables (step 5) showed significant prediction, $R^2=.427$, $F_{inc}(4, 607) = 46.19$, $p<.0001$, after controlling for all friendship and control variables. Results showed that girls with

Table 10

Hierarchical Multiple Regression Predicting Dieting from Social Constructs (n=629)

Social Constructs	Unstandardized Beta Weight (B)(SE)	Standardized Beta Weight β	Semi-Partial Correlation (r)
Step 1			
BMI	.08 (.01)	.29***	.29
Age	-.01 (.03)	-.01	-.01
Average age of menarche	-.06 (.02)	-.12**	-.11
R^2= .11, Adjusted R^2 = .10, R^2 change=.11, R= .33***			
Step 2			
Friendship closeness	.18 (.08)	.09*	.08
Average popularity	.05 (.04)	.05	.04
Leadership	-.03 (.04)	-.03	-.02
R^2= .12, Adjusted R^2 = .11, R^2 change = .01, R= .35*			
Step 3			
Social rejection	-.03 (.06)	-.02	-.02
Overweight tease	.05 (.05)	.04	.04
Underweight tease	.07 (.04)	.07	.06
R^2= .12, Adjusted R^2 = .11, R^2 change = .01, R= .35			
Step 4			
Tease weight upset	.38 (.10)	.17***	.13
Tease weight not upset	-.20 (.11)	-.07	-.06
Tease body-shape upset	.34 (.10)	.15**	.12
Tease body-shape not upset	-.08 (.09)	-.03	-.03
Tease appearance upset	.21 (.10)	.09*	.07
Tease appearance not upset	-.22 (.11)	-.08*	-.07
Tease general upset	-.06 (.10)	-.02	-.02
Tease general not upset	-.07 (.10)	-.03	-.03
R^2= .25, Adjusted R^2 = .23, R^2 change = .13, R= .50***			

Step 5

External self	.24 (.05)	.18***	.14
Same sex esteem	.09 (.05)	.06	.05
Opposite-sex esteem	.09 (.03)	.09*	.08
Peer attributions	.35 (.04)	.41***	.31

R^2= .43, Adjusted R^2 = .41, R^2 change = .17, R= .65***

Step 6

Social reinforcement	.33 (.07)	.20***	.14
Peer modeling	.12 (.05)	.09**	.08

R^2= .47, Adjusted R^2 = .45, R^2 change =.05, R= .69***

Step 7

Menarche x external self	-.05 (.02)	-.08**	-.07
BMI x external self	.04 (.01)	.09**	.07
BMI x attributions	-.03 (.01)	-.15***	-.11
Menarche x tease body-shape	.10 (.03)	.11**	.08

R^2= .50, Adjusted R^2 = .47, R^2 change =.02, R= .70***

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*p<.05. **p <.01. ***p<.001.

higher external selves ($p<.0001$), higher opposite-sex relational esteem ($p<.01$), and strong attributions about the importance of weight and appearance for popularity and dating ($p<.0001$) reported higher levels of dieting. Finally, peer pressure (step 6) significantly predicted dieting after controlling for all other general peer and social self variables, $R^2=.473$, F_{inc} (2, 605) = 26.57, $p<.0001$. Both social reinforcement ($p<.0001$) and peer modeling ($p<.01$) contributed uniquely to dieting behavior in adolescent girls.

Several of the interaction effects were significant (step 7), $R^2=.495$, F_{inc} (4, 601) = 6.15, $p<.0001$. A significant BMI by peer attributions interaction was found ($p<.0001$), with underweight girls who had higher scores on peer attributions reporting higher dieting. Also, a significant age of menarche by severe body-shape teasing was found ($p<.005$). Results indicated that for late developers, the greater the body-shape teasing, the higher the dieting (see Appendix N).

Bulimia. For bulimia, all steps of the regression analysis were statistically significant, with the exception of step 2 (see Table 11). The control variables were significant predictors of bulimia, $R^2 = .029$, $F_{inc}(3, 625) = 6.20$, $p<.0001$, with age ($p<.01$) and age of menarche ($p<.01$) showing unique prediction. Older and early maturing girls reported more bulimic behavior than younger, later maturing girls. After controlling for maturational variables, social characteristics of the subject (step 2) were not significant. Step 3 was also statistically significant, $R^2 = .049$, F_{inc} (3, 619)= 3.19, $p<.05$, with peer reported teasing about being overweight showing unique prediction ($p<.05$). Girls who were teased about being overweight reported greater bulimic behavior than girls who were not teased. Self-reported teasing (step 4) contributed above and beyond the previous

Table 11

Hierarchical Multiple Regression Predicting Bulimia from Social Constructs (n=629)

Social Constructs	Unstandardized Beta Weight (B)(SE)	Standardized Beta Weight β	Semi-Partial Correlation (r)
Step 1			
BMI	.02 (.01)	.08*	.08
Age	.07 (.03)	.11**	.10
Average age of menarche	-.04 (.02)	-.11**	-.11
R^2 = .03, Adjusted R^2 = .02, R^2 change = .03, R= .17***			
Step 2			
Friendship closeness	.06 (.06)	.04	.04
Average popularity	.04 (.04)	.05	.05
Leadership	-.00 (.03)	-.00	-.00
R^2 = .04, Adjusted R^2 = .03, R^2 change = .01, R= .19			
Step 3			
Social rejection	-.04 (.04)	-.04	-.04
Overweight tease	.09 (.04)	.12*	.09
Underweight tease	.06 (.03)	.08	.07
R^2 = .05, Adjusted R^2 = .04, R^2 change = .02, R= .22*			
Step 4			
Tease weight upset	.21 (.08)	.12**	.09
Tease weight not upset	-.10 (.09)	-.05	-.04
Tease body-shape upset	.28 (.08)	.17***	.13
Tease body-shape not upset	.04 (.07)	.02	.02
Tease appearance upset	.24 (.08)	.14**	.11
Tease appearance not upset	.00 (.09)	.00	.00
Tease general upset	.06 (.08)	.03	.03
Tease general not upset	.03 (.08)	.01	.01
R^2 = .16, Adjusted R^2 = .14, R^2 change = .11, R= .40***			

Step 5

External self	.26 (.04)	.26***	.20
Same sex esteem	-.02 (.04)	-.02	-.02
Opposite-sex esteem	.05 (.03)	.07	.06
Peer attributions	.16 (.03)	.25***	.19

R^2 = .29, Adjusted R^2 = .27, R^2 change = .13, R= .54***

Step 6

Social reinforcement	.28 (.06)	.22***	.16
Peer modeling	-.01 (.04)	-.01	-.01

R^2 = .32, Adjusted R^2 = .30, R^2 change = .03, R= .57***

Step 7

Menarche x leadership	.03 (.01)	.07*	.07
Menarche x external self	-.04 (.02)	-.08*	-.07
BMI x external self	.02 (.01)	.08*	.07
Menarche x attributions	.03 (.01)	.09*	.07
BMI X reinforcement	.04 (.01)	.11**	.09

R^2 = .36, Adjusted R^2 = .33, R^2 change = .04, R= .60***

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*p<.05. **p <.01. ***p<.001.

steps, $\underline{R^2} = .160$, $\underline{F_{inc}}(8, 611) = 10.04$, $\underline{p}<.0001$, with severe weight ($\underline{p}<.01$), body-shape ($\underline{p}<.0001$), and appearance related ($\underline{p}<.001$) teasing contributing uniquely. The social self variables (step 5) also added significantly to bulimic behavior after controlling for previous social constructs, $\underline{R^2} = .291$, $\underline{F_{inc}}(4,607) = 28.12$, $\underline{p}<.0001$. Unique contributions were found for external self ($\underline{p}<.001$) and peer attributions about the importance of weight and appearance for dating and popularity ($\underline{p}<.0001$), with girls with higher scores on external self and higher peer attributions reporting more bulimic behavior. Finally, peer pressure was a significant predictor of bulimia, $\underline{R^2} = .322$, $\underline{F_{inc}}(2, 605) = 13.62$, $\underline{p}<.0001$, with unique variance for social reinforcement ($\underline{p}<.0001$), but not peer modeling. Several of the interaction effects (step 7) were significant, $\underline{R^2} = .358$, $\underline{F_{inc}}(5, 600) = 6.71$, $\underline{p}<.0001$), though none predicted uniquely ($\underline{p}>.005$), and thus were not interpreted.

Body esteem. For body esteem, all steps of the regression analysis were statistically significant (see Table 12). For the control variables, $\underline{R^2}=.128$, $\underline{F_{inc}}(3, 625) = 30.47$, $\underline{p}<.0001$, only BMI showed unique variance ($\underline{p}<.001$), with girls with lower BMIs reporting higher body esteem. Step 2 was also significant, $\underline{R^2}= .140$, $\underline{F_{inc}}(3, 622) = 2.97$, $\underline{p}<.05$, with girls who were nominated by peers as leaders ($\underline{p}<.01$) showing higher body esteem. Average popularity and friendship closeness were not unique predictors of body esteem. After controlling for maturational and social characteristics, negative peer relations (step 3) showed statistical significance, $\underline{R^2}=.153$, $\underline{F_{inc}}(3, 619)=3.14$, $\underline{p}<.05$, with teasing about being underweight contributing uniquely ($\underline{p}<.05$). Results indicated that girls who were teased about being underweight (but not overweight) reported lower body esteem.

Table 12

Hierarchical Multiple Regression Predicting Body Esteem from Social Constructs (n=629)

Social Constructs	Unstandardized Beta Weight (B)(SE)	Standardized Beta Weight β	Semi-Partial Correlation (r)
Step 1			
BMI	.08 (.01)	-.34***	-.34
Age	.02 (.03)	.02	.02
Average age of menarche	.03 (.02)	.06	.06
R^2= .13, Adjusted R^2 = .12, R^2change = .13, R= .36***			
Step 2			
Friendship closeness	.00 (.07)	.00	.00
Average popularity	-.06 (.04)	-.07	-.06
Leadership	.10 (.03)	.11**	.11
R^2= .14, Adjusted R^2 = .13, R^2change = .01, R= .37*			
Step 3			
Social rejection	-.06 (.05)	-.06	-.05
Overweight tease	-.04 (.04)	-.05	-.04
Underweight tease	-.08 (.04)	-.09*	-.08
R^2= .15, Adjusted R^2 = .14, R^2change = .01, R= .39*			
Step 4			
Tease weight upset	-.28 (.08)	-.15***	-.12
Tease weight not upset	-.02 (.08)	-.01	-.01
Tease body-shape upset	-.46 (.08)	-.25***	-.20
Tease body-shape not upset	-.06 (.07)	-.03	-.03
Tease appearance upset	-.41 (.08)	-.22***	-.17
Tease appearance not upset	.05 (.08)	.02	.02
Tease general upset	-.06 (.08)	-.03	-.03
Tease general not upset	.05 (.08)	.02	.02
R^2= .37, Adjusted R^2 = .35, R^2change = .21, R= .61***			

Step 5

External self	-.32 (.04)	-.29***	-.23
Same sex esteem	-.03 (.03)	-.03	-.02
Opposite-sex esteem	.02 (.02)	.03	.03
Peer attributions	-.30 (.02)	-.42***	-.32

R^2= .64, Adjusted R^2 = .63, R^2 change = .27, R= .80***

Step 6

Social reinforcement	-.01 (.05)	-.01	-.00
Peer modeling	-.08 (.03)	-.07**	-.06

R^2= .64, Adjusted R^2 = .63, R^2 change = .01, R= .80**

Step 7

BMI x popularity	-.01 (.01)	-.06*	-.06

R^2= .65, Adjusted R^2 = .63, R^2 change = .00, R= .80*

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*p<.05. **p <.01. ***p<.001.

Self-reported teasing (step 4) was statistically significant, $\underline{R^2}$ = .369, $\underline{F_{inc}}$ (8,611) = 26.19, $\underline{p}$<.0001, with severe teasing about weight ($\underline{p}$<.0001), body-shape ($\underline{p}$<.0001) and appearance ($\underline{p}$<.0001) contributing uniquely. Girls who reported being upset about weight, body-shape, and appearance related teasing had lower body esteem than girls who were not upset by this teasing and those who were not teased at all. The social self variables (step 5) also contributed to body esteem after controlling for the peer variables, $\underline{R^2}$ = .638, $\underline{F_{inc}}$(4,607) = 113.06, $\underline{p}$<.0001. Girls with higher external selves ($\underline{p}$<.0001) and higher attributions about the importance of appearance and weight for dating and popularity ($\underline{p}$<.0001) reported lower body esteem. Same and opposite-sex relational esteem did not contribute uniquely. Finally, after controlling for all other variables, peer pressure (step 6) significantly predicted body esteem, $\underline{R^2}$=.644, $\underline{F_{inc}}$ (2, 605)= 4.31, $\underline{p}$<.05. However, only peer modeling showed unique variance ($\underline{p}$<.05), with girls who reported more peer modeling, indicating lower body esteem. The final step (interaction effects) was significant, $\underline{R^2}$=.647, $\underline{F_{inc}}$ (1, 604)= 5.26, $\underline{p}$<.05, though none of the individual variables were significant at the $\underline{p}$< .005 level.

Social Risk Factors for Eating Disordered and Non-Eating Disordered Groups

In order to evaluate the clinical significance of the overall individual level findings, social constructs (see above) were used to differentiate non-eating disordered girls ($\underline{n}$=669) and eating disordered girls ($\underline{n}$=72) using logistic regression analysis. These two groups were created based on the three subscales of the Children's Eating Attitudes Test (i.e., dieting, bulimia/food preoccupation, and oral control), with a cutoff of 25 or above indicating disordered eating. Using this cutoff score, 9% of girls were classified as eating

disordered which is comparable to results found in the literature using this measure (Garner & Garfinkel, 1979; Maloney et al., 1988). We were interested in how accurately these social constructs could differentiate eating disordered from non-eating disordered adolescent girls, after controlling for BMI. Only significant variables were retained for the final model.

Logistic regression analysis. In this hierarchical logistic regression analysis, BMI was entered on the first step followed by the significant social construct variables. Results indicated that BMI was statistically significant (χ^2 (1, N = 741) = 8.77, p<.01), though it did not correctly predict group membership. That is, eating disordered girls had higher BMIs than non-eating disordered girls, although BMI was not a good variable for group classification. The second step was also statistically significant (χ^2 (9, N = 741) = 135.39, p<.0001), with friendship closeness (p<.01), peer nominations of underweight teasing (p<.01), self-reported weight teasing (p<.05), external self (p<.001), opposite-sex relational esteem (p<.001), peer attributions (p<.01), and social reinforcement (p<.0001), differentiating eating disordered from non-eating disordered girls. Girls in the eating disordered group were more likely than non-eating disordered girls to be involved in a close friendship, to be teased about their weight, to have higher external selves, higher opposite-sex relational esteem, higher importance ratings of weight and appearance for popularity and dating, and to report more social reinforcement. Correct classification of participants based on the logistic regression was not impressive; 98.51% of non-eating disordered girls, but only 29.17% of eating disordered girls were correctly classified using these social constructs. Thus, these social constructs do not appear to be useful for

discriminating clinical levels of eating disordered from non-eating disordered individuals. However, it is important to be aware of the social characteristics which may increase the individual's risk of developing more severe eating problems. Results suggest that a more complete model of eating disorders (e.g., two-factor model) may be useful in differentiating eating from non-eating disordered patients, including both eating pathology and general psychopathology (Steiger & Seguin, 1999). Table 13 shows the regression coefficients, Wald statistics, and odds ratios and 95% confidence intervals for each of the predictors.

Discussion

The purpose of the present study was to examine the role of peers in the development of problematic eating behaviors (i.e., dieting and bulimia) and body esteem. Unlike previous research, peer relations were examined at three levels: the level of the clique, the level of the best friendship pair, and the level of the individual. Based on theories of socialization (e.g., Hartup, 1983; Kandal, 1980; Stice, 1998), it was hypothesized that peers would play an integral role in the development of eating behaviors and body esteem through social reinforcement (i.e., comments or actions that perpetuate the thin ideal, such as teasing about weight and encouragement to diet/exercise), and modeling (i.e., imitation of peer behaviors and attitudes) This study is unique in that it examined perceptions of social reinforcement and peer modeling as distinct contributors to eating problems and body esteem. Also, this study included two data sources, participant-reports and peer-reports, which tend to be more accurate than simply examining participant reports of their peers' behaviors.

Table 13

Hierarchical Logistic Regression Analysis of Social Constructs as a Function of Eating Disorder Group

Variables	β	Wald Test (z-ratio)	Odds Ratio	95% CI Lower	Upper
Step 1					
BMI	.09	9.4	1.1**	1.0	1.2
Step 2					
Friendship closeness	0.9	2.0	2.3**	1.2	4.5
Underweight tease	0.4	6.9	1.4**	1.1	1.9
Severe weight tease	-0.2	0.4	0.8	0.4	1.6
Non-severe weight tease	2.6	6.0	13.1**	1.7	103
External self	0.6	6.9	1.7**	1.2	3.0
Opposite-sex esteem	0.5	12	1.7***	1.3	2.3
Peer attributions	0.5	9.7	1.6***	1.2	2.1
Social reinforcement	1.1	19	3.0***	1.8	4.8

**p<.001, ***p<.0001

Eating Behaviors, Body Esteem, and Perceptions of Peer Pressure in Cliques and Best Friend Pairs

The first objective of this study was to examine how much of the variance in eating behaviors, body esteem, and peer pressure about weight and appearance was at the level of the clique and at the level of the best friend pair in comparison to the individual level. Results indicate that for dieting and weight esteem, a greater proportion of variance is found at the best friend pair level (ICCs = .22 & .20, respectively) than for bulimia and appearance esteem outcomes (ICCs = .10 & .13, respectively). On the other hand, in cliques, the ICCs for dieting and bulimia (.08 & .06, respectively) and weight and appearance esteem (.07 & .08, respectively), though lower than in friendship pairs, are relatively similar. These findings highlight that at the level of the friendship pair, dieting behavior and specific feelings about one's weight, (rather than bulimia and appearance esteem), seem to be important shared characteristics, while the amounts of variability associated with the clique level is almost equal for dieting and bulimia and weight and appearance esteem.

Also, though the ICCs are much higher in the friendship pairs than in the cliques (i.e., almost double), the pattern of results is quite similar. That is, best friend pairs and cliques showed similar ICCs in eating behavior outcomes, *in addition to* their perceptions and feelings about their bodies (e.g., weight & appearance esteem) and themselves (e.g., self esteem). These findings are surprising since one would expect higher intra-class correlations for behaviors than for values and attitudes, particularly about the self (e.g., Kandel, 1978; Tolson & Urberg, 1993). However, results from this

study underscore that not only do peers play an important role in the development of eating behavior (particularly dieting), they also play an important role in feelings about one's body and one's self.

Further, although dieting and bulimia showed statistically significant between-clique variability, the intra-class correlations were not as high as expected (<.10). These findings imply that although peer pressure about weight and appearance is a salient feature among cliques (25% of between-group variance), some clique members may be better able to resist these pressures. This is clarified later in the examination of personal characteristics that place girls in high pressure cliques at greater risk for the development of problematic eating. Further, during adolescence, eating behavior, in addition to weight and appearance norms (e.g., peer attributions), may not be as important a group phenomena as smoking (Ennett & Bauman, 1993), drug and alcohol use (Ennett & Bauman, 1991; Bauman & Ennett, 1996; Baily & Hubard, 1991), and sexual behavior, since these are shared activities exclusive to the peer group (and usually against parental wishes). Eating behavior is shared with both peers and with family members (e.g., mealtimes, family holidays, outings with friends), and may be more strongly influenced by one source or the other, or by a variety of sources combined.

Of all the variables assessed in this study, the strongest between-clique variability was found for perceptions of social reinforcement and peer modeling (25% of between-group variance). This finding was expected given that peer pressure is a group-level phenomenon (and therefore the items focused on group-level phenomena), and norms regarding weight and appearance are likely to be transmitted through the clique

environment. Relatively high between-clique variability was also found for age of first date, popularity, social rejection, and opposite-sex relational esteem (though not as strong as in friendship pairs). For best friend pairs, the highest between-pair intra-class correlations were found for average popularity, social rejection, and age of first date, (accounting for almost ½ of the variability between friendship pairs), followed by peer modeling (ICC = .35) and social reinforcement (ICC = .27). Thus, the strongest associations for best friends are in their social relations (i.e., acceptance, rejection, relations with opposite sex peers), with perceptions of peer pressure falling closely behind. Also, give the slightly higher ICC for peer modeling than for social reinforcement, imitation of friend behaviors may be more important for transmitting norms in best friend pairs than reinforcement of socially accepted behaviors. Findings highlight that social status and peer pressure about weight and appearance are more salient than eating behaviors in both best friend pairs and cliques.

The ICCs for rejection by peers was quite high for both friendship pairs (ICC = .37) and for cliques (ICC = .21). Thus, perhaps girls who are nominated as rejected by the larger peer group are able to develop close friendships and are part of social cliques, which may serve as a protective factor against the negative peer relations (e.g., teasing) that they experience. Surprisingly, lower and non-significant ICCs were found for self and peer-reported weight, body-shape, and appearance-related teasing at the level of the clique. Thus, teasing about weight and appearance (rather than social rejection) appears to be experienced as an individual phenomenon rather than a clique level phenomenon. This may be attributed to the fact that one or two girls in each clique are teased about their

weight and their looks rather than a particular clique as a whole. However, unlike cliques, in friendship pairs, stronger pair-level associations were found for severe body-shape teasing (ICCs = .02 versus .21, respectively). Thus, it is possible that girls who are going through similar maturational changes (ICC = .18 for age of menarche in best friend pairs), and are teased because of these changes (or lack thereof), befriend one another.

In general, results highlight the need to examine peer relations at both the level of the best friend pair and the level of the clique. Although best friend pairs are generally nested within cliques (i.e., sub-clique within a clique), this reflects the natural structure of the social network. Most of the ICCs were significantly stronger in the friendship pairs than in cliques, with similarities and differences emerging. This does not imply that cliques are less important than friendship pairs, rather cliques and best friends may play different roles in adolescent social development. The statistical procedure used to determine the amount of variability ascribed to clique, pair, and individual levels in this study (i.e., intra-class correlations using HLM) is a significant improvement over studies which have used simple product-moment correlations, since the hierarchical nature of the data is taken into account (e.g., girls nested within pairs/cliques). To our knowledge, no other study has examined the data in this way. Also, our method for identifying cliques (CSM procedure) is more accurate than methods used in other studies, which are generally based on peer nominations of their own social groups.

Group Characteristics Associated with Peer Pressure, Eating Behaviors, and Body Esteem

In relation to peer pressure about weight and appearance, girls in nuclear status cliques perceived higher levels of social reinforcement and peer modeling than girls in

secondary and peripheral cliques, (accounting for 9% and 12% of between-group variance, respectively), after controlling for BMI, age, and individual status. Thus, clique status is an important factor for both perceived social reinforcement and peer modeling, with girls in higher status cliques reporting greater pressure to be thin. This finding confirms the notion that thinness and beauty (and pressure to meet these standards) are important norms for adolescent girls, and are linked with clique centrality or popularity within the social network. The relation between binge eating and prestige has also been demonstrated in college sororities (Crandall, 1988).

Number of group members was not an important predictor of individual perceptions of social reinforcement and peer modeling. It was expected that girls in smaller cliques would have greater opportunity to develop closer relationships, and therefore, would experience greater pressure to be thin in order to maintain these relationships. Nonetheless, perhaps it is not the *size* of the clique, rather the cohesion of clique members, the intimacy of clique member relationships, and the number years that the clique members have been together that is of greater importance. Recent studies have indicated that group cohesion may be a strong factor in the transmission of group norms (Carron & Brawley, 2000). Also, in a college sample, Crandall (1988) found that the size of the relation between binge eating and peer binge eating increased as the friendships became more cohesive. The association between group cohesion/intimacy and perceptions of peer pressure merits further investigation in an adolescent population. Also, given that only 9%-12% of the variance in perceived peer pressure was explained by group status, other group level factors that may account for differences in individual perceptions of peer

pressure about weight and appearance should be explored. Possibilities include size of school, school climate (e.g., schools that emphasize fashion shows vs. science fairs and athletic abilities), teacher involvement, socioeconomic status, and clique involvement in dating.

Clique status was not an important predictor of eating behaviors and body esteem, after controlling for BMI, age, and individual status. Rather, for dieting, 96% of the between-clique variance was accounted for by average clique peer pressure (both social reinforcement and peer modeling), and average age of menarche. Similarly, the majority of between-clique variance in bulimia (83%) and body esteem (75%) was accounted for by average clique social reinforcement. This indicates that differences in eating behaviors and body esteem can be explained primarily by clique pressure to be thin. Thus, the importance of pressure by peers at the level of the clique in influencing eating behaviors and body esteem cannot be overlooked. Findings suggest that girls in high-pressure cliques (both high reinforcement and modeling for dieting, and reinforcement for bulimia/body esteem) are at greater risk for the development of problematic eating behaviors and poor body esteem than girls in low-pressure cliques.

Also, early maturation of clique members was an important factor contributing to dieting behavior (but not bulimia, body esteem, or perceptions of peer pressure). Thus, although cliques of early maturating girls may not necessarily report more pressure to meet the thin ideal, they are more likely to diet. Research has shown that early maturation (but not puberty in general) often leads to greater body dissatisfaction when a gap between the ideal and reality is encountered (Alsaker, 1995a). Since early maturing

cliques are likely to deviate from the norm (i.e., due to weight gain associated with puberty), they may turn to dieting in order to fit in with the larger social network.

At this point, we can conclude with confidence that cliques play an important role in shaping adolescent girls' eating behaviors and attitudes. However, the mechanisms through which these processes occur must be examined more thoroughly. Longitudinal research is crucial in examining peer group processes, particularly experiences of peer pressure. For example, it would be interesting to examine changes in entry/dismissal from cliques based on violation of group norms and the development of group norms (re; eating behavior and attitudes) over time. Group structure and processes can be examined at different points over the academic year in several grades, or a cohort of girls can be followed from entry into high school until graduation.

Which Girls are Most Vulnerable for the Development of Eating Problems when in a High Pressure Group?

After examining group characteristics associated with individual perceptions of peer pressure and eating behaviors, we explored factors which could increase the risk for the development of problematic eating behaviors for girls in high pressure cliques. For dieting, low body esteem, high appearance preoccupation, and high body-shape teasing were important risk factors in cliques with high perceived social reinforcement and peer modeling. Also, low general self esteem was an important risk factor for dieting in high reinforcement cliques. For bulimia, in high pressure cliques (i.e., social reinforcement and modeling), girls with lower general self esteem, lower body esteem, higher peer nominations of overweight teasing, and girls who report being upset by body-shape

teasing reported more bulimic behavior. In addition, social reinforcement moderated the effect of severe weight-related teasing on bulimic behavior.

Thus, for both dieting and bulimia, girls who feel good about themselves and their bodies may be better able to resist pressure from peers to meet the thin ideal. It is notable that body-shape teasing, in particular, is a salient risk factor for dieting and bulimia in high-pressure cliques. This finding highlights the necessity of delineating independent types of teasing behavior, and emphasizes the salience of teasing about one's body-shape during this developmental period. Results from this study also indicate that girls who experience two types of teasing (body-shape and weight) are at greater risk for more severe eating pathology (i.e., bulimia) when in high pressure cliques. To our knowledge, this study is the first to distinguish between body-shape, appearance, and weight-related teasing, which has proven to be important during adolescence.

Results from this study suggest that there are specific characteristics that place girls in high pressure cliques at risk for the development of problematic eating behaviors, with slightly different patterns emerging for dieting and bulimia. For example, appearance preoccupation was an important risk factor for only dieting, while weight-related teasing (both peer and self-report) was an important risk factor for only bulimia. The development of a model examining other relevant personality factors (e.g., perfectionism), in addition to general psychopathology (e.g., depression), as mediators of the relationship between peer pressure and eating behaviors would provide additional insight into this process. Further, the relationship between substance use (cigarettes, alcohol & drugs) and weight control behaviors has been illustrated in middle school girls (Shisslak et al., 1998)

and in adolescent girls (Holderness, Brooks-Gunn, & Warren, 1994). Thus, it would be important to further examine the relationship between risky eating behaviors and other health risk behaviors (e.g., smoking, drug use, sexual promiscuity) in order to determine if girls with certain personality characteristics (i.e., in high pressure groups) are at general risk for a variety of unhealthy behaviors. This would help to determine if intervention should be aimed at general risk taking behaviors or specific to body and weight related issues.

Relational Model of Eating Behaviors and Body Esteem

At the level of the individual, an exploration of relational variables associated with eating behaviors and body esteem was conducted. For dieting, girls with higher BMIs and early maturing girls, were more likely to diet. This finding is consistent with previous literature linking weight and advanced pubertal maturation to problematic eating behaviors (Kaltiala-Heino, Rissanan, Rimpela, & Rantanen,1999; Alsaker, 1995b). Early maturing girls and girls who are overweight tend to be dissatisfied with their bodies, and therefore, are more likely to diet. After controlling for bio-maturational variables, results indicated that girls involved in closer friendships were more likely to diet, though this effect was quite small (1% of variance). These results are consistent with other findings from the current study indicating that girls who are involved in best friendships share associations in their dieting behavior. Girls with close friendships may share information about dieting, they may encourage each other in their weight loss efforts, or they may diet in unison to conform to peer norms. Findings from this study also indicate that dieting occurs in both popular and unpopular girls, and in both socially isolated/rejected and socially included/

accepted girls, indicating that dieting has become more normative over the last few decades, occurring not only among the elite. In addition, self-reported weight, body-shape and appearance-related teasing were important predictors of dieting (13% of additional variance). Thus, *self-perceptions* of being teasing by peers seems to be a more important contributor to dieting behavior than *peer-perceptions* of social rejection, teasing, and popularity.

Results also indicate that girls who see themselves through the eyes of their peers, believe in the value of weight and appearance for popularity and dating, and have higher opposite-sex relational esteem, report higher levels of dieting behavior. It is interesting that opposite-sex, rather than same-sex relational esteem, was a significant predictor of dieting behavior. This is consistent with research which has identified links between dieting, dating, sexual activity, and mixed-sex social activities (Cauffman & Steinberg, 1996). Both social reinforcement and peer modeling contributed to dieting behavior, after controlling for all other social factors. This finding emphasizes the important role of peer pressure in influencing dieting behavior during adolescence.

For bulimia, both age and age of menarche, but not BMI, were significantly related to bulimic behavior. Older girls were more likely to report bulimic behavior than younger girls, and early maturing girls were more likely to report bulimic behavior than later maturing girls. Again, these findings were expected given that bulimic behavior tends to increase in later adolescence, and early maturing girls are more likely to develop eating problems than later maturing girls. Also, research has shown that the weight of bulimic girls tends to vary (Yates, 1989), and thus BMI was not expected to be a significant

predictor. Peer nominated teasing about being overweight showed unique, but small, prediction (2%). In addition, self-reported teasing contributed above and beyond peer teasing (11% of additional variance), with severe weight, body-shape, and appearance related teasing associated with higher reports of bulimia. Thus, unlike dieting, for bulimia, both self-perceptions of teasing, in addition to peer reports of overweight teasing, are important predictors. Similar to dieting, girls with higher external selves and higher peer attributions about the importance of weight and appearance for popularity and dating reported higher levels of bulimic behavior. Further, peer pressure was a significant predictor of bulimia, with unique variance for social reinforcement, but not peer modeling, (3% of additional variance).

For body esteem, girls with higher BMIs reported lower body esteem (13% of variance). Age of menarche was not related to body esteem, indicating that although early maturation may have a significant effect on eating behaviors (both dieting and bulimia), pubertal development in general, regardless of timing, is important for the development of body image. Similar findings were reported by Stormer and Thompson (1996) in a college-aged retrospective study. In addition, girls who were nominated by peers as leaders reported higher body-esteem (1% of variance), and girls who were teased about being underweight reported lower body esteem (1% of variance). Thus, perhaps girls who are considered to be leaders by their peers feel confident about themselves in general and about their bodies. Also, being teased about being underweight could have a negative effect on adolescent girls' body esteem, especially when their peers' bodies are beginning to develop. During data collection, many of the girls indicated that they were quite upset

about being too thin, and wanted to know if teasing about weight included being "too thin."

Similar to bulimia and dieting, self-reported teasing (severe teasing about weight, body-shape, and appearance) was a strong predictor of body esteem, explaining an additional 21% of the variance. The effect of teasing on body esteem was much stronger than for dieting and bulimia (21% versus 11% & 13% of the variance, respectively). Thus, perhaps teasing influences eating behaviors both directly, and indirectly, via body esteem. In a sample of adolescent girls, Thompson et al., (1995) found that body image mediated the effect of teasing on eating disturbance. Thus, in future, path analysis would be helpful to examine the mediating role of teasing on body esteem and peer pressure. In addition, parallel to findings for dieting and bulimia, girls who had higher external selves and higher attributions about the importance of appearance and weight for dating and popularity reported lower body esteem. Again, the effect of these social self variables on body-esteem (27%) was stronger than the effect of these variables on dieting (17%) and bulimia (13%), which may indicate both direct and indirect pathways. Peer pressure significantly predicted body esteem after controlling for all other variables, though the effects were quite small (1%). Girls who reported more peer modeling, indicated lower body esteem.

Of all the social and relational variables assessed in this study, external self and attributions about the importance of weight and shape for popularity and dating were particularly important for both eating behaviors and body esteem. Girls with high external selves rely strongly on the opinions and standards of others (namely friends) in judging the

self. Since these girls depend tremendously on what their peers think of them for their own self-evaluations, it is not surprising that they would conform to peer norms regarding eating behavior and beauty. Peer attributions about the importance of weight and appearance for popularity and dating was also an important predictor. Though popularity was not related to eating behavior or body esteem, results suggest that it is the mere *belief* that being thinner and more attractive will lead to greater popularity and dating that contributes to negative feelings about the body and problematic eating behaviors. Similar findings were reported by Oliver & Thelen (1996) in a sample of 3rd to 5th grade children. They found that peer likability (i.e., the belief that being thin will increase how much peers like them) was the strongest predictor of both body image and eating. In the current sample, overweight girls were not less likely than underweight girls to be involved in close friendships, to be popular, to be leaders, to have high opposite-sex relational esteem, and to date members of the opposite sex. Thus, even though popularity and dating are not linked to thinness or attractiveness, nor to eating behaviors, these girls have internalized these norms and accepted them as true.

It is also important to highlight that self-reported teasing was a significant predictor of body esteem and eating behaviors. Regardless of whether these girls were nominated by their peers as being teased, perceptions of being teased about body and appearance (and not general teasing), and the impact of the teasing on well-being, is important. For example, findings indicated that only body-shape, weight, and appearance related teasing that was upsetting predicted bulimia and body esteem. For dieting, body-shape and weight teasing that was upsetting, and both upsetting and non-upsetting

appearance teasing, were important. These findings highlight the need to assess not only presence of teasing, but also the affect associated with this teasing. Further, in this study, being teased about being underweight was just as harmful for some girls as being teased about being overweight, especially for body esteem. Girls who are late maturers or those who have higher metabolisms are very often the targets of weight-related teasing. One girl in this study commented, "I look and feel underweight. It makes me feel depressed, since I am not happy with the way I look and when people tell me that I'm disgusting and I look so skinny." Thus, it is important to differentiate teasing about being overweight and underweight in developmental research when girls' bodies are in the process of transforming.

Though many of the peer relations variables were significant predictors of eating behaviors and body esteem, they were poor at correctly classifying eating disordered from non-eating disordered individuals. This was not surprising given that the prediction of eating disorders relies on a more complex pattern of biological, psychological, developmental, and social factors (Steiger & Seguin, 1999). Nonetheless, in future, application of path analysis techniques would be useful in outlining the direct and indirect pathways from relational factors to problematic eating behaviors. From our exploratory analysis, it appears that the most important relational variables to include in the model are involvement in a close friendship, involvement and quality of relations with members of the opposite sex, weight and body specific teasing, peer pressure, externalized self-perceptions, and peer attributions. A more complete model should also include parental variables (e.g., maladaptive family attitudes toward eating/weight), more specific peer

relations variables (e.g., social anxiety, friendship quality), in addition to other characteristics of the self that could place girls at higher risk for conforming to peer pressure. These include both psychopathology (e.g., depression, anxiety) and personal characteristics (e.g., perfectionism, lack of interoceptive awareness, poor coping skills, identity problems). In a recent study, Pike (1995) found increased power for predicting bulimic symptomatology when family and friendship systems were examined in conjunction with personality variables. Also, a positive relationship between difficulty expressing conflict with peers and bulimic symptoms was found, suggesting that friendship quality or more specific social skills may be important contributors to eating pathology.

Limitations of the Study

Although this study highlights the association between peer relations, body esteem, and eating behaviors, there are several methodological limitations which should be addressed. First, the primary measure used in this study (Peer Pressure and Eating Scale) is in an early stage of development. Though it is an improvement over previous measures, items should be modified based on findings from this study in order to increase reliability. It would be important to add more items related to bulimia, rather than weight and appearance. Also, exercise items should be modified to include reasons for exercising (i.e., for weight loss versus to stay fit), rather than exercise in general. Also, this measure did not distinguish between pressure exerted by best friends versus the clique as a whole. Second, although we attempted to control for preexisting group and pair similarities, there may have been additional items which covary with eating behavior and body esteem which were not included in this study (e.g., depression, participation in social activities). Third,

using this measure, group processes were assessed at the level of the individual rather than at the level of the group. Though this was interesting for preliminary exploration, it is necessary to obtain more direct measures of group processes, perhaps using observational methods (in the lunchroom), experience sampling methods, or teacher ratings of specific cliques. Using these techniques, objective measures of group level variables could be assessed including ratings/observation of pressures used in specific cliques, quantity and quality of clique verbalizations about weight and appearance, clique status, and clique involvement in school activities.

Also, in order to meet assumptions of independence for the statistical analyses used in this study, many girls who were multi-group members were placed in one group based on criteria determined by the authors of this study. This may not be an accurate reflection of the social network. Also, some of the girls who were assigned to cliques were non-participants in the study, and therefore, we are lacking information from all group members.

Finally, in some of the schools it was very difficult for girls to complete the negative class play items, particularly items concerning weight, appearance, and social rejection. Although research has shown that these types of measures do not have any harmful effects or consequences (Bell-Dolan, Foster, & Sikora, 1989; Hayvren & Hymel, 1984), some girls were very uncomfortable with these items. Some of the girls reported that they felt that it was socially unacceptable to say negative things about their peers. Also, given the nature of the questions in this study, it would have been useful to include a measure of social desirability.

Future Directions

The cross-sectional design used in this study did not allow us to differentiate the effects of socialization and selection. Although we chose schools where girls had been together for most of their elementary school years, and we collected the data at the end of the school year, it was still impossible to assess peer influence (or group processes) in the true sense of the word. Also, the assessment of peer pressure about weight and appearance was based on self-perceptions, which may not be as accurate as objective behavioral measures. In future, longitudinal methodologies could be used to examine peer pressure more systematically. For example, eating behaviors and attitudes, perceptions of peer pressure, in addition to clique membership, clique cohesion/intimacy and clique status, could be assessed at the beginning of the school year, in the middle of the school year, and at the end of the school year in several grades. Both changes in clique composition (controlling for cohesion), and changes in eating behaviors and attitudes could be assessed at each point. At the same time, it would also be interesting to examine other adolescent health risk behaviors (e.g., alcohol, cigarette & drug use, sexual promiscuity) in order to explore mechanisms associated with eating specific pressures versus pressures to engage in more general risk taking behaviors. A cohort approach could also be taken, where a sample of high school girls is followed over several years, from entry into high school until graduation. Using this technique, eating behaviors and attitudes and clique stability could be assessed over time.

The differential effects of direct and indirect / subtle pressures on eating behaviors and attitudes also merits further investigation. Alsaker (1995b) reports that indirect

pressures (e.g., modeling) are the most powerful means for transmitting group norms during adolescence. For example, one girl in our study commented: "Some people make me sick. They weigh under 100 pounds and are way too thin and tall, and they think that they are fat. We sit at lunch and discuss it, all the time. I am not fat or skinny, I think that I am normal. But they make me feel that I am fat, even though inside I know that I am not." Another girl commented: " My best friend is always worrying about her weight, and although she always says "You're so thin," her stressing makes me stressed." Thus, simply having a best friend who diets, or being part of a high dieting clique can have a tremendous impact on the way girls feel about their own bodies. Similar results were found by Wertheim, et al. (1997) in an interview study where indirect social influences (i.e., social comparison, joint dieting, avoidance of social disapproval) were more commonly reported than direct pressures to diet from peers. Given these findings, in addition to the differential effects of social reinforcement and peer modeling in best friend pairs and cliques, and on dieting and bulimia, measures which discriminate direct and indirect pressures should be refined for future research.

Though it is relatively easy to question girls about direct influences, indirect, or subtle influences are difficult to assess. We attempted to examine this phenomenon by decomposing variability between and within clique members/best friend pairs in their eating behaviors and attitudes (ICCs), and by asking girls about the eating attitudes and behaviors of their friends. Although these methods are improvements over previous methodologies, they are nonetheless incomplete. Qualitative approaches may be useful data-gathering tools for the development of rich descriptors of indirect processes. For

example, Wertheim et al. (1997) used an interview format (open and closed-ended questions) to gather information about both direct and indirect peer influences on eating behaviors (e.g., Have you ever been on a diet?) In future, cliques identified as being at high risk could have an open discussion about their eating habits and the pressures they experience to conform to eating specific behaviors and norms. Observation of clique behavior (e.g., during lunch) and teacher ratings of behavior may also be important data-gathering tools for the examination of indirect effects. Finally, an experience sampling procedure could be used, where teens record their eating experiences (with both family and peers). Conversations about food and weight, mealtime experiences, and weight related teasing could be recorded, indicating whom they were with at the time and their feelings about these experiences.

It would also be useful for future research to examine more systematically the positive influences peers have on eating behaviors and attitudes, rather than only the negative (e.g., Berndt & Keefe, 1995). For example, once girls are sensitized to the role of the media and peers in influencing ideas of beauty, they can use their clique pressure tactics (especially high status cliques) in social action projects to combat these pressures. For example, they can fight against clothing companies that make only small-sized clothing, or they can sensitize supermarkets to the negative effects of magazines on female development. In this way, their pressure tactics can be used in a more positive way. Also, once girls learn about the negative effects of dieting and about healthy eating habits, they can support each other in their health efforts rather than their weight loss efforts. Peers can encourage one another to develop interests other than weight and appearance, perhaps

in certain athletic activities. Thus, peers can have a very positive influence on one another if the pressure is shifted to positive activities.

In the current study we explored teasing by same-sex peers. It is very likely that teasing by opposite-sex peers and by family members also has a significant effect on body esteem and eating behaviors. In a retrospective study, Rieves & Cash (1996) found that though peers in general (62%) and friends (47%) make up the largest category of teasers, family members also engage in teasing behavior (mother, 30%; father 24%). It would be useful for future research to examine teasing and weight-related expectations from both boys and family members. Also, it would be interesting to compare the effects of teasing and peer pressure in same and mixed-sex schools, and in schools with uniforms versus schools without uniforms.

Finally, size of school and school climate may also be important mediators of peer pressure and would be important variables to include in future research. One girl in our study commented, "I feel the environment at my school encourages a healthy outlook on life. We are strong, always helping each other out, and our school encourages healthy, active lives. My mental and physical state is largely due to my school and its attitudes." Thus, differences in school climates (i.e., those that promote fashion shows and those that are athletically oriented) may have a significant impact on body esteem and importance of thinness. Another girl commented, "Long school hours add to the general unhealthy lifestyles of kids these days. We are generally too sedentary." She may be right. Also, given the importance of clique status and individual status in influencing eating behaviors and peer pressure, schools which begin to emphasize other areas of importance for

prestige (i.e., intelligence, athletics), may be able to modify the associations between the thinness and status. With the help of both teachers and students, teasing and dieting could become unacceptable within the school system.

Implications for Intervention

Given the effects of individual and group-level variables on eating behaviors and body esteem, findings from this study highlight the need for intervention at different levels. Using a "high-risk" approach (i.e., secondary prevention), girls or cliques identified as being at risk for the development of problematic eating behaviors could be targeted for intervention. Based on findings from the current study, girls with low self esteem, low body esteem, high appearance preoccupation, high external selves, and those who are teased about their bodies and their weight (individual-level), especially girls in high pressure, prestigious cliques (group-level) are at the highest risk for problematic eating behaviors. Individual psychotherapy or group therapy could be implemented with targeted girls or cliques. Nonetheless, although a high-risk approach may help to prevent specific individuals from developing problematic eating behaviors, it is unlikely to change the prevalence of eating disorders within the population at large.

Primary prevention for eating disorders is also an important area of intervention that has increased in recent years. Primary prevention is usually implemented at the level of the general student population within the school system (rather than targeting high risk individuals or groups). School-based primary prevention for eating disorders has focused on nutrition, healthy eating, body image and body-shape concerns, and evaluation of media messages (e.g., Smolak, Levine, & Schermer, 1998). In the short-term, these

programs have had minimal success in changing eating behaviors and body esteem (though they do increase knowledge).

Findings from the current study suggest that it would be useful for eating disorder prevention to focus on teasing behavior, particularly about body-shape, weight and appearance. Over the past decade, research about teasing and bullying in the schools, and means to deal with the bullying, has increased significantly (Olweus, 1991; 1993). This research surge occurred as a result of three student suicides resulting from teasing in Norway. School intervention programs dealing with teasing and bullying in the schools have been quite successful. Olweus (1991) found that two years after his intervention program began, bullying decreased by approximately 50% using a variety of measures. At this point, most bullying intervention programs focus on general teasing. Results from the current study indicate that girls who are disturbed by weight specific-teasing, rather than general teasing or social rejection, are likely to have low body esteem and to engage in problematic eating behaviors. Thus, primary prevention, especially during early adolescence, dealing with the negative effects of weight, body and appearance-related teasing, would be particularly helpful for increasing body esteem and reducing problematic eating behaviors.

Findings also suggest that more comprehensive prevention programs which include the negative effects of teasing behavior, peer messages about dieting and body-shape, ways to combat teasing behavior, methods to enhance self esteem and bolster body esteem, and education about the negative effects of dieting would be useful. Also, at the group level, intervention could focus on severing the ties between group prestige and

pressure to uphold the thin ideal. Smolak et al. (1998) suggest that primary prevention programs should be implemented in elementary school before partial or full eating disorders develop, while secondary prevention approaches would be more useful in middle and high school populations. Also, Wertheim et al. (1997) suggest that using peer facilitators (rather than counselors or teachers) may be a useful method for prevention. This seems reasonable in light of findings from this study which highlight the importance of peers (and peer pressure) during adolescence.

At a higher organizational level, intervention could be implemented at the level of the school, by changing school policy, and the level of the community, through public health reform (e.g., population approach). For example, schools could implement a zero-tolerance policy for teasing, school fashion shows could be prohibited, and prevention could be included as part of the school curriculum. At the level of the community, convenience stores could remove magazines depicting unrealistic models from their shelves, magazines could use more realistic models in their ads, or a bill board free zone could be set up in high school areas. Though intervention at these levels may not prevent specific girls who are at risk from developing eating disorders, they may begin to change societal attitudes about weight and appearance, and in turn, make dieting less normative.

Conclusions

Peers and peer relations have a tremendous impact on the way girls feel about themselves and their bodies. One 8th grade girl in our study commented, "I think that the aspect of my life that most affects how I think about my weight and appearance is the general comments that I get from friends (girls and boys, but more boys). When they like

something, I am happy and try to make the best of it. When they dislike something, I do my best to change it or get rid of it. What others think or say about me is the deciding factor in what I think about myself." Findings from this study highlight that peer pressure takes many forms, affecting adolescent girls of all ages. Peers exert influence through both direct means, such as positive or negative verbal feedback and comments (i.e., teasing, direct reinforcement, direct teaching), and through modeling (vicarious reinforcement). These techniques are powerful mechanisms for transmitting what is acceptable and unacceptable behavior in both social networks and best friend pairs.

Results from the current study highlight the high prevalence of problematic eating behaviors (especially dieting), and low body esteem in adolescent girls, and the importance of peers in contributing to these behaviors and attitudes. In general, girls who are overweight, are early developers, are teased about their weight, appearance and body-shape, see themselves through the eyes of their peers, have internalized the belief that thinness and attractiveness will lead to increased popularity and dating, and those who experience pressure from peers to be thin, seem to be at the greatest risk for the development of eating problems. These findings have implications for our society at large. They point to the strong need to change the beliefs and attitudes of young girls and adolescents about the importance of thinness, and the link between thinness and success. This may occur with the implementation of national prevention programs combating these false beliefs. In this way, girls may begin to value themselves for attributes other than their looks and their weight, leading to much more "successful" lives.

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APPENDIX A

Letters to principals and parents and consent forms

March 14, 1997

Dear Principal,

As a follow-up to our recent phone conversation, we are writing to ask you for permission to conduct our research project in your school, and to provide you with information regarding our project. You will also find following a letter to parents and consent forms.

Adolescence is an important developmental period for the emergence of body dissatisfaction, dieting and eating problems. Young adolescent girls are growing up in a social and cultural environment that glorifies thinness, and they are being exposed to unhealthy messages about the importance of thinness, dieting, and attractiveness. Adolescent concern about weight and dieting has captured the attention of both clinicians and researchers due to the possibility that early weight preoccupation could lead to the development of later eating disorders.

Although the influence of both the media and family members on the development of eating problems have been investigated, few studies, if any, have examined the influence of peers. Since peer relations and peer pressure become increasingly salient during adolescence, one would expect peers to have an important influence on the development of eating behaviors and body satisfaction in adolescent girls. Also, given that girls rely strongly on social experiences to define their sense of self, and that thinness and appearance have been linked with social acceptance, adolescent girls may become increasingly compliant with peer expectations regarding appearance and weight in order to gain social approval or popularity.

With support from the Social Sciences and Humanities Research Council of Canada and from the Fonds pour la Formation des Chercheurs et L'aide a la Recherche of Quebec, we are conducting an investigation of social factors influencing the development of eating behaviors and body dissatisfaction in adolescent girls. More specifically, we are hoping to gain a better understanding of the role that peers play in the development of eating behaviors and attitudes. This investigation is being conducted by Melissa Lieberman, a Ph.D candidate at Concordia University, under the supervision of Dr. Donna White, a psychologist and researcher in the field.

The present project requires the participation of as many girls as possible in grades 7 through 10. During the first session, students will be given a brief explanation of the study and what participation involves. Students under the age of fourteen will be given a letter and a consent form to take home to their parents. Students over fourteen years of age will sign their own consent forms. Only students with consent will be eligible to participate.

This project will involve students' completion of several questionnaires concerning eating behaviors, self and body esteem, and peer pressure. Many of these questionnaires are commonly used for research in this area. Students will also be asked to list their best

friends, and to nominate students in their grade who generally hang around together. Most students find this quite enjoyable. Height and weight will be measured in a private area of the classroom. All answers will remain confidential, and students will have the option to withdraw from the project if they so desire.

These questionnaires will be completed during two sessions of approximately 45 minutes each. The scheduling of these sessions will be arranged at the schools' and the teachers' convenience in order to minimize disruption of school time. I would be happy to meet with the teachers to explain the project in more detail. Also, upon completion of the project, several sessions aimed at improving body image could be provided to the students by our research team. Students will also be given the name and phone number of Dr. Donna White, a professional psychologist, should they have any of their own concerns regarding weight and appearance.

We would greatly appreciate your involvement in our project, and hope that the above meets with your approval. If you have any further questions or need any further information, please to not hesitate to call us.

Thank-you,

Melissa Lieberman, M.A.
Project Coordinator
(848-2256)

Donna White, Ph.D
Project Director
(848-7542)

March 1997

Dear Parents,

We are writing to ask permission for your child to participate, at school, in a project which was approved by your child's school principal and teachers.

We are currently conducting an investigation of social factors which may influence eating behaviors and body dissatisfaction in adolescent girls. More specifically, we are hoping to gain a better understanding of the role that peers play in the development of eating behaviors and attitudes. This work is important because early eating problems and poor body satisfaction could contribute to the development of later eating disorders. This investigation is being conducted by Melissa Lieberman, a Ph.D candidate at Concordia University, under the supervision of Dr. Donna White, a psychologist and researcher in the field. This project is being supported by the Social Sciences and Research Council of Canada and the Fonds pour la Formation des Chercheurs et L'aide a la Recherche of Quebec.

This project involves the participation of adolescents, ages 12-15. During class time, participants will be given a brief explanation of the study and what participation involves. The adolescents will be asked to complete a series of questionnaires concerning eating behavior, self and body esteem, and peer pressure. Students will also be asked to list their best friends in the grade. In order for our research to be meaningful, it is important that the majority of the class participate in this task. The questionnaire packet will take approximately 2 class periods (45 minutes each) to complete. Since there are no right or wrong answers, students usually find answering the questions interesting. Height and weight measures will be taken for each participant.

All information obtained from individuals in this study will remain strictly confidential to the research team. **Please indicate on this form whether your child will participate in this study by providing your signature on the appropriate line.** To encourage your child to return the form, all students who return their forms (*whether you consent or not*), will be eligible for a raffle of gift certificates for Cineplex Odeon movie passes. We would like to know your decision even if you **do not** agree to your child's participation. It should be noted that participation is completely voluntary and the participant can terminate at any time.

We need as many participants as possible in order to complete this study. Thus your consent would be greatly appreciated. If you have any questions concerning this study, please do not hesitate to contact us.

We would like to take this opportunity to thank you in advance for your time and interest in our investigation.

Melissa Lieberman, M.A.
Project Co-ordinator (848-2256)

Donna R. White, Ph.D
Project Director (848-7542)

CONSENT FORM

By signing this consent form, I understand that my child will be involved in a study regarding the influence of peers on the development of eating behaviors and body satisfaction. I know that participation is completely voluntary. No one other than the researchers will have access to the information my child will provide.

Please complete the following:

Adolescent's Name: (please print) _____

School: _____

Grade: _____

Check where applicable:

_____ I **agree** to my child's participation in this project.

OR

_____ I do **not** agree to the above.

_____ _____

Parent's Name (Please print) Parent's Signature

Address:

_____

_____

_____

Please indicate whether or not you are interested in a summary of the results of the study:

YES___ NO___

(If *yes*, make sure you have included your address above!)

Please return this form to your teacher or the school secretary as soon as possible!

Consent Form to Participate in Research

I agree to participate in this study which will examine the ways in which girls develop ideas about eating and the how they feel about their bodies. I understand that this program of research is being conducted by Melissa Lieberman, a Ph.D candidate, under the supervision of Dr. Donna White, a psychologist at the Centre for Research in Human Development at Concordia University. I understand that I will be asked to fill out several questionnaires, which will take approximately 2 class periods. I understand that my weight and height will be measured in a private area of the classroom following the first session.

Furthermore, I understand that my participation in the study is totally anonymous, and that the answers I provide are strictly confidential. I also understand that I am free to discontinue participating at any point in the study without giving any notice and without any negative consequences. I understand that I am participating in this research solely to advance knowledge in the area of social factors influencing the development of eating behaviors, and that the study has no further motive with which I have not been told about. I also understand that the overall results of this study may be published.

I have read the above conditions and I understand this agreement, and therefore I freely consent and agree to participate in this study.

Print Name:_____ Age:___

Signature:_____

In the future, we may also like to examine how parents may influence the development of eating attitudes and behaviors in their daughters. We would appreciate you providing your parents' names, phone numbers and addresses so that we may contact them to request their participation.

Mother's Name:_____
Phone Number:_____
Full Address: _____
_____

Father's Name:_____
Phone Number:_____
Full Address: _____
_____

APPENDIX B

Verbatim instructions to participants

Peer Influence on Eating Attitudes and Behaviors
Verbatim Instructions to Participants

SOCIOMETRIC ASSESSMENT:

Introductory Phase:

Hi. My name is _____, and these are my assistants _____ and _____.
We are here from Concordia University.

In grades 9 & 10:
Some of you may not have been here during the assembly. Read names of those students who you did not receive consent forms from.
-tell them a little about study, what we are looking at, what study involves, 2 questionnaire sessions and weight and height measurement in private. Tell them how this important research is and that most girls enjoy it (see shpil). Strongly encourage them to participate. The more subjects we have, the more meaningful the research is.
-I have extra consent forms here if you wish to participate.
-distribute consents, let them fill them out, add their subject numbers to extra questionnaires

For grade 7 & 8:
Next, name the non-participants, if any. Ask them to raise their hands and tell them; "we know that you are not participating so please take out some work or something to read quietly at your desk, OR please follow _____ to the library."

As you may remember, we are interested in learning about what girls your age think and feel about their bodies and about eating, and how your friends may influence these feelings.
-today you will fill out a packet of questionnaires, and then you will got out in threes and wait (location) with your shoes off so we can take your weight and height measurements. Like the questionnaires, the weight measurements are confidential/anonymous so we are going to ask you to stand backwards.

Before we get started, there are some very important things to tell you. The first thing is, this is not a test. There are no right or wrong answers. What we want to know is your opinions and feelings.
The second thing is, since we are asking for your opinion, we will keep it private. This means that I will not show your answers to anyone. And because I am going to keep it private, you can feel free to be honest about what you really think.
Also, because it is private, it is important for you **not to look at what other students are writing** down and not to let others know what you have written down.
-tell them they can use paper to cover answers, move so they are not next to each other

The last thing I want to tell you is that there is no talking while you are filling out the questionnaires. Because I have important things to tell you, you need to listen carefully. If

you are talking, you can't hear my instructions and you won't know what to do. So if you have any questions, just raise your hands and _____ or _____will come over to help you.
Okay, those are the three things I wanted to tell you; This is not a test, this is private and no talking, just listening.

Assessment Phase:
Now we're ready to start. _____ & _____ are going to pass out the questionnaires. **Please do not begin until I've had a chance to explain more about them.**

(Leader will call out the students names and when student identifies herself, the appropriate questionnaire will handed to the participant.)

Does everyone have a pencil/pen ready? (Helpers: Distribute if needed)
If you are all ready, let's begin. No more talking, everyone should be quiet. I will answer all questions after I'm finished explaining (If hands up at this point, ask them to wait because you are probably going to answer their questions anyway).

(Leader: show them the grade list)
On the first page, you will see a list of the names of the girls in your grade at school. I want you to look for your own name on the list and draw a circle around it. (Wait until everyone is ready). All done? If your name is not on the list, please raise your hand now.
(If a child's name is missing, ask everyone to write it at the bottom of the first page. Write it on the blackboard as well.)

Turn to the second page (Show them second page). First, fill in the top part, your grade, school and age. Now let me explain the next few pages and then you can begin.

We to know about your friendships. Who are **your** best friends in your grade? So, when I tell you to start, I want you to write down the names of your best friends from your grade. Put your very best friend's name on line 1, put your second best friend on line 2, third best on line 3 and so on. You can name as many or as few friends as you want. Just make sure to write down the first name and the first letter of the last name for each best friend you list, and remember to pick friends from the grade list on page 1.

Before you start, turn to the next page (only do this in older grades, for younger grades do each part separately).
What I'd like you to do for this part is to write down the names of the girls in your grade who "hang around" together. Again, I want you to write the first name and the first letter of the last name for each girl in the group, using the grade list on page 1. You have enough space to write down the names of six groups or "cliques" of girls, but just fill in as many groups as there are girls in your grade who hang around together. The groups may be different sizes. Also, if you are in one of these groups, don't forget to write down your own name.

Now look at the next page,
For this part, you are to write down the names of the girls in your grade who do **not** hang around with a particular group. Again, write down the first name and the first letter of the last name for each girl you name using the grade list on page 1. You can write as many or as few names as you want. If **you** do not hang around with a particular group, please include your own name here.

Do you have any questions before we start?
Possible questions:
Q: What if my best friend is not in this grade/school? A: Try to write down your best friends from your own grade, but if your very best friend is in a different grade or school, you can write their name on the first line (with their grade or school in brackets), and then pick your other best friends from the grade list.
Q: What if I don't have any friends in this grade or school? A: Try to write down the names of girls in your grade who you "hang around" with the most or who you spend the most time with.
Q: What if I can't put them in any order, they are ALL my best friends? A: It doesn't matter who exactly is number 1, 2 or 3, you can really put them in any order you want. Try to put them in order of who you feel closest to or who you share the most secrets with.
Q: What if ___ is in more than one group or clique? Try to put them in the group who they hang around with the most. If they hang around equally in two groups, you can write their names down in both groups.
Q: What if there are more than 6 groups of girls in the grade? A: If there are more than 6 groups, you write the rest of the groups on the bottom of the page.

Okay. Now you can start. Remember, no talking and if you have a question raise your hands and we will come to your desk.

Revised Class Play Instructions:
Now turn to the next page where it says instructions for class play. This section is different so everyone needs to listen carefully.
What we want you do is to pretend that you are the director of a play starring the students in your grade/class.

Who can tell me what a director does? (Allow students to raise their hands and answer the question).
Right. The director of a play has many things to do, but the most important job is to choose the right people to act in the play. So for this part, your job is to choose the students who seem to fit each role in real life.
Let's try one together. Who in your class would you choose to play the role of a fast runner athlete? (Wait for a response) Good.

There are a few important rules that you should know before we start.
First, you can only choose one person from your grade/class for each part, although the same

person can be chosen for more than one role. For example you can choose one person to be a fast runner and the same person to be a good student, but you cannot choose 2 people to be good students. If you think that 2 people would be equally good for the same part, choose the **one** person who you feel would play the part the best.

The second rule is that you cannot choose yourself for any of the parts.

Okay, now we can begin. Turn to the next page. The roles are listed across the top of the page, with a column of names under each role. First, find your own name in the first column and cross it out. Do not circle it, put an X or a line through it. Now cross out your name in all the columns on the first page.
(If they feel that crossing out their name ruins the anonymity, you can tell them they don't have to but they should remember not to choose themselves).

Now lets try the first one together. Circle the name of the person in your class/grade who could play the part of a Good Leader. Remember to choose only one name from the column directly underneath "good leader."

Now you can continue to do the rest on your own. Remember to cross out your own name on each page. If you need help, please raise your hand and we will come to your desk.

Potential questions:
Q: What if I can't find anyone in the class who could play this part? A: Just try your hardest to think of someone who can play the role, but if you are really stuck, you can leave it blank.

Q: What if I would be the best one for this part? A: If you want, you can put a star beside your own name if you feel that you would be the best person, but try to find someone else in your class/grade who could also play the part.

Is everyone done? Okay let's move on to the next one.

PEER EATING INFLUENCE SCALE:

This questionnaire is very important so please pay attention. I am going to read the instructions from the top of the page out loud. Please follow along.

This scale measures both your attitudes and behaviors and your friends' attitudes and behaviors about food, appearance and dieting. When answering the questions, try to think about the friends who you feel closest to, or the friends who have the greatest effect on your behavior and ideas.

Remember there are no right or wrong answers so you can be honest about the way you feel. You are to read each question carefully and then circle the number which best applies to you.

There are six possible answers for each question:

False, Mostly False, More False than True, More True than False, Mostly True and True
Remember, false means that it is **never ever** true for you and True means that it is **always** true for you (100% true).

There may be very subtle differences between some of the items, so please read each question carefully.

Let's look at the examples together. The first one says "getting good grades is important to me." Please circle your answer now. The second one says "It is important for my friends to get good grades." Circle your answer. So you see from this example that you have to pay close attention because the same ideas may repeat, but one could be about you and the other about your friends.

Okay. Please do the rest on your own. Raise your hands if you have any questions and one of us will come to your desk.

That's it. Thank you very much. We will see you on _____to finish the rest of the questionnaires.

Weight and Height procedure**********

Helpers:
Walk around the classroom and make sure that the children are checking one item only. Try to catch any mistakes you see so they can be corrected on the spot.
The questionnaires may upset some children. If you notice that a child is upset ask her if something is wrong. Ask gently. Ask they if they want to talk about some of these things in private after they finish.

Second Phase:

Hello. Do you remember us? We are from the Eating Habit project at Concordia University. My name is _____, and my assistants today are _____ and _____.

This time we are going to do something different, but before we start, I want to remind you of a few important things we told you last time.

1. There are no right or wrong answers. This is not a test, we just want your feelings and opinions.
2. Since we are asking for your opinions, we will keep everything that you tell us private. This way you can feel free to be honest about what you really think. Also, because it is private, it is important for you to be careful not to look at what other kids are writing down
3. We would like you to work quietly. If you have any questions, raise your hand and one of us will come to your desk.

Now we are ready to begin. You can work on most of these questionnaires on your own, but let's go over the instructions for the first one together to refresh your memories.

Instructions for the SDQ:

This is a chance to look at yourself. This is not a test. There are no right or wrong answers. Be sure that your answers show how you feel about yourself.
YOU ARE TO READ EACH SENTENCE TO YOURSELVES, and mark your answer on the sheet. There are six possible answers for each question:
False, Mostly False, More False than True, More True than False, Mostly True and True
Remember, false means that it is never ever true for you and True means that it is always true for you.

Look at the examples in the middle of the page. The first 2 have already been completed by a student named Kaylie. The first sentence says, I like to read magazines. Kaylie chose true because she always likes to read magazines, whenever she has the chance. The second sentence says, in general I keep my room tidy. Kaylie chose More false than true because her room is usually messy, but sometimes she cleans it up and it is neat.
You try the next one. It says, I like to watch TV.
Please turn the page and continue quietly on your own. Again, raise your hand if you need help and we will come to you.
The rest of the questionnaires are quite straightforward. Please remember to read the instructions for each questionnaire carefully. The last questionnaire is a general information form. At the end, there are a few lines for you to write down any comments or questions you have about the study. We would really appreciate your feedback. Okay. You may continue with the questionnaire package. Again, if you have any questions, raise your hand and one of us will come to you.

De-briefing:

The purpose of this study was to look at how girls your age feel about their bodies and their weight, to look at eating behaviors and attitudes in girls your age and to determine the role of peers in influencing some of your feelings in these areas.

This research will help us to discover factors that may influence the development of eating problems in adolescent girls, so we can design effective intervention and prevention programs.

Information:

-as many of you probably know, there is a lot of pressure for girls in our society to be thin, from friends, parents, and the media
-this effects girls no matter how much they weigh, whether they are underweight, average weight and overweight, they still feel pressure to be thin
-as you may also know, during puberty girls tend to gain some weight, and it is important for you to remember that weight gain is a normal part of development
-also, like height, genetics play an important role in determining weight and there is usually a genetically defined range that the body stays within
-It is also during adolescence that many girls begin to think about dieting.
-watching what you eat can be healthy if is done properly, however, fad diets (taking pills, skipping meals, and excessive dieting) are very unhealthy
-in the end, most girls end up gaining even more weight and some girls may end up developing an eating problem
-So if you feel that you are eating when you are upset or depressed, or if you are dieting excessively, it could become dangerous, could lead to health problems, increased depression, more weight gain, and in some cases to other kinds of eating problems
-so if you are going to try to lose weight, it would be important to do it in a reasonable and healthy way.

-some of the questionnaires you filled out may have been difficult for many of you, especially when you had to pick people in your class to play certain parts in the play. This is normal, it was probably hard to pick girls in you class who are teased or left out. But it is important to remember that teasing or being left out or ignored does happen to a lot of girls your age, and there are ways you can get help. If you feel bad about some of these things or if these things happen to you, we'd be happy to speak with you or give you the name of someone to speak with. Also, if you want to talk about weight issues or dieting we are also available to speak to. I am writing down a number on the board. If anyone here would like to talk about any of the issues or any other concerns please feel free to call the number on the board. Ask for either Melissa or Michelle.

Questions about the study?
Comments?

APPENDIX C
Sociometric and Clique Nomination Measures

School:_____

Grade: 7__ 8__ 9__ 10__

Age: ___

Teacher's Name:_____

1. Name your best friends in your grade. Please name girls only. (See grade list on page 1).

BEGIN WITH YOUR *VERY BEST* FRIEND

(First name and first letter of last name)

1. _____
2. _____
3. _____
4. _____
5. _____

_____

_____

_____

2. Name the girls in your grade who "hang around" together a lot.

Fill in as many groups as there are girls in your grade who hang around together. You do not have to fill in names for all six groups.

Please include **your own name** if you belong in one of these groups!!

(First name and first letter of last name)

GROUP 1:	GROUP 2:	GROUP 3:
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.
5.	5.	5.
6.	6.	6.
7.	7.	7.

(First name and first letter of last name)

GROUP 4:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

GROUP 5:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

GROUP 6:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

3. Name the girls in your grade who **do not** hang around with a particular group.

If ***you*** do not hang around with a particular group, please include yourself here.

(First name and first letter of last name)

1. _____

2. _____

3. _____

4. _____

5. _____

_____

_____

_____

Table C1

Frequency of Friendship Cliques of Different Member Size

Clique Size	No. of Cliques	% cliques	No. of girls	% of girls
2	5	4%	10	1%
3	12	10%	36	4%
4	11	9%	44	5%
5	13	11%	65	8%
6	24	20%	144	17%
7	12	10%	84	10%
8	13	11%	104	12%
9	6	5%	54	6%
10	5	4%	50	6%
11	3	3%	33	4%
12	6	5%	72	8%
13	6	5%	78	9%
14	1	<1%	14	2%
15	2	2%	30	4%
16	0	0%	0	0%
17	1	<1%	17	2%
18	0	0%	0	0%
19	1	<1%	19	2%

Note. n = 854

APPENDIX D
General Information and Self-Reported Teasing

General Information:

Please *circle* the answer which best applies to you:

1) Please indicate your current dieting status:

a) I am on a diet whereby I am eating considerably less in order to lose weight

b) I am on a diet whereby I am eating less in order to maintain a recent weight loss

c) I am not currently on a diet, but I try to watch what I eat

d) I am not currently on a weight control diet

2) Please indicate your dieting history:

a) I have never dieted to lose weight

b) I have attempted to lose weight through dieting about once or twice in my life

c) In the past year, I have attempted to lose weight more than twice

d) I am chronically dieting to lose weight

3) I think I am:	**(circle)** underweight	normal weight	overweight
4) My parents think I am:	**(circle)** underweight	normal weight	overweight
5) My friends think I am:	**(circle)** underweight	normal weight	overweight

6) Please indicate your weight status history:

From **birth to 5** I was:	**(circle)** underweight	normal weight	overweight
From **age 5 to 9** I was:	**(circle)** underweight	normal weight	overweight
From **age 9 to 12** I was:	**(circle)** underweight	normal weight	overweight
Since age 12 I have been:	**(circle)** underweight	normal weight	overweight

7) Have you ever been teased by others about your weight or size?

Yes__ No__

If **YES**, how did it make you feel? (Please circle **one** answer)

Really upset me Somewhat upset me Upset me a little Didn't upset me

8) Have you ever been teased by others about your body-shape (e.g., large/small breasts, big hips, too short/tall)?

Yes__ No__

If **YES,** how did it make you feel? (Please circle **one** answer)

Really upset me Somewhat upset me Upset me a little Didn't upset me

9) Have you ever been teased by others about the way you look?

Yes__ No__

If **YES**, how did it make you feel? (Please circle **one** answer)

Really upset me Somewhat upset me Upset me a little Didn't upset me

10) Have you ever been teased by others about things other than your body or appearance?

Yes__ No__

If **YES**, what?_____

How did it make you feel? (Please circle **one** answer)

Really upset me Somewhat upset me Upset me a little Didn't upset me

11) Have you started "going out" with boys (i.e., dating) yet?

Yes__ No__

If **YES**, how old were you when you first started?

Please check **one** answer:

__Under 10 years __10-10 ½ years __10 ½ -11 years __11-11 ½ years
__11 ½ -12 years __12-12 ½ years __12 ½ -13 years __13-13 ½ years
__13 ½ -14 years __Over 14 years

12) Have you had your period yet?

Yes__ No__

If **YES,** how old were you when you first had it?

Please check **one** answer:

__Under 10 years __10-10 ½ years __10 ½ -11 years __11-11 ½ years
__11 ½ -12 years __12-12 ½ years __12 ½ -13 years __13-13 ½ years
__13 ½ -14 years __Over 14 years

13) Mother's highest level of education:

_____ Less than grade 7
_____ Secondary I or II
_____ Secondary III or IV
_____ High School Diploma
_____ College, CGEP, or specialized school
_____ University: Bachelor Degree (B.A.)
_____ University: Master's Degree or Higher

Father's highest level of education:

_____ Less than grade 7
_____ Secondary I or II
_____ Secondary III or IV
_____ High School Diploma
_____ College, CGEP, or specialized school
_____ University: Bachelor Degree (B.A.)
_____ University: Master's Degree or Higher

14) My parents are:

_____ Married
_____ Separated/Divorced
_____ Other

Please feel free to write down any additional comments or questions you may have about the questionnaires or the study in general:

_____

_____

_____

APPENDIX E

Children's Eating Attitudes Test

INSTRUCTIONS:

This questionnaire measures your attitudes, feelings and behaviours about food and eating. There are no right or wrong answers. Your answers are completely confidential, so please try to be honest about your feelings.

Please read each question carefully and circle the number which best applies to the statement below.

EXAMPLE:	**Always**	**Very Often**	**Often**	**Sometimes**	**Rarely**	**Never**
I like to eat vegetables	1	2	3	4	5	6

	Always	**Very Often**	**Often**	**Sometimes**	**Rarely**	**Never**
1. I am scared about being overweight	1	2	3	4	5	6
2. I stay away from eating when I am hungry	1	2	3	4	5	6
3. I think about food a lot of the time	1	2	3	4	5	6
4. I have gone on eating binges where I feel that I might not be able to stop	1	2	3	4	5	6
5. I cut my food into small pieces	1	2	3	4	5	6
6. I am aware of the energy (calorie) content of the foods that I eat	1	2	3	4	5	6
7. I try to stay away from foods such as bread, potatoes and rice	1	2	3	4	5	6
8. I feel that others would like me to eat more	1	2	3	4	5	6
9. I vomit after I have eaten	1	2	3	4	5	6
10. I feel very guilty after eating	1	2	3	4	5	6
11. I think a lot about wanting to be thinner	1	2	3	4	5	6
12. I think about burning up energy (calories) when I exercise	1	2	3	4	5	6
13. Other people think I am too thin	1	2	3	4	5	6
14. I think a lot about having fat on my body	1	2	3	4	5	6
15. I take longer than others to eat my meals	1	2	3	4	5	6

16. I stay away from foods with sugar in them 1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
17. I eat diet foods 1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
18. I think that food controls my life 1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
19. I can show self-control around food 1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
20. I feel that others pressure me to eat 1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
21. I give too much time and thought to food 1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
22. I feel uncomfortable after eating sweets 1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
23. I have been dieting 1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
24. I like my stomach to be empty 1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
25. I enjoy trying rich new foods 1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
26. I have the urge to vomit after eating 1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6

APPENDIX F

Revised Body Esteem Scale

INSTRUCTIONS: Indicate how often you agree with the following statements: ranging from "never" (0) to "always" (4). Circle the appropriate number beside each statement.

1	I like what I look like in pictures.	0	1	2	3	4
2	Other people consider me good looking.	0	1	2	3	4
3	I'm proud of my body.	0	1	2	3	4
4	I am preoccupied with trying to change my body weight.	0	1	2	3	4
5	I think my appearance would help me get a job.	0	1	2	3	4
6	I like what I see when I look in the mirror.	0	1	2	3	4
7	There are lots of things I'd change about my looks if I could.	0	1	2	3	4
8	I am satisfied with my weight.	0	1	2	3	4
9	I wish I looked better.	0	1	2	3	4
10	I really like what I weigh.	0	1	2	3	4
11	I wish I looked like someone else.	0	1	2	3	4
12	People my own age like my looks.	0	1	2	3	4
13	My looks upset me.	0	1	2	3	4
14	I'm as nice looking as most people.	0	1	2	3	4
15	I'm pretty happy about the way I look.	0	1	2	3	4
16	I feel I weigh the right amount for my height.	0	1	2	3	4
17	I feel ashamed of how I look.	0	1	2	3	4
18	Weighing myself depresses me.	0	1	2	3	4
19	My weight makes me unhappy.	0	1	2	3	4
20	My looks help me to get dates.	0	1	2	3	4
21	I worry about the way I look.	0	1	2	3	4
22	I think I have a good body.	0	1	2	3	4
23	I'm looking as nice as I'd like to.	0	1	2	3	4

APPENDIX G
The Peer Pressure and Eating Scale and Subscales

INSTRUCTIONS:

This scale measures both your own attitudes and behaviours, and your friends' attitudes and behaviours about food, appearance and dieting. When answering the questions, try to think about the friends who you feel **closest** to, or the friends who have the greatest effect on your behaviour and ideas.

- Remember, there are no **RIGHT** or **WRONG** answers so you can be honest about the way you feel!

- Please read each question **carefully** and circle the number which best applies to you!

There may be very **subtle** differences between some of the items, so please read each question carefully!!

EXAMPLE:

	False	Mostly false	More false than true	More true than false	Mostly true	True
1. Getting good grades is important to **me**	1	2	3	4	5	6
2. It is important for **my friends** to get good grades	1	2	3	4	5	6

	False	Mostly false	More false than true	More true than false	Mostly true	True
1. It is important for me to do well at sports	1	2	3	4	5	6
2. My friends and I rarely talk about weight and dieting	1	2	3	4	5	6
3. If I was better looking, I would be more popular	1	2	3	4	5	6
4. My friends and I talk about our appearance quite often	1	2	3	4	5	6
5. My friends are often on a diet	1	2	3	4	5	6
6. I would feel better about myself if I lost weight	1	2	3	4	5	6
7. Boys would be more attracted to me if I was better looking	1	2	3	4	5	6
8. My friends have shown me ways that I could use to lose weight (e.g., diets, vomiting, laxatives, etc.)	1	2	3	4	5	6
9. My friends think that it is important to exercise	1	2	3	4	5	6
10. I would feel more positive about myself if I was better looking	1	2	3	4	5	6
11. It is important to my friends that I am "good looking"	1	2	3	4	5	6
12. My friends exercise regularly	1	2	3	4	5	6
13. If I was thinner, boys would be more attracted to me	1	2	3	4	5	6
14. My friends think that it is important to do well at sports	1	2	3	4	5	6
15. My friends would like me more if I lost weight	1	2	3	4	5	6
16. My friends often point out the calories and/or fat content of the foods that I eat	1	2	3	4	5	6
17. Physical appearance is important to my friends	1	2	3	4	5	6
18. Boys would ask me out more if I was better looking	1	2	3	4	5	6
19. My friends **do not** watch what they eat carefully	1	2	3	4	5	6
20. My friends encourage me to exercise	1	2	3	4	5	6
21. It is important to **my friends** that I am thin	1	2	3	4	5	6

22.	I would be a more successful person if I were thinner	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
23.	"Looks" are not important to me	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
24.	My friends are satisfied with their weight	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
25.	My friends put pressure on me to lose weight	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
26.	I feel that my friends expect me to be thin	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
27.	My friends have told me that I should exercise more often	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
28.	My friends would like me more if I was better looking	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
29.	"Looks" are not important to my friends	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
30.	If I was thinner, boys would ask me out more	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
31.	Physical appearance is important to me	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
32.	It is important to my friends that **they** are thin	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
33.	My friends encourage me to diet	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
34.	I would be more popular if I lost weight	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
35.	If I was better looking, I would be a more successful person	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6
36.	It is important to me that I am thin	1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 6

Peer Pressure and Eating Scale

Peer Modeling:

1. It is important to my friends that they are thin
2. My friends are satisfied with their weight (R)
3. My friends are often on a diet
4. Physical appearance is important to my friends
5. "Looks" are not important to my friends (R)
6. My friends exercise regularly
7. My friends think its important to exercise
8. My friends **do not** watch what they eat carefully (R)

Social Reinforcement:

1. It is important to my friends that I am thin
2. My friends put pressure on me to lose weight
3. My friends often point out the fat and/or calorie content of the foods that I eat
4. My friends encourage me to diet
5. My friends have shown my ways I could use to lose weight
6. My friends have told me that I should exercise more often
7. It is important to my friends that I am good looking
8. My friends and I rarely talk about weight and dieting (R)
9. My friends and I talk about our appearance quite often
10. My friends encourage me to exercise
11. I feel my friends expect me to be thin

Peer Attributions:

1. If I was thinner, boys would be more attracted to me
2. If I was thinner, boys would ask me out more
3. Boys would ask me out more if I was better looking
4. Boys would be more attracted to me if I was better looking

5. I would be more popular if I lost weight
6. If I was better looking, I would be more popular
7. My friends would like me more if I lost weight
8. My friends would like me more if I was better looking

Filler Items:

1. I would be a more successful person if I was thinner
2. If I was better looking, I would be a more successful person
3. I would feel more positive about myself if I were better looking
4. I would feel better about myself if I lost weight
5. It is important to me to do well at sports
6. My friends think that it is important to do well at sports
7. It is important to me that I am thin
8. Physical appearance is important to me
9. "Looks" are not important to me

Correlations:

	Peer Modeling	Attributions
Social Reinforcement	.51**	.48**
Peer Modeling		.26**

** $p<.001$

APPENDIX H

Peer Nominations

CLASS PLAY

INSTRUCTIONS:

Pretend that you are the director of a play starring the students in your grade. Your job is to choose the students in your grade who could play each part or role the best. Try to pick the students who seem to fit each part in real life.

The roles in the play are listed across the top of the page. Underneath each role are the **name** for you to choose from.

For each role, first cross out your own name, and then circle the name of the person who you feel would best fit that role.

IMPORTANT RULES:

1. You can only choose one person for each role, although the same person can be chosen for more than one role!
2. You cannot choose yourself for any of the roles!

NOW TURN THE PAGE

Please circle the name of the person in your grade who:

Is a good leader	People make fun of	"Hangs out" alone rather than with others	Is teased because of the way they look	Has good ideas for things to do	Gets called names by others	Is overly concerned with their appearance	Someone you can trust	People talk behind their back	Has many friends
Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.
Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C
Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.
Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.
Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.
Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.
Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.
Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.
Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.
Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.
Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.
Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.
Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M	Aimie M.	Aimie M.
Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.
Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.
Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.
Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.
Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.
Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.
Adriana V.P.	Adriana V.P	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.
Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.
Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.

Please circle the name of the person in your grade who:

Feelings get hurt easily	Everyone listens to	Is really good looking	Has trouble making friends	Is usually sad	Feels that looks are really important	Has a good sense of humour	Is teased about being overweight	Can't get others to listen	Helps other people when they need it
Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.
Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C
Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.
Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.
Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.
Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.
Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H	Sharon H.	Sharon H.	Sharon H.	Sharon H.
Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.
Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.
Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.
Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.
Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.
Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.
Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.
Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.
Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.
Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.
Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.
Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.
Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.
Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.
Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G	Julia G.

Please circle the name of the person in your grade who:

Is very shy	Is polite	Is often chosen last for sports	Makes new friends easily	Is ignored by others	Everyone likes to be with	Is often left out	People do mean things to	Is usually happy	Is teased about being too thin	Can get things going
Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.	Martha B.
Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C	Rachel C
Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.	Caroline F.
Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.	Diana F.
Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.	Andrea H.
Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.	Joanna H.
Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.	Sharon H.
Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.	Stephanie J.
Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.	Nidhi K.
Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.	Marie K.
Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.	Ka Ki L.
Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.	Alysia M.
Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.	Aimie M.
Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.	Andréanne M.
Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.	Shivani O.
Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.	Vanessa P.
Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.	Jennifer P.
Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.	Cristina R.
Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.	Ildiko T.
Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.	Adriana V.P.
Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.	Benedikta K.
Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.	Julia G.

APPENDIX I

Self Description Questionnaire-II

Self-Description Questionnaire - II
SDQ-R

This is a chance to look at yourself. It is not a test. There are no right answers, and everyone will have different answers. Be sure your answers show how you feel about yourself.

Please read each sentence and choose the answer that is best for you. There are six possible answers for each question: "True," "False" and four answers in between. Make a mark on the line under the answer you choose.

Examples:

(Two already completed by a student, Kaylie)

	False	Mostly False	More false than true	More true than false	Mostly true	True
1. I like to read magazines.	____	____	____	____	____	X
2. In general, I keep my room tidy.	____	____	X	____	____	____
3. I like to watch T.V.	____	____	____	____	____	____

You should have only ONE answer for each sentence. Please do not leave out any of the sentences, even if you are not sure where to mark an X.

		False	Mostly False	More false than true	More true than false	Mostly true	True
1.	Overall, I have a lot to be proud of.	___	___	___	___	___	___
2.	I enjoy things like sports, gym and dance.	___	___	___	___	___	___
3.	My parents are usually unhappy or disappointed with what I do.	___	___	___	___	___	___
4.	People come to me for help in most school subjects.	___	___	___	___	___	___
5.	It is difficult for me to make friends with members of my own sex.	___	___	___	___	___	___
6.	People of the opposite sex whom I like don't like me.	___	___	___	___	___	___
7.	I am lazy when it comes to things like sports and hard physical exercise.	___	___	___	___	___	___
8.	Overall, I am no good.	___	___	___	___	___	___
9.	I get along well with my parents.	___	___	___	___	___	___
10.	I'm too stupid at school to get into a good university.	___	___	___	___	___	___
11.	I make friends easily with boys.	___	___	___	___	___	___
12.	I make friends easily with girls.	___	___	___	___	___	___
13.	Most things I do, I do well.	___	___	___	___	___	___
14.	I'm good at things like sports, gym and dance.	___	___	___	___	___	___
15.	It is difficult for me to talk to my parents.	___	___	___	___	___	___
16.	If I work really hard, I could be one of the best students in my school year.	___	___	___	___	___	___

		False	Mostly False	More false than true	More true than false	Mostly true	True
17.	Not many people of my own sex like me.	___	___	___	___	___	___
18.	I am not very popular with members of the opposite sex.	___	___	___	___	___	___
19.	Nothing I ever do seems to turn out right.	___	___	___	___	___	___
20.	I am awkward at things like sports, gym and dance.	___	___	___	___	___	___
21.	My parents treat me fairly.	___	___	___	___	___	___
22.	I get bad marks in most school subjects.	___	___	___	___	___	___
23.	I am popular with boys.	___	___	___	___	___	___
24.	I am popular with girls.	___	___	___	___	___	___
25.	Overall, most things I do turn out well.	___	___	___	___	___	___
26.	I am better than most of my friends at things like sports, gym and dance.	___	___	___	___	___	___
27.	I have lots of arguments with my parents.	___	___	___	___	___	___
28.	I learn things quickly in most school subjects.	___	___	___	___	___	___
29.	I do not get along very well with boys.	___	___	___	___	___	___
30.	I do not get along very well with girls.	___	___	___	___	___	___
31.	I don't have much to be proud of.	___	___	___	___	___	___
32.	I try to get out of sports and physical education classes whenever I can.	___	___	___	___	___	___

		False	Mostly False	More false than true	More true than false	Mostly true	True
33.	My parents understand me.	___	___	___	___	___	___
34.	I am stupid at most school subjects.	___	___	___	___	___	___
35.	I have good friends who are members of my own sex.	___	___	___	___	___	___
36.	I have lots of friends of the opposite sex.	___	___	___	___	___	___
37.	I can do things as well as most people.	___	___	___	___	___	___
38.	I can run a long way without stopping.	___	___	___	___	___	___
39.	I do not like my parents very much.	___	___	___	___	___	___
40.	I do well in tests in most school subjects.	___	___	___	___	___	___
41.	Most boys try to avoid me.	___	___	___	___	___	___
42.	Most girls try to avoid me.	___	___	___	___	___	___
43.	I feel that my life is not very useful.	___	___	___	___	___	___
44.	I hate things like sports, gym and dance.	___	___	___	___	___	___
45.	My parents really love me a lot.	___	___	___	___	___	___
46.	I have trouble with most school subjects.	___	___	___	___	___	___
47.	I make friends easily with members of my own sex.	___	___	___	___	___	___
48.	I get a lot of attention from members of the opposite sex.	___	___	___	___	___	___
49.	Overall, I am a failure.	___	___	___	___	___	___
50.	I'm good at most school subjects.	___	___	___	___	___	___

		False	Mostly False	More false than true	More true than false	Mostly true	True
51.	I have few friends of the same sex as myself.	___	___	___	___	___	___
52.	If I really try, I can do almost anything I want to do.	___	___	___	___	___	___
53.	Most school subjects are just too hard for me.	___	___	___	___	___	___
54.	I enjoy spending time with my friends of the same sex.	___	___	___	___	___	___

APPENDIX J

Silencing the Self Scale

Opinions Questionnaire

We would like to know how you feel about different things. We would like you to tell us how much you agree or disagree with the following statements. After each statement, circle the answer that best describes the way you feel about it.

1. I don't tell my friends how I feel about some things when I know it will cause a conflict between us.

Not True 1——2——3——4——5 Really True

2. Sometimes I feel like a different person when I am with my friends.

Not True 1——2——3——4——5 Really True

3. I tend to judge myself by how I think my friends see me.

Not True 1——2——3——4——5 Really True

4. I feel dissatisfied because I am not able to do all the things students are supposed to be able to do these days.

Not True 1——2——3——4——5 Really True

5. I feel I have to act in a certain way to please my friends.

Not True 1——2——3——4——5 Really True

6. I avoid getting into arguments with my friends.

Not True 1——2——3——4——5 Really True

7. I tell my friends how I feel even though it might lead to a conflict between us.

Not True 1——2——3——4——5 Really True

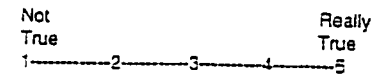
8. When my friends' opinions conflict with mine, I think it is better to agree with my friends than to lose the friendship.

Not True 1——2——3——4——5 Really True

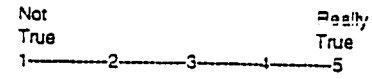
9. My friends don't really know the "true" me.

Not True 1——2——3——4——5 Really True

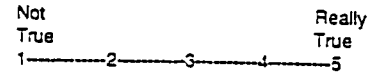
10. When my friends think one way about something and I think another way, I can always tell my friends what I am thinking.



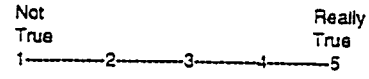
11. My friends appreciate me for who I am.



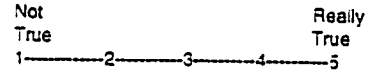
12. When I make decisions, my friends' thoughts and opinions influence me more than my own thoughts and opinions.



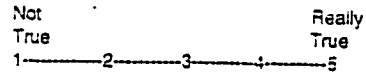
13. I feel that my friends don't really know who I am.



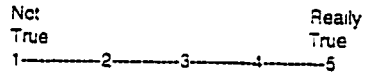
14. When my friends do something that really makes me angry I let them know how angry I am.



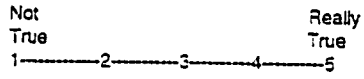
15. I often feel responsible for my friends' feelings.



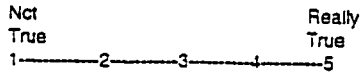
16. I find it hard to know what I think and feel because I spend a lot of time thinking about how my friends are feeling.



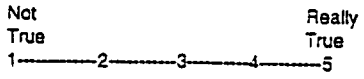
17. I try to hide my feelings when I think they will cause trouble between me and my friends.



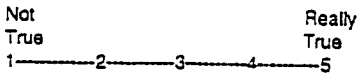
18. I never seem to measure up to the standards I set for myself.



19. Sometimes I don't really act like my true self when I am with my friends.



20. I only tell my friends how I am feeling about something if I know that they are feeling the same way too.



APPENDIX K

Means and standard deviation tables for school differences, age differences and weight group differences

Table K1

Means, Standard Deviations, and Significance Levels as a Function of School

School	1 (n = 68) Mean (SD)	2 (n = 118) Mean (SD)	3 (n = 333) Mean (SD)	4 (n = 357) Mean (SD)
GENERAL				
Age of First Date***	7.00 (2.29)	4.95 (2.66)	6.62 (2.54)	6.64 (2.44)
Age of First Period***	6.39 (1.89)	6.55 (1.81)	5.68 (2.32)	6.20 (1.80)
BMI	20.5 (2.60)	20.7 (3.35)	21.4 (3.36)	21.4 (3.30)
SDQ-II				
Same-Sex Esteem	5.04 (0.78)	4.94 (0.83)	5.17 (0.65)	5.14 (0.79)
Opposite-Sex Esteem	3.80 (1.23)	4.23 (1.06)	4.30 (1.09)	4.26 (1.07)
Physical Ability Esteem***	4.49 (1.05)	4.54 (0.99)	4.65 (0.92)	4.90 (0.92)
General Self Esteem	4.73 (1.03)	4.76 (0.82)	4.95 (0.78)	5.04 (0.87)
SILENCING THE SELF				
Silent Self	2.74 (0.67)	2.63 (0.74)	2.65 (0.69)	2.57 (0.78)
Divided Self	2.35 (0.89)	1.89 (0.76)	2.06 (0.88)	1.98 (0.91)
External Self	2.51 (0.72)	2.32 (0.72)	2.35 (0.73)	2.23 (0.75)
CHEAT				
Dieting***	2.75 (1.17)	2.98 (1.09)	2.59 (0.99)	2.55 (0.99)
Bulimia	2.05 (0.74)	1.90 (0.76)	1.88 (0.76)	1.79 (0.72)
Oral Control	2.44 (0.71)	2.46 (0.76)	2.47 (0.70)	2.45 (0.73)

BES				
Weight Esteem	2.10 (1.18)	1.97 (1.08)	2.13 (1.08)	2.32 (1.11)
Appearance Esteem	1.95 (0.99)	1.91 (0.88)	2.09 (0.86)	2.22 (0.90)
PRESENCE OF SELF REPORTED TEASING				
Weight Related	0.37 (0.49)	0.34 (0.48)	0.44 (0.50)	0.42 (0.49)
Body-shape Related	0.57 (0.50)	0.57 (0.50)	0.59 (0.49)	0.57 (0.50)
Appearance Related	0.39 (0.49)	0.41 (0.49)	0.41 (0.49)	0.44 (0.50)
General Teasing	0.51 (0.50)	0.44 (0.50)	0.36 (0.48)	0.36 (0.48)
PEER PRESSURE AND EATING SCALE				
Social Reinforcement ***	2.18 (0.64)	2.24 (0.59)	1.96 (0.59)	1.99 (0.64)
Peer Modeling***	3.83 (0.84)	3.94 (0.77)	3.46 (0.73)	3.47 (0.74)
Peer Attributions	2.91 (1.25)	2.91 (1.12)	2.68 (1.16)	2.59 (1.20)

***$p<.005$

Table K2

Means, Standard Deviations and Significance Levels as a Function of Age Group

	Younger (n = 420) (Grades 7 & 8)		Older (n = 456) (Grades 9 & 10)	
Variable & Measure	Mean	(SD)	Mean	(SD)
GENERAL				
Age of First Date***	5.27	(2.16)	6.93	(2.60)
Age of First Period***	5.67	(1.88)	6.36	(2.07)
BMI	20.6	(3.10)	21.6	(3.39)
SDQ-II				
Same-Sex Relational Esteem	5.16	(0.77)	5.09	(0.73)
Opposite-Sex Relational Esteem	4.22	(1.08)	4.26	(1.11)
Physical Ability Esteem***	4.88	(0.89)	5.02	(0.81)
General Self Esteem	5.02	(0.81)	4.88	(0.88)
SILENCING THE SELF				
Silent Self***	2.71	(0.73)	2.54	(0.73)
Divided Self	2.01	(0.88)	2.04	(0.89)
External Self	2.26	(0.75)	2.35	(0.75)

CHEAT				
Dieting	2.60	(0.98)	2.67	(1.07)
Bulimia***	1.74	(0.64)	1.96	(0.82)
Oral Control	2.51	(0.70)	2.41	(0.74)
BES				
Weight Esteem	2.28	(1.13)	2.09	(1.07)
Appearance Esteem	2.16	(0.93)	2.07	(0.87)
PRESENCE OF SELF REPORTED TEASING				
Weight Related	0.38	(0.49)	0.45	(0.50)
Body-shape Related	0.54	(0.50)	0.62	(0.49)
Appearance Related	0.39	(0.49)	0.45	(0.50)
General Teasing	0.36	(0.48)	0.41	(0.49)
PEER PRESSURE AND EATING SCALE				
Social Reinforcement	1.99	(0.63)	2.07	(0.61)
Peer Modeling	3.60	(0.77)	3.51	(0.77)
Peer Attributions	2.71	(1.23)	2.68	(1.13)

***$p<.005$

Table K3

Means, Standard Deviations and Significance Levels as a Function of Weight Group

Weight Group	Average Mean (SD) (n = 628)	Underweight Mean (SD) (n = 124)	Overweight Mean (SD) (n = 124)
GENERAL			
Age of First Date	6.30 (2.55)	6.05 (2.68)	6.41 (2.57)
Age of First Period***	5.95 (2.02)	7.29 (1.72)	5.64 (1.99)
SDQ-II			
Same-Sex Esteem	5.13 (0.75)	5.15 (0.71)	5.07 (0.76)
Opposite-Sex Esteem	4.29 (1.10)	4.18 (1.02)	4.04 (1.12)
Physical Ability Esteem	4.77 (0.93)	4.70 (1.01)	4.51 (0.98)
General Self Esteem	4.92 (0.84)	4.99 (0.90)	5.00 (0.87)
SILENCING THE SELF			
Silent Self	2.62 (0.75)	2.66 (0.68)	2.60 (0.72)
Divided Self	2.00 (0.89)	2.10 (0.84)	2.08 (0.90)
External Self	2.31 (0.75)	2.26 (0.72)	2.34 (0.77)

CHEAT			
Dieting***	2.67 (1.02)	2.00 (0.83)	3.11 (0.92)
Bulimia	1.86 (0.74)	1.72 (0.55)	1.97 (0.91)
Oral Control***	2.45 (0.73)	2.79 (0.73)	2.17 (0.50)
BES			
Weight Esteem***	2.21 (1.05)	2.90 (0.89)	1.32 (0.97)
Appearance Esteem***	2.13 (0.89)	2.29 (0.89)	1.80 (0.90)
PRESENCE OF SELF-REPORTED TEASING			
Weight Related***	0.35 (0.48)	0.44 (0.50)	0.72 (0.45)
Body-shape Related	0.57 (0.50)	0.58 (0.49)	0.61 (0.49)
Appearance Related	0.39 (0.49)	0.45 (0.50)	0.55 (0.50)
General Teasing	0.37 (0.48)	0.45 (0.50)	0.36 (0.48)
PEER VARIABLES			
Friendship Closeness	1.67 (0.53)	1.64 (0.53)	1.63 (0.52)
Average Popularity	.10 (0.94)	-.06 (0.97)	-.09 (0.96)
Leadership	-0.05 (1.00)	-0.03 (0.97)	-0.21 (0.84)
Overweight Tease***	-0.20 (0.47)	-0.29 (0.08)	1.24 (1.93)
Underweight Tease***	-0.14 (0.66)	1.06 (1.82)	-0.29 (0.27)

Social Rejection***	-0.07 (0.77)	-0.05 (0.73)	0.42 (1.20)
Appearance Preoccupation	0.02 (1.01)	0.07 (1.14)	-0.18 (0.57)
Good Looking***	0.05 (1.05)	0.05 (0.99)	-0.30 (0.43)
PEER PRESSURE AND EATING SCALE			
Social Reinforcement	2.03 (0.60)	1.91 (0.58)	2.14 (0.72)
Peer Modeling	3.56 (0.77)	3.56 (0.75)	3.54 (0.79)
Peer Attributions***	2.66 (1.16)	2.15 (0.93)	3.38 (1.21)

***$p<.005$

APPENDIX L

Comparison of ICCs for friendship pairs and cliques

Table L

Comparison of Clique and Pair Intra-class Correlations

Variable	Friendship Pairs	Cliques
General Information		
Body Mass Index	0.24	0.06
Average Age of Menarche	0.18	0.12
Age of first date	0.40	0.21
Peer Pressure and Eating Scale		
Social Reinforcement	0.27	0.24
Peer Modeling	0.35	0.26
Peer Attributions	0.11	0.08
Self esteem		
Same Sex Relations Esteem	0.18	0.11
Opposite-sex Relations Esteem	0.21	0.13
Physical Ability Esteem	0.24	0.11
General Self Esteem	0.22	0.10
Silencing the Self		
External Self	0.10	0.05
Divided Self	0.10	0.06
Silent Self	0.07	0.04
Body Esteem		
Weight Esteem	0.20	0.07
Appearance Esteem	0.13	0.08

Variable	Friendship Pairs	Cliques
Children's Eating Attitudes Test		
Dieting	0.22	0.08
Bulimia and Food Preoccupation	0.10	0.06
Oral Control	0.01	0.02
Eating Disorder Group	0.07	0.05
Peer Nominations		
Average Popularity	0.49	0.13
Peer Nominated Leadership	0.13	0.09
Peer Nominated Rejection	0.37	0.21
Peer Nominated Appearance Preoccupation	0.14	0.07
Peer Nominated Good Looking	0.19	0.04
Peer Nominated Overweight Tease	0.03	0
Peer Nominated Underweight Tease	0.02	0
Self Reported Teasing		
Self-reported severe weight tease	0.01	0.02
Less severe weight-related teasing	0.04	0.01
Self-reported severe body-shape teasing	0.21	0.02
Less severe body-shape teasing	0.03	0
Self-reported severe appearance teasing	0.12	0.03
Less severe appearance-related teasing	0.08	0
Self-reported severe general teasing	0.01	0.04
Less severe general teasing	0.02	0.02

APPENDIX M

Tables of results for HLM models including random intercept and significant fixed effects

Table M1

Results of Final Model for Self Esteem (Level-1) and Randomly Varying Slope for Social Reinforcement against Dieting & Bulimia

Dieting as Outcome

Random Effect		Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept						
Social Reinforcement	μ_{0j}	0.07	0.27		179.71	.000
	r_{ij}	0.74	0.86			

Fixed Effects	Parameter	Coefficient	SE	t-ratio	p-value
Intercept	γ_{00}	2.62	0.04	61.10	.000
BMI	γ_{10}	0.10	0.01	10.37	.000
Physical Abilities	γ_{20}	0.08	0.04	2.15	.03
Social Reinforcement	γ_{21}	0.19	0.10	1.79	.07
General Self	γ_{30}	-0.41	0.04	-9.47	.000
Social Reinforcement	γ_{31}	-0.24	0.12	-2.04	.04

Bulimia as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Social Reinforcement	μ_{0j}	0.02	0.16	146.16	.05
	r_{ij}	0.45	0.67		

Fixed Effects	Parameter	Coefficient	SE	t-ratio	p-value
Intercept	γ_{00}	1.84	0.03	60.84	.00
BMI	γ_{10}	0.02	0.01	2.63	.01
General Self	γ_{30}	-0.30	0.03	-9.52	.00
Social Reinforcement	γ_{31}	-0.19	0.08	-2.38	.02

Table M2

Results of Final Model for Self Esteem (Level-1) and Randomly Varying Slope for Peer Modeling against Dieting & Bulimia

Dieting as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Peer Modeling	μ_{0j}	0.08	0.28	183.04	.000
	r_{ij}	0.74	0.86		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.62	0.04	61.10	.00
BMI	γ_{10}	0.10	0.01	10.37	.00
Physical Abilities	γ_{00}	0.09	0.04	2.40	.02
Peer Modeling	γ_{21}	0.09	0.08	1.20	.23
General Self	γ_{30}	-0.42	0.04	-9.96	.00
Peer Modeling	γ_{31}	-0.15	0.09	-1.82	.07

Bulimia as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Peer Modeling	μ_{0j}	0.03	0.16	150.02	.03
	r_{ij}	0.45	0.67		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	1.85	0.03	61.0	.00
BMI	γ_{10}	0.02	0.01	2.66	.01
General Self	γ_{30}	-0.31	0.03	-10.2	.00
Peer Modeling	γ_{21}	-0.12	0.06	-1.97	.05

Table M3

Results of Final Model for Silencing the Self (Level-1), and Randomly Varying Slope for Social Reinforcement against Dieting & Bulimia

Dieting as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Social Reinforcement	μ_{0j}	0.06	0.25	165.23	.000
	r_{ij}	0.74	0.86		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.63	0.04	63.65	.000
BMI	γ_{10}	0.09	0.01	9.83	.000
Divided Self	γ_{20}	0.03	0.05	0.66	.51
Social Reinforcement	γ_{21}	-0.17	0.14	-1.24	.21
External Self	γ_{30}	0.46	0.06	8.13	.000
Social Reinforcement	γ_{31}	0.12	0.14	0.86	.39

Bulimia as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Social Reinforcement	μ_{0j}	0.00	0.04	157.14	.01
	r_{ij}	0.49	0.70		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	1.86	0.03	70.30	.000
BMI	γ_{10}	0.01	0.01	1.76	.08
Divided Self	γ_{20}	0.14	0.04	3.69	.000
Social Reinforcement	γ_{21}	0.08	0.11	0.74	.46
External Self	γ_{30}	0.28	0.05	5.92	.000
Social Reinforcement	γ_{31}	0.15	0.13	1.23	.22
Silent Self	γ_{40}	-0.09	0.04	-2.01	.05
Social Reinforcement	γ_{41}	-0.01	0.12	-0.07	.95

Table M4

Results of Final Model for Silencing the Self (Level-1) and Randomly Varying Slope for Peer Modeling against Dieting & Bulimia

Dieting as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Peer Modeling	μ_{0j}	0.06	0.25	165.34	.01
	r_{ij}	0.74	0.86		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.63	0.04	64.66	.000
BMI	γ_{10}	0.09	0.01	9.94	.000
Divided Self	γ_{20}	0.03	0.05	0.57	.57
Peer Modeling	γ_{21}	-0.21	0.10	-2.10	.04
External Self	γ_{30}	0.46	0.05	8.52	.000
Peer Modeling	γ_{31}	0.10	0.12	.87	.38

Bulimia as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Peer Modeling	μ_{0j}	0.01	0.08	161.80	.01
	r_{ij}	0.48	0.69		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	1.86	0.03	68.59	.000
BMI	γ_{10}	0.01	0.01	1.79	.07
Divided Self	γ_{20}	0.14	0.04	3.74	.000
Peer Modeling	γ_{21}	0.04	0.08	0.54	.59
External Self	γ_{30}	0.30	0.05	6.53	.000
Peer Modeling	γ_{31}	0.03	0.10	0.27	.79
Silent Self	γ_{40}	-0.09	0.04	-2.02	.04
Peer Modeling	γ_{41}	-0.09	0.09	-0.93	.35

Table M5

Results of Final Model for Body Esteem (Level-1) and Randomly Varying Slope for Social Reinforcement against Dieting & Bulimia

Dieting as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Social Reinforcement	μ_{0j}	0.01	0.09	117.73	>.005
	r_{ij}	0.47	0.69		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.64	0.03	92.89	.000
BMI	γ_{10}	0.02	0.01	3.14	.002
Body Esteem	γ_{20}	-0.82	0.03	-24.59	.000
Social Reinforcement	γ_{21}	-0.30	0.09	-3.45	.001

Bulimia as Outcome

Random Effect		Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept						
Social Reinforcement	μ_{0j}	0.00	0.06		138.42	.11
	r_{ij}	0.39	0.63			

Fixed Effects	Parameter	Coefficient	SE	t-ratio	p-value
Intercept	γ_{00}	1.85	0.03	73.51	.000
BMI	γ_{10}	-0.02	0.01	-2.89	.004
Body Esteem	γ_{20}	-0.47	0.03	-15.45	.000
Social Reinforcement	γ_{21}	-0.29	0.08	-3.65	.000

Table M6

Results of Final Model for Body Esteem (Level-1) and Randomly Varying Slope for Peer Modeling against Dieting & Bulimia

Dieting as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Peer Modeling	μ_{0j}	0.01	0.09	119.84	.46
	r_{ij}	0.47	0.69		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.65	0.03	94.2	.000
BMI	γ_{10}	0.02	0.01	3.12	.002
Body Esteem	γ_{20}	-0.83	0.03	-25.1	.000
Peer Modeling	γ_{21}	-0.18	0.06	-2.96	.004

Bulimia as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Peer Modeling	μ_{0j}	0.02	0.13	141.57	.08
	r_{ij}	0.38	0.62		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	1.85	0.03	68.7	.000
BMI	γ_{10}	-0.02	0.01	-2.86	.005
Body Esteem	γ_{20}	-0.47	0.03	-15.7	.000
Peer Modeling	γ_{21}	-0.22	0.06	-3.80	.000

Table M7

Results for Final Model for Peer Nominations (Level-1) and Randomly Varying Slope for Social Reinforcement against Dieting & Bulimia

Dieting as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Social Reinforcement	μ_{0j}	0.08	0.29	176.09	.000
	r_{ij}	0.91	0.95		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.61	0.05	57.16	.000
BMI	γ_{10}	0.10	0.01	11.21	.000
Appearance Preoccup.	γ_{20}	0.18	0.04	4.52	.000
Social Reinforcement	γ_{21}	0.21	0.10	1.99	.05

Bulimia as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Social Reinforcement	μ_{0j}	0.05	0.22	159.69	.001
	r_{ij}	0.51	0.71		

Fixed Effects	Parameter	Coefficient	SE	t-ratio	p-value
Intercept	γ_{00}	1.86	0.04	50.86	.000
BMI	γ_{10}	0.01	0.01	1.28	.20
Overweight Tease	γ_{20}	0.06	0.03	1.64	.10
Social Reinforcement	γ_{21}	0.35	0.09	3.73	.000

Table M8

Results for Final Model for Peer Nominations (Level-1) and Randomly Varying Slope for Peer Modeling against Dieting & Bulimia

Dieting as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Peer Modeling	μ_{0j}	0.10	0.32	210.27	.000
	r_{ij}	0.76	0.87		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.61	0.05	57.2	.000
BMI	γ_{10}	0.10	0.01	11.2	.000
Appearance Preoccup.	γ_{20}	0.19	0.04	5.32	.000
Peer Modeling	γ_{21}	0.16	0.08	2.03	.04

Bulimia as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Peer Modeling	μ_{0j}	0.05	0.22	155.78	.01
	r_{ij}	0.51	0.72		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	1.86	0.04	50.38	.000
BMI	γ_{10}	0.01	0.01	1.15	.25
Overweight Tease	γ_{20}	0.07	0.04	2.09	.04
Peer Modeling	γ_{21}	0.20	0.07	3.01	.003

Table M9

Results for Final Model for Self-Reported Teasing (Level-1) and Randomly Varying Slope for Social Reinforcement against Dieting & Bulimia

Dieting as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Social Reinforcement	μ_{0j}	0.04	0.19	134.22	.07
	r_{ij}	0.70	0.84		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.48	0.06	43.55	.000
BMI	γ_{10}	0.07	0.01	7.44	.000
Weight Upset	γ_{20}	0.38	0.09	4.20	.000
Social Reinforcement	γ_{21}	0.22	0.22	0.99	.32
Weight Not Upset	γ_{30}	-0.17	0.09	-1.84	.07
Social Reinforcement	γ_{31}	-0.18	0.26	-0.70	.49
Body Upset	γ_{40}	0.20	0.09	2.24	.05
Social Reinforcement	γ_{41}	0.91	0.23	3.93	.000
Body not Upset	γ_{50}	-0.11	0.08	-1.37	.17
Social Reinforcement	γ_{51}	0.53	0.21	2.55	.01
Appearance Upset	γ_{60}	0.11	0.09	1.30	.19
Social Reinforcement	γ_{61}	0.09	0.23	0.42	.68

Appearance not Upset	γ_{70}	-0.21	0.09	-2.21	.03
Social Reinforcement	γ_{71}	-0.17	0.27	-0.62	.53

Bulimia as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Social Reinforcement	μ_{0j}	0.03	0.16	143.52	.05
	r_{ij}	0.43	0.65		

Fixed Effects	Parameter	Coefficient	SE	t-ratio	p-value
Intercept	γ_{00}	1.66	0.04	36.82	.00
BMI	γ_{10}	0.01	0.01	1.07	.29
Weight Upset	γ_{20}	0.20	0.07	2.75	.006
Social Reinforcement	γ_{21}	0.42	0.18	2.40	.02
Weight Not Upset	γ_{30}	-0.07	0.07	-0.95	.34
Social Reinforcement	γ_{31}	-0.04	0.20	-0.19	.85
Body Upset	γ_{40}	0.17	0.07	2.48	.05
Social Reinforcement	γ_{41}	0.81	0.18	4.33	.00
Body not Upset	γ_{50}	0.01	0.06	0.21	.83
Social Reinforcement	γ_{51}	0.23	0.16	1.40	.16
Appearance Upset	γ_{60}	0.22	0.07	3.24	.01
Social Reinforcement	γ_{61}	-0.29	0.18	-1.67	.10
Appearance not Upset	γ_{70}	0.03	0.07	0.46	.64
Social Reinforcement	γ_{71}	-0.14	0.21	-0.65	.51

Table M10

Results of Final Model for Self-Reported Teasing (Level-1) and Randomly Varying Slope for Peer Modeling against Dieting & Bulimia

Dieting as Outcome

Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Peer Modeling	μ_{0j}	0.00	0.05	130.24	.10
	r_{ij}	0.75	0.86		
Fixed Effects	**Parameter**	**Coefficient**	**SE**	**t-ratio**	**p-value**
Intercept	γ_{00}	2.48	0.05	45.33	.000
BMI	γ_{10}	0.07	0.01	7.32	.000
Weight Upset	γ_{20}	0.39	0.09	4.25	.000
Peer Modeling	γ_{21}	0.11	0.18	0.62	.54
Weight Not Upset	γ_{30}	-0.17	0.10	-1.81	.07
Peer Modeling	γ_{31}	-0.37	0.25	-1.45	.15
Body Upset	γ_{40}	0.25	0.09	2.75	.006
Peer Modeling	γ_{41}	0.66	0.17	3.81	.000
Body not Upset	γ_{50}	-0.10	0.08	-1.21	.23
Peer Modeling	γ_{51}	0.48	0.16	2.99	.003
Appearance Upset	γ_{60}	0.15	0.09	1.79	.07
Peer Modeling	γ_{61}	0.14	0.17	0.79	.43

Appearance not Upset	γ_{70}	-0.19	0.10	-2.03	.042
Peer Modeling	γ_{71}	0.02	0.24	0.10	.92

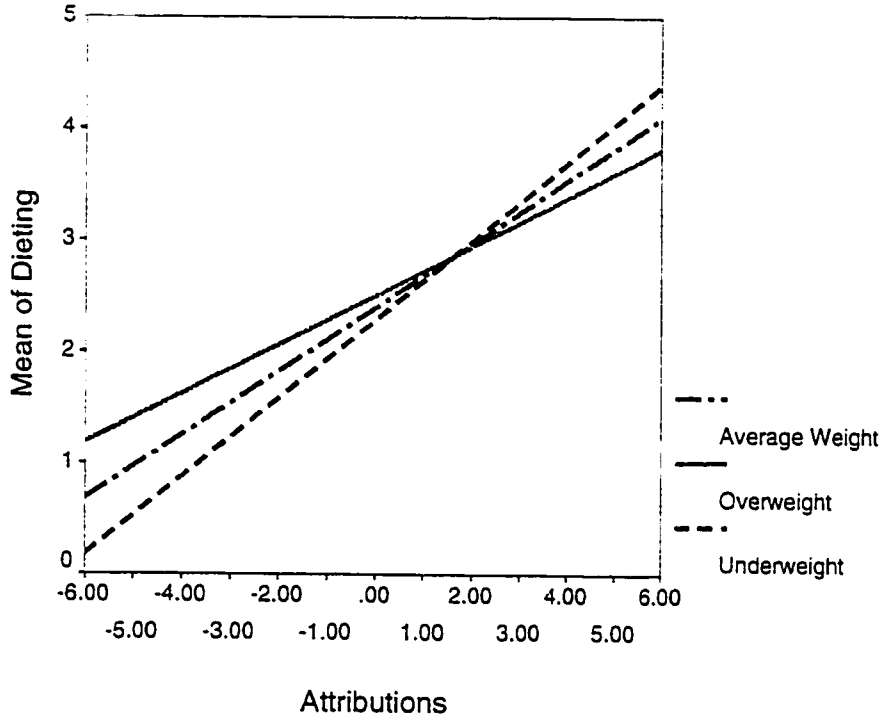
Bulimia as Outcome

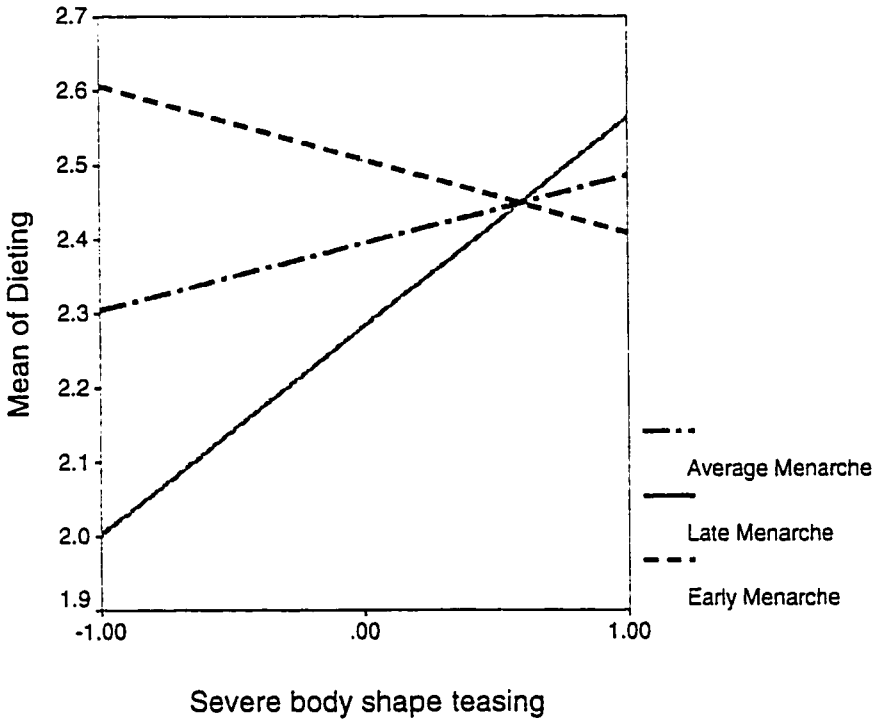
Random Effect	Parameter Estimate	Variance (μ)	SD	Chi-square	p-value
Intercept					
Peer Modeling	μ_{0j}	0.04	0.19	155.36	.01
	r_{ij}	0.43	0.66		

Fixed Effects	Parameter	Coefficient	SE	t-ratio	p-value
Intercept	γ_{00}	1.66	0.05	35.51	.000
BMI	γ_{10}	0.01	0.01	1.06	.29
Weight Upset	γ_{20}	0.22	0.07	3.13	.002
Peer Modeling	γ_{21}	0.20	0.14	1.40	.16
Weight Not Upset	γ_{30}	-0.07	0.07	-0.92	.36
Peer Modeling	γ_{31}	0.11	0.20	0.56	.57
Body Upset	γ_{40}	0.20	0.07	2.92	.004
Peer Modeling	γ_{41}	0.41	0.14	2.98	.003
Body not Upset	γ_{50}	0.02	0.06	0.24	.80
Peer Modeling	γ_{51}	-0.01	0.13	-0.08	.93
Appearance Upset	γ_{60}	0.22	0.07	3.26	.001
Peer Modeling	γ_{61}	-0.05	0.14	-0.35	.73
Appearance not Upset	γ_{70}	0.03	0.07	0.34	.73
Peer Modeling	γ_{71}	-0.29	0.19	-1.55	.12

APPENDIX N

Regression Analysis Interaction Effects


5
4
3
2
1
0
Mean of Dieting
-6.00
-4.00
-2.00
.00
2.00
4.00
6.00
-5.00
-3.00
-1.00
1.00
3.00
5.00
Attributions
Average Weight
Overweight
Underweight


2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
Mean of Dieting
-1.00
.00
1.00
Severe body shape teasing
Average Menarche
Late Menarche
Early Menarche

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Motivational Modulation of On-Line Attention Control Processes

Catherine Poulsen

A Thesis

in

The Department

of

Psychology

Presented in Partial Fulfilment of the Requirements

for the Degree of Doctor of Philosophy at

Concordia University

Montreal, Quebec, Canada

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Entitled: Motivational Modulation of On-line Attention Control Processes

and submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY (Psychology)

complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the final examining committee:

Dr. S. Misra — Chair

Dr. D.E. Meyer — per Dr. Meyer — External Examiner

Dr. J. White — External to Program

Dr. N. Phillips — Examiner

Dr. P. Shizgal — Examiner

Dr. N. Segalowitz — Thesis Supervisor

Approved by _____
Chair of Department or Graduate Program Director

August 24 2000

_____
Dean of Faculty

ABSTRACT

Motivational Modulation of On-Line Attention Control Processes

Catherine Poulsen, Ph.D.
Concordia University, 2000

This thesis brings together two broad subdisciplines of psychology -- cognition and motivation -- in order to explore how motivational processes interact on-line with cognitive mechanisms in directing human behaviour and performance. A series of five experiments were conducted in which the Rogers and Monsell (1995) task switching paradigm was combined with motivational manipulations involving earned point incentives (Derryberry, 1993) to investigate the effects of prior and current motivation on task execution, attention switching, and inhibition. Using a left/right button press, participants alternated every second trial between vowel/consonant (letter task) and even/odd (digit task) judgments in response to target-foil stimulus pairs (e.g., A3, G#, ?6) presented on a computer monitor. Participants responded to the letter or digit target while inhibiting the competing (letter or digit) or neutral (symbol) foil. Task motivation was manipulated by assigning participants equal or differential incentives for letter and digit task performance during an initial training phase or during the switch task itself. Motivational incentives were found to have a large and selective influence on attention switching, evidenced by faster switching to the high-valued than low-valued task, but had no effect on either simple task execution processes or the inhibition of task-set cuing by a competing foil. In addition, *prior* motivational experience with

differential task incentives during training had a greater and more reliable impact on attention switching than did *current* differential incentives applied during the switch task itself. These results reveal that motivation does not simply have a global facilitating influence on performance, but rather operates through highly specific mechanisms to bias goal-directed behaviour. Results are interpreted in terms of the apparent differential sensitivity to motivational input exhibited by attention control mechanisms versus automatic, stimulus-triggered processes. A further distinction is made between implicit motivational modulation of executive control mechanisms versus the engagement of an optional, incentive-based performance strategy. Also discussed are speculations regarding underlying neural mechanisms mediating these motivational influences on attention and the potential implications of these results for skill development and performance.

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First and foremost, I would like to thank my thesis supervisor, Norman Segalowitz. To adequately express the invaluable inspiration, guidance, and support Norman has given me over the years would require another document equal to the size of this thesis. He has always welcomed new and challenging avenues of research, and encourages and works with his students to stimulate and pursue their interests and ideas. His exceptional dedication to research, teaching, and learning I will always hold up as a model in my own academic life. It has been a privilege and honour to have Norman as my supervisor, mentor, and friend.

I am also indebted to Natalie Phillips and Peter Shizgal who so generously shared their time and expertise to broaden my knowledge of cognitive neuroscience both within the context of my thesis research and beyond. The many hours they devoted to enriching my education is greatly appreciated.

A special thanks to my wonderful husband, Sid Mitchell, for his unwavering love, support, and enthusiasm throughout my doctoral studies; and to my father and Eira for their love and encouragement, and their ready hospitality during weekend and holiday retreats to the peacefulness of my family's home in the country.

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their friendship, have made my years at Concordia more fulfilling and enjoyable.

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INTRODUCTION

Understanding and enhancing learning and performance has long been an objective of psychologists and educators. Specialization within the field of psychology itself has resulted in separate approaches to achieving these goals. *Cognitive* psychologists have typically focussed on issues of memory and attention, such as effective encoding and retrieval strategies, information processing demands of a task, the balance between automatic and controlled processing, and more recently, the development of attentional control. *Motivational* psychologists for their part have examined broader dynamics of motivation and performance such as goal selection, effort, and persistence over time. Although significant advancements in our understanding of skill development have resulted from these two approaches, there has been surprisingly little research into how motivational processes interact on-line with cognitive mechanisms in directing human behaviour and performance. How important are motivational dispositions in guiding attention during performance? To what extent can an individual override motivational influences through voluntary control of attention?

In this thesis, I bring together two broad areas of psychology -- cognition and motivation -- to enhance our understanding of attentional processes in skilled performance. More specifically, I investigate the role of prior and current motivational incentives on attention control mechanisms during performance, in particular, on the ability to intentionally switch attention

between tasks and inhibit irrelevant information in order to enhance performance.

The Concepts of Attention and Motivation

Both attention and motivation are complex and multifaceted constructs that encompass a variety of related processes and functions. Because of this, these terms have come to have multiple meanings, depending on the context and theoretical tradition of the researcher. In addition to the more specific operational definitions presented later, I will, therefore, briefly sketch the approach to attention and motivation taken in this thesis.

Attention

Attention has been variously described by experiential state (e.g., conscious awareness, alertness, clearing of consciousness, absorption); by metaphor (e.g., bottleneck, cognitive resource(s), spotlight, zoom lens, executive controller); by modality (e.g., visual, auditory, motor or attention-to-action); by function (e.g., selection, preparation, maintenance, vigilance, control); by source and degree of control (endogenously-cued, voluntary, controlled; exogenously-cued, involuntary, automatic); and by mechanism (e.g., facilitation, inhibition) (Broadbent, 1958; Fernandez-Duque & Johnson, 1999; Kahneman, 1973; Posner & Boies, 1971; Schneider, Dumais, & Shiffrin, 1984; Styles, 1997).

Based on the results of studies combining cognitive paradigms and functional neuroimaging techniques, Posner and Petersen (Posner & Dehaene, 1994; Posner & Petersen, 1990; see also Posner & Rothbart, 1992) found

evidence of three interacting attentional networks subserving distinct functions. In their model, the *anterior* network, associated with activation of the anterior cingulate, left lateral frontal lobe, and basal ganglia, is implicated in target detection, focal awareness, and voluntary control of thought and action. The *posterior* network, involving the posterior parietal lobes, superior colliculus and thalamus, is involved in spatial orienting of attention. Lastly, the *vigilance* network, mediated by noradrenergic projections from the locus coeruleus to the right frontal lobe and right parietal lobe, influences the efficient operation of the other two networks through arousal and the maintenance of an alert state. These three attentional networks, though not exhaustive, are quite consistently distinguished throughout much behavioural and neuropsychological research (Parasuraman, 1998) and can serve as a broad framework for investigating the influence of both cognitive and motivational factors. It is important to remember, however, that these three components may be involved to varying degrees in the performance of any single task, and can themselves be further broken down into more basic processes and subsystems.

In this thesis, I focus primarily on attention processes involved in the control of action, what Posner and Petersen (1990) referred to as the anterior attention system. Both endogenous (voluntary) and exogenous (automatically triggered) control of action within this system is considered and is described as operating through the combined mechanisms of facilitation and inhibition of action schemata.

Motivation

Motivation has been explored within diverse theoretical and empirical traditions, including behavioural, neurophysiological and social psychological approaches. At a basic level, motivation concerns the energization, direction, and persistence of behaviour. One approach to motivation, and the approach adopted in this thesis, is to view it in terms of the positive or negative incentive value of a behavioural goal. As Dickinson (1995) states, "Although knowledge of an instrumental contingency mediates the selection of the appropriate action for bringing about a particular outcome, motivational processes determine whether or not the outcome is a goal to be pursued or, in other words, whether the outcome has *incentive value*. Thus, instrumental behavior is mediated not only by a representation of the action-outcome relation, but also by a representation of the incentive value of the outcome" (pp. 162-163). He further argues that incentive value is acquired through experience with hedonic reactions to a goal, such that previously neutral stimuli will develop motivational significance and influence future goal-directed behaviour. In his research with rats, these hedonic reactions are related to basic biological need states such as hunger and thirst; in humans, higher-level motivational states, such as the need for achievement or success (Atkinson, 1964; McClelland, 1961; Weiner, 1992), may be implicated in determining the incentive value of a goal.

In this thesis, incentive value is manipulated through the awarding of points toward the goal of achieving a maximal score. However, the focus of this research is not the computations or processes involved in determining the

incentive value, but rather the impact of that incentive value on the control of attention during performance.

Attention Control Processes and Skilled Performance

Central to most cognitive models of attention in skill development is the distinction between controlled and automatic processing. While definitions of these two processing modes are still a source of considerable debate (e.g., Pashler, 1998), controlled processes are typically described as relatively slow, effortful, resource-demanding, volitional, and accompanied by awareness; in contrast, automatic processes are relatively fast, effortless, resource-independent, and ballistic, and can operate outside of conscious awareness. The progression from novice to expert is, in part, characterised by increasing automatization of repetitive, lower-level component processes, which then function independently of deliberate control and free up attentional resources for the higher-level, strategic components of performance (Ackerman, 1989; Anderson, 1983).

Another important aspect of skill development is proficient deployment of control processes themselves (Gopher, 1993). Complex skills in natural environments cannot be carried out in an invariant fashion. Skilful performance requires flexibility of attention and processing in response to one's goals and to the changing characteristics of the environment. When performing even a moderately complex skill, the performer must flexibly attend and respond to sources of relevant information, while inhibiting attention and responses to irrelevant information. Failure to switch attention appropriately

among sources of relevant information can result in rigid, suboptimal performance (Gopher, Weil, & Siegel, 1989; Tipper, Weaver, & Houghton, 1994)). Conversely, the switching of attention to off-task stimuli as well as interference resulting from poor inhibition of unrelated information can lead to inconsistent and distracted performance (Gernsbacher & Faust, 1995; Tipper, Eissenberg, & Weaver, 1992).

Theories of Attention Control

In recent years, considerable interest has been shown in explicating the control of attention (e.g., Baddeley & Della Sala, 1996; Gopher, 1996; Meyer & Kieras, 1997; Monsell, 1996; Posner & DiGirolamo, 1998; Shallice, 1994; see also Styles, 1997). These models again pick up on the controlled and automatic processing distinction, but place greater emphasis on how these modes of processing together contribute to the coordination of coherent action and thought, and begin to address the functional architecture of voluntary, executive control mechanisms.

The Norman-Shallice Model

Norman and Shallice (1986; Shallice, 1988; Shallice, 1991; Shallice, 1994; Stuss, Shallice, Alexander, & Picton, 1995) proposed an attentional framework in which schemata (defined broadly as programmes that coordinate processes carried out by special-purpose cognitive subsystems) compete for control of action (internal thoughts or external behaviours). A lateral inhibitory mechanism called *contention scheduling* allows only the most strongly activated schema to operate at any given moment. The schema selected by

contention scheduling continues to operate until the activation level of a competing schema is strong enough to overcome lateral inhibition, resulting in a switch of attention. A schema is likely to be at a high level of activation if it has been activated frequently (e.g., habits) or recently, and can be automatically triggered by environmental stimuli or the output of other schemata.

Contention scheduling mechanisms are sufficient for the coordination of routine activities and automatic components of complex skills, but cannot alone account for controlled performance under novel or variable conditions. Norman and Shallice therefore posit a *supervisory attentional system* (SAS) that enables, for example, voluntary control of goal-directed action. The SAS operates through a top-down bias on contention scheduling by selectively raising or lowering the activation level of competing schemata to meet current goals. This feature is of central importance since it suggests that the SAS cannot direct attention or action independently of contention scheduling. Rather, it can only function by enhancing or overcoming lower-level activation influences. Norman and Shallice contend that the SAS is required for deliberate control of attention during planning and decision making, troubleshooting, novel action sequences, dangerous or technically difficult tasks, and in the inhibition of habitual actions or temptations. More specifically, it may be called into play for a number of attention control functions (Stuss et al., 1995) including the two of interest in this thesis, voluntary attention switching and deliberate inhibition of competing schemata.

Consistent with this framework, patients with frontal lobe damage exhibit selective impairment of supervisory control of attention and behaviour (Shallice, 1988), including difficulty in voluntary switching of attention (perseverative errors) and in inhibiting inappropriate habitual responses or responses cued by environmental stimuli (utilization behaviours). Similar phenomena are occasionally observed in normal individuals during momentary lapses of attention control (Reason, 1984).

Motivation and Attention Control Processes

Consideration of the influence of motivation on executive control of attention raises questions of how voluntary attention processes may be enhanced or limited by motivational dispositions. Within their model of attention-to-action, Norman and Shallice (1986) only briefly consider the potential impact that motivation may have on the resolution of schema competition and action selection. They propose that, like the SAS, motivation may influence contention scheduling by biasing schema activation levels, but suggest that motivational influences would operate over a longer time frame than the SAS. This view takes into account the role of long-term dispositions toward stimuli and their associated action schemata, but does not acknowledge the potentially strong impact of immediate motivational states on the guidance of attention. Furthermore, they do not discuss the possible implications of such motivational influences for the efficient operation of on-line supervisory attention control.

Simon (1994) has suggested that attention may act as a mediator between motivation and behaviour. In very broad terms, he proposed that strong motivation would serve to maintain attention on current behaviours or tasks, whereas weak motivation would allow attention to be captured by irrelevant information, resulting in a shift to new goals or tasks. In line with Simon's proposal, one possibility is that the ease of an attentional switch during task engagement is, in part, a function of the relative motivational significance of the current activity versus that of competing action schemata and stimuli developed through prior experience. This entails that greater intervention by the SAS would be required to switch away from a highly motivated activity since underlying biases would tend to maintain attention on this task. In contrast, an attentional switch would be easier or more likely if the competing stimulus and its action schema are highly motivating to the individual. This would facilitate SAS intervention in a task-appropriate switch, but would present a greater challenge to SAS intervention in the inhibition of a task-inappropriate switch.

According to this view, motivational significance of current and competing tasks could have both beneficial and deleterious influences on attention during skill development and performance. At a broad level, poorly motivated performance could be more susceptible to distraction and switching of attention to off-task sources of stimulation, whereas highly motivated performance would be resistant to exogenous capture of attention. In addition, where task motivation is high, the motivational bias associated with the currently activated schema may further spread activation to other relevant

schemata and inhibition to unrelated schemata, thereby facilitating both relevant attention switching and inhibition of irrelevant attention switching. Such a process may be related to the feeling of effortless attentional control experienced by an individual who is fully absorbed in an activity, a state that has been referred to as 'flow' (Csikszentmihalyi & Csikszentmihalyi, 1988; Csikszentmihalyi, Rathunde, Whalen, & Wong, 1993). Finally, in many learning environments performers are guided primarily by explicit goals or instructions provided by the teacher or trainer. If supervisory attention can only partially engage or inhibit a switch of attention and control remains susceptible to other influences on contention scheduling, task performance may nevertheless suffer. In extreme cases such as during strong visceral states, supervisory control may even be insufficient to overcome strong lower-level motivational influences on schema activation values (Loewenstein, 1996).

At a finer level, motivational signals may play an important role in guiding the selection and coordination of task processing components that lead to successful outcomes, facilitating appropriate switching and inhibiting inappropriate switching. In research on decision making under conditions of uncertainty, Bechara and colleagues (Bechara, Damasio, Damasio, & Anderson, 1995; Bechara, Damasio, Tranel, & Damasio, 1997; Bechara, Tranel, Damasio, & Damasio, 1996) found that normal individuals develop early biasing signals, based on prior rewards and penalties, that guide performance advantageously before they are able to formulate a cognitive strategy or even express a hunch. Such implicit motivational signals may

plausibly operate during attention switching as well. These early motivational signals should generally lead to performance improvements, but in some circumstances the reverse may occur. For example, in complex tasks that require frequent strategic switching of attention, initial patterns of positive and negative feedback may lead to premature commitment to suboptimal strategies and limit further exploration of riskier, but ultimately more optimal, attention strategies (Erev & Gopher, 1999).

Consideration of even just these few potential implications of motivated attention processes for skill development underscore the merit of developing a better understanding of the interactions between motivation and attention, their underlying mechanisms, and their combined impact on learning and skilled performance. Recent theoretical interest in attention control has been accompanied by the development of relevant empirical paradigms that permit more fine-grained investigation of the cognitive components of attention switching and action control. These cognitive studies will be reviewed in the next section. While, to the best of my knowledge, this thesis represents the first investigation into the influence of motivational factors on these control mechanisms, recent research by Derryberry and colleagues (e.g., Derryberry, 1988; Derryberry, 1989; Derryberry, 1991; Derryberry, 1993; Derryberry & Reed, 1994; Derryberry & Reed, 1998) has combined motivational manipulations with cognitive paradigms to investigate immediate influences of motivational states on attentional arousal, focusing and orienting. Application of their methodological techniques for studying motivational influences on

on-line attention control processes will be discussed in the final section of the introduction.

Empirical Investigations of Control Mechanisms in Attention Switching

Several cognitive experimental paradigms have been developed to examine the role of attention during task switching (Allport, Styles, & Hsieh, 1994; Los, 1999; Meiran, 1996; Rogers & Monsell, 1995; Rubinstein, Meyer, & Evans, in press; Segalowitz, Poulsen, & Segalowitz, 1999) and its implications for skilled performance (Gopher, 1996; Segalowitz, O'Brien, & Poulsen, 1998). These paradigms attempt to isolate and measure the contribution of executive and stimulus-triggered control of action during task switching under various experimentally-manipulated conditions. In this thesis, I extend these manipulations to include consideration of motivational factors. Consequently, the results of these studies and the various interpretational issues that have emerged regarding underlying cognitive mechanisms will be given close consideration here.

Early Evidence of Supervisory Attention Control in Task Switching

In a paradigm first employed by Jersild (1927), the pure versus alternating block paradigm, participants perform two tasks, A and B, in pure blocks where the same task is repeated across trials (i.e., AAA . . .; BBB . . .) and in alternating blocks where participants must switch between tasks across trials (i.e., ABABA . . .). Here, performance on pure blocks serves as a baseline for calculating the cost associated with switching between tasks in

alternating blocks. Factors that may influence switch costs are explored by varying, for example, the nature of the stimuli, task cues, or task complexity.

Interestingly, task switching does not always incur reaction time costs. One determinant of whether costs are incurred in switching is whether the stimuli unambiguously cue the task to be performed. With univalent stimuli -- stimuli that unambiguously cue the task -- there is often no difference in completion times between pure and mixed blocks, and there may even be a slight benefit for alternating blocks. For example, in one experiment by Jersild and later replicated by Spector and Biederman (1976), participants were marginally *faster* when alternating between subtracting three from two-digit numbers and giving the antonym to common words in alternating blocks than when performing these two tasks repeatedly in pure blocks. In contrast, with bivalent stimuli -- stimuli that do not unambiguously cue which task is to be performed -- substantial switch costs are virtually always observed (but see Allport & Wylie, 1999 for an exceptional case). For example, when participants had to alternate between adding three and subtracting three from two-digit number stimuli, they were on average 402 ms slower per item in alternating than in pure lists (Spector & Biederman, 1976, Experiment 3). This result is consistent with the view that when no exogenous cue is available to unambiguously trigger the appropriate task set, an endogenous, supervisory control mechanism must intervene to assist in task set selection.

Distinguishing Supervisory and Contention Scheduling Control Mechanisms

Further evidence for the engagement of supervisory attention control in task switching was provided by Rogers and Monsell (1995), who developed the 'alternating runs' paradigm to address two weaknesses they perceived in the pure versus alternating block paradigm. First, as compared to pure blocks, alternating blocks require not only switching between task sets, but also the maintenance of two task sets in working memory rather than just one task set, leading to a potential overestimate of switch costs with this paradigm. Second, they argued, the perceived difficulty of alternating blocks may have led to enhanced effort or arousal, possibly accounting for the absence of costs and even benefits sometimes obtained in alternating blocks with univalent stimuli. Rogers and Monsell's alternating runs paradigm overcomes these problems by including both switch and repeat trials within blocks. Rather than alternating on every trial between task A and B (i.e., ABAB . . .), participants alternated on every second trial (i.e., AABBAA . . .). Here, performance on repeat trials serves as baseline, and RT switch costs are computed by subtracting mean RT on these repeat trials from mean RT on switch trials (errors costs can be similarly computed).

Another particularly advantageous feature of the Rogers and Monsell paradigm is the inclusion of a condition (called the crosstalk condition) in which both univalent and bivalent stimuli are intermixed within blocks across switch and repeat trials. A brief description of their paradigm should help clarify this. Stimuli consisted of target-foil pairs (e.g., 2E, A#, ?6) presented in one of four quadrants on a computer monitor. Targets were either letters or digits.

Bivalent stimuli were created by pairing the target with a competing foil (i.e., letter target with a digit foil or vice versa; e.g, U4, 6E), and univalent stimuli were created by pairing the target with a neutral symbol foil (e.g., 2#, ?K). With a left/right button press, participants performed vowel/consonant (letter task) and even/odd (digit task) judgments. Thus, bivalent stimuli afforded both letter and digit task sets, whereas univalent stimuli uniquely specified only one of these two task sets on a given trial. Quadrant position further cued the task to be performed (e.g., letter task in the top two quadrants, digit task in the bottom), and stimulus presentation rotated in clockwise fashion. This resulted in regular alternation between two letter task and two digit task trials, the first trial of each requiring task switching and the second trial requiring only task repetition. Stimuli on one third of all trials were univalent and on two thirds were bivalent and were counterbalanced across switch and repeat trials. Thus, in contrast to the pure versus alternating block paradigm, the crosstalk condition of the Rogers and Monsell paradigm permitted the simultaneous assessment of two distinct challenges to attention control: switching of task set (performance on switch versus repeat trials) and inhibition of inappropriate task set cuing from the competing foil (performance on bivalent versus univalent stimulus trials).

Across all five of their experiments, Rogers and Monsell found a substantial increase in RT on switch trials compared to repeat trials (switch cost), and on bivalent stimulus trials compared to univalent stimulus trials (task-set cuing cost). In the crosstalk condition of Experiment 1, for example, the mean switch cost was 289 ms and the mean task-set cuing cost was

approximately 175 ms (estimated from Figure 2, p. 215). However, contrary to earlier studies by Jersild (1927) and Spector and Biederman (1976), Rogers and Monsell also found a relatively large and significant switch cost of 161 ms in a no-crosstalk condition where only univalent stimuli, which unambiguously cued the required task, were used. A critical issue, and the source of much current debate, concerns the interpretation of these costs. For example, while these reaction time costs suggest the presence of additional challenges to task performance, do they necessarily entail the intervention of a supervisory attention control mechanism? If not, what other evidence can be brought to bear on this issue? If supervisory control *is* implicated, can the size of the cost be used to index the duration of a discrete supervisory attention process?

Evidence from additional experiments in the Rogers and Monsell (1995) paper suggest that supervisory processes are indeed implicated in the control of task switching between two potentially competing task sets, but that the duration of this inferred endogenous control process cannot be determined by the size of the switch cost. First, Rogers and Monsell found that the size of the switch cost declined by up to one third with increasing response-stimulus interval (RSI) when RSI (150, 300, 450, 600, or 1200 ms) was varied across blocks (Experiment 3), but not when the same RSIs were randomly intermixed within blocks (Experiment 2). This suggests that an active, preparatory process can be strategically deployed to facilitate switching. However, the decline in switch cost reached asymptote at 600 ms, leaving a large residual switch cost of over 100 ms when RSI was increased to 1200, long past the largest switch cost observed at the original 150 ms RSI. Thus, even when

provided with maximal preparation time, a persistent switch cost remained. Rogers and Monsell attributed these results to a two-phase switching process, an endogenously-cued preparatory phase that can be executed in advance of stimulus presentation, and an exogenously-triggered phase that engages the required task set upon presentation of a task-relevant stimulus. They argue that task switching requires the combined suppression of the just-executed and now-irrelevant task set, and activation of the previously-suppressed but now-relevant task set, a process they termed *task set reconfiguration*. They further conclude from these results that an endogenous component can begin this reconfiguration process, but completed task set reconfiguration must await an exogenous cue.

This endogenous, preparatory process also seemed to be engaged in the no-crosstalk condition. Here, not only was there a significant switch cost, but as in the crosstalk condition it declined significantly with increasing RSI (again reaching asymptote at a 600 ms RSI). A possible reason for endogenous involvement here, despite unambiguous stimulus cuing of the appropriate task, might be that the experimental context as a whole promoted potential conflict between these two task sets, resulting in the development of mutually inhibitory links. In this experiment, the same individuals participated in both the crosstalk and no-crosstalk conditions. The competition between task sets experienced in the crosstalk condition, therefore, may have transferred to performance during the no-crosstalk condition. This, in turn, would have encouraged the deployment of a supervisory control mechanism to assist in

the reversal of task set activation and inhibition required when switching between competing task sets.

In contrast to the observed reduction in switch costs, increasing the RSI had no effect on the costs associated with inappropriate task set cuing from the competing foil of bivalent stimuli. As in earlier experiments, RTs on bivalent stimulus trials, where the stimulus cues both the currently relevant and irrelevant task set (e.g., 5E), were slower than on univalent stimulus trials (e.g., 5#), but this cost was *not* reduced by extending preparation time. Task set cuing costs from the competing foil, therefore, seem to arise from lower level competition factors that are not controlled in advance by an endogenous mechanism. On repeat trials, and on switch trials following endogenous switch preparation, this competition contributes to total reaction time but appears to be resolved with little, if any, further intervention of a discrete supervisory process.

The Rogers and Monsell (1995) experiments thus support the engagement of an endogenous control process during task switching between competing task sets, but less so or not at all in the control of inappropriate cuing from the competing foil. Moreover, results suggest that there are two distinct stages involved in attention switching -- an endogenously controlled preparatory stage, and an exogenously cued completion phase. However, given the presence of residual switch costs, the total magnitude of the switch cost clearly cannot be used alone as a measure of this endogenous control process. Nor can the reduction in switch cost be used as a measure of the duration of a preparatory supervisory attention process since, as pointed out by Allport and

colleagues (Allport & Wylie, 1999; Allport et al., 1994), the increase in RSI far exceeded the corresponding reduction in switch cost. Finally, the absence of a reduction in the task set cuing effect on switch trials suggests that the endogenous component of switching does not act through direct enhancement or inhibition of task sets. If endogenous preparation did involve partial reconfiguration of task set as argued by Rogers and Monsell, it would be difficult to explain why this partial reconfiguration would not lead to a reduced effect of task set cuing from the competing foil. Although the evidence is consistent with the idea that some form of endogenous bias can be introduced in advance to facilitate switching, exactly what form that bias takes is in need of further exploration.

Despite the difficulties inherent in measuring the duration of supervisory attention control in switching, corroborative evidence of endogenous intervention in switching comes from a number of other studies that have employed various paradigms and tasks. Meiran (1996), using either bivalent target location tasks or bivalent shape/colour object discrimination tasks, presented participants with an instructional cue prior to each trial that indicated which task should be performed on the upcoming bivalent stimulus. When the time between this instructional cue and the onset of the bivalent target stimulus (the cue-target interval) was increased from about 200 to 1500 ms, there was a significant reduction in switch cost. As with the long RSI interval in Rogers and Monsell, residual switch costs were still observed at the long cue-target interval. By independently varying the response-cue interval and the cue-target interval, Meiran was further able to conclude that the

reduction in switch cost was not due to simple dissipation of priming effects from the previous trial, but rather was attributable to advanced, endogenous preparation of task set. In yet another attention switching paradigm, Gopher (1996) as well found that the cost of switching between tasks (judging digit value vs. numerosity of displayed digits) and between performance strategies (speed vs. accuracy) was reduced by advanced cuing.

Using the pure versus alternating block paradigm, Rubinstein, Meyer, and Evans (in press) applied an additive factors approach (Sternberg, 1969; Sternberg, 1998) to the study of attention control during task switching by experimentally manipulating selected factors putatively associated with different components of either task execution (e.g., stimulus identification) or executive control (e.g., goal shifting). While stimulus discriminability, for example, affected overall RT but not switch costs, Rubinstein et al. found that both task set cuing and rule complexity did affect switch cost -- switch cost decreased with task set cuing and increased with rule complexity. Moreover, these effects were roughly additive, adding further support to a two-stage model of executive control: a goal-shifting stage (similar to Rogers and Monsell's endogenous preparation of task set reconfiguration); and a rule activation stage (similar to Rogers and Monsell's exogenously-cued completion of task set reconfiguration).

Lower-level Influences on Switch Costs

Research by Allport and colleagues (Allport & Wylie, 1999; Allport & Wylie, in press; Allport et al., 1994; Wylie & Allport, 1999) underlines the

potentially strong contribution of lower-level factors to switch costs. While acknowledging that switching between competing tasks must involve some type of endogenous control process to avoid an otherwise perseverative error, they argue that "involuntary priming (both positive and negative) of task-specific condition-action rules is the principal determinant of performance costs in switching between competing tasks" (Allport & Wylie, 1999, p. 274). As described below, this may be especially true of the Stroop-like stimuli used in their research, where one of two tasks is strongly dominant. In the traditional Stroop task, for example, when presented a colour word written in an incongruent ink colour (e.g., red written in green), reading the word dominates naming the colour of the ink.

Allport et al. (1994) employed the pure versus alternating block paradigm using traditional colour-word Stroop stimuli as well as other Stroop-like stimuli (e.g., digit arrays where the subject must make judgments regarding either the value of the digits or the number of elements in the array), and later extended their research to include the Rogers and Monsell (1995) alternating runs paradigm and other designs, again with Stroop and Stroop-like stimuli (Allport & Wylie, 1999; Allport & Wylie, in press; Wylie & Allport, 1999). The results of the Rogers and Monsell experiments and those of Allport and colleagues initially appear incompatible, but may overall represent complementary rather than conflicting views of the challenges and attention control processes implicated in task switching. That is, whereas Rogers and Monsell studied the moderating role of *current* trial activation/inhibition demands (e.g., competing-foil versus neutral-foil trials) using tasks of equal

difficulty, Allport and colleagues focused on the role of *preceding* trial activation/inhibition demands using Stroop-like stimuli.

In all of the Allport studies (Allport & Wylie, 1999; Allport & Wylie, in press; Allport et al., 1994; Wylie & Allport, 1999) task set activation and inhibition settings on *preceding* trials had a powerful influence on switch cost, an effect they called task-set inertia. This effect involved both positive priming of the now-competing task from its activation on the preceding trial, and negative priming of the now-target task from its inhibition on the preceding trial. For example, switching to a bivalent word-reading trial (e.g., the word "red" written in green ink) from a *univalent* colour-naming trial (a series of coloured Xs) yielded a small switch cost of only about 20 ms; in contrast, switching to a bivalent word-reading trial from a now *bivalent* colour-naming trial (e.g.,the word "blue" written in brown ink -- name the colour of the ink), yielded a large switch cost of approximately 100 ms (Allport & Wylie, in press; Wylie & Allport, 1999). This difference is attributable not to the characteristics of the current word-naming switch trial -- since bivalent Stroop colour words were used in both cases, but rather to the nature of the preceding trial. Specifically, a large switch cost was incurred when the preceding trial was a Stroop word rather than a series of Xs because performance on the current switch trial required overcoming both activation of colour naming and inhibition of word reading from the preceding trial (and this despite an intertrial interval of over 1000 ms that maximised potential anticipatory switch preparation). On the basis of this and other experimental results (see Allport & Wylie, in press), they concluded that these (residual) switch costs reflect primarily

disengagement of prior task-set configuration when switching *from* a previous task, rather than *engagement* of upcoming task-sets when switching *to* the current trial.

It is perhaps worth noting here that Allport and colleagues further demonstrated that activation/inhibition patterns between competing tasks may persist over the long-term and also affect repeat trials (Allport & Wylie, in press). For this reason, they argue that performance on repeat trials in the alternating runs paradigm and indeed any trials following experience with bivalent stimulus tasks may not be representative of pure task performance. While this adds additional weight to caution in interpreting switch cost magnitudes, it does not negate the presence of additional challenges to the control of performance on switch trials and the need for supervisory attention control to ensure accurate responding. It is primarily because of the need to override automatic task-set priming patterns on switch trials that would otherwise lead to error that endogenous, supervisory attention processes are engaged. Their findings do, however, highlight the difficulties in attempting to infer and measure such executive processes through switch costs alone. More informative are selective effects of specific manipulations (e.g., length of the RSI, advanced cuing, differential practice, and task dominance) on various measures of performance (e.g., switch costs, stimulus ambiguity costs, and simple task execution).

Asymmetric Switch Costs

In Rogers and Monsell (1995), alternating between letter and digit tasks produced roughly symmetric switch costs. That is, as assessed by the relative increase in RT, switching from the letter to digit task was no easier or harder than switching from the digit to letter task. Other researchers (e.g., Allport et al., 1994; Rubinstein et al., in press), however, have obtained asymmetric switch costs leading to questions concerning the nature and source of such asymmetric costs.

Allport and colleagues (Allport & Wylie, 1999; Allport & Wylie, in press; Allport et al., 1994; Wylie & Allport, 1999) consistently obtained 'paradoxical' asymmetric switch costs when switching between competing Stroop-like tasks. For example, when all stimuli were Stroop colour words, contrary to intuitive expectations a *small*, virtually negligible, switch cost obtained when switching to the non-dominant task (e.g., colour naming) whereas a large switch cost obtained when switching to the dominant task (e.g., word reading). Allport and colleagues attributed this counterintuitive effect to the differential inhibition required on the trial preceding colour-naming and word-reading switch trials. That is, because word reading is the overwhelmingly dominant task, little inhibition of colour naming is required on word reading trials. Consequently, there is little negative priming to be overcome when switching from a word-reading to a colour-naming trial. In contrast, strong inhibition of word reading is required on colour-naming trials; hence, the large switch costs obtained when switching from a colour-naming to a word-reading trial.

A study by Yeung (1997, reported in Allport & Wylie, in press), conducted in the Allport laboratory using the alternating runs paradigm, illustrated that these asymmetric task dominance effects in switching could be induced through differential practice of two initially equivalent tasks performed in response to single digit stimuli -- adding 3s and subtracting 2s. Before practice, switch costs were roughly equal (approximately 65 ms). After a short practice session with one of these tasks, designated A, the cost of switching to A (the now-dominant task) increased and the cost of switching to B (the now non-dominant task) was eliminated. After a subsequent practice session with task B, this asymmetric switch cost was reversed, again resulting in a large switch cost to the now-dominant task B, and a reduction in switch cost to the now non-dominant task A.

Rubinstein et al. (in press) also found asymmetric switch costs in two of their experiments. In Experiment 3, for example, participants were asked to classify shape stimuli according to one of four possible dimensions -- size, shading, shape, or numerosity -- in four pure blocks, within which only one sorting dimension was required, or in two alternating blocks. In one of the alternating blocks, participants switched between size and shading, and in the other, between shape and numerosity. In both alternating block conditions, asymmetric switch costs obtained; a smaller switch cost obtained when switching from shading to size than vice versa, and when switching from numerosity to shape than vice versa. Unlike with classic Stroop stimuli, determining task dominance here is less obvious. If defined by participants' relative speed of performance in the pure task blocks, dominance would be

assigned to shading over size, and numerosity over shape, and the results would conform to Allport and colleagues' findings of smaller switch costs when switching to the non-dominant task (i.e., switching to size; switching to numerosity).

Rubinstein et al., however, tested a different hypothesis based on subjective familiarity. With a new group of participants, they obtained subjective familiarity scores on a range from 1 to 4 that were based on a composite of paired familiarity comparisons between the four tasks (frequency of similar discriminations during daily activities) which were then averaged across participants. Familiarity scores for size, shading, shape, and numerosity were, respectively, 2.29, 1.86, 3.57, and 2.29. Thus, judging size was more familiar than shading, and judging shape was more familiar than numerosity. In a two-predictor multiple linear regression analysis with switch cost as criterion variable, subjective familiarity of the task preceding the switch correlated positively with switch cost, and subjective familiarity of the current task (to which the switch was made) correlated negatively with residualized switch cost (i.e., with the contribution of the first predictor, preceding-task familiarity, removed). In other words, it was both harder to switch *from* and easier to switch *to* a familiar task. Moreover, predicted switch costs conformed very closely to observed switch costs, adding further support to this familiarity hypothesis.

Thus, in Rubinstein et al's Experiment 3, if dominance is defined by RT in pure blocks (faster = dominant), the results support either the dominance or familiarity hypothesis since, in both competing task combinations, the faster

task had a lower familiarity score; however, if dominance is defined by subjective familiarity (more familiar = dominant), the results are consistent only with the familiarity hypothesis. The situation was different in the case of Experiment 4, in which participants performed either addition, subtraction, multiplication, or division operations, again in pure blocks and in blocks alternating between addition and subtraction, or multiplication and division. Here, addition was simply assumed to be more familiar than subtraction, and multiplication more familiar than division. Consistent with Rubinstein et al.'s hypothesis, switch costs were smaller when switching from subtraction to addition than vice versa, and from division to multiplication than vice versa. Unlike Experiment 3, however, if dominance here were based on mean RT in pure blocks, addition would be assigned as dominant over subtraction, and division as dominant over multiplication, leading to a rejection of Allport's dominance hypothesis in the case of addition/subtraction alternation, and support for the dominance hypothesis in the case of multiplication/division alternation.

Taken together, the asymmetric switch costs in Rubinstein et al.'s Experiments 3 and 4 are most consistent with their familiarity hypothesis. How then to explain Allport's results when surely reading a word would be considered more familiar than naming a colour, and switch costs are considerably larger in switching to word reading than to colour naming? Without going into the detail of their computational formulas and models, Rubinstein et al. claim that special processing considerations are implicated in asymmetric switching costs involving Stroop stimuli due to the highly

automatized activation of word reading. Using order-of-processing diagrams to map the overlapping of mental processes that may underlie the Stroop task, Rubinstein et al. argue that the executive control processes of goal shifting and rule activation are obscured by the extra time required to edit automatic word reading responses on colour naming trials. While this is a plausible explanation of the asymmetric switching patterns with Stroop stimuli, it is a less convincing explanation of the asymmetric switching patterns that arose after only brief practice with one or the other of two initially equivalent addition and subtraction tasks in the Yeung (cited in Allport & Wylie, in press) experiment described earlier. To conclude, Rubinstein et al. offer the intriguing possibility that subjective perceptions may in some situations influence switch costs; specifically, subjectively familiar tasks may be both easier to engage and more difficult to disengage than less familiar tasks. However, the evidence for this remains preliminary and inconclusive.

Summary

In terms of the Norman-Shallice model, these studies provide evidence for a lower-level contention scheduling mechanism that controls competition between competing task schemata through the establishment of inhibitory links. The strength of both schema activation and inhibitory links to competing schemata is sensitive to how closely these task sets compete for control of action and how frequently and recently they have been engaged. The evidence also supports the existence of a supervisory attention system that biases contention scheduling to ensure appropriate, goal-directed schema selection

under conditions of conflict or uncertainty. As Norman and Shallice proposed, this top-down bias cannot bypass the influence of lower-level activation and inhibition patterns. Consequently, these patterns will continue to exert considerable influence on reaction times and switch costs. In situations of extreme inequality between competing task sets, the contribution of these lower level activation/inhibition patterns to reaction times and switch costs may be particularly large. When switching between more equal task sets, other factors such as advanced cuing, extended preparation time, and subjective task familiarity have been found to influence the efficiency of task switching.

Investigating Motivational Influences on On-Line Attention Control Processes

As exemplified by the research just reviewed on attention control processes in task switching, research on attention and performance is typically restricted to the consideration of cognitive factors and processes. Where motivation is considered, the research has tended to address global influences of motivation on attention, such as generalized arousal, effort and maintenance of attention, measured over relatively long time periods (e.g., Kanfer & Ackerman, 1996; Kanfer, Ackerman, Murtha, Dugdale, & Nelson, 1994; Reeve, 1989; Schiefele, 1991). Results from such studies say little about the moment-by-moment influences of motivation on component cognitive processes that occur on the order of milliseconds.

A notable exception is research conducted by Derryberry and colleagues (e.g., Derryberry, 1988; Derryberry, 1989; Derryberry, 1991; Derryberry,

1993; Derryberry & Reed, 1994; Derryberry & Reed, 1998), who applied motivational manipulations within traditional cognitive laboratory reaction time tasks. In these studies, participants performed speeded responses to target stimuli within a computer game format where the object was to accrue points through execution of fast and accurate responses. Motivational states were manipulated through current-trial point incentives and preceding-trial performance feedback signals. Using such point-incentive techniques, Derryberry has successfully studied motivational influences on a variety of on-line attention processes, including the arousal, focusing, and orienting of attention.

In one such study, Derryberry (1993) examined the effects of positive incentives (trials on which points could be gained), negative incentives (trials on which points could be lost), and neutral incentives (no points at stake), in conjunction with either high (five-point) or low (two-point) incentive size. Targets consisted of letter-digit pairs (e.g., M5, W3, 5V). Valuable targets always consisted of an M or W paired with either a 2 or 5. The letter indicated the valence of the incentive, either positive (e.g., M) or negative (e.g., W), and the digit indicated the potential number of points to be earned or lost (i.e., 2 or 5 points). Nonvaluable targets were created by replacing either the letter with V or A or the digit with 3 or 4. Participants were instructed to press a right button if the target was valuable (e.g., M5, 2M, W2, 2W) and a left button if it was nonvaluable (e.g., V5, 3M, W4). Fast and accurate responses were followed by a positive feedback signal (i.e., a smiling face), and slow or inaccurate responses by a negative feedback signal (i.e., a frowning face).

Reaction time patterns revealed a general bias in favour of positive and large incentives. On valuable trials, participants responded more quickly to positive than negative incentive targets and to large than small incentive targets. On nonvaluable trials, RT was fastest for targets with small incentive features (e.g., 2V, A2), followed by negative and large features (e.g., W3, 5A, V5), and slowest to targets containing positive incentive features (e.g., M3, 4M), indicating greater interference from positive and large incentive features than negative and small features. In addition, negative feedback led to a general focusing of attention on valuable targets, evidenced by faster RTs to valuable targets and slower RTs to nonvaluable targets (especially those that shared a large value feature, e.g., 5V, A5) following negative versus positive feedback. Derryberry interprets this result in terms of adaptive narrowing of attentional focus during anxiety, facilitating both attending to important information and inhibiting distraction (see also Derryberry & Reed, 1998).

In addition to these attentional focusing effects, the nature of the feedback also influenced the direction of attentional orienting. On valuable target trials, a congruent feedback effect obtained: performance was enhanced for positive targets following positive feedback, and negative targets following negative feedback. In contrast, an incongruent effect obtained on nonvaluable target trials: following negative feedback, RT was slowest for nonvaluable targets that contained a positive feature (e.g., 3M, M4). Derryberry argues that congruent and incongruent effects, by acting in opposition, may serve a motivationally-guided adaptive influence on attention. Following failure, for example, attention would be oriented toward additional threats (a congruent

effect favouring negative incentive targets), but once cues indicating possible relief were engaged (positive incentive features of nonvaluable targets), it would be difficult to then disengage attention from them (hence the incongruent effect).

To summarize, results from this and other studies by Derryberry and colleagues suggest that motivation can selectively orient attention toward positive and negative incentive stimuli and influence the breadth of attentional focus, thereby serving an adaptive *non-voluntary* regulatory role in attention. Their research, however, has not directly addressed the effect of motivation on the *voluntary* control of attention. By combining Derryberry's point incentive manipulations with the Rogers and Monsell (1995) paradigm, this thesis represents a first step in exploring the effect of motivation on attention control mechanisms.

PARADIGM AND OVERVIEW OF THE EXPERIMENTS

Five experiments were conducted to investigate the influence of motivation on attention and performance. The basic paradigm and motivational manipulations are described below, followed by an outline of the experiments conducted and analytic procedures used.

Task Switching Paradigm

The task switching paradigm employed throughout this thesis was based on the crosstalk condition of Experiment 1 of Rogers & Monsell (1995). In this paradigm, subjects respond to target-foil stimulus pairs (e.g., A3, 9E, G#, ?6) presented on a computer monitor. Targets are either letters (A, E, I, U; G, K, M, R) or digits (2, 4, 6, 8; 3, 5, 7, 9). Foils are letters, digits, or neutral symbols (%, #, ? *). Using a left/right button press, subjects perform vowel/consonant (letter task) or even/odd (digit task) judgments.

In an initial *training* phase, subjects receive extensive blocked training on the letter and digit tasks in order to learn the appropriate left/right button press mappings for the letter and digit judgments. During this training, the letter or digit target is always paired with a neutral foil and is presented in a single square in the centre of the monitor.

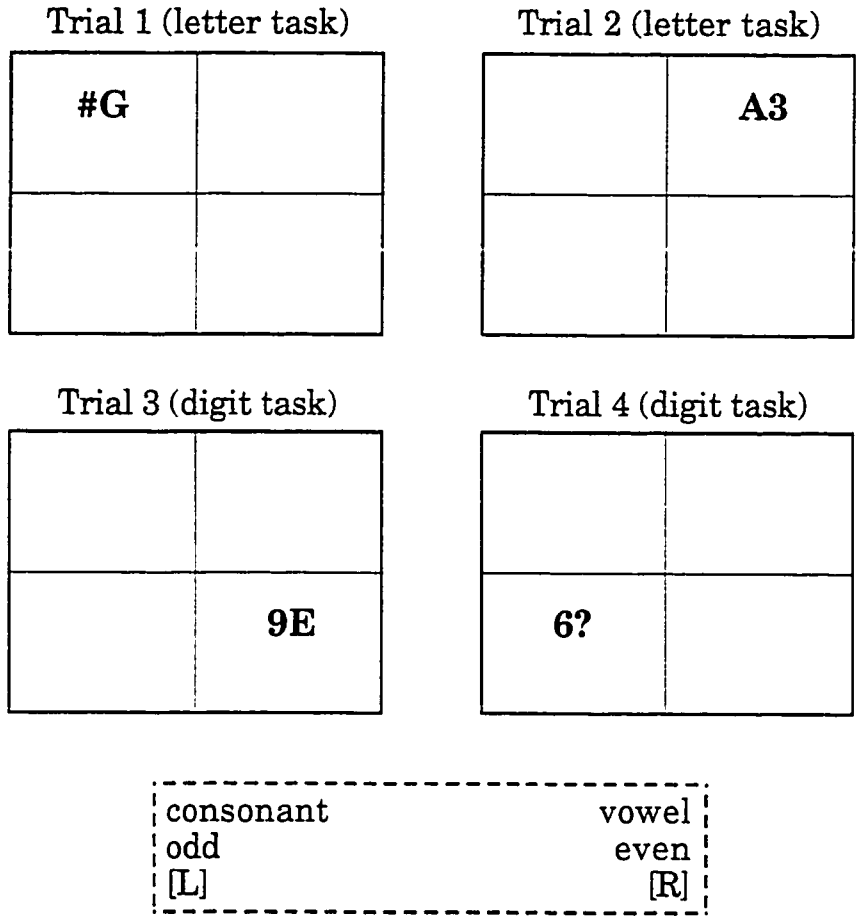
As briefly described earlier, during the subsequent *switch task* phase, stimulus pairs are presented in one of four quadrants. The quadrant position cues the subject to perform either the letter or digit task (e.g., letter task in the top two quadrants; digit task in the bottom two quadrants). Stimulus pairs are presented in clockwise rotation resulting in a regular alternation of *repeat*

trials, on which the subject performs the same task as on the previous trial, and *switch* trials, on which the subject has to switch attentional focus from the letter to the digit task or vice versa. On one third of the trials, the target is paired with a neutral foil, and on two thirds of the trials it is paired with a competing foil (e.g., a digit foil with a letter target). Figure 1 displays an illustrative sequence of trials, including left/right response mappings and task quadrant assignments.

Recall that participants are generally slower on switch trials than repeat trials (the switch effect) and on competing-foil trials than neutral-foil trials (the task-set cuing effect). This basic switch effect is typically computed as the difference in RT on switch versus repeat trials, collapsed across type of foil (competing, neutral). Similarly, this basic task-set cuing effect (referred to subsequently in this thesis as the *cue inhibition* effect) is computed as the difference in RT on competing-foil versus neutral-foil trials, collapsed across trial type (switch, repeat). All experiments in this thesis test for these two basic effects.

In addition, however, I computed four performance indices in order to assess task execution under varying on-line attention demands (see Figure 2 for a schematic representation): 1) task execution in the absence of any additional attentional demands, termed *base reaction time* (base RT) and operationally defined as mean RT on the repeat/neutral-foil trials; 2) task execution requiring inhibition of inappropriate task-set cuing from the competing foil, termed *cue inhibition cost* (CI Cost) and computed as the difference in mean RT on repeat/competing-foil versus repeat/neutral-foil trials;

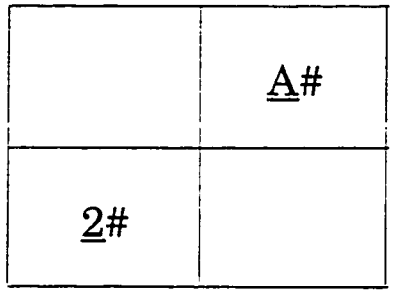
(a)



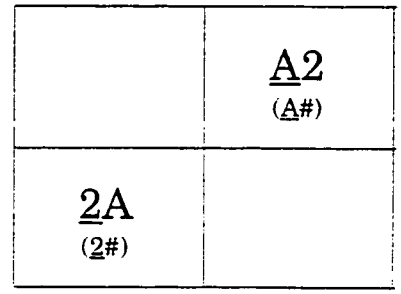
(b)

letter task (SW)	letter task (R)
digit task (R)	digit task (SW)

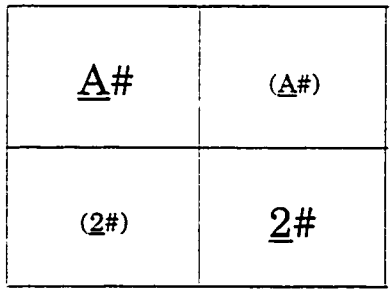
Figure 1. (a) Illustrative sequence of trials and response mappings; (b) corresponding task-quadrant assignments and resultant alternation of switch (SW) and repeat (R) trials.



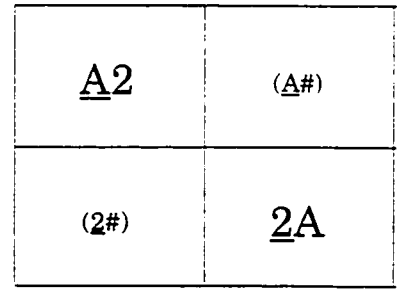
(a) Base reaction time (Base RT)



(b) Cue inhibition cost (CI cost)



(c) Switch cost (SW cost)



(d) Switch with cue inhibition cost (SWCI cost)

Figure 2. Schematic representation of the four computed performance indices used to assess on-line attention and task execution processes during performance of the switch task. Assume letter task assignment to top quadrants, digit task to bottom, as illustrated in Figure 1. Underlined characters represent targets, 'A' represents letter stimuli, '2' represents digit stimuli, and '#' represents neutral foils. Stimulus pairs in parentheses represent comparison trial types for the three cost computations. Each index is computed separately for letter and digit trials.

3) task execution requiring a switch of task set, termed *switch cost* (SW Cost) and computed as the difference in mean RT on switch/neutral-foil versus repeat/neutral-foil trials; and 4) task execution requiring both a switch of task set and inhibition of inappropriate task-set cuing, termed *switch with cue inhibition cost* (SWCI Cost) and computed as the difference in mean RT on switch/competing-foil versus repeat/neutral-foil trials. These computed indices allowed me to examine the effects of switching and cue inhibition, separately and in combination, against a common base reaction time (RT on repeat/neutral-foil trials). Thus, together with base RT, these measures offer four unique indices on which to assess the effects of differential letter and digit task incentive manipulations described below.

Motivational Manipulations

Motivational manipulations were modelled on those used by Derryberry and colleagues (Derryberry, 1993; Derryberry & Tucker, 1994). All motivational manipulations situate the participant in a computer game context where the object is to accrue as many points as possible. Participants are told they will gain points for fast and accurate responses (here termed *zaps*) and that the challenge level will increase across each block of the experiment. Task motivation is manipulated through the application of equal or differential point incentives for performance on letter and digit trials. When assigned equal incentives, participants earn four points per letter or digit zap; when assigned differential incentives, participants earn six points per letter zap and two points per digit zap, or vice-versa. Immediate auditory feedback following each zap is provided through a series of two, four or six beeps,

corresponding to the number of points earned on that trial. Summary feedback is given at the end of each block. Across Experiments 2, 4, and 5, task motivation is manipulated through the application of equal and/or differential incentives during training, during the switch task itself, or both. The incentive structures are summarized in Table 1 and are described in greater detail below.

Table 1

Motivational incentive structure applied in Experiments 2, 4, and 5

	Incentives	
Experiment	Training Phase	Switch Task Phase
Experiment 2		
Equal group (control)	equal	equal
Differential groups	differential	equal
Experiment 4	equal	differential
Experiment 5	differential	reverse differential

Overview of the Experiments

Experiment 1 is a replication of the Rogers and Monsell (1995) task switching paradigm that was used in all subsequent experiments. Experiments 2, 4, and 5 then combine this task switching paradigm with motivational

manipulations to investigate, respectively: a) the effect of *prior* motivational experience on attention and performance; b) the effect of *current* motivation on attention and performance; and c) the ability of current motivation to *overcome* the influence of prior motivational experience on attention and performance. Experiment 3 was conducted to rule out a potential confound to the assessment of the motivational manipulations of Experiments 4 and 5.

Experiment 1: Partial Replication of Rogers and Monsell (1995, Experiment 1)

In Experiment 1, the Rogers and Monsell (1995) task switching paradigm was used without any motivational manipulations. Since the basic switch and cue inhibition effects of this paradigm underlie the attentional performance indices used in later experiments, it was important to verify their replicability before going on to examine the impact of motivational manipulations on these indices. It was also essential to verify that performance on letter- and digit-task trials was comparable and did not interact with either switching or cue inhibition effects. The absence of any initial task dominance permits, in later experiments, the contrast of letter and digit task performance as a function of motivational biases created through differential incentive structures.

Experiment 2: Effects of prior motivation

Experiment 2 investigated whether differential motivational experience can create an attentional bias in favour of the letter or digit task. To create high- and low-motivated task sets, participants were assigned differential incentives for letter and digit task zaps during the training phase of the

experiment. During the subsequent switch task, participants were assigned equal incentives for both letter and digit zaps. The influence of differential incentives was assessed on each of the four switch task performance indices described above. Since participants received equal incentives during the switch task itself, any motivational biases evidenced on the letter and digit performance indices could be attributed to their *prior* experience with differential incentives during training. For comparison, an additional group of participants received equal incentives throughout both training and switch task phases.

Experiment 3: Test of a potential confound to differential switch task incentives

Since Experiments 4 and 5 apply differential incentives during the switch task, it was essential to ensure that processing of the immediate auditory feedback from the preceding trial would not confound any obtained motivation effects. For example, if a participant were awarded six points per letter zap and two points per digit zap, digit switch trials that followed a letter zap would be preceded by six-beep feedback, whereas letter switch trials that followed a digit zap would be preceded by only two beeps. If processing of more feedback beeps from the preceding trial alone led to longer latencies on the current trial, it would be difficult to determine whether longer latencies on digit switch trials versus letter switch trials were due to the incentives manipulation itself, or simply to processing of feedback from the preceding trial. To verify that the number of feedback beeps in the absence of

motivational significance did not influence any of the performance indices of interest, participants in Experiment 3 consistently earned one point per letter or digit zap, regardless of the number of beeps that followed a zap. On half the trials of the switch task, letter zaps were followed by six beeps and digit zaps by two beeps, and on half the trials the reverse. Performance on basic switch and cue inhibition effects were then compared as a function of the number of beeps that preceded a given trial.

Experiment 4: Effects of current motivation

Whereas Experiment 2 concerned prior motivational experience, Experiment 4 explored the effects of *current* motivation on attention control. During training, participants received equal incentives for the letter and digit tasks followed by differential incentives during the switch task. In contrast to possible implicit motivational influences from prior experience, participants here might be expected to engage intentional incentive-based strategies during the switch task in order to maximise point earnings. The influence of differential incentives was again assessed on each of the four performance indices.

Experiment 5: Ability of current motivation to override prior motivational biases

Experiment 5, a more stringent test of the impact of current motivation, explored whether current motivation can actually *overcome* attentional biases developed through prior motivational experience. Participants received differential incentives for the letter and digit tasks during training (as in

Experiment 2) and *reverse* incentives during the switch task. For example, a participant receiving six points per letter zap and two points per digit zap during training, would receive two points per letter zap and six points per digit zap during the switch task. If current motivations are able to override prior motivational experience, reversing the motivation manipulation for the switch task should reverse the effects found in Experiment 2.

Participant Selection and Inclusion/Exclusion Criteria

For all experiments, participants were recruited from the Concordia University student population and were volunteers paid at a rate of $6.00 per hour. All participants were required to have a language with an alphabetic script similar to English as their mother tongue, have vision corrected to normal, and no diagnosed reading, attentional, visual, or motoric impairments. None of the participants were involved in more than one of the present experiments and none had previously participated in any other attention switching studies in our laboratory.

Pilot testing for Experiment 2 revealed that the inclusion of performance incentives led to an increase in errors since point earnings depended upon speed of response as well as accuracy. Moreover, pilot participants with high error rates tended to exhibit attention and motivation effects in their pattern of errors, but not their reaction time data. This suggested that, when faced with performance challenges, these individuals rushed their responses at the risk of committing an error. Their response latencies, therefore, could not be assumed to reflect changes in performance demands and were deemed unsuitable for

inclusion. Consequently, for Experiments 2, 4, and 5, participants were excluded if they made more than 20 errors within any counterbalanced 4-block sequence of 192 trials (i.e., a maximum error rate of 10.4%).

General Analytic Procedures

All analyses were conducted on reaction time (RT) data only. Due to the requirement to maintain high accuracy during performance, too few errors were committed to permit meaningful analyses on the error data. Along with minor experiment-specific adjustments, analyses in all experiments (except Experiment 3) were conducted according to the common strategies and procedures described here.

Alpha was set at .05 for all statistical tests. Analyses involving within-subjects factors with more than two levels were corrected for positive bias if the sphericity assumption was violated. In such cases, the Greenhouse-Geisser Epsilon value is reported, along with the adjusted p value. Significant interactions were explored through simple effects analyses, with alpha adjusted for the number of levels across which simple effects were conducted.

Data Preparation

Data from practice blocks, warm-up trials, and trials on which participants committed errors were excluded. Following Rogers and Monsell (1995), trials immediately following an error were also excluded since their RTs may be affected by: 1) the extended response-stimulus interval that is provided following an error to allow the participant to recover; and 2) potential interference during this interval of normal preparation for the next trial by the

error recovery process. From a motivational perspective, removal of these trials also avoided any contamination due to possible differential facilitation of performance on high-incentive versus low-incentive trials following negative feedback, as obtained in Derryberry (1993).

Each participant's data was then winsorized (Wilcox, 1997) to stabilize participant RT means and reduce distortion from outliers. Since outliers were of concern only at the upper end of the RT distributions, winsorizing was applied only to the top 10% of each critical design cell. This consisted of rank ordering the data within each cell and replacing the top 10% of the data points of each cell with the next highest data value. If, for example, the cell contained 30 data points, the top three values would be replaced with the fourth highest value, thereby reducing the influence of extreme outliers. Winsorizing at 10% was considered sufficient to capture extreme outliers without replacing too large a proportion of the data. After winsorizing, data were aggregated by the relevant variables to obtain participant RT cell means for the subsequent group analyses.

Analysis of Basic Attention Effects

Before going on to explore the influence of motivation on attention, it was important to establish in each of the experiments that the basic switch and cue inhibition effects of this paradigm obtained. Switch task data were, therefore, first subjected to a within-subjects analysis of variance (ANOVA) examining the effects of trial type (switch, repeat) and foil (neutral, competing).

Analysis of Motivation Effects

In Experiments 2, 4, and 5, the effects of motivation on basic task execution, attention switching and inhibition of task-set cuing by the competing foil were assessed in a series of planned comparisons. First, RT data from the training phase were analysed for the immediate influence, if any, of motivational manipulations on basic task execution. Latencies on the letter task and digit task trials were compared as a function of the high, low, or equal incentives applied to each task during training.

Next, and most central to this thesis, four planned comparisons were conducted to examine the influence of motivational manipulations on performance during the switch task. The four performance indices described above (base RT, CI Cost, SW Cost, and SWCI Cost) were first computed for each participant, for the letter and digit tasks separately. In four parallel analyses, performance on these indices was then assessed as a function of the incentive value associated with the letter and digit tasks.

EXPERIMENT 1

Experiment 1 was conducted to verify the reliability of the attention switching paradigm later employed in conjunction with motivational incentive manipulations. I thus sought to replicate the basic findings from the crosstalk condition of Experiment 1 of Rogers and Monsell (1995) and establish a foundation for subsequent experiments of this thesis.

Of particular interest was replicability of their switch effect and task-set cuing effect (refered to here as *cue inhibition* effect). That is, participants should be slower to respond on trials that require a switch of attention from the letter to the digit task, or vice versa, than on trials that require the same task set as the previous trial. They should also evidence longer latencies on trials where the target is paired with a competing, rather than a neutral, foil. These two effects presumably reflect additional attention challenges present when an individual must perform an intentional switch of attention or selectively respond to one dimension of a bivalent stimulus while inhibiting task-set cuing from the competing dimension.

It was also important to verify that the letter and digit judgment tasks were roughly comparable in difficulty in order to attribute, with greater confidence, differences in performance in later studies to the differential incentives then applied to these tasks. I therefore sought to replicate -- in addition to the switch and cue inhibition effects mentioned above -- both the absence of a main effect of task (letter, digit) and the absence of any interaction effects involving task.

Finally, it should be noted that Experiment 1 constituted part of a larger study (see Segalowitz et al., 1999) conducted both as a replication and extension Rogers and Monsell's Experiment 1 (1995), and as a precursor to another programme of research in the Segalowitz laboratory. In the methods section below, I describe the complete design of this larger study since components pertinent to my thesis were intermixed with the full study. However, only the data and analyses of the crosstalk condition undertaken for this thesis are subsequently reported and discussed.

Method

Participants

Eight paid volunteers (3 male, 5 female), aged 17 to 23 years (M = 20.5 years) participated.

Materials

Stimuli consisted of target-foil pairs presented on a computer monitor. Targets were either letters or digits. Letters were drawn equally from the set {A, E, I, U, G, K, M, R} and digits from the set {2, 4, 6, 8, 3, 5, 7, 9}. Targets were paired with either a neutral foil or a competing foil. Neutral foils were nonalphanumeric symbols associated with neither the letter nor the digit task, and were drawn equally from the set {%, #, ?, *}. Competing foils were characters drawn equally from the competing target set (i.e., a letter target paired with a digit foil, or a digit target paired with a letter foil). Stimuli were presented in uppercase 24-point Palatino font on a 14-inch computer monitor

set to 640 x 480 pixel resolution. For reasons unrelated to this thesis, the target and foil characters were presented as a vertically adjacent pair, rather than horizontally adjacent as in Rogers and Monsell (1995). Stimulus presentation and data collection was programmed in HyperCard, Version 2.3, software and run on a Macintosh Quadra 630 computer. Using a number key pad with the 4 key relabelled as a left arrow and the 6 key relabelled as a right arrow, participants categorized a letter target as a vowel or consonant (letter task), and a digit target as even or odd (digit task) by pressing the left arrow with their left index finger or the right arrow with their right index finger.

Training stimuli. Eight blocks of 24 letter trials and eight blocks of 24 digit trials were constructed, for a total of 192 training trials per letter and digit task. For training, targets were always paired with a neutral foil. Stimulus trials were counterbalanced across the training blocks such that each target occurred equally often with each foil and in each position (top, bottom). Target-foil pairs were sequenced in pseudo-random order, with the restriction that no target or foil be repeated on two successive trials.

Switch task stimuli. Four practice and 16 experimental blocks of 48 trials were created for the crosstalk and for the no-crosstalk conditions. For the crosstalk condition, targets were paired with a neutral foil on one third of the trials and with a competing foil on two thirds of the trials. On half of these competing-foil trials the foil was associated with a response that was *congruent* with the required target response (i.e., both the target and foil were associated with the same left or right button response), and on half the foil was associated with a response that was *incongruent* with the required target response (i.e.,

the target was associated with a left, and the foil with a right, button response, or vice versa). For the no-crosstalk condition, targets were always paired with a neutral foil.

Trials were sequenced throughout such that two consecutive letter-task trials alternated with two consecutive digit-task trials. This resulted in a regular alternation of *repeat* trials, on which participants performed the same task as on the previous trial, and *switch* trials, on which participants switched attentional focus from the letter to the digit task, or vice versa. The first 12 trials of each experimental block were considered warm-up trials and, along with the practice block trials, were excluded from all analyses. This left 36 experimental trials per block for a total of 576 experimental trials per condition.

Experimental trials were counterbalanced across each 4-block sequence of 144 experimental trials. In the crosstalk condition, there was one experimental trial for each combination of the following variables: task (letter or digit), trial type (switch or repeat), response (left or right), foil type (neutral, congruent, incongruent), response on the preceding trial (left or right), and foil type on the preceding trial (neutral, congruent, incongruent). In the no-crosstalk condition, there were nine experimental trials for each combination of the following variables: task (letter or digit), trial type (switch, repeat), response (left or right), and response on the preceding trial (left or right). Targets appeared randomly in the top or bottom positions (half the time in each). Finally, trials were sequenced such that there were never more than four successive left or right button press responses required. From the

resultant crosstalk and no-crosstalk counterbalanced trial sequence templates, unique stimulus sequences for the four practice and 16 experimental blocks per condition were created for each participant through pseudo-random sampling from the target and foil exemplar sets, with the restriction that each target and foil occur an equal number of times and no target or foil be repeated on two successive trials.

Procedure

All participants completed a standard consent form describing the general purpose and procedures of the experiment and detailing participant confidentiality and rights. Instructions were given in writing prior to each phase of the experiment, with oral clarifications provided upon request (see Appendix A for written instructions).

Throughout the experiment, participants sat at a comfortable viewing distance, approximately 60 centimetres, from the computer monitor. Each block of trials began with the message "Press any key to begin." Approximately 450 ms later, the first stimulus pair appeared. Participants categorized a letter target as a vowel or consonant, and a digit target as even or odd. For half the participants, consonants and even digits required a left button press response, and vowels and odd digits required a right button press response. The digit response assignments were reversed for the remaining participants, with even digits requiring a right, and odd digits requiring a left, button response.

Stimuli remained on screen until the participant responded or until a deadline of 5000 ms. The interval between the participant's response and presentation of the next stimulus (the response stimulus interval, RSI) was approximately 450 ms, including computing overhead time. If the response was incorrect, a computer-generated "boing" sound was played and an extra 1500 ms were added to the RSI to allow the participant time to recover from the error. At the end of each block of trials, participants received summary feedback consisting of their mean reaction time and the total number of errors for that block. Participants were instructed to respond as quickly as possible without sacrificing accuracy.

Training. To learn the appropriate stimulus-response mappings, participants completed eight letter-task blocks in alternation with eight digit-task blocks. Target-foil stimulus pairs were presented in an 8 cm by 4.5 cm rectangle in the centre of the monitor. Throughout training, instructions for left and right button press assignments appeared as a reminder at the bottom of the screen.

Switch Task. Participants completed four practice blocks and four 4-block experimental sequences in both the crosstalk and no-crosstalk conditions of the switch task. Each target-foil stimulus pair was presented in one of four 8 cm by 4.5 cm quadrants on the monitor. The quadrant position cued participants to perform either the letter or digit task. The two quadrants (always contiguous) assigned to the letter and digit tasks were counterbalanced across participants to control for possible eye movement and position confounds. This resulted in four possible quadrant task assignments:

1) letter task in the top quadrants; digit task in the bottom; 2) letter task in the right quadrants, digit task in the left; 3) letter task in the bottom quadrants, digit task in the top; and 4) letter task in the left quadrants, digit task in the right. The four quadrant task assignments were crossed with the two button press response assignments across participants, resulting in a counterbalanced set of eight unique participant assignments. Stimulus blocks always began with two letter-task trials and proceeded in clockwise rotation. Left and right button press assignments appeared as a reminder at the bottom of the screen during practice blocks, but were removed for all experimental blocks.

Testing was conducted over two sessions on separate days. Following training in Session 1, participants completed two practice blocks followed by two 4-block sequences of the crosstalk condition and two practice blocks followed by two 4-block sequences of the no-crosstalk condition. Half the participants began with the crosstalk condition and half with the no-crosstalk condition. In Session 2, participants completed an additional two practice blocks followed by two 4-block sequences per condition, with the order of conditions reversed from that of Session 1 (i.e., participants beginning with the crosstalk blocks in Session 1 would begin with the no-crosstalk blocks in Session 2, and vice versa). Each session lasted approximately one hour.

Results

The data presented below concern only the crosstalk condition of the switch task. As mentioned earlier, data for the no-crosstalk condition was

collected for purposes outside the scope of this thesis and will not be reported here (see Segalowitz et al., 1999).

Among the experimental trials, those trials on which participants made an error (M = 4.0%) and trials immediately following error trials were also excluded, resulting in a mean loss of 44 of the 576 experimental trials per participant (7.6%). Individual participant data were then winsorized at the top 10% of each cell of the following combination of variables: sequence (1, 2, 3, 4), trial type (switch, repeat), foil (neutral, congruent, incongruent), and task (letter, digit). While data were subsequently aggregated by session (thereby collapsing across sequences 1 and 2, and 3 and 4), they were winsorized by sequence in order to ensure that potential practice effects would not lead to the inappropriate adjustment of outliers. Finally, the data were aggregated to obtain the mean RTs per participant for each cell defined by the following combination of variables: Session x Trial Type x Foil x Task.

The individual participant aggregated means were entered into a within-subjects analysis of variance (ANOVA) with the following factors: session (Session 1, Session 2), trial type (switch, repeat), foil (neutral, congruent, incongruent), and task (letter, digit). Importantly, results revealed that both trial type and foil significantly affected RT, and no differences in performance between the letter and digit tasks obtained. Group mean RTs, and switch and cue inhibition costs for both tasks and sessions are presented in Appendix B, Table B1. As in the original Rogers and Monsell (1995) study, switch cost was computed by subtracting RT on repeat trials from RT on switch trials, collapsed across foil type. Similarly, cue inhibition cost was computed by

subtracting RT on neutral-foil trials from RT on competing-foil trials, collapsed across trial type.

Participants were slower to respond on switch trials (M = 898 ms) than repeat trials (M = 647 ms), F (1, 7) = 40.80, $p < .0005$, MSE = 74,504. This switch effect is illustrated on the left side of Figure 3. The difference between mean RT for switch trials and repeat trials yielded a switch cost of 251 ms. Trial type also interacted with session, F (1, 7) = 24.58, $p = .002$, MSE = 10,036, due to a smaller switch cost for Session 2 (M = 179 ms) than Session 1 (M = 323 ms). Despite this reduction, simple effects analysis indicated that the switch effect was still significant for Session 2, F (1, 7) = 37.36, $p < .0005$, MSE = 20,802.

The nature of the foil also significantly affected performance, F (2, 14) = 36.66, $p < .0005$, MSE = 8,051. This cue inhibition effect is illustrated on the right side of Figure 3. Two posthoc comparisons were conducted using t -tests and Bonferroni-adjusted alpha levels. Participants responded significantly more quickly to targets paired with a neutral foil (M = 695 ms) than to targets paired with a foil from the competing task set (M = 811 ms), t (7) = 7.13, $p <$ .0005. Latencies on congruent (M = 821 ms) and incongruent (M = 801 ms) competing-foil trials did not differ significantly from each other, t (7) = 1.61, *ns*. The difference between mean RT on neutral-foil and competing-foil trials yielded a cue inhibition cost of 116 ms.

Finally, trial type did not interact with foil, F (2, 14) = .85, $p = .448$, MSE = 2,560. In addition, there was no main effect of task; nor did it enter into any interactions with other variables, all Fs < 1.

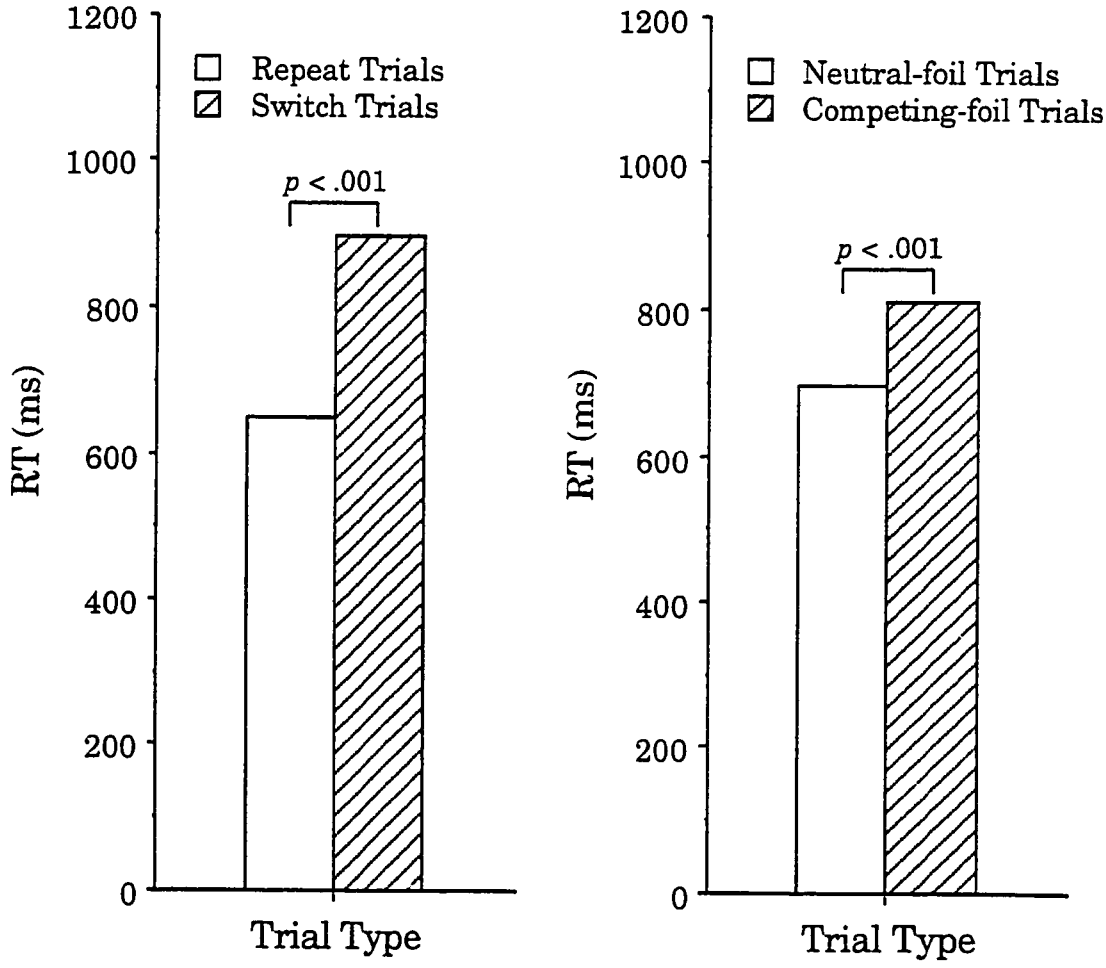


Figure 3. Mean RT (ms) by trial type. The contrast on the left depicts the switch effect; the contrast on the right depicts the cue inhibition effect.

Discussion

Experiment 1 successfully replicated the basic results of Rogers and Monsell's (1995) task switching paradigm. Of paramount importance was replication of the switch and cue inhibition main effects since subsequent experiments of this thesis will assess the influence of motivational manipulations on attention processing using performance indices based on these effects.

Both significant switch and cue inhibition effects obtained. Participants were significantly slower to respond on trials that required a switch of attention between task sets. The size of the switch cost, 251 ms (39% increase), was comparable to Rogers and Monsell's mean switch cost of 289 ms (40% increase). Since switch cost has been found to decrease with increasing RSI, the slightly smaller cost in this experiment was to be expected, since here the RSI was 450 ms as compared to a 150 ms RSI in Rogers and Monsell. Overall, the consistency in the switch effect between experiments suggests that this effect is large, robust, and highly reliable.

Participants were also slower to respond on trials where a competing, rather than neutral, foil was present. While Rogers and Monsell do not specify the magnitude of their cue inhibition cost, it can be estimated from the values graphed in their Figure 2 (Rogers & Monsell, 1995, p. 215) to be approximately 175 ms (23% increase). The cue inhibition effect of 116 ms found in this replication is somewhat smaller but still substantial, representing a RT increase of 17% over neutral-foil trials. This small reduction in cue inhibition cost may be due to participant sampling differences or to the fact that target-

foil pairs were presented vertically, rather than horizontally adjacent as in Rogers and Monsell, making them perceptually more separable and the competing foil easier to ignore. This latter factor may also have contributed to the absence of a Trial Type x Foil interaction in the present experiment. Lastly, as in Rogers and Monsell, the congruency of response between the competing foil and target had no effect on reaction time; that is, RT on congruent trials did not differ significantly from RT on incongruent trials. This provides further support for Rogers and Monsell's argument that the increase on competing-foil trials is due primarily to inappropriate task-set cuing that must be inhibited, and not to crosstalk at the level of response selection.

A third concern was replication of the *absence* of any reliable differences in performance between the letter and digit judgment tasks. As in Rogers and Monsell (1995), no effects of task obtained, either globally or in interaction with trial or foil type. This provides further evidence of the initial comparability of the letter and digit tasks and their suitability for use in subsequent experiments to assess experimentally-manipulated motivational biases.

To conclude, this replication of the Rogers and Monsell (1995) paradigm provided a solid foundation for Experiments 2 through 5 of this thesis. Both the switch and cue inhibition effects obtained and, importantly, no differences between performance on the letter and digit tasks were found.

EXPERIMENT 2

Following replication of the basic effects of the attention switching paradigm in Experiment 1, the purpose of Experiment 2 was to explore the impact of prior motivational experience on these on-line attention processes during performance of the switch task. The motivational significance of letter and digit task trials was manipulated through experience with either differential or equal incentives during the training phase. The application of differential incentives for the letter and digit tasks was counterbalanced across participants, with a letter-motivated (LM) group receiving six points per letter zap (a fast, correct response as operationally defined below) and two points per digit zap, and a digit-motivated (DM) group, the reverse. An equally-motivated (EM) group received four points per either letter or digit zap. During the switch task phase, all groups received equal four-point incentives for both letter and digit zaps. Consequently, any biases in letter and digit task performance by the differentially motivated participants during the switch task could be attributed to *prior* experience with training incentives. Letter and digit task performance was compared on each of the four switch task performance indices as described in *Paradigm and Overview of the Experiments*: base task execution (base RT), switch cost (SW cost), cue inhibition cost (CI cost) and switch with cue inhibition cost (SWCI cost).

I hypothesized that prior experience with differential incentives would create an enduring bias favouring the previously high-incentive task. Moreover, I predicted that this influence would extend beyond a global

energizing of performance, to actually modulate on-going cognitive processes engaged during performance. This experiment set out to explore the specificity of such influences. Because the Rogers and Monsell (1995) task switching paradigm affords assessment of basic task execution, attention switching and inhibition demands within a single task, it is particularly well suited for examining the nature of motivational effects on different forms of on-line attention control and execution processes.

Effects specific to attention processes would be revealed in differences on the CI, SW, and SWCI cost measures. Based on the view that motivation may serve to bias individuals to attend and respond to stimuli of perceived high value (e.g., Simon, 1994; Wise, 1987), I predicted that it would be easier to switch from a low-motivated task to a high-motivated task than vice versa, and easier to ignore a competing foil from the low-motivated than high-motivated task. For example, a LM participant would find it easier to switch from a digit trial to a letter trial, than vice versa, and harder to ignore a letter foil on a digit trial than a digit foil on a letter trial. An analogous, but of course reverse, pattern would be expected for a DM participant. Consequently, I predicted both a smaller SW cost and a smaller CI cost for the previously high-incentive than low-incentive task. This also led to the prediction of a smaller SWCI cost for the previously high-incentive than low-incentive task. The most recent work on asymmetric switch costs since conducted by Allport and colleagues (e.g., Allport & Wylie, 1999; Allport & Wylie, in press; Wylie & Allport, 1999) offers an interesting alternative prediction. If prior experience with differential task incentives affects schema activation levels analogously

to differential amounts of practice, one might expect to obtain *larger* SW costs for the high-motivated than low-motivated tasks -- the paradoxical asymmetry found in the Allport and colleagues studies.

While effects of motivation on attention processes were the major focus of this research, differential motivational experience may also directly affect the strength of stimulus-response set bonds, or what Norman and Shallice (1986) refer to as schemas. If motivation does have such an effect, it would be evidenced by faster responses on repeat/neutral foil trials of the previously high-incentive, as compared to the low-incentive, task. That is, a smaller base RT would be expected for the previously high-incentive task.

Finally, in contrast to the differentially-motivated participants, I predicted that no difference would obtain between the letter and digit tasks on any of the performance indices for the equally-motivated participants. This is consistent with the results of Experiment 1, which showed no general bias toward letter or digit task performance.

Method

Participants

Participants were randomly assigned to each of the three motivation group conditions (LM, DM, and EM) until the eight positions (counterbalanced for task quadrant and left/right response mapping assignments as in Experiment 1) required for each group were filled. In order to meet counterbalancing and inclusion criteria (see *Paradigm and Overview of the Experiments*), a total of 44 participants were tested. Seventeen were

eliminated for exceeding the maximum error criterion and two for disruptions during testing. One participant was eliminated because his overall performance cast doubt as to whether the instructions had been understood.

A final set of 24 paid volunteers, all female and aged from 19 to 32 years (M = 23.2 years), were retained for analyses.

Materials

Visual stimuli were identical to the training and crosstalk condition of Experiment 1, except that the target-stimulus pairs were presented horizontally adjacent as in Rogers & Monsell's (1995) original study. Immediate auditory feedback for earned points consisted of a series of beeps generated by the computer using the Hypercard 2.3 "play" feature with its built-in harpsichord sound generator. This and all subsequent experiments were run on a Power Macintosh 4400 computer and presented on a 15-inch rather than 14-inch monitor, again set to 640 x 480 pixel resolution. Written instructions were modified to include specification of the task incentives (see Appendix C for a sample set of instructions).

Procedure

General experimental set up, procedures for administration of the consent form and instructions, participant counterbalancing, and stimulus presentation and response parameters were identical to Experiment 1. The major procedural changes involved the elimination of the no-crosstalk condition and the inclusion of motivational incentives and feedback as described below.

All participants were instructed that they were to play a computer game involving simple letter and digit judgments where the object was to win as many points as possible by responding quickly and accurately. They were further informed that it was a difficult task and that the challenge level would be adjusted at the end of each block. The speed criterion was defined operationally as an RT faster than the 75th percentile RT of comparable trials of the previous block (this operational definition was not communicated to the participant). Thus, participants earned points for every correct response faster than the criterion RT. These responses were referred to as *zaps*.

To ensure that the probability of receiving a reward remained constant across the different trial types, the criterion was calculated separately for letter and digit task trials during training, and for trials in each of the four quadrants during the switch task (letter switch and repeat trials, and digit switch and repeat trials). Had this not been done -- for example, had switch and repeat trials been assigned the same criterion -- participants would have been rewarded more frequently on repeat than switch trials, since switch-trial RTs are generally longer than repeat-trial RTs. Similarly, if motivation were to affect switch costs as hypothesized, participants would have been rewarded more frequently on trials associated with the high-valued task than on trials associated with the low-valued task. By using separate criteria, however, the incentive value manipulation was not confounded with frequency of reward.

During training, the letter-motivated (LM) group received six points per letter trial zap as compared to two points per digit trial zap; the digit-motivated (DM) group received six points per digit trial zap as compared to two points per

letter trial zap; and the equally-motivated (EM) group received four points per letter or digit trial zap. During the switch task, all groups received equal, four-point rewards for both letter and digit trial zaps. Thus, the differential incentives for the LM and DM groups were applied only during the training task. Participants were informed of the point value of zaps in written instructions prior to both training and the switch task, and were reminded on-screen of the point value of letter and digit zaps at the beginning of each block of trials. To encourage participants to treat both training and the switch task as equally important in terms of point earnings and performance, training was always referred to as Part 1, and the switch task as Part 2, of the experiment when interacting with participants.

For all groups, the 75th percentile RT criteria corresponded to an expected earning of 144 points per block, given a comparable level of performance as the previous block (i.e., 36 zaps per 48-trial block at an average of 4 points per zap). However, to maintain motivation and minimize commission of errors through rushed responses, participants were told that a good player typically scores from 100 to 120 points per block. Participants were asked to make as few errors as possible and were given a 10-point bonus if they made fewer than five errors per block.

Participants received both immediate auditory feedback and end-of-block summary feedback. Following each zap, a series of computer-generated beeps sounded, the number of beeps corresponding to the number of points earned on that trial (2, 4, or 6). If the response was correct, but too slow to earn points, no beeps were played. As in Experiment 1, if a participant

responded incorrectly, an alerting 'boing' was sounded and 1500 ms were added to the RSI to facilitate recovery before onset of the next trial. At the end of each block, on-screen performance feedback indicated the total number of zaps and corresponding points earned for each the 24 letter and 24 digit trials, the number of errors made and whether a bonus was earned, and the total score for that block. In addition, qualitative descriptors were placed next to the total score as follows: fewer than 80 points, "DON'T GIVE UP!"; 80-99 points, "NOT BAD!"; 100-119 points, "GOOD!"; 120-129 points, "GREAT!"; 130-139 points, "SUPER!"; 140-149 points, "EXCEPTIONAL!!"; more than 150 points, "UNBELIEVABLE!!!". To allow participants to track their progress and to ensure that they fully processed the feedback, participants recorded their feedback at the end of each block on a "Performance Record" chart and handed it in at the end of the experiment.

Testing lasted approximately 90 minutes, and was divided into two sessions separated by an obligatory 10-minute break. Following training in Session 1, participants completed the first half of the switch task. They returned after the break for Session 2, during which time they completed the second half of the switch task, responded to two brief questionnaires on their experience, and were debriefed. (The questionnaire data were collected for purposes beyond the purview of this thesis and will not be presented here.)

Training. The training phase served both to train participants on the appropriate stimulus-response mappings and to expose participants to either differential (LM and DM groups) or equal (EM group) motivational experience with the letter and digit tasks. As in Experiment 1, participants completed

eight blocks of 24 letter-task trials and eight blocks of 24 digit-task trials. However, in Experiment 2 these blocks were combined into eight double blocks of 48 trials consisting of 24 letter-task trials followed by 24 digit-task trials, or vice-versa. An on-screen message informing the participant of the upcoming task and the point value per zap preceded each sequence of 24 trials. The task for the first 24 trials of each block was counterbalanced across participants and alternated for each participant across the eight double blocks.

Participants were told that the first of these 48-trial blocks was for practice only and, therefore, no points were awarded and only immediate error feedback was given. Letter and digit task performance on this practice block was then used to establish the RT criteria for earning points during the first of the game blocks. Immediate and summary reward feedback was provided for the seven remaining 48-trial blocks as described above, with RT criteria recalculated after each successive block.

Switch Task. The switch task consisted of the four practice blocks (here divided into two double blocks of 96 trials each) and 16 experimental blocks of the crosstalk condition only of Experiment 1. Quadrant task assignments were counterbalanced across participants as before. Throughout the switch task phase of the experiment, letter and digit zaps were of equal, 4-point value for all motivation groups (LM, DM, and EM).

During Session 1 of the switch task, participants completed one double practice block, during which no points were awarded and only immediate error feedback was provided, followed by eight experimental blocks (two counterbalanced four-block sequences). Performance on the last 48 trials of

the practice block were used to set the RT criteria for earning points on the first experimental block, after which the RT criteria were reset after each successive block. In Session 2 after the 10-minute break, participants again warmed up with a double practice block, followed by the final eight experimental blocks. The RT criteria for the first of these eight experimental blocks was again based on the final 48 trials of the preceding practice block, after which the RT criteria were reset after each successive block.

Results

Among the experimental trials of the switch task data, 11.2% of the differentially-motivated subjects' data were lost through elimination of trials on which errors were committed (M = 5.8%) and trials immediately following errors; similarly, 9.5% of the equally-motivated group trials were lost through elimination of trials on which errors were committed (M = 4.9%) and trials immediately following errors. The remaining data for each participant were winsorized at the upper 10% of each data cell of the following combination of variables: sequence (1, 2, 3, 4), trial type (switch, repeat), foil (neutral, competing), and task (letter, digit). The RT data were then aggregated to obtain mean RTs per participant according to the following break variables: session (1, 2), trial type, foil, and task. Since the congruency of the competing foil had no effect on RT in either Experiment 1 of this thesis or in Rogers & Monsell's (1995) original experiment, in analyses of this and all remaining experiments I collapsed congruent and incongruent foil trials into a single cell. Thus, the foil variable now had just two levels: neutral and competing. Lastly, the LM and

DM group means were combined into a single data file by recoding the letter and digit tasks as high-motivated or low-motivated tasks. For example, the letter task was recoded as the high-motivated task for the LM participants and as the low-motivated task for the DM participants. Note that, in this experiment, task motivation is defined throughout both the training and switch task data analyses as a function of the differential incentives applied during the *training* phase since it the effect of this prior motivational experience on switch task performance that is of interest.

The training data were also prepared prior to analysis. After first excluding practice block trials, 10.7% of training data of the differentially-motivated subjects was eliminated due to errors (M = 5.5%) and removal of trials immediately following errors; similarly, 12.6% of training data of the equally-motivated participants was eliminated due to errors (M = 6.5%) and removal of trials immediately following errors. The remaining training data of each participant were winsorized at the upper 10% of each the letter and digit trial data cells and then aggregated by task (letter, digit). Again, the LM and DM group means were combined into a single data file by recoding the letter and digit tasks as high-motivated and low-motivated tasks.

Separate, but parallel, analyses of the basic attention and motivation effects were conducted for the differentially-motivated participants (LM and DM groups) and the equally-motivated participants (EM group).

Basic Attention Effects (LM & DM Groups)

To test for the presence of the basic switch and cue inhibition effects for the differentially-motivated participants, a mixed-design ANOVA was performed on the LM and DM groups' switch task data with three within-subjects variables of session (Session 1, Session 2), trial type (switch, repeat), and foil (neutral, competing), and one between-subjects variable of group (LM, DM). Results revealed that both switch and cue inhibition effects obtained.

First, there was a significant main effect of trial type. Participants were slower to respond on switch (M = 846 ms) than repeat trials (M = 575 ms), F (1, 14) = 38.15, $p < .0005$, MSE = 61,602, yielding a global switch cost of 271 ms. This switch effect is shown on the left side of Figure 4. As in Experiment 1, however, trial type interacted with session, F (1, 14) = 17.03, $p = .001$, MSE = 5,802, due to a smaller switch cost for Session 2 (M = 215 ms) than Session 1 (M = 323 ms). Nevertheless, the simple main effect of trial type was still significant for Session 2 despite this reduction, F (1, 14) = 29.93, $p = .001$, MSE = 24,805.

Second, there was a significant main effect of foil, F (1, 14) = 69.71, $p <$ .0005, MSE = 5,774. Participants responded more slowly on competing-foil trials (M = 766 ms) than neutral-foil trials (M = 654 ms), yielding a global cue inhibition cost of 112 ms. This cue inhibition effect is shown on the right side of Figure 4. While this effect did not interact with session, F (1, 14) = .11, $p = .747$, MSE = 1,679, there was a three-way interaction involving foil, session, and the between-subjects factor of group, F (1, 14) = 4.98, $p = .042$; MSE = 1,679, due to a small *decrease* in cue inhibition cost from Session 1 (M cost = 138 ms) to

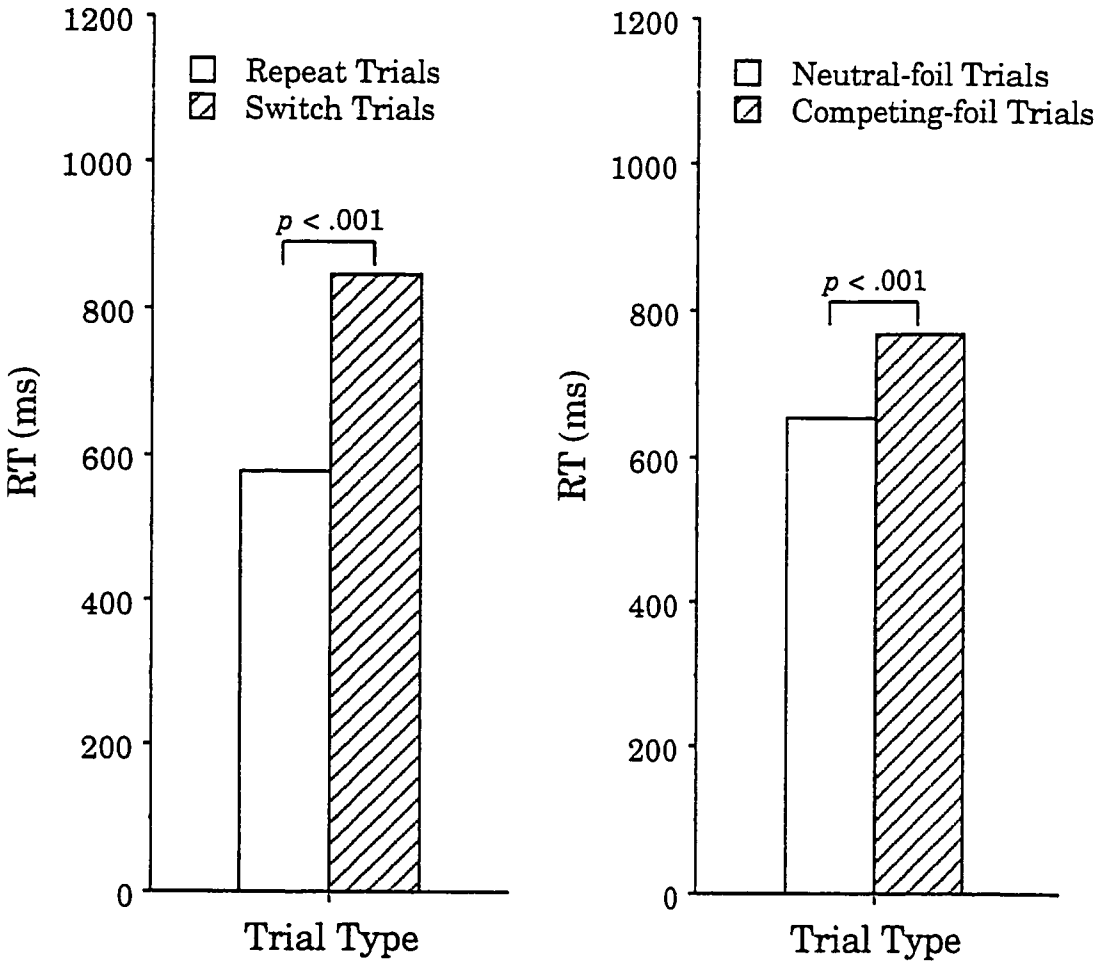


Figure 4. Mean RT (ms) by trial type for the differentially motivated participants in Experiment 2. Switch and cue inhibition effects are depicted on the left and right, respectively.

Session 2 (*M* cost = 110 ms) for the DM group, coupled with a small *increase* in cue inhibition cost from Session 1 (*M* cost = 82 ms) to Session 2 (*M* cost = 119 ms) for the LM group. Simple interaction analyses revealed, however, that the Session x Foil interaction was not significant for either the DM group, $F(1, 14) = 1.81$, $p = .200$, $MSE = 1{,}679$, or the LM group, $F(1, 14) = 3.28$, $p = .092$, $MSE = 1{,}679$.

Finally, there was an interaction between trial type and foil, $F(1, 14) = 6.23$, $p = .026$, $MSE = 3{,}144$. Switch cost was greater on competing-foil trials (*M* = 296 ms) than neutral-foil trials (*M* = 246 ms). Simple effects, however, revealed that the effect of trial type was still significant for neutral foil trials, $F(1, 14) = 29.86$, $p = .001$, $MSE = 32{,}492$. Similarly, cue inhibition cost was greater for switch trials (*M* = 137 ms) than repeat trials (*M* = 87 ms), but again, the simple effect for foil was still found to be significant for repeat trials, $F(1, 14) = 45.45$, $p = .001$, $MSE = 2{,}689$.

Basic Attention Effects (EM Group)

To test for the presence of the basic switch and cue inhibition effects for the equally-motivated participants, a within-subjects ANOVA was performed on the EM group's switch task data with the following variables: session (Session 1, Session 2), trial type (switch, repeat), and foil (neutral, competing). As in the differentially-motivated subjects' analysis, both significant switch and cue inhibition effects obtained.

Participants were slower to respond on switch (*M* = 729 ms) than repeat trials (*M* = 531 ms), $F(1, 7) = 20.38$, $p = .003$, $MSE = 30{,}963$, yielding a global

switch cost of 198 ms. This switch effect is shown on the left side of Figure 5. Again, switching improved with practice, from 251 ms in Session 1 to 146 ms in Session 2, as revealed by a significant Trial Type x Session interaction, F (1, 7) = 29.83, p = .001, MSE = 1,476. The simple effect of trial type for Session 2, however, remained significant despite this reduction, F (1, 7) = 15.55, p = .006. MSE = 10,986.

The main effect of foil was also significant. Participants were slower to respond on competing-foil (M = 676 ms) than neutral-foil trials (M = 584 ms), F (1, 7) = 132.45, p < .0005, MSE = 1,038, a global cue inhibition cost of 92 ms. This cue inhibition effect is shown on the right side of Figure 5. There were no interactions between foil and either trial type or session.

Motivation Effects (LM & DM Groups)

First, in order to test for any immediate motivational bias on basic response execution, the training data of the differentially-motivated participants were submitted to a 2 x 2 mixed-design ANOVA with the within-subjects variable of task motivation (high, low) and the between-subjects variable of group (LM, DM). No main effect of task motivation obtained, F (1, 14) = .46, p = .506, MSE = 515. However, task motivation did interact significantly with group, F (1, 14) = 24.54, p < .0005, MSE = 515, due to reverse effects of task motivation for the LM and DM groups. Simple effects analyses revealed that the LM group responded significantly more slowly on low-motivated (M = 504 ms) than high-motivated (M = 470 ms) task trials, F (1, 14) = 9.13, p = .009, MSE = 515, whereas the DM group responded significantly

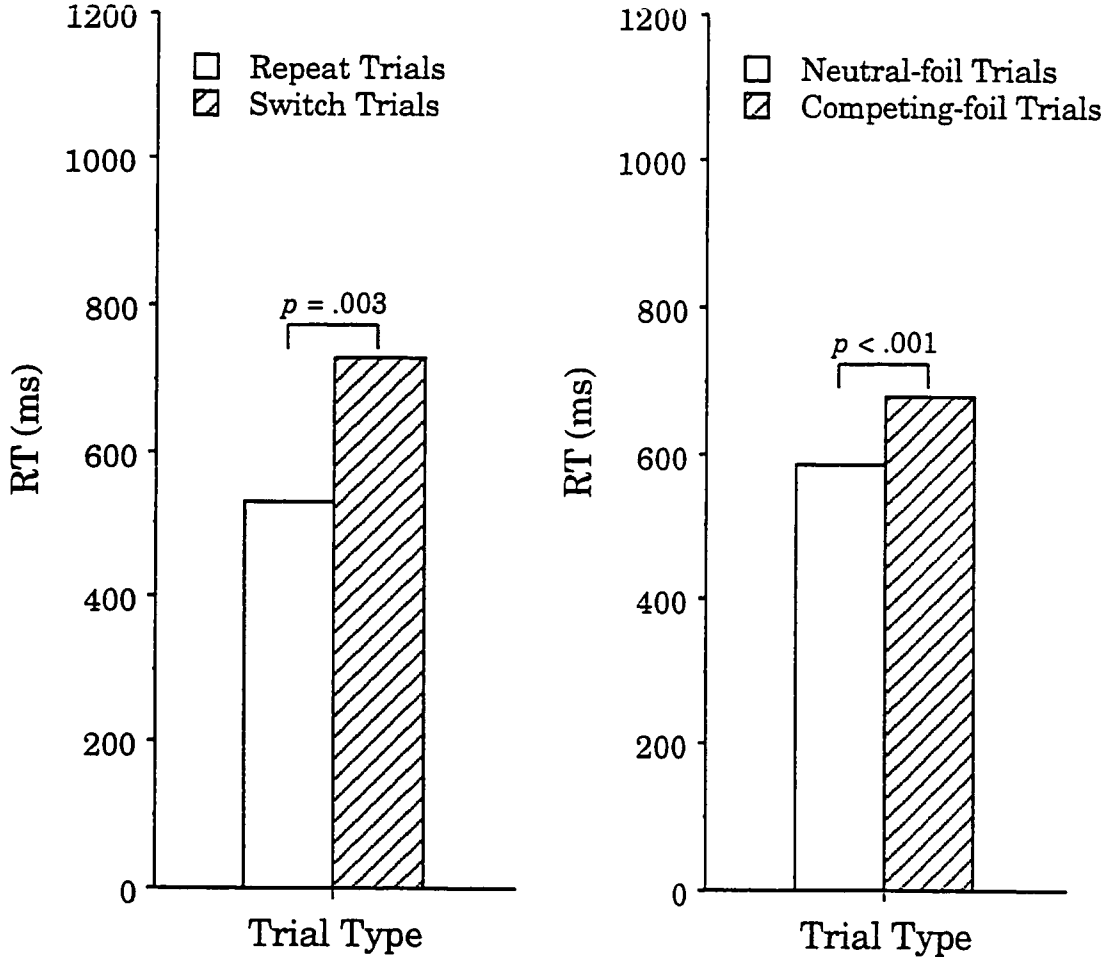


Figure 5. Mean RT (ms) by trial type for the equally motivated participants in Experiment 2. Switch and cue inhibition effects are depicted on the left and right, respectively.

more slowly on high-motivated (M = 498 ms) than low-motivated (M = 452 ms) task trials, F (1, 14) = 15.88, p = .001, MSE = 515. In effect, during training both groups performed faster on the letter than the digit task, irrespective of task incentives.

Next, to address the central question of whether experience with differential incentives during training affects subsequent equal-incentive switch task performance, a series of four planned analyses were conducted on the switch task data. Base RT, CI cost, SW cost, and SWCI cost were first computed for each participant for the high-motivated and low-motivated tasks separately, and then entered into four separate 2 x 2 x 2 mixed-design ANOVAs with two within-subjects variables of session (Session 1, Session 2) and task motivation (high, low), and one between-subjects variable of group (LM, DM). Table B2 of Appendix B presents the group means of the four performance indices for the high- and low-motivated tasks and for both sessions of the switch task. Mean RT for the four trial types used to compute the cost indices are presented in Table B3 of Appendix B.

The contrasts between the high- and low-motivated tasks for base RT and the three attention cost indices are displayed on the left and right sides of Figure 6, respectively. Only the SW and SWCI cost analyses yielded significant main effects of task motivation: SW cost was smaller for the high-motivated (212 ms) than low-motivated task (280 ms), F (1, 14) = 15.03, p = .002, MSE = 4,965; SWCI cost was also smaller for the high-motivated (346 ms) than low-motivated task (421 ms), F (1, 14) = 10.19, p = .007, MSE = 8,821. In addition, task motivation did not interact with session in either the SW or the SWCI

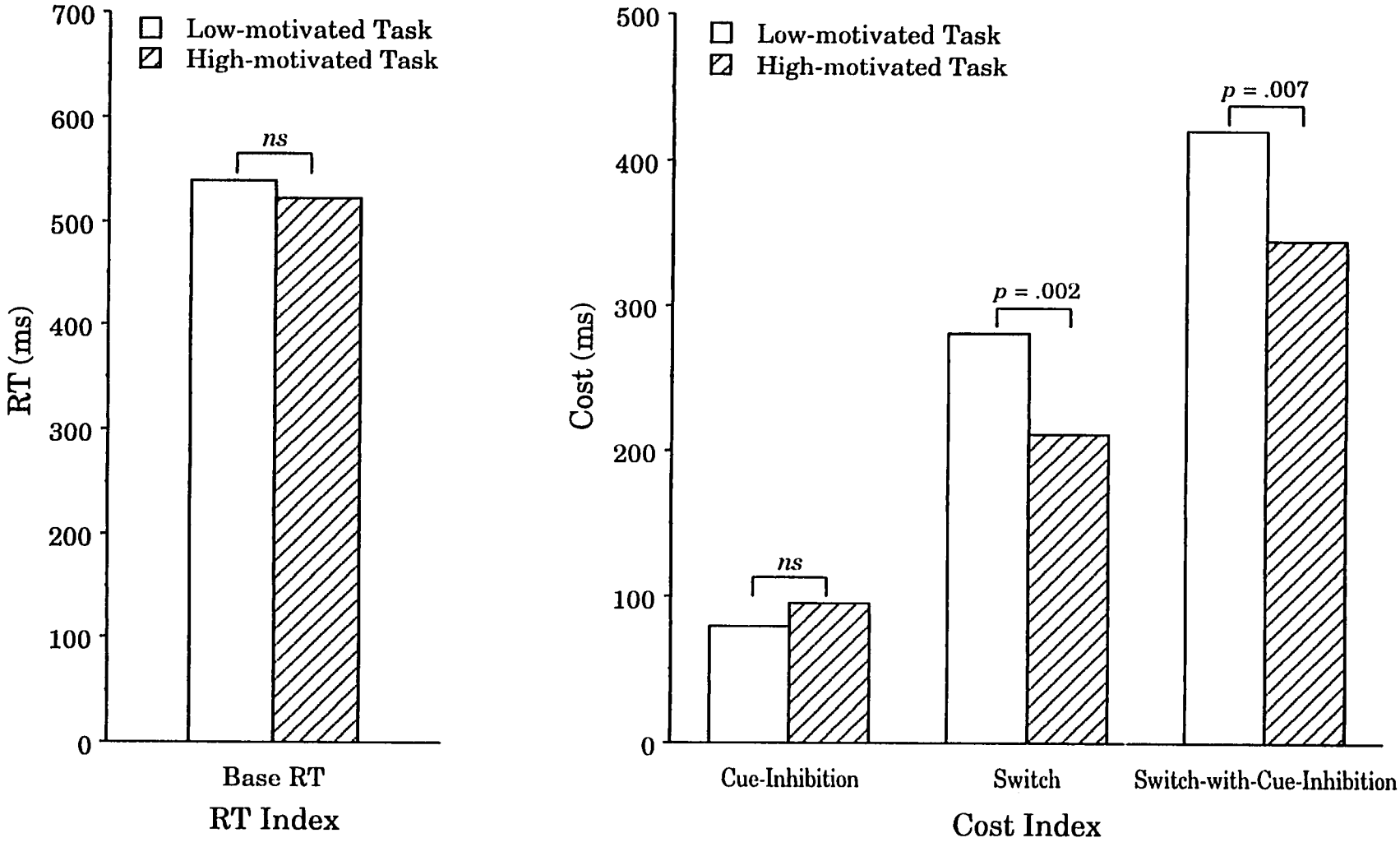


Figure 6. Mean base RT (ms) and costs (ms) by current task motivation for differentially motivated participants in Experiment 2.

cost analyses, indicating that this task motivation effect persisted through both sessions of the switch task.

Task motivation did not affect base RT, F (1, 14) = 2.17, p = .162, MSE = 1,887; nor was there a main effect of task motivation in the CI cost analysis, F (1, 14) = .87, p = .366, MSE = 5,194. There was a Task Motivation x Group interaction in the CI cost analysis due to a *smaller* CI cost for the high-motivated task (M = 72 ms) than the low-motivated task (M = 100 ms) for the DM group, but a *larger* CI cost for the high-motivated task (M = 119 ms) than the low-motivated task (M = 58 ms) for the LM group, F (1, 14) = 6.04, p = .028, MSE = 5,194. Simple effects analyses revealed that the task motivation effect was not significant for the DM group, F (1, 14) = 1.16, p = .299, MSE =5,194, or the LM group, F (1, 14) = 5.75, p = .031, MSE =5,194. None of the other analyses yielded a significant Task Motivation x Group interaction.

Finally, it is worth noting that there was no significant main effect of group in any of the performance index analyses, all Fs < 2.1, indicating that the letter- and digit-motivated groups performed comparably overall.

Motivation Effects (EM Group)

For comparison with the differentially-motivated group results, a comparable set of training and switch task analyses were run on the participants who received equal incentives during training. First, a t-test comparing letter and digit task performance during training was conducted. Despite receiving equal incentives for both letter and digit zaps, participants responded more quickly on letter task (M = 443 ms) than digit task (M = 469

ms) trials, thus showing a small (M_{diff} = 25.28 ms, SE = 10.16 ms), but significant, advantage for the letter task during training, $t(7) = 2.49$, $p = .042$.

The performance of the EM group during the switch task was examined next in a series of four planned analyses of the switch task data. Base RT, CI cost, SW cost, and SWCI cost were computed for each participant for the letter and digit tasks separately. Table B4 of Appendix B presents the group means of the four performance indices for the high- and low-motivated tasks and for both sessions of the switch task. Mean RT for the four trial types used to compute the cost indices are presented in Table B5 of Appendix B. Each of these performance indices were subjected to a 2 x 2 within-subjects ANOVA with the variables of session (Session 1, Session 2) and task (letter, digit).

The contrasts between letter and digit task performance indexed by base RT and the three attention costs are shown on the left and right sides of Figure 7, respectively. In contrast to the differentially-motivated group analyses, no significant effects of task obtained in the base RT or any of the attention cost analyses, all Fs < 1.5. Nor were any of the Task x Session interactions significant, all Fs < 1.5.

Discussion

In addition to again replicating the basic switch and cue inhibition effects of this paradigm, Experiment 2 more importantly revealed that motivational experience could have a longlasting impact on on-line cognitive processes during performance. Moreover, this effect was highly specific, selectively affecting attentional set switching, but not inhibition of task-set

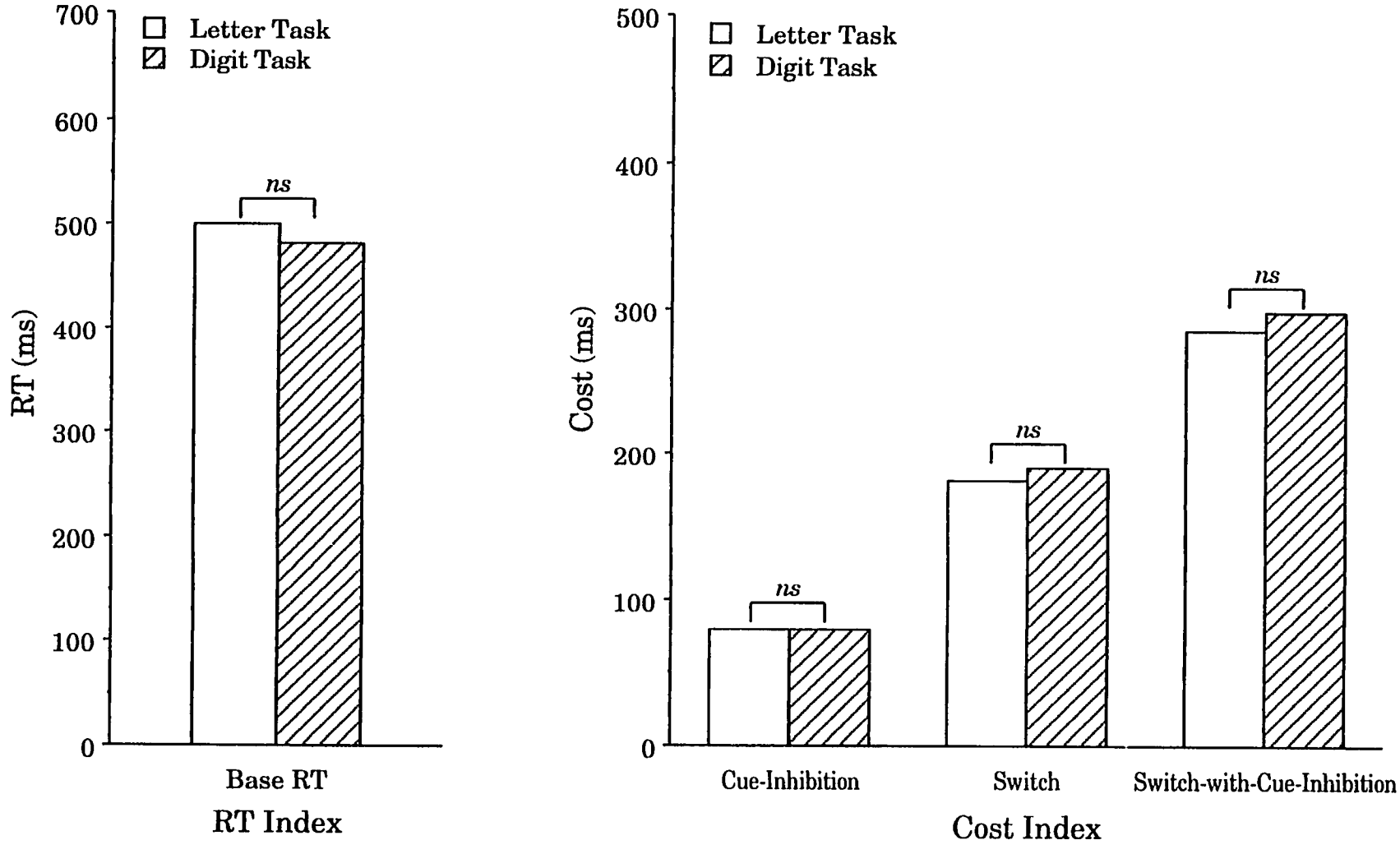


Figure 7. Mean base RT (ms) and costs (ms) by current task motivation for equally motivated participants in Experiment 2.

cuing from the competing foil or basic task execution. These effects cannot be attributed to current incentive-based strategies since all groups received equal incentives during the switch task itself; rather, it suggests that an implicit bias was created and persisted in influencing attention switching during subsequent performance.

As in Experiment 1, large and significant switch and cue inhibition effects obtained for both the differentially and equally motivated participants. The magnitudes of these effects for both groups were comparable, and similar to those of previous experiments. Collapsed across letter and digit task trials, differentially-motivated participants yielded a mean global switch cost of 271 ms (47% increase) and a mean global cue inhibition cost of 112 ms (17% increase). Equally motivated participants performed somewhat better, with a mean global switch cost of 198 ms (37% increase) and a mean global cue inhibition cost of 92 ms (16% increase). Although these effects generally diminished with practice, they remained quite large and significant through both sessions of the switch task. Having established the presence of these basic attention effects, of particular interest was the influence of prior incentive experience.

As predicted, when participants were trained on the letter and digit tasks under differential incentives, they showed a persistent bias favouring the previously high-incentive task. However, this effect was even more selective than predicted, having a large impact on both SW and SWCI cost indices, and no effect on CI cost or base RT. In addition to the large magnitude and statistical reliability of these selective effects, the overall pattern of results is

also internally consistent. First, the magnitude of the motivational effects on SW and SWCI costs are remarkably similar. Participants were, on average, 68 ms faster on high- than low-motivated switch trials with neutral foils, and 75 ms faster on high- than low-motivated switch trials accompanied by competing foils. Thus, similar motivational effects obtained on two indices that implicate switching, each based on a unique set of switch trials. This finding is also consistent with the absence of an effect on CI cost and suggests that the motivational effect on SWCI costs is due predominantly to modulation of attentional switching between tasks. This influence of prior motivational experience on switching was also persistent. Although the magnitude of motivational differences for SW cost decreased from Session 1 to Session 2, whereas the magnitude of SWCI cost increased somewhat, neither of these changes was significant. Thus, the impact of prior incentives on set switching did not appear to diminish over time.

An interesting issue concerns whether these motivational effects on switching are due to differential difficulty in disengaging *from* the high-motivated versus low-motivated task, or differential facility in switching *to* the high-motivated task versus the low motivated task. The design of the present study cannot resolve this question since switching from and switching to always involved both a high- and low-motivated task set and so confounded independent assessment of these two aspects of switching. I return to this issue in the general discussion and suggest another paradigm that could be used in combination with motivational incentives to better address this question.

The absence of an effect on base RT suggests that prior motivational experience with differential task incentives did not differentially strengthen corresponding task sets. Rather, performance of the high- and low-valued tasks appeared to be equally triggered by the target on repeat/neutral foil trials and comparably executed. The absence of a motivational effect on CI cost further indicates that participants found it no more challenging to inhibit inappropriate task set activation triggered by a competing foil from the previously high-incentive task than from the previously low-incentive task. This again is indicative of comparable stimulus triggering of task set for the high- and low-motivated tasks. Together, these results suggest that task set activation, triggered either appropriately by the target on repeat/neutral foil trials or inappropriately by the foil on repeat/competing foil trials, was not influenced by prior motivational experience.

Focusing of attention likewise appeared to be unaffected by prior motivational experience in this experiment. Enhanced target focusing on competing-foil trials might be expected both to facilitate target activation and inhibit foil activation, resulting in smaller CI costs on previously high-incentive than low-incentive task trials. This did not obtain. Rather, as described above, participants were equally slowed by the presence of competing foils regardless of the acquired motivational significance of the target and foil.

The finding of a selective impact on attention switching for participants who experienced differential task incentives during training is reinforced by the counterbalancing of incentive assignments since, for motivational effects to obtain, the letter-motivated and digit-motivated participants had to show

opposite performance on letter and digit tasks. Furthermore, an equally motivated group, who received the same task incentives throughout, was included as an additional comparison group. Like the participants in Experiment 1, who performed the switch task without any experimentally-manipulated incentives, the equal-incentive group here performed comparably on all indices of letter and digit task performance. Specifically, no differences between letter and digit task performance obtained on base RT or any of the attentional cost indices for this group. Although both the differentially and equally motivated groups did evidence a small, significant bias in favour of the letter task during training, there is no evidence that this difference carried over into performance during the switch task phase or otherwise contributed to the prior motivation effect on switching obtained here.

Finally, given that letter and digit task incentives during the switch task phase were equal for all participants, it is highly unlikely that an incentive-based strategy could account for this prior-motivation effect on set switching. Instead, the results of this study appear to reveal a selective and *implicit* influence of motivational experience on an *intentional* supervisory attention control mechanism. The theoretical implications of this intriguing result and possible underlying mechanisms will be explored later, within the *General Discussion* section of this thesis.

EXPERIMENT 3

Before proceeding with Experiments 4 and 5, in which differential incentives for letter and digit task trials are applied during the switch task itself, it was important to verify that current trial reaction times would not be affected simply by perceptual processing differences in the immediate feedback signal of the preceding trial. Such an effect would introduce a confound in interpreting RT differences in terms of the *motivational* value of the incentives.

Since all participants are, on average, rewarded on 75% of the trials due to an adaptive speed criterion for zaps, letter and digit trials in Experiments 4 and 5 will differ not only in terms of their incentive value, but also in terms of the positive feedback signal (two versus six beeps) that is processed during the preparatory interval (the RSI leading up to the current trial). For example, for participants receiving six points per letter trial zap and two points per digit trial zap, many digit switch trials would be preceded by a six-beep feedback signal from the preceding letter trial, whereas many digit switch trials would be preceded by only a two-beep feedback signal from the preceding digit trial. If perceptual processing of the six- and two-beep feedback signals differentially affected current trial preparation and reaction time, it would be impossible to determine whether larger digit switch trial RTs were due to increased processing demands of the preceding six-beep letter trial feedback or to the lower motivational value of digit trials as compared to letter trials.

In the first instance, it was important to equate the playing time of six and two beeps since a participant may wait to begin preparation for the next trial until after feedback has finished playing. However even with time equated, by virtue of their number, six beeps may be either more demanding or take longer to process than two beeps, and thereby interfere more with concurrent preparation for the upcoming trial. Consequently, after first equating the play time of all positive feedback signals, Experiment 3 further explored whether the number of feedback beeps, *in the absence of differential motivational significance*, would influence reaction times.

Both letter and digit zaps throughout Experiment 3 were assigned a value of one point, regardless of the number of beeps in the feedback signal. During training, all zaps were followed by four-beep feedback. During the switch task, half of all letter and all digit trial zaps were followed by six-beep feedback and half by two-beep feedback. As in previous experiments, I expected to obtain significant switch and cue inhibition effects. Most importantly, however, I hoped to obtain *no* main effect for number of preceding beeps and no significant interactions of this variable with either trial type or foil type.

Method

Participants

Eight paid volunteers (1 male), aged 20 to 33 (M = 24.4 years) participated.

Materials

Visual stimuli were identical to Experiment 2. Immediate auditory feedback again consisted of a series of beeps generated by the computer using the Hypercard 2.3 "play" feature with its built-in harpsichord sound. The duration of beeps was adjusted so that a sequence of two, four, or six beeps required approximately the same play time, about 350 ms. Since the RSI was 450 ms, this allowed a full 100 ms between the offset of the auditory feedback and the onset of the next stimulus.

Procedure

General experimental set up, administration of consent form and instructions, subject counterbalancing, and stimulus presentation and response parameters were identical to Experiments 1 and 2. As in Experiment 2, participants completed the experiment in the context of a computer game during which they earned points for fast and accurate responses. However, in both the training and switch task phases of Experiment 3, all participants earned just one point per letter or digit zap, and the number of beeps following each zap was no longer related to the number of points earned.

During training, a series of four beeps always sounded after each letter or digit zap. During the switch task, either two or six beeps sounded after a zap. For half the participants, letter zaps were followed by six beeps and digit zaps by two beeps during the first and third counterbalanced sequences of four 48-trial blocks, whereas digit zaps were followed by six beeps and letter zaps by two beeps during the second and fourth four-block sequences. This assignment

was reversed for the remaining participants. Thus, each participant completed two counterbalanced sequences of 144 experimental trials in which letter trials were preceded by two beeps and digit trials by six beeps, and two sequences in which the reverse was true. Since both letter and digit zaps were worth one point each throughout, this afforded analysis of RTs as a function of the number of beeps that preceded each trial type when number of beeps held no motivational significance for the participant. Scheduling and completion of blocks during the training and switch task phases were otherwise identical to Experiment 2.

Lastly, to further minimize errors due to rushed responses and to maximize the number of trials preceded by positive feedback signals, the RT criterion for zaps in this experiment was relaxed to an RT faster than the 90th percentile, rather than 75th percentile, of comparable trials of the previous block. This corresponded to an expected gain of 43 points per block, given a similar level of performance as the previous block (43 one-point zaps per 48-trial block). A bonus of two points was added if fewer than five errors were committed. Participants were told that a good player typically scores in the 36-38 point range on each block.

Results

Following elimination of trials on which errors were committed (M = 8.0%), and trials immediately following error trials (a total mean loss of 15.4% of experimental trials), individual data files were winsorized at the upper 10% of

each data cell defined by the variables: trial type (switch, repeat), foil (competing, neutral), and preceding beeps (0 beeps, 2 beeps, 6 beeps).

To examine the effect of the number of preceding beeps on RT performance, a 2 x 2 x 3 (Trial Type x Foil Type x Preceding Beeps) within-subjects ANOVA was conducted. Only the main effects of trial type and foil type were significant. Participants responded more quickly on repeat trials (M = 556 ms) than switch trials (M = 776 ms), F (1, 7) = 33.66, p = .001, MSE = 34,412. They also responded more quickly on neutral-foil trials (M = 611 ms) than competing-foil trials (M = 721 ms), F (1, 7) = 19.46, p = .003, MSE = 14,754. Importantly, however, the number of preceding beeps did not significantly affect reaction time, F (2, 14) = 1.55, p = .247, MSE = 1,821. Indeed, the mean RTs of trials following 0, 2, and 6 beeps were very similar in magnitude: 676, 658, and 664 ms, respectively. Moreover, preceding beeps did not enter into any two-way or three-way interactions with trial type or foil, all Fs < 1. Switch and cue inhibition effects as a function of the number of preceding beeps is shown in Figure 8. Table B6 in Appendix B displays the mean RTs for each of the four types of trials (trial type x foil) as a function of the number of preceding-trial feedback beeps.

Discussion

By eliminating the motivational significance of the number of beeps played, Experiment 3 tested whether the mere perceptual processing of two- versus six-beep feedback on the preceding trial would affect reaction times of the current trial. Results revealed that, when total feedback play time is held

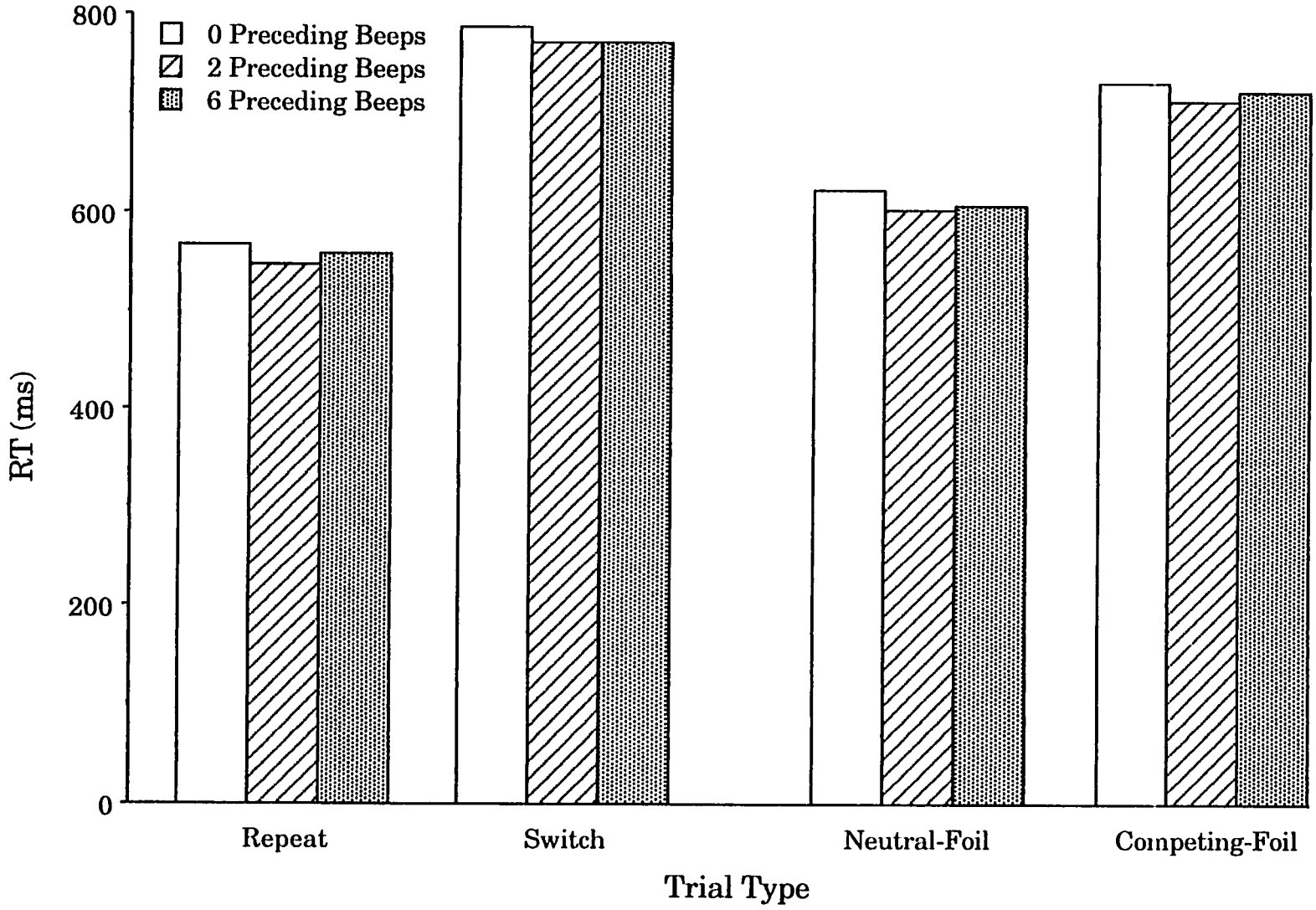


Figure 8. Mean RT (ms) by trial type as a function of the number of feedback beeps played on the preceding trial in Experiment 3. Switch and cue inhibition effects are also evident in the comparisons on the left and right, respectively.

constant, the number of feedback beeps on the preceding trial does not affect the reaction time of the current trial.

While the main effects of switch and cue inhibition previously found with this paradigm again obtained here, the number of preceding beeps did not in any way moderate these effects. This suggests that the number of preceding beeps processed during the interval preceding a switch or competing foil trial does not interfere with preparation for that upcoming trial or add to any working memory load associated with that trial.

These results indicated that it was appropriate to proceed with the differential feedback manipulations during the switch task phase of Experiments 4 and 5. Interpretation of any effects of task incentives obtained in these upcoming experiments could now safely discount the likelihood of contamination by non-motivational processing effects of differential preceding trial feedback.

EXPERIMENT 4

In contrast to Experiment 2, which addressed the impact of prior incentive experience on subsequent performance, Experiment 4 examined the influence of *current* incentives. Current motivation was manipulated by applying differential incentives during the switch task itself, again counterbalancing the high- and low-motivated task assignment across participants. Thus during the switch task, a letter-motivated (LM) group received six points per letter zap and two points per digit zap, and a digit-motivated (DM) group, the reverse. To equate prior motivational experience, all participants received equal four-point incentives for both the letter and digit tasks during training. It was not necessary to include a group receiving equal incentives throughout both training and the switch task here, since this was already done in Experiment 2. The influence of current differential incentives was assessed by comparing performance between the high- and low-motivated tasks on each of the four performance indices: base RT, SW cost, CI cost, and SWCI cost.

Given that participants are receiving differential incentives during performance of the switch task itself, they may be expected to engage explicit, incentive-based strategies in an attempt to maximise their point earnings. Such an explicit strategy may create a stronger effort-driven influence than the implicit bias assumed to operate in Experiment 2. Increased effort, for example, on high-incentive task trials may lead to enhanced performance across all performance indices for the high-motivated task, but would likely

have the greatest impact on trials making the highest demand on cognitive resources (Kahneman, 1973).

I predicted, therefore, a smaller SWCI cost, SW cost and CI cost for the high-incentive than low-incentive task. Since the basic attention costs previously obtained in this paradigm have revealed that attention challenge is greatest on switch/competing-foil trials, followed by switch/neutral-foil trials, and repeat/competing-foil trials, I further predicted that the greatest current-incentive effects would obtain for SWCI cost, followed by SW cost, and lastly by CI cost. Despite the selective effect of prior motivational incentives on attention switching obtained in Experiment 2, given the different process hypothesized to underlie current incentive influences, I did not predict a similar selective effect here. Finally, I expected that current incentives would have the smallest effect, if any, on base RT since performance on these very simple trials is likely to be relatively automatic and benefit little from enhanced effort.

Method

Participants

Participants were randomly assigned to each of two motivation group conditions (LM and DM) until the eight counterbalanced positions required for each group were filled. Any participant who exceeded the maximum error criterion was eliminated from the study and another participant was tested to fill his/her place. For this reason, a total of 24 paid volunteers were tested, from which a final set of 16 participants (4 male, 12 female), aged from 19 to 24 years (M = 21.5 years), were retained for analyses.

Materials

Visual stimuli were identical to Experiments 2 and 3. The immediate auditory reward signal was identical to that used in Experiment 3, with the play time of two, four, and six beep feedback again all equal to approximately 350 ms. Written instructions were modified to reflect the change in incentive structure described below.

Procedure

General experimental set up, administration of the consent form and instructions, subject counterbalancing, and stimulus presentation and response parameters were the same as in Experiments 1 to 3. As in Experiment 2, participants completed the tasks in the context of a computer game during which they earned points for fast and accurate responses. The speed criterion for zaps was also defined and applied in an identical fashion to Experiment 2.

In contrast to Experiment 2, however, differential incentives were applied during the *switch task* phase of Experiment 4, instead of the training phase. During training, all participants earned four points for each letter or digit zap. Throughout the switch task, half the participants earned six points per letter zap and two points per digit zap (letter-motivated, LM group), and half the participants earned the reverse (digit-motivated, DM group). All other procedures concerning expected point earnings per block, immediate and end-of-block error and reward feedback, scheduling and completion of blocks during the training and switch task phases, and so on, were otherwise identical to

Experiment 2. As in Experiment 2, participants concluded testing with the completion of three brief questionnaires on their experience, and were debriefed.

Results

In the switch task data, exclusion of trials on which errors were committed (M = 5.6%), and trials immediately following errors resulted in a loss of 11.1% of experimental trials. As in Experiment 2, the remaining switch task data for each participant were winsorized at the top 10% of data cells defined by the following variables: sequence (1, 2, 3, 4), trial type (switch, repeat), foil (neutral, competing), and task (letter, digit). Data were then aggregated by session (1, 2), trial type, foil, and task. Finally, the LM and DM data were combined into a single data file by recoding the letter and digit tasks as high-motivated or low-motivated tasks. In contrast to Experiment 2, however, task motivation here is defined by the differential incentives applied during the switch task itself.

In the training data, after first excluding the practice block, 10.6% of trials were eliminated due to errors (M = 5.4%), and trials immediately following errors. The remaining training data of each participant were winsorized at the upper 10% of letter and digit trial data cells and aggregated by task (letter, digit).

Basic Attention Effects

As in Experiment 2, the basic switch and cue inhibition effects of this paradigm obtained. The switch task data were subjected to a mixed-design ANOVA with three within-subjects variables of session (Session 1, Session 2),

trial type (switch, repeat), and foil (neutral, competing), and one between-subjects variable of group (LM, DM).

There was a main effect of trial type, F (1, 14) = 24.03, $p < .0005$, MSE = 47,972, and a significant Trial Type x Session interaction, F (1, 14) = 13.14, p = .003, MSE = 4,088. Overall, participants responded more slowly on switch (M = 754 ms) than repeat trials (M = 564 ms), yielding a global switch cost of 190 ms. In addition, this global switch cost decreased with practice from 231 ms in Session 1 to 149 ms in Session 2. Despite this decrease, the simple effect of trial type for Session 2 remained significant, F (1, 14) = 15.66, p = .001, MSE = 22,636. The switch main effect is shown on left side of Figure 9.

There was also a main effect of foil, F (1, 14) = 59.22, $p < .0005$, MSE = 8,599, and a significant Foil x Session interaction, F (1, 14) = 14.23, p = .002, MSE = 1,935. Participants responded more slowly on competing-foil (M = 722 ms) than neutral-foil (M = 596 ms) trials, yielding a global cue inhibition cost of 126 ms. This global cue inhibition cost decreased with practice, from 156 ms in Session 1 to 97 ms in Session 2. Despite this decrease, the simple effect of foil for Session 2 remained significant, F (1, 14) = 61.05, p = .001, MSE = 2,457. The main effect of cue inhibition is shown on right side of Figure 9.

There was no main effect of group, nor did group enter into interaction with any other variables, all Fs < 1.2, indicating that, in terms of the basic attention effects, the LM and DM groups performed in a similar fashion throughout.

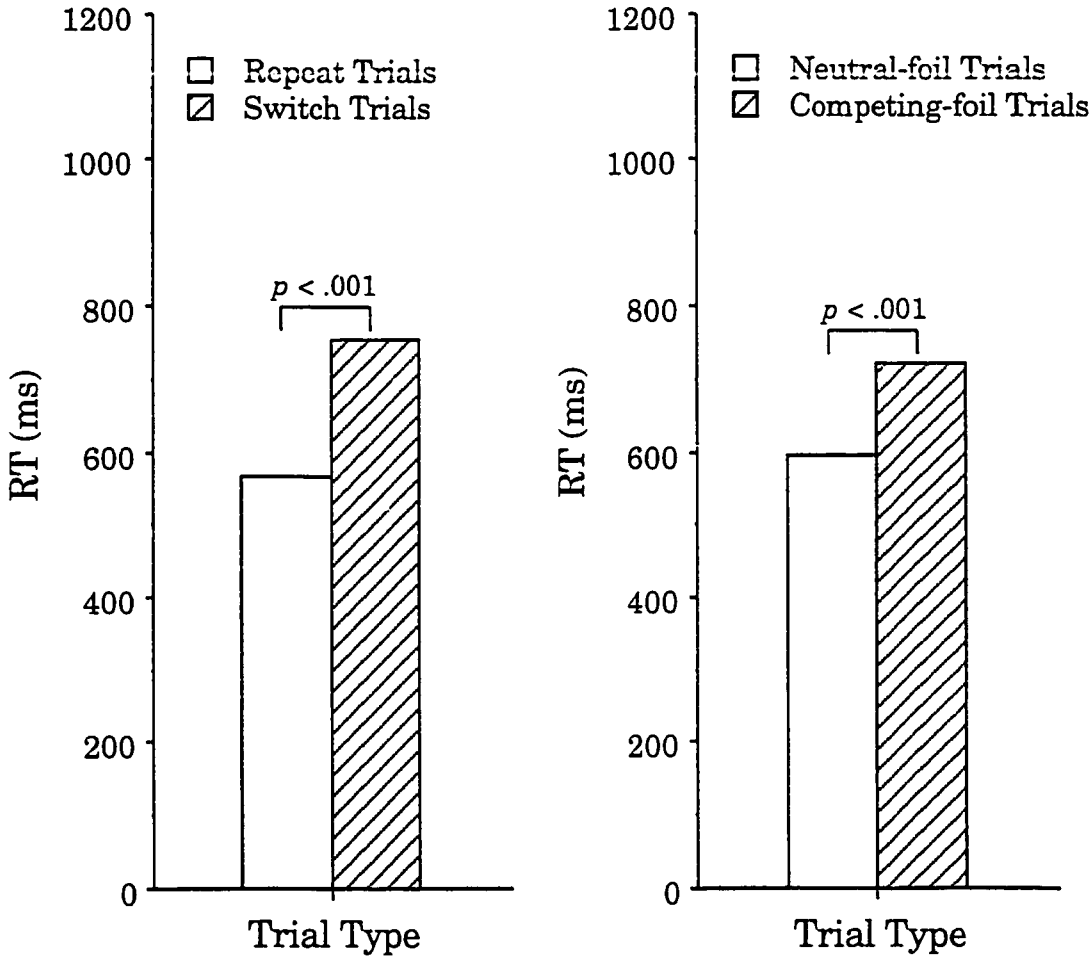


Figure 9. Mean RT (ms) by trial type in Experiment 4. Switch and cue inhibition effects are depicted on the left and right, respectively.

Motivation Effects

Analysis of the training data, during which participants received equal incentives for performance on the letter and digit tasks, revealed a small, but significant, advantage for the letter task in both groups. A mixed-design ANOVA was conducted on the training data with the within-subjects variable of task (letter, digit) and the between-subjects variable of group (LM, DM). A significant main effect of task obtained, $F(1, 14) = 22.71$, $p < .0005$, $MSE = 954$, due to faster responding on letter ($M = 444$ ms) than digit trials ($M = 496$). The Group x Task interaction was not significant, $F < .1$.

The central question concerning the impact of current differential incentives for letter and digit task performance in effect during the switch task itself was examined in four planned analyses of the switch task data. After computing base RT, CI cost, SW cost, and SWCI cost for each participant for the high-motivated and low-motivated tasks, the means for each index were subjected to a 2 x 2 x 2 mixed-design ANOVA with two within-subjects variables of session (Session 1, Session 2) and task motivation (high, low), and the between-subjects variable of group (LM, DM). Table B7 of Appendix B presents the group means of the four performance indices for the high- and low-motivated tasks and for both sessions of the switch task. Mean RT for the four trial types used to compute the cost indices are presented in Table B8 of Appendix B.

Inspection of the means reveals several trends in the data. Mean differences between performance on the high- and low-motivated tasks were negligible in magnitude for both base RT ($M_{diff} = 11$ ms) and CI cost ($M_{diff} = 4$

ms), but were relatively large for both SW cost (M_{diff} = 39 ms) and SWCI cost (M_{diff} = 57 ms). Furthermore, these two costs increased across switch task sessions, during which differential incentives had been applied (SW cost: $M_{Session\ 1}$ = 19 ms, $M_{Session\ 2}$ = 59 ms; SWCI cost: $M_{Session\ 1}$ = 38 ms, $M_{Session\ 2}$ = 76 ms).

However, despite these trends in the means, the four planned ANOVAs revealed that these task motivation differences were not significant for any of the four indices. There was no main effect of task motivation in the analysis of base RT, F (1, 14) = 1.06, p = .320, MSE = 2,033; CI cost, F (1, 14) = .05, p = .826, MSE = 6,239; SW cost, F (1, 14) = .86, p = .369, MSE = 28,274; or SWCI cost, F (1, 14) = 1.18, p = .269, MSE = 44,240. Nor was the Task Motivation x Session interaction significant in either the SW cost analysis, F (1, 14) = 1.21, p = .290, MSE = 5,499, or the SWCI cost analysis, F (1, 14) = .87, p = .365, MSE = 6513. Although these differences were not significant, in order to facilitate comparison with Experiment 2, the mean base RTs for the high- and low-motivated tasks collapsed across session are shown on the left side of Figure 10. Similarly, the right side of Figure 10 shows the mean CI, SW, and SWCI costs for the high- and low-motivated tasks, also collapsed across session.

There was only one significant interaction with group, that of Group x Task Motivation in the base RT analysis, F (1, 14) = 13.34, p = .003, MSE = 2,033. Base RT was *faster* for the high-motivated task (M = 481 ms) than the low-motivated task (M = 533 ms) for the LM group, but was *slower* for the high-

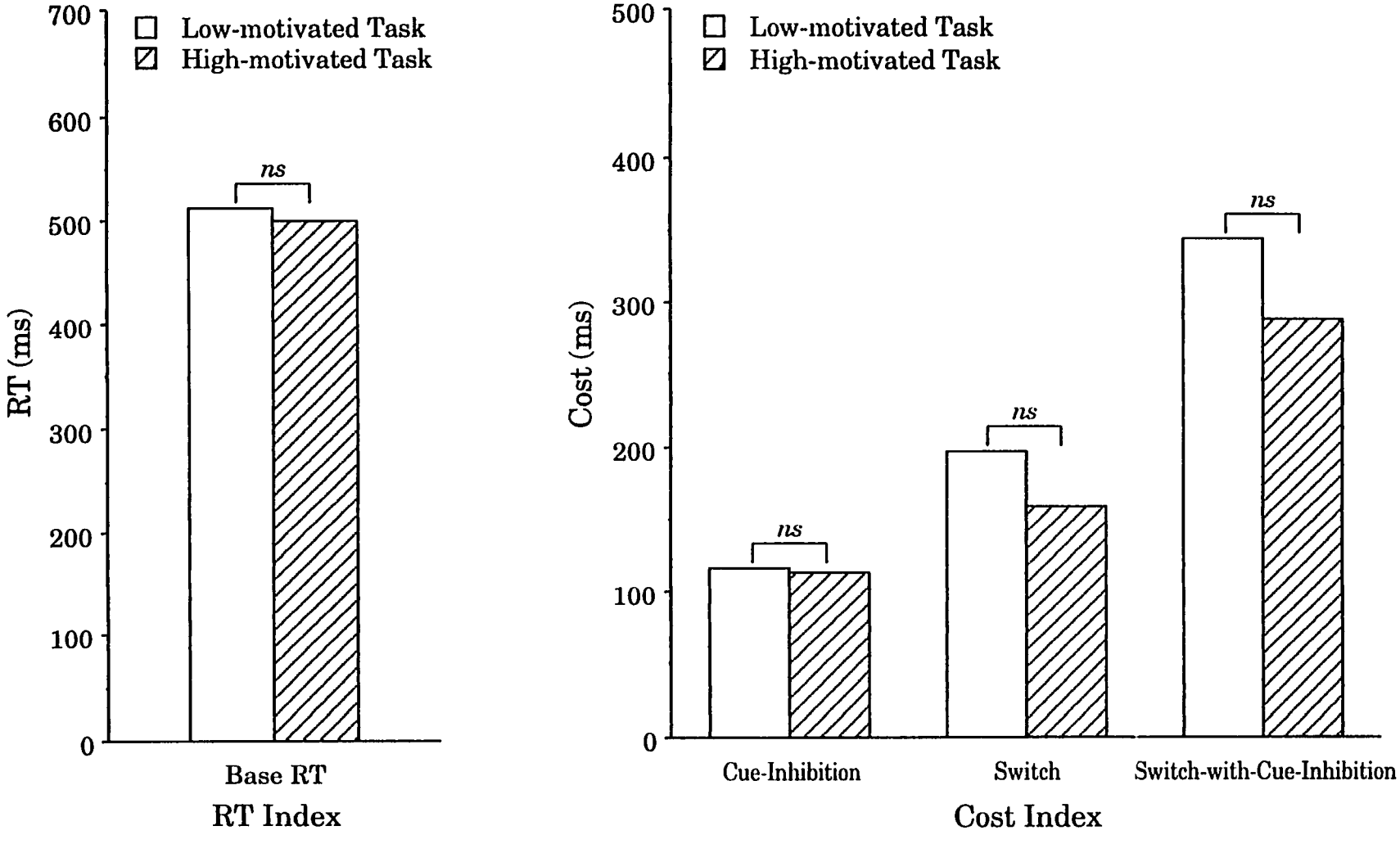


Figure 10. Mean base RT (ms) and costs (ms) by current task motivation in Experiment 4.

motivated task (M = 521 ms) than the low-motivated task (M = 491 ms) for the DM group. Simple effects analyses revealed that the task motivation effect was significant for the LM group, F (1, 7) = 10.96, p = .005, MSE = 2,033, but not the DM group, F (1, 7) = 3.43, p = .085, MSE = 2,033. Finally, there was no main effect of group in any of the performance index analyses, all Fs < .1, indicating that the LM and DM groups performed comparably overall.

Discussion

Experiment 4 again replicated the basic attention effects of this paradigm. However, current incentives evidenced only a nonsignificant trend toward faster switching from the low to the high-motivated task and no trend at all for cue inhibition. Finally, as expected, current motivation did not affect basic performance on repeat/neutral-foil trials.

As in all previous experiments, participants evidenced both significant switch and cue inhibition effects. The magnitude of the switch cost (190 ms, a 34% increase) and the cue inhibition cost (126 ms, a 21% increase) were both large and roughly comparable to previous results.

Examination of current differential incentives on these attention effects yielded no significant differences. The magnitude of the differences for the high- and low-motivated groups on SW cost (39 ms) and SWCI cost (57 ms) were 43% and 24% smaller, respectively, than the magnitude of these costs in Experiment 2, where differential incentives were applied during training and incentives were equal during the switch task itself. In addition, the effect of task motivation on SW cost and SWCI cost was also much more variable in

the present experiment where the *MSE*s were 28,274 and 44,240, respectively, than in Experiment 2 where the corresponding *MSE*s were 4,965 and 8,821, respectively. Thus rather than having a greater effect than prior incentives on performance, current incentives had a smaller and less reliable influence, even on difficult trials where voluntary enhancement of effort would be expected to have the greatest impact.

Despite the failure to reach statistical significance, the motivational trend on switch costs was, importantly, present in both SW and SWCI costs and in both cases increased from Session 1 to Session 2. This provides some evidence of consistency since these two costs are based on separate switch trials, those with and without a competing foil, respectively. Second, these results are in striking contrast to the equally motivated group of Experiment 2, whose SW and SWCI costs were virtually identical for both tasks across both sessions.

As in Experiment 2, there was no evidence of any influence at all on CI cost, again suggesting a somewhat greater sensitivity to motivational biasing in attentional set shifting than inhibition of task set cuing. Again as in Experiment 2, there was no influence of motivation on basic task execution, with participants performing equally well on high- and low-motivated base RT trials.

Two possible influences may have contributed to the absence of a significant motivational effect of current incentives on attention control processes. First, compatible with the notion of a voluntary incentive-based strategy, participants may have been inconsistent in its application. Rather

than an implicit motivational bias developed over multiple experiences with differential letter and digit task values, the effect of motivation here would likely rely much more heavily on explicit control strategies. If participants failed to maintain this strategy across trials, its potential effect would overall be diminished. In addition, increased variability in its application across participants could also have led to less reliable results and a failure to find statistical significance (as indicated by the large *MSE*s for the effect of task motivation on these two indices) despite a relatively large trend for the switch cost indices. Second, because participants received equal task incentives during training, they may have learned to discount the importance of incentive values. This, in turn, may have resulted in reduced attention to the differential incentive values subsequently applied during the switch task, and, therefore, reduced effects on performance. The consistent increase in the magnitude of both SW and SWCI costs from Session 1 to Session 2 suggests that participants may have increased their attention to current incentives and/or their use of an explicit incentive-based strategy over time. These two issues are further explored in the *General Discussion*.

EXPERIMENT 5

Experiment 5 explored the ability of current differential incentives to override the influence of prior incentives. Results of Experiment 2 already indicated that prior experience with differential incentives can have a persistent effect on attentional set shifting despite the presence of equal incentives during the switch task. The shift to equal incentives, however, may not have been strong enough to engage an incentive-based performance strategy during the switch task. Consequently, in Experiment 5, the differential task incentives during training were *reversed* during the switch task. For example, a participant receiving 6 points per letter zap and 2 points per digit zap during training, would receive 2 points per letter zap and 6 points per digit zap during the switch task. Again, task incentives were counterbalanced across participants, and the influence of now *reversed* differential incentives on switch task performance was assessed by comparing performance between the current high-incentive and low-incentive tasks on base RT, SW cost, CI cost, and SWCI cost indices.

As in Experiment 4, I predicted that an intentional incentive-based strategy would be engaged to bias performance in favour of current incentives. Based of the observed increase in the motivational trend observed in SW cost and SWCI cost from Session 1 to Session 2 of Experiment 4, I hypothesized that a voluntary incentive strategy would be applied immediately by participants to override prior incentive influences, but that its effect would increase in consistency and efficiency over time as participants learn the basic performance requirements of the switch task and accrue increasing experience

with the reversed differential incentives. The switch task was extended by two additional sessions in order to test this hypothesis. Finally, I again hypothesized that a voluntary strategy would be most effective on trials requiring the greatest degree of attentional control, and be least influential on relatively automatic performance components.

More specifically, I predicted the greatest influence of current incentives on SWCI cost and SW cost. These two costs were expected to show immediate and increasing biases in favour of current incentives across switch task sessions; that is, smaller costs for the *current* high-incentive than low-incentive task. Given that neither base RT nor CI cost was previously affected by prior or current incentives, I predicted less or no influence on CI cost, and no effect on base RT. Participants were, therefore, expected to have roughly equal CI cost and base RT values for the current high-incentive and low-incentive tasks.

Method

Participants

Participants were randomly assigned to each of two motivation group conditions (LD and DL) until the eight counterbalanced positions required for each group were filled. Any participant who exceeded the maximum error criterion was eliminated from the study and another participant was tested to fill his/her place. For this reason, a total of 21 paid volunteers were tested, from which a final set of 16 participants (4 male, 12 female), aged from 19 to 32 years (M = 23.3 years), were retained for analyses.

Materials

Visual stimuli were again the same as used in Experiments 2 through 4, with the following minor modifications to the creation of the training and switch task blocks. In order to examine motivational influences from early to late in training as experience with differential incentives accrued, an additional block of 48 trials (24 letter and 24 digit) was added to the beginning of training as practice (later discarded in analyses) and the remaining 384 training trials were counterbalanced within each of three sets of 128 trials (rather than across the entire 384 trials as in previous experiments). Within each set, each target occurred equally often with each foil, and in each position (left, right). Because a set of 128 trials does not divide evenly into blocks of 48 trials (24 letter and 24 digit), it was necessary to insert some trials from Set 2 towards the end of Set 1 and just after the beginning of Set 3. However, there was no overlap between Set 1 and Set 3, thereby permitting comparison of motivational influences on performance early and late in training through the analysis of data exclusively from these two sets. As before, target-foil pairs were sequenced in pseudo-random order, with the restriction that no target or foil be repeated on two successive trials.

For the switch task, an additional 16 experimental blocks of 48 trials were created to permit examination of the effects of the now reversed differential incentives extended across two additional switch task sessions. All other aspects, including counterbalancing within each four-block sequence of trials, remained the same as before.

The immediate auditory reward signal was identical to that used in Experiments 3 and 4, with the play time of two, four, and six beep feedback again all equal to approximately 350 ms. Written instructions were modified to reflect the additional blocks and change in incentive structure.

Procedure

General experimental set up, administration of the consent form and instructions, subject counterbalancing, and stimulus presentation and response parameters were the same as in the previous experiments. As in Experiments 2 and 4, participants completed the tasks in the context of a computer game during which they earned points for fast and accurate responses. The speed criterion for zaps was also defined and applied in an identical fashion to Experiments 2 and 4. This time, however, differential incentives were applied during training and then reversed for the switch task.

During training, the LD group received six points per letter zap and two points per digit zap, whereas the DL group received six points per digit zap and two points per letter zap. Throughout the switch task these differential incentives were reversed; thus, what was previously the high-incentive task during training, now became the low-incentive task during the switch task, and vice versa. Specifically, during the switch task, the LD group received six points per digit zap and two points per letter zap, and the DL group received six points per letter zap and two points per digit zap. All other procedures concerning expected point earnings per block, immediate and end-of-block error and reward feedback were otherwise identical to Experiments 2 and 4.

With the additional training block and switch task blocks, testing now lasted approximately one hour and 45 minutes, and was divided into the training phase and four sessions of the switch task. In the training phase, participants completed the practice block followed by eight game blocks, during which the differential incentives were applied. As before, the practice block (during which no rewards were given) was used to establish the RT criteria for earning points during the first of the game blocks, with RT criteria then recalculated after each successive game block.

Participants proceeded immediately to the switch task phase, beginning with the first 96-trial practice block followed by two 4-block experimental sequences of the switch task (Session 1). After a two-minute break, this was followed by another two 4-block sequences (Session 2). After a 10-minute break, participants completed the second 96-trial practice block and another two 4-block sequences (Session 3), again followed by a two-minute break and then the final two 4-block sequences of the switch task (Session 4). As before, the last 48 trials of each of the practice blocks were used to calculate the RT criteria for earning points during the subsequent experimental block, after which the RT criteria were recalculated after each successive experimental block. Finally, as before, participants concluded testing with the completion of three brief questionnaires on their experience, and were debriefed.

Results

In the switch task data, exclusion of trials on which errors were committed (M = 4.9%), and trials immediately following errors resulted in a loss of 9.6% of experimental trials. The remaining switch task data for each participant were winsorized at the top 10% of data cells defined by the following variables: sequence (1 through 8), trial type (switch, repeat), foil (neutral, competing), and task (letter, digit). Data were then aggregated by session (1, 2, 3, 4), trial type, foil, and task. Finally, the LD and DL groups' switch data were combined into a single data file by recoding the letter and digit tasks as high-motivated or low-motivated tasks, where task motivation was defined by the current differential incentives applied during the switch task itself.

To examine the early and late influence of differential incentives applied during training, only the RT data of trials from Sets 1 and 3 were retained for analysis. Of these, exclusion of trials on which errors were committed (M = 5.2%), and trials immediately following errors resulted in a loss of 9.9% of trials. The remaining training data for each participant were winsorized at the top 10% of data cells defined by set (1, 3) and task (letter, digit), and then aggregated by set and task. Finally, the LD and DL groups' training data were again combined into a single data file by recoding the letter and digit tasks as high-motivated or low-motivated tasks, but defined here by the differential incentives in place during training. Thus, in analyses of both the training and switch task phases, it is the effect of the incentives currently in place that determines the designation of high- and low-motivated tasks.

Basic Attention Effects

The switch task data were subjected to a mixed-design ANOVA with three within-subjects variables of session (1, 2, 3, 4), trial type (switch, repeat), and foil (neutral, competing), and one between-subjects variable of group (LD, DL). Again, the basic switch and cue inhibition effects of this paradigm obtained.

There was a main effect of trial type, F (1, 14) = 72.51, $p < .0005$, MSE = 29,937. Overall, participants responded more slowly on switch (M = 730 ms) than repeat trials (M = 546 ms), yielding a global switch cost of 184 ms. This switch main effect is shown on the left side of Figure 11. In addition, a significant Trial Type x Session interaction obtained, F (3, 42) = 12.90, Greenhouse-Geisser Epsilon = .68653, $p < .0005$, MSE = 4,119, due to a decrease in global switch cost across sessions (259, 196, 152, and 129 ms for Sessions 1 to 4, respectively). Despite this decrease, the simple effect of trial type was significant for all sessions, all Fs > 40, $p < .0005$.

There was also a main effect of foil, F (1, 14) = 75.10, $p < .0005$, MSE = 8,293. Participants responded more slowly on competing-foil (M = 688 ms) than neutral-foil (M = 589 ms) trials, yielding a global cue inhibition cost of 99 ms. This cue inhibition effect is shown on the right side of Figure 11. The Foil x Session interaction not significant, F (1, 14) = 2.41, p = .081, MSE = 932, indicating that cue inhibition costs remained roughly constant across sesssions.

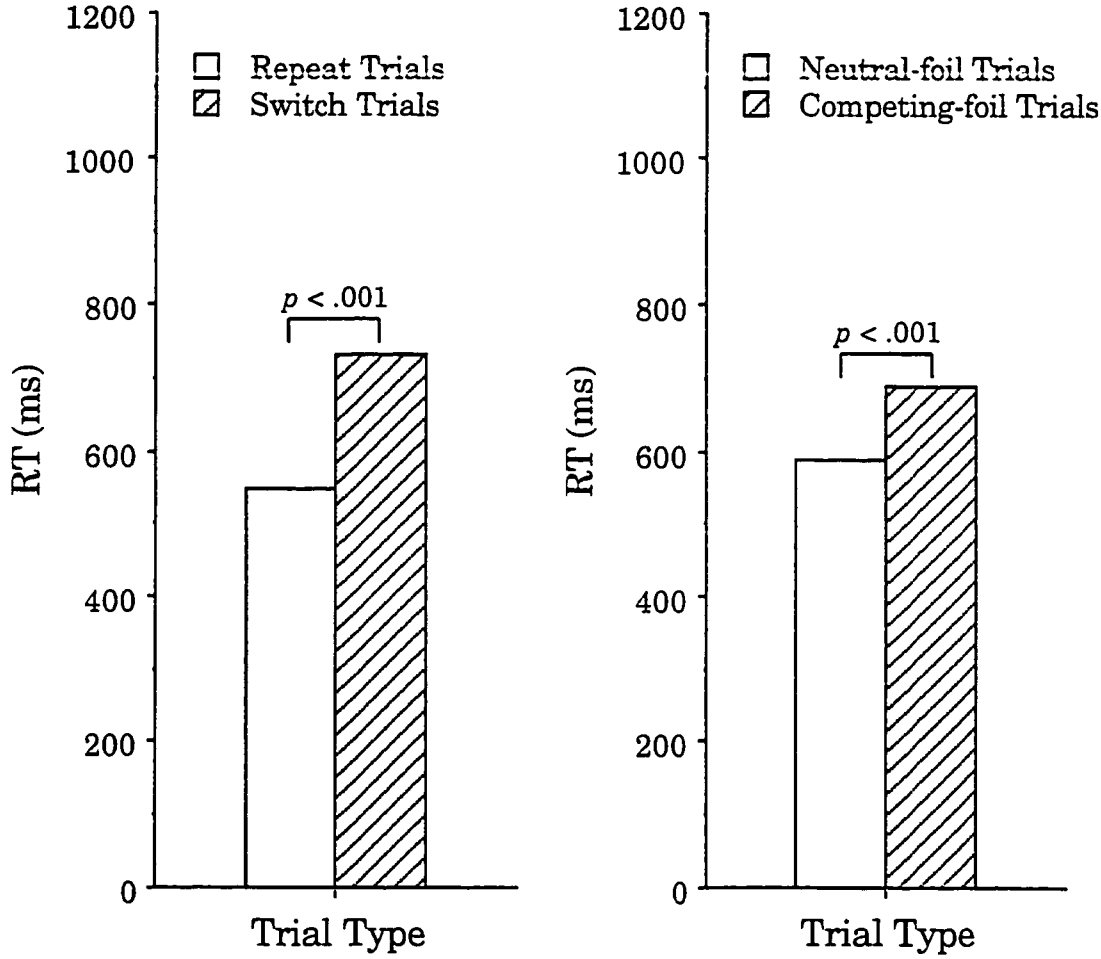


Figure 11. Mean RT (ms) by trial type in Experiment 5. Switch and cue inhibition effects are depicted on the left and right, respectively.

The Trial Type x Foil interaction also was significant, F (1, 14) = 21.36, p < .0005, MSE = 2,373. Switch cost was greater on competing-foil trials (M = 213) than neutral-foil trials (M = 156), but the simple effect of trial type was still significant for neutral-foil trials, F (1, 14) = 51.96, p < .0005, MSE = 14,993. Similarly, cue inhibition cost was greater on switch trials (M = 127) than repeat trials (M = 70), but the simple effect of foil was still significant for repeat trials, F (1, 14) = 80.40, p < .0005, MSE = 1,988.

Finally, as in Experiments 2 and 4, there was no main effect of group, nor did group enter into interaction with any other variables, all Fs < 2.2. This indicates that, in terms of the basic attention effects, the LD and DL groups performed in a similar fashion throughout.

Motivation Effects

To examine the effects of differential incentives in place during training, a 2 x 2 x 2 mixed-design ANOVA was conducted on the training data with two within-subjects variables of set (Set 1, Set 2) and task motivation (high, low), and one between-subjects variable of group (LD, DL). Although no main effect of task motivation obtained, there was a significant Task Motivation x Group interaction, F (1, 14) = 19.61, p = .001, MSE = 969, due to opposite effects of task motivation for LD and DL groups. The LD group responded more *slowly* on low-motivated (M = 510 ms) than high-motivated (M = 492 ms) task trials, but simple effects analysis revealed that this difference was not significant, F (1, 14) = 2.68, p = .124, MSE = 969. In contrast, the DL group responded significantly more *quickly* on low-motivated (M = 493 ms) than high-motivated

(M = 544 ms) task trials, F (1, 14) = 21.40, $p < .0005$, MSE = 969. In effect, during training there was a general advantage for the letter task across both groups, although this advantage was not significant for the LD group. Finally, although there was, not surprisingly, an overall reduction in RT with practice from Set 1 (M = 548 ms) to Set 3 (M = 471 ms), F (1, 14) = 47.29, $p < .0005$, MSE = 2,050, this set effect did not interact with either task motivation or group, all Fs < 2.

To examine the effects of the now reversed differential incentives on performance during the switch task, four planned analyses on the switch task performance indices were conducted. Base RT, CI cost, SW cost, and SWCI cost were first computed for each participant for the high-motivated and low-motivated tasks separately, and then entered into four separate 4 x 2 x 2 mixed-design ANOVAs with two within-subjects variables of session (1, 2, 3, 4) and task motivation (high, low), and one between-subjects variable of group (LD, DL). Table B9 of Appendix B presents the group means of the four performance indices for the high- and low-motivated tasks and for both sessions of the switch task. Mean RT for the four trial types used to compute the cost indices are presented in Table B10 of Appendix B.

Inspection of the means reveals a trend toward faster base RTs and smaller SW and SWCI costs for the currently high-motivated than low-motivated task. However, the four planned ANOVAs revealed that these differences were not significant for any of the four indices. There was no main effect of task motivation in the analysis of base RT, F (1, 14) = 1.42, p = .253, MSE = 63,244; CI cost, F (1, 14) = 2.63, p = .127, MSE = 3,675; SW cost, F (1,

14) = 2.58, p = .130, MSE = 33,595; or SWCI cost, F (1, 14) = 2.20, p = .161, MSE = 45,346. Also, the Task Motivation x Session interaction was not significant in any of the analyses despite observed changes in the magnitude of mean differences across sessions -- particularly for the SWCI cost. To facilitate comparison with Experiments 2 and 4, the mean base RTs for the high- and low-motivated tasks collapsed across session are are shown on the left side of Figure 12. Similarly, the right side of Figure 12 shows the mean CI, SW, and SWCI costs for the high- and low-motivated tasks, also collapsed across session. Finally, it is worth noting that there was no main effect of group in any of the performance index analyses, all Fs < .5, nor did group interact with task motivation, all Fs < 3.3, indicating that the LD and DL groups performed comparably.

Discussion

In addition to again replicating the basic switch and cue inhibition effects of this paradigm, Experiment 5 revealed that reversing the differential incentive values for letter and digit tasks during the switch task could counter, but not reliably reverse the motivational bias of prior task incentive experience. The trend in favour of current incentives was evident immediately on SW cost and SWCI cost indices, but contrary to predictions, it was strongest in Session 2 and then declined in Sessions 3 and 4.

As previously, the robust switch and cue inhibition effects obtained. There was a global switch cost of 184 ms (a 34% increase) and a global cue inhibition cost of 99 ms (a 17% increase), both relatively large and significant.

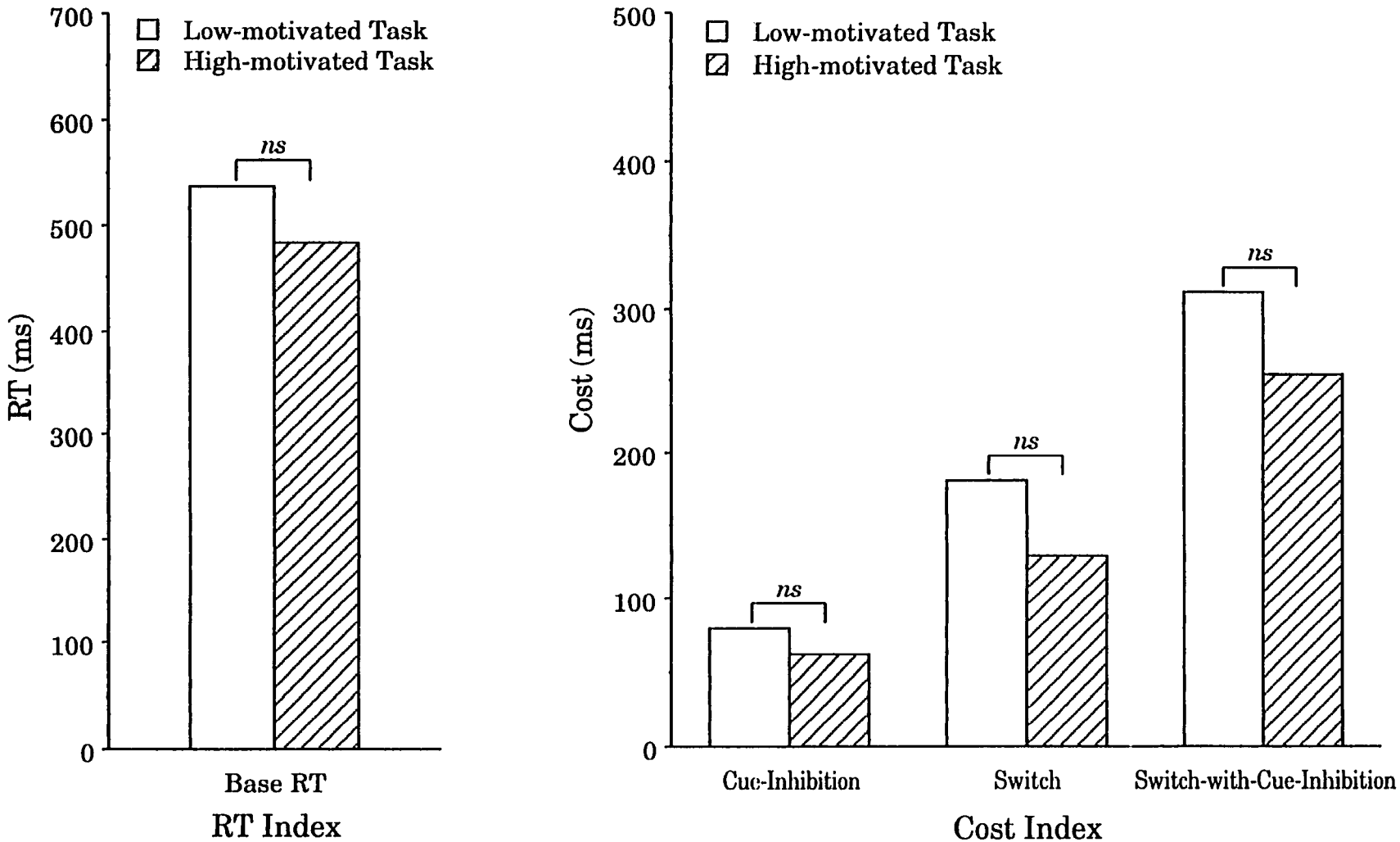


Figure 12. Mean base RT (ms) and costs (ms) by current task motivation in Experiment 5.

Results of the motivational analyses, however, only weakly supported predictions. Current reversed incentives were clearly able to overcome the large and highly reliable effects of prior incentives on SW and SWCI cost obtained in Experiment 2. Moreover, this shift away from prior incentive value biases was evident from the first session of the switch task where the direction of task incentive differences for both SW and SWCI cost favoured the *current* high-incentive task. This suggests that a voluntary strategy based on current incentives could be immediately engaged, in order to at least neutralize the influence of prior incentive experience. Also in line with predictions, the largest magnitude of task incentive differences was observed for SW and SWCI costs, representing the high-demand switch trials.

Contrary to predictions, this current motivation trend for SW and SWCI costs never reached statistical significance and did not consistently increase over time. The largest differences between the current high- and low-incentive tasks on these indices obtained in Session 2, where the differences were 94 ms and 102 ms for SW and SWCI costs, respectively. In contrast to the large and highly significant *prior* motivational effects on SW and SWCI costs in Experiment 2, the large but nonsignificant differences obtained here for *current* incentives are again suggestive of a voluntary incentive-based strategy that was inconsistently applied across participants. This inconsistency across participants is evidenced, as in Experiment 4, by very large *MSE*s for the task motivation effect on SW and SWCI costs -- 33,595 and 45,346, respectively -- as compared to Experiment 2, where the corresponding *MSE*s were only 4,965 and 8,821, respectively.

Somewhat puzzling is the apparent decrease in the magnitude of the current incentives trend for SW and SWCI costs after Session 2. This decrease could in part be accounted for by the corresponding linear decrease in basic switch cost across sessions. However, another factor may have been the adaptive speed criterion for zaps. Recall that this criterion was defined as a RT faster than the 75th percentile RT of comparable trials of the preceding block and was designed to hold the frequency of reward constant across tasks and trial types by computing separate criteria for letter and digit switch and repeat trials. Consequently, participants may have learned after a time that increased effort on the high-incentive task would not result in a consistently greater number of zaps earned, leading to a reduced engagement of this strategy and the maintenance of a small but much diminished benefit on switching performance.

GENERAL DISCUSSION

Three major findings emerged from the present studies. First, it was revealed that motivation can exert a considerable influence on the efficiency of on-line attention control processes. This effect was most clearly illustrated by the results of Experiment 2, where voluntary switching of task set was faster when switching from the low- to high-valued task than vice versa. This finding is particularly noteworthy given the relatively subtle manipulation of motivational value applied in this research. Both tasks were associated with a positive incentive value that differed in magnitude by only four reward points per trial. Moreover, the motivational manipulation was confined solely to the experimental context, involved no monetary reward, and bore no relation to participants' prior experience or future activity outside the laboratory.

Second, task motivation did not simply have a global facilitating influence on performance. Motivational incentives selectively impacted indices of task switching, affecting neither simple task execution nor the resolution of attentional challenge arising from the presence of a competing foil. This selective effect was highly reliable in Experiment 2 for both switch cost (SW cost) and switch-with-cue-inhibition cost (SWCI cost). While the selective effect of differential task motivation on switching was less reliable under the conditions of Experiments 4 and 5 and therefore failed to reach statistical significance, the direction and magnitude of the mean SW cost and SWCI cost differences for the low- and high-motivated tasks are indicative of a consistent trend favouring attention switching from the low- to the high-motivated task.

This is in distinct contrast to the magnitude of the differences between the low- and high-motivated tasks for both base RT and cue inhibition cost, which were negligible in Experiments 2 and 4, and generally quite small in Experiment 5. In addition to providing further support for the distinction between different components of attention, this outcome suggests that motivation can modulate cognitive and attentional processes in a highly selective fashion through specific mechanisms.

Third, motivational experience with the tasks during the initial training phase seemed particularly influential. In Experiment 2, initial experience with differential task incentives introduced a persistent bias during subsequent set switching, during which equal task incentives were in effect. In Experiment 4, following initial experience with equal incentives, the influence of subsequent differential incentives on set switching was limited to a non-significant trend. Finally, differential incentives applied during the switch task in Experiment 5 were able to neutralize, but not reliably overturn participants' prior experience with reversed differential incentive values experienced during the training phase.

I argue, below, that these results do not support the view that prior or current motivational experience directly influenced stimulus-response bonds or task set activation levels. Rather, the findings suggest that *prior* motivational experience acts primarily by adding a bias to endogenous intervention by the supervisory attention system, and that *current* motivational experience may directly influence the supervisory system through adoption of a voluntary strategy that explicitly incorporates incentive values. In neither case did the

motivational manipulations affect the processes implicated in basic task execution or task set cuing by the competing foil since both these processes operate through exogenous triggering, without the intervention of supervisory control.

Motivation Effect as Strengthening of S-R Bonds

From a behavioural reinforcement perspective, motivational incentives may be expected to enhance performance by differentially strengthening the associations between stimuli and their required responses (here, the letter and digit stimuli and their left and right hand responses). Such an explanation, however, is inconsistent with the pattern of results of this research. First, in neither Experiment 2 nor 5 did the differential incentives applied during training affect reaction times on letter and digit task training trials. It is unlikely that this absence of a motivational effect during training was due to insufficient experience with the differential incentives. In Experiment 5, where performance early and late in training was contrasted, motivational incentives did not affect performance even late in training. In fact, across all incentive experiments participants tended to respond during the training phase more quickly on letter task than digit task trials, regardless of whether the letter task incentives were greater, smaller, or equal to digit task incentives. Second, performance during the switch task on repeat/neutral-foil trials (base RT) was similarly unaffected by either prior or current task incentive manipulations. Performance here was approximately equal on letter and digit task trials, regardless of incentives. This again indicated the absence of a direct

motivational effect on simple task processes since these trials involved only basic task execution upon presentation of the stimulus, without any additional attention challenges. Lastly, the pattern of asymmetry in the switch costs here is different from the asymmetry that arises from task dominance or simple strengthening of one task set over the other, suggesting that the motivational bias introduced through incentive manipulations operates via a different mechanism (see below, *Asymmetric Switch Costs and Motivation*).

Motivation Effect as an Intentional Incentive-driven Strategy

From a cognitive strategy perspective, motivational incentives may be expected to enhance performance through the adoption of a rational and explicit, or even implicit, strategy devised to maximise reward gains (Erev & Gopher, 1999). Again, such an explanation cannot account for the entire pattern of current findings. In Experiments 4 and 5, where differential incentives were applied during the switch task itself, intentional strategies may have come into play. Consistent with the notion of *voluntary* engagement of supervisory attention control, following completion of the experiment roughly one third of participants reported that the differential value of letter and digit zaps had affected their strategy, whereas two thirds of participants claimed to have adopted no strategy based on the differential incentive structure and approximately half said they hadn't even paid attention to the difference. Thus, the degree to which an optional, intentional strategy is engaged may be influenced by the perceived importance of incentive value differences. This could account for the increased variability across participants that resulted in

non-significant effects of motivation on task switching in these two experiments, despite rather large differences in the magnitude of SW cost and SWCI cost for the low- and high-incentive tasks.

In Experiment 2, differential incentives were applied during the training phase only, and all participants received equal incentives for the letter and digit tasks during performance of the switch task itself. Consequently, it is highly unlikely that an endogenous strategy favouring one task over the other would have been adopted during the switch task. Interestingly, upon debriefing all participants claimed to have paid no attention to the differential point values during training and cared only about getting as many 'zaps' as possible, regardless of the point-value of the zaps. Indeed, some participants needed to be reminded during debriefing that letter and digit zaps had been differentially rewarded in the training phase. Although these incentive manipulations did go on to have a powerful influence over performance during the subsequent switch task, the evidence points to a non-strategic mechanism.

Motivation Effect as Modulation of SAS Intervention

As discussed above, neither a traditional behavioural reinforcement nor cognitive strategy account can adequately explain the motivational effects obtained in this thesis, especially the highly selective influence of prior motivation on attention switching in Experiment 2. I propose that the motivational bias arising from *prior* differential incentives affected attention switching through modulation of input from the supervisory attentional system (SAS). Such modulation either facilitated or inhibited SAS intervention

during switching, depending on the relative motivational significance of the task sets. In contrast, prior experience with differential task incentives did not influence either base RT or cue inhibition cost since performance in these instances involved exogenous, stimulus-triggered activation of task set, not endogenous control. *Current* motivational incentives (Experiments 4 and 5), however, may have operated through an explicit strategy adopted by the SAS to enhance overall point earnings. When engaged, this additional SAS intervention facilitated switching to the currently more valuable task set and was able to overcome prior incentive biases. The rationale underlying this interpretation follows.

Results from Rogers and Monsell (1995) suggest that the letter and digit task sets acquired during training are triggered automatically upon presentation of a corresponding stimulus. On repeat/neutral-foil trials, only the appropriate task set is triggered and performance proceeds unimpeded since there is little, if any, task set competition (the appropriate task set is already primed and no foil is present to trigger the competing task set). On repeat/competing-foil trials, however, the inappropriate task set is automatically triggered by the foil, causing interference and requiring the resolution of task set competition before the response can be carried out. This competition, or interference, is thought to be responsible for the increase in reaction time observed on competing-foil trials, the cue inhibition cost. Rogers and Monsell argue that this is the same stimulus-triggered activation of task set exhibited by capture errors in normal individuals, and by utilization behaviour observed in patients with frontal lobe damage. In these cases, an

involuntary habitual action is triggered by an environmental stimulus and performed unintentionally due to a momentary lapse of control in normal individuals, and a pathological loss of executive control in patients with frontal lobe damage.

In both capture errors and utilization behaviour, the action undertaken is *not* goal-directed or motivated, and so arguably may well bypass processes that assess the value of an action. Similarly, both performance on repeat/neutral-foil trials and exogenous triggering by a competing foil may automatically engage corresponding task sets. Accordingly, one would expect to obtain a cost due to inappropriate exogenous cuing by the competing foil, but the *magnitude* of the exogenous cuing to be resolved would be identical for both the high-motivated and low-motivated task foils since this exogenous cuing would not be influenced by motivational assessment. This is what obtained in the present series of experiments. As in the traditional Rogers and Monsell paradigm, the presence of a competing foil brought about an increase in reaction time as compared to neutral-foil trials for both the high- and low-motivated tasks. However, motivational manipulations did not affect the magnitude of this difference (the cue inhibition cost) because, I contend, the foil automatically and *equally* triggered the competing task set, irrespective of whether it was associated with the high- or low-motivated task. This argument would also apply to competing foils on switch trials. In Experiment 2, differential incentives led to faster switching to the high-motivated than low-motivated task, but the difference in switch costs was not affected by the motivational value of the competing foil. That is, although switching was

slower overall when a competing foil was present (i.e., SWCI costs were larger than SW costs), the RT increase was roughly identical for both the high- and low-motivated tasks, 134 ms and 141 ms respectively. This provides further evidence of the motivational neutrality of task set triggering by the competing foil.

In contrast to the automatic, stimulus-triggering of task set implicated in both base RT and CI cost indices, most evidence to date (see Introduction) suggests that switching between competing task sets requires context-appropriate, goal-directed control of attention. In addition, there is considerable evidence that this switching process occurs in two stages, an endogenous preparatory stage and a stimulus-triggered implementation stage. According to the Norman and Shallice (1986) model, endogenous preparation would involve the intervention of a supervisory attention system (SAS) that actively raises or lowers schema activation levels in order to bias contention scheduling of task set selection toward meeting current goals. The highly selective impact of motivation only on indices of attention switching suggests that motivational incentives are having a direct modulatory influence either on the operation of the SAS itself, or on the input of the SAS to the lower-level contention scheduling system. One obvious possibility is the incorporation of the incentive value of the goal into explicit performance strategies mediated by the SAS. As argued above, this may well occur in Experiments 4 and 5, where differential incentives during performance of the switch task itself are in effect. However, results of Experiment 2, where differential incentives during training are followed by equal incentives during the switch task, point to an implicit

modulation of the input signal from the supervisory control system to lower-level task set selection processes. The strength of this modulation would depend on motivational outcomes of prior task performance experiences. A possible physiological mechanism for such modulation is presented below in the section *Speculations Regarding Underlying Neural Mechanisms.*

In summary, the present results suggest that acquired motivational biases operate primarily to guide voluntary, context-specific, goal-directed behaviours, and have little, if any, direct influence on habitual, automatised actions. If one views habitual responses, or automaticity, as a form of acquired modularity, it is interesting to note that Fodor (1983) made a similar proposal within a very different theoretical context. He argued that modularized processes enable fast responses because they are encapsulated and hence shielded from top-down influence. Only a limited amount of information needs to be considered and one does not need to decide whether that information is worth processing; one merely computes set transformations on *triggering* data. In contrast, unencapsulated, controlled behaviours such as voluntary attention switching would be open to, and in many situations may benefit from, input regarding the motivational value of a given action choice.

Possible Methodological Influences

Predictability of Switching

An additional factor which could have further influenced the selectivity of motivational effects is predictability of attentional challenge. Specifically, in this paradigm switching is predictable, but the presence of a competing foil is

not. If motivational influences are engaged through expectancies prior to stimulus onset, predictable switching of task set may have enhanced the effect of differential incentive biases. Conversely, the unpredictability of competing-foil trials may have made it difficult for motivational expectancies to come into play. While the present data cannot speak directly to this possibility, the absence of a motivational effect on repeat/neutral-foil trials makes an explanation based purely on predictability less plausible. In Experiment 2, for example, although both switch and repeat trials were equally predictable, a motivational bias obtained for switch trials (819 vs. 735 ms) but not repeat trials (539 vs. 523 ms). At the least, therefore, such an explanation would need to consider the issue of predictability in the context of endogenous intervention processes.

The importance of predictability could be assessed through two different experimental modifications to the present design. First, trials could be structured to make both switching and the presence of a competing foil predictable. This could be accomplished by superimposing upon the current double alternation of letter and digit task trials alternation between a four-trial cycle of neutral-foil trials and a four-trial cycle of competing-foil trials. This would permit investigation of the influence of prior and current incentives on the inhibition of *predictable* task cuing from the competing foil. If, as argued above, motivational biases act primarily through modulation of endogenous control processes, one would predict a motivational effect to the extent that endogenous preparation can facilitate inhibition of a competing foil. However, given that competing-foil trials were always unpredictable in the original

Rogers and Monsell design, the extent to which inhibition of such cuing can be endogenously prepared for has yet to be examined. If task cuing is entirely stimulus-triggered and cannot be prepared for in advance, no effect of motivational incentives would be predicted, even for predictable competing-foil trials.

A second way to investigate the issue of predictability would be to apply differential prior and/or current task incentives within an *unpredictable* switching version of this paradigm. For example, one could cue the required task set by coloured background (see, for example, Rogers et al., 1998) rather than quadrant location (thereby avoiding the introduction of variability due to location unpredictability), and pseudo-randomly vary the occurrence of repeat and switch trials, making the occurrence of a switch trial unpredictable. If, under these conditions, an endogenous preparatory control process is not engaged during task switching, an effect of motivational incentives on switch cost should no longer obtain.

Strength of Motivational Manipulations

The motivational manipulations in the current series of experiments were relatively subtle. The point-based incentives had no impact outside the laboratory and payment for participation was in no way related to the participant's performance or total score. Therefore, it could be argued that stimulus-triggered processes such as those indexed by base RT and CI cost are not immune, but are simply less sensitive, to motivational modulation than are goal-directed processes such as endogenous attention switching. Results from

these experiments clearly cannot rule out the possibility that had more powerful motivational incentives been used, effects on basic task execution and control of inappropriate task-set cuing would have obtained. Such a finding would support a weaker version of the strong interpretation proposed earlier and require a modification of, or addition to, the proposed mechanism(s) by which motivational signals modulate cognitive activity in this task. In particular, it would suggest a potential direct influence of motivation on the lower-level schema activation and selection processes.

Asymmetric Switch Costs and Motivation

Further evidence of the distinct nature of motivational influences on the control of switching comes from comparison of the pattern of asymmetric switch costs in the present studies versus those obtained by Allport and colleagues (Allport & Wylie, 1999; Allport & Wylie, in press; Allport et al., 1994; Wylie & Allport, 1999). In the Allport studies, where task dominance has developed through differential amount or recency of practice with alternative task sets, participants are faster overall and experience less interference from the irrelevant stimulus dimension when performing the dominant task than the nondominant task. They are nevertheless *slower* in switching to the dominant task than in switching to the nondominant task. Allport and colleagues account for this paradoxical asymmetry in switch costs in terms of the strength of the underlying schemata, or stimulus-response set bonds. Thus, for example, switching from the nondominant to the dominant task is slower due to negative priming that results from strong inhibition of this

dominant task schema on the preceding nondominant task trial. Switching to the nondominant task is faster since relatively little inhibition of the nondominant task schema is required on the preceding dominant task trial.

In the present experiments, where experience with differential task incentives could be characterized as producing dominance of the high-motivated task over the low-motivated task, the results are very different from those of Allport and colleagues. Here, participants perform *equally* well in both tasks on the repeat trials and are *equally* slowed in both tasks by the presence of a competing foil. Furthermore, they are *faster* in switching to the dominant (high-motivated) task than in switching to the nondominant (low-motivated) task -- the reverse pattern of asymmetry to that of Allport and colleagues. The type of task dominance created by differential motivational experience therefore appears to operate through different mechanisms than the processes affected by increased practice.

Interestingly, subjective familiarity of alternative task sets was a better predictor of speed of switching in Rubinstein et al. (in press) than was dominance as defined by mean RT in pure task blocks. Similar to the present study, participants were faster to switch from the less familiar to the more familiar task than vice versa. Given the potential influence of motivational or affective factors on subjective ratings, it is possible that similar motivational mechanisms underlie both the Rubinstein et al. findings and those obtained here.

Switching *to* versus Switching *from*

A related issue that arises when considering the source of asymmetric switch costs is whether the asymmetry arises from differential ease in switching *from* the previous trial task set or differential ease in switching *to* the current trial task set. For example, in Experiment 2 subjects may have been faster when switching from the low-motivated task to the high-motivated task than vice versa because it was easier to disengage attention from the low-motivated than high-motivated task set, because it was harder to engage the low-motivated than high-motivated task set, or both.

In the case of task dominance due to differential practice, Allport and Wylie (Allport & Wylie, 1999; Wylie & Allport, 1999) convincingly illustrate through clever experimentation that the pattern of task set activation and inhibition engaged on preceding trials has a very strong impact on current trial performance, particularly in the case of switch trials. Thus, they reason, it is primarily the need to overcome inhibition of the competing task set on the trial *from* which the switch is made that is responsible for asymmetric switch costs. However, as argued above, it is unlikely that differential task schema strength, which presumably underlies the Allport et al. asymmetry effect, would also underlie the motivation-based asymmetry effect obtained in the present research since a reverse pattern of asymmetry, and equal performance in both tasks on repeat neutral-foil and on repeat competing-foil trials was found here. Consequently, disengagement from the preceding-trial task set may or may not play as important a role in the motivation-based effect on switching

obtained here. If indeed disengagement does contribute to motivation-based switch costs, it is probably due to a different process than negative priming.

Rubinstein et al. (in press) found that the task familiarity of both the preceding and current trials contributed independently to the statistical prediction of switch costs. Specifically, it was both easier to switch *from* a less familiar task and to switch *to* a more familiar one. While this analysis may be tapping more subjective influences on attention that are akin to motivation, it remains to be determined whether distinctly motivational influences modulate primarily the disengagement or engagement operations of task set selection.

Employing the Posner cuing paradigm (Posner, 1980; Posner, Snyder, & Davidson, 1980) along with positive and negative incentive and feedback signals, Derryberry (1989) examined the impact of motivation on the engage and disengage components of attention in the visuospatial domain. In the basic version of this paradigm, a target stimulus appears in one of two spatial locations and the subject must press a key as soon as the target is detected. Presentation of the target is preceded by either a valid, invalid, or neutral cue. On neutral trials, the cue provides no information regarding the location of the upcoming target. Performance on these trials serves as a baseline. On valid trials, the target appears at the cued location. The RT difference between valid and neutral trials indexes the benefits of advanced engagement of attention at the cued location. On invalid trials, the target appears at the uncued location. The RT difference between invalid and neutral trials indexes the costs of disengaging attention from the cued location before moving to the actual target location.

In Derryberry (1989), changes in the motivational significance of positive and negative target locations (where points could be gained or lost, respectively) as a function of the need state arising from positive or negative feedback on the previous trial selectively affected cuing costs, but not cuing benefits. For example, following negative feedback participants were slower to disengage from positive than negative locations on invalid cuing trials, but were no faster to engage positive than negative locations on valid cuing trials. If one interprets the effect of negative feedback as increasing the incentive value of potential point gains at positive locations, a similar process may have operated in the present study, where incentive value was instead manipulated by actual incentive magnitude with feedback kept roughly constant for the high- and low-motivated tasks. However, in addition to the obvious differences in motivational manipulations between these two studies, it is important to recognize the difference in attentional mechanisms involved. The Posner cuing paradigm employed by Derryberry is primarily designed to assess visuospatial attention shifting associated with the posterior attention network. In contrast, the paradigm used in this research is designed to assess voluntary attention switching between cognitive task sets associated with the anterior attention network.

Given the proposed differences in neural mechanisms implicated most strongly in each of these paradigms, it would be of great interest to adapt the Posner cuing paradigm to examine directly the effect of motivation on disengage and engage components of switching between task sets. Rather than cuing location, advance cues would validly or invalidly cue the upcoming task

set. The costs and benefits as a function of the differential motivational significance of the task sets could be used as a measure of motivational influences on engage and disengage operations. Such an adaptation without motivational manipulations has already been employed to examine the control of task set switching in Parkinson's patients (Hsieh, Hwang, Tsai, & Tsai, 1996) and shows promise for use with incentive applications.

Prior versus Current Incentive Effects on Performance

As previously discussed, results of this thesis revealed that prior incentive experience during training had a relatively large, reliable, and persistent effect on subsequent performance. In Experiment 2, following 384 trials of training with differential point incentives for letter and digit task performance, a motivational bias on task switching favouring the previously high-incentive task persisted throughout an additional 768 trials in which equal incentives for the letter and digit task were in effect. Moreover, this motivational effect did not reliably decline as a function of exposure to equal incentives. Thus, the change in incentive structure to equal task incentives during the switch task seemed unable to modify the initial bias created by differential task values. This seemingly implicit influence of prior motivational experience selectively and persistently affected the efficiency of voluntary attention switching by speeding switching to the previously high-incentive task or slowing switching to the previously low-incentive task. In contrast, when participants received equal task incentives throughout both the training and

switch task phases, there was no difference between switching performance on the letter and digit tasks.

In Experiment 4, where prior experience during training with equal task incentives was followed by differential task incentives during the switch task, there was an immediate trend favouring switching to the now high-incentive task and the magnitude of that trend grew from Session 1 to Session 2 of the switch task. However, in contrast to the reliable influence of prior motivational experience in Experiment 2, current motivational incentives failed to produce a reliable effect on performance in Experiment 4. As argued earlier, this suggests that a different motivational mechanism was underlying the trend observed in this experiment, specifically, an explicit, voluntary, and optional strategy that can be immediately deployed, rather than an implicit motivational influence accrued through extended experience. As a result of initial exposure to equal incentives, the default pattern of equal switching between tasks would dominate performance unless an endogenous strategy were engaged to favour the now high-incentive task. If this optional strategy were applied inconsistently, current motivational effects on attention switching between tasks would then fail to reach significance.

A similar effect obtained in Experiment 5, where following prior experience with differential incentives during training, an immediate trend in favour of current incentives was observed. Again, the immediate and highly unreliable influence of current incentives may be explained by the engagement of an explicit, endogenous strategy that was inconsistently applied leading to variability both within and across subjects.

While the engagement of an optional endogenous strategy may be a plausible explanation of the differential reliability of prior and current motivational incentives on performance, it cannot account for why the presumably more reliable implicit motivational mechanism failed to adjust to the change in task values applied during the 768 trials of the switch task in Experiments 2 and 4 and the 1536 trials of the extended switch task in Experiment 5. One possibility consistent with results across all three experiments is that initial task incentive exposure is particularly resistant to revision, but without an underlying theoretical rationale this is hardly more than a restatement of the results. Rather, it could be argued that the overall attentional demands of the training and switch task phases of these experiments may have contributed to the persistence of the initial motivational values associated with the letter and digit tasks. Research on latent inhibition, the slowing of associative learning following nonreinforced stimulus preexposure, suggests that attention processes may mediate the learning of reward contingencies (Redgrave, Prescott, & Gurney, 1999b; Weiner, 1990). In terms of the present experiments, the additional attention demands of the switch task, in contrast to the relatively easy performance demands during training, may have reduced the allocation of attentional resources to the relative point values of letter and digit zaps. As a consequence, greater tuning of the motivational significance of the letter and digit tasks would take place during the training phase and tend to persist through performance of the switch task. In contrast to the implicit motivational mechanism, the incorporation of current motivational incentives

into an explicit strategy may not be similarly affected. Here, incentive influences would be mediated by cognitive strategies, as another source of information to guide performance, rather than by an implicit mechanism that acquires task value through experience.

The effect of differential attention demands of training and switch task phases on *implicit* learning of motivational significance would apply equally to all three incentive-manipulation experiments, but may have been additionally amplified in Experiments 2 and 4. In Experiment 2, the equal value of incentives during the switch task may have further reduced the salience of these current task values, thereby resulting in still slower learning and influence of current incentives on the proposed implicit motivational mechanism, and continued influence of prior motivational experience on task switching. In Experiment 4, attentional allocation to current differential incentives may also have been further dampened through a process akin to latent inhibition or learned irrelevance. In both these phenomena, learning of new reinforcement contingencies is slowed due to preexposure during which an animal learns to ignore a stimulus required in the later learning environment. During training, participants may have learned to attend to the occurrence of immediate auditory feedback following zaps (responses for which points were earned), while ignoring the number of beeps making up that signal since both letter and digit zaps were equally signalled by a series of four beeps. Thus, the mechanism underlying implicit motivational influences may have been resistant to revision not only due to increased attentional demands of the switch task itself, but also because they had learned to ignore the relative

value of letter and digit zaps since this was largely irrelevant during the initial training phase.

To summarize, this interpretation is based on several assumptions, notably: 1) motivational effects on attention switching can be mediated by either an implicit motivational mechanism or an explicit strategy; 2) motivational significance is acquired by the implicit motivational mechanism through extended experience, whereas an explicit strategy to maximize point gains can be immediately formulated and engaged; 3) some attentional resources need to be allocated to the value of letter and digit zaps during performance in order for the implicit motivational mechanism to benefit from experience; 4) the influence of an explicit strategy is highly variable since it requires controlled, explicit engagement; and 5) the disposition of the implicit motivational mechanism will act as a default unless overridden by an explicit strategy that incorporates the current task incentive values.

At present, this interpretation is clearly speculative, but suggests a number of follow-up experiments. For example, the need to allocate attentional resources to processing of auditory reward feedback in order for the postulated implicit mechanism to acquire task values could be tested in a modification of Experiment 2. Participants would first undergo training and the switch task as currently designed, with differential incentives during training and equal incentives during the switch task. Following this, participants would receive a second round of "training" (i.e., blocked task trials) in which incentive manipulations are reversed, again followed by a switch task phase with equal incentives. Presumably, experience under the relatively simple task demands

of the blocked training task would leave sufficient attentional resources for processing the differential task feedback and permit new learning by the mechanism mediating implicit influences of motivational value on performance. This, in turn, would lead to the opposite pattern of incentive values on subsequent task switching from that obtained following initial training. Second, the influence of learned irrelevance of task point values could be examined by assigning another group of participants to equal incentives during both the initial training and switch task phases, followed by the same second round of differential training and equal switch task incentive described above. If initial exposure to equal incentives leads participants to ignore subsequent differential task values, the effect of the second round of training with differential incentives on subsequent task switching should be attenuated. Importantly, in both these experiments the application of explicit incentive-based strategies during the switch task would be minimized since both the letter and digit tasks would at that time be assigned equal incentives.

Speculations Regarding Underlying Neural Mechanisms

Converging evidence from studies of neuropsychological patients (e.g., Hayes, Davidson, Keele, & Rafal, 1998; Rogers et al., 1998) and animal-based neurophysiological research (e.g., Masterman & Cummings, 1997; Mink, 1996; Redgrave, Prescott, & Gurney, 1999a; Watanabe, 1998) suggests that both the frontal cortex and the basal ganglia are implicated in task switching and the integration of the behavioural and motivational significance of tasks. More specifically, the planning and preparation phase of task switching appears

most closely associated with the executive control functions of the frontal cortex and is impaired in patients with frontal lobe damage, whereas the implementation phase appears to be related to competitive striatal action control and is impaired in patients with Parkinson's disease (PD), a progressive neurological disease associated with striatal dopamine depletion (Hayes et al., 1998).

Proposed Mechanisms Underlying Task Set Switching

In a modified version of the Rogers and Monsell (1995) predictable switching paradigm used in the present research, Rogers et al. (1998) found impaired switching early in performance in both left and right frontal lobe patients. Persistent switching deficits on switch trials with a competing foil present in left frontal lobe patients indicated that the left frontal cortex continued to play a role in the control of set switching, even late in performance. In contrast, Parkinson's patients were unimpaired early in switching, but showed increasing errors on switch trials over time, leading Rogers et al. to propose that striatal dopamine depletion results in progressive behavioural inflexibility and the inability to implement task set reconfiguration signals initiated by the frontal cortex.

Stablum, Leonardi, Mazzoldi, Umiltà, and Morra (1994) compared performance of patients with severe closed head injury (CHI) affecting the frontal cortex on both predictable and unpredictable switching with unidimensional stimuli. In the predictable condition, where advanced preparation was possible, switch costs were three times greater in CHI

patients than normal controls. However in the unpredictable condition, where switching could be completely stimulus-triggered, the mean switch cost of CHI patients was equal to that of normal controls. This again suggested that the executive, preparatory component of attention switching is impaired in frontal lobe patients, whereas automatic, stimulus-triggered switching is spared.

Finally, Hayes, Davidson, Keele, and Rafal (1998), in a study of unpredictable task set switching with univalent and bivalent stimuli found that Parkinson patients were slower both in switching between tasks and in inhibiting task set cuing from the currently irrelevant task dimension of bivalent stimuli. Interestingly, Parkinson patients have been found to perform normally in Posner's spatial cuing paradigm (Rafal, Posner, Walker, & Friedrich, 1984), providing further evidence of the distinction between the mechanisms underlying visuospatial shifting of attention (posterior network) and those underlying task set switching (frontal cortex and basal ganglia).

Importantly, the frontal lobes and the basal ganglia are densely interconnected via highly structured, parallel circuits (Alexander & Crutcher, 1990; Alexander, Crutcher, & DeLong, 1990; Chow & Cummings, 1999; Masterman & Cummings, 1997) that project from specific areas of the frontal cortex to the striatum, to the globus palidus and substantia nigra, to the thalamus, and then back to the same originating regions of the frontal cortex. Five such circuits have been identified (each named for the area of the frontal cortex from which it projects). These circuits subserve specific functions and remaining largely segregated throughout cortical and subcortical regions. Three of these circuits, projecting from areas of the prefrontal cortex, may play an

essential role in coordinating activity between preparatory and implementation phases of attentional set switching, and in mediating motivational influences on performance.

The dorsolateral circuit is closely implicated in the executive control of behaviour. Dorsolateral regions of the prefrontal cortex are associated, in part, with working memory functions that permit the integration and manipulation of information in the service of goal-directed behaviour. Damage to this circuit is characterized by impairments in planning, memory search strategies and task set switching, and by increased dependency on environmentally-triggered behaviour. The anterior cingulate circuit, with its converging projections from the 'limbic' regions, is closely associated with motivational and emotional behaviour, and lesions within this system are marked by apathy and impaired initiation of behaviour (either motor or cognitive). The orbitofrontal circuit, in addition to mediating the inhibition of socially inappropriate behaviour, is implicated in the recognition of reinforcing stimuli and modulation of behaviour as a function of changing reinforcement contingencies. Dysfunction in this circuit can also lead to difficulty in set switching and is believed to underlie obsessive-compulsive disorder (Chow & Cummings, 1999).

An important feature within each of these circuits is their further subdivision into direct and indirect pathways from the striatum to the globus palidus. The direct pathway has a net excitatory effect on behavioural output, whereas the indirect pathway has a net inhibitory effect on behaviour. It is the opposition of these two pathways that is hypothesized to permit striatal gating of competing motor and cognitive programs (Mink, 1996), and thus may serve

a contention scheduling function in the coordination of excitatory and inhibitory links between competing schemata (Norman & Shallice, 1986). The frontostriatal projections may further provide the physiological mechanism by which the supervisory attention system exerts an endogenous bias on the selection of action schemata. More direct physiological evidence comes from single cell recording within the basal ganglia-thalamic circuits of Parkinson's patients by Kropotov and Etlinger (1999), who observed selective neuronal firing patterns consistent with the involvement of the basal ganglia in coordinating task set selection and attention switching. In addition, basal ganglia activity increased in amplitude when a stimulus was actively attended and during voluntary control of behaviour, providing further evidence of the involvement of these circuits during goal-directed action.

The Role of Dopamine in Behavioural Switching and Motivation

Dopaminergic neurotransmission is broadly associated with the activation of cognitive or motor behaviour and has been closely implicated in both attention switching and motivation, as well as working memory. Originating in the ventral tegmental and substantia nigra cell bodies located in the brain stem, dopaminergic cells project widely, via three subsystems, to the frontal cortex (mesocortical), the limbic regions (mesolimbic), and the basal ganglia (mesostriatal), and are integral to the normal functioning of frontostriatal circuits. Redgrave, Prescott, and Gurney (1999a) recently proposed that tonic changes in dopamine (DA) transmission may be associated with a general increase or decrease in the responsiveness of striatal-mediated

behavioural switching, and phasic changes with triggering the interruption and switching of on-going behaviour in response to behaviourally or motivationally salient stimuli.

Consistent with this proposal, an increase in tonic levels of DA has been found to facilitate behavioural switching, whereas depletion of DA suppresses both initiation and switching of behaviour (Dunnett & Robbins, 1992). It is a decrease in tonic striatal DA levels that is believed to underlie the set switching deficits in Parkinson's disease patients, as demonstrated, for example, by Hayes et al. (1998) through comparison of set switching performance in patients both on and off L-Dopa medication.

Single cell recordings in awake monkeys (Schultz, 1998; Schultz, Tremblay, & Hollerman, 1998) have revealed that a brief phasic increase in the firing rate of dopaminergic cells immediately follows delivery of unpredicted rewards. After learning, these phasic responses transfer to the earliest reward-predicting stimulus, and no change in the rate of firing occurs upon actual presentation of the reward unless it is better than predicted (phasic increase) or worse than predicted (phasic decrease). These findings led Shultz and colleagues to conclude that phasic dopamine responses act as a global error signal in the prediction of reward. However, given that DA neurons also fire in response to novel stimuli and respond before foveal identification of the stimulus can take place, Redgrave et al. (1999b) argued that phasic DA bursts may instead act as an imperative signal to switch attentional and behavioural responses to stimuli of potential significance.

Of particular relevance here, dopaminergic projections from the substantia nigra pars compacta terminate on the same striatal neurons that receive prefrontal cortical input in such a fashion as to permit highly selective modulation of incoming cortical signals (Masterman & Cummings, 1997; Mink, 1996). In addition, descending projections from the anterior cingulate and limbic regions to the substantia nigra pars compacta (SNpc) may further allow motivational information mediated by the anterior cingulate circuit to influence, through its modulation of SNpc DA activity, the cognitive and motor inputs of the other largely segregated frontal-subcortical circuits (Masterman & Cummings, 1997).

Returning now to the results of this thesis, these dopaminergic inputs to the striatum may be one mechanism by which the acquired motivational value of letter and digit task sets could modulate supervisory control system input to lower-level task set selection processes during attentional set switching. This mechanism would not require that the motivational significance of letter and digit task sets be explicitly represented in working memory, but rather would afford an implicit influence of motivation acquired through prior experience with differential task incentives. The implication of dopamine in both behavioural switching and motivation may also relate to the observed sensitivity of switching processes to the motivational manipulations applied in the current paradigm.

Finally, it should be noted that dopaminergic cells are not the only neurons that selectively respond to reward-related information. For example, Kimura (1997) found that during the course of conditional learning, an

increasing proportion of tonically active striatal neurons develop a pause in their tonic firing upon presentation of reward-predictive stimuli, a response he argues is initially conditioned by dopaminergic inputs to the striatum. It is not clear, however, what selective role these neurons might play in task switching and why such a conditioned response would not also have affected both basic task execution and the strength of inappropriately-triggered task set cuing in the present study.

Watanabe (1998; 2000) has identified reward- and reinforcement-related neurons in both the orbital and lateral regions of the prefrontal cortex. However, only neurons in the lateral prefrontal cortex also coded the behavioural demands associated with reward (for example whether a reward is associated with a go or no-go response) and the correctness of the response regardless of the receipt of a reward. Given that the lateral prefrontal cortex receives projections from both the orbitofrontal and posterior cortex and has numerous neurons related to sustained cognitive representations (working memory-related neurons), Watanabe suggested that this region may play a critical role in integrating both motivational and cognitive information in the service of goal-directed behaviour. Perhaps it is this motivation-related activity in the lateral prefrontal cortext that mediated the explicit representation and influence of motivational incentives on task switching in Experiments 4 and 5 of the present thesis.

These proposed underlying neurophysiological mechanisms are obviously highly speculative at this point, but could be explored through single cell recording in a primate version of the present paradigm. One important

difference between such a study and the present human study would be the more central role of motivational reinforcement in the primate acquisition of the basic response pairings and switch task. In the present study, participants received detailed verbal instructions explaining both the task to be performed and the incentive values of the competing task sets. Therefore, reward feedback following zaps served as an additional incentive in the performance of the task, but was not essential in mediating the learning of the task *per se*.

While it is ethically impossible to explore these proposed underlying mechanisms through single cell recording in humans, advances in noninvasive brain imaging techniques have greatly enhanced the ability to study ongoing human brain activity. One such method, dense array (e.g., 128-channel) recording of event-related brain electrical potentials (ERP), now affords millisecond temporal resolution along with much improved source localization (Gevins, 1998; Gevins, Leong, Smith, Le, & Du, 1995; Tucker, Liotti, Potts, Russell, & Posner, 1994). Using dense array ERP methods along with filtering techniques, Luu and Tucker (1999) recently recorded the presence of oscillating electrical brain activity in centromedial and frontal cortex most suggestive of reverberant activation of frontal-subcortical circuits from striatal gating of response set competition. If, as proposed here, task incentives modulate striatal task set selection processes, then these motivational effects should be revealed in changes to this oscillatory activity. This methodology would not permit the detailed analysis afforded by single cell recordings and would be limited to inferred subcortical activity based on cortical recordings, but may present an initial strategy for investigating motivational modulation of

frontal-subcortical circuit activity in normally-functioning humans. In addition, one might look for changes in unfiltered, non-oscillatory prefrontal cortex activity correlated with current differential task incentive values reflective of explicit coding of motivational significance.

Another approach would be to investigate the performance of various neuropsychological patients on this motivational adaptation of the task switching paradigm. For example, would Parkinson's patients, who suffer from tonic depletion of striatal dopamine levels, also evidence reduced sensitivity to motivational signals mediated by phasic dopaminergic activity? One might also explore whether patients with damage to the ventromedial prefrontal cortex, who were unable to develop biasing signals based on prior rewards and penalties in the gambling task developed by Bechara and colleagues (Bechara et al., 1995; Bechara et al., 1997; Bechara et al., 1996), would also show reduced effects of differential incentives on task switching in the present paradigm.

Implications for Skill Development and Performance

The experiments conducted here begin to address basic issues related to the motivational modulation of attention control processes during performance of a complex task. As stated in the introduction, one of the long-term objectives of this programme of research is to develop better approaches to enhancing learning and performance. While further research is clearly required, preliminary consideration of at least some potential implications of the present findings for skill development will be briefly explored in this section.

First, the strong impact of initial motivational experience on attention switching obtained in this study indicates that early skill learning experiences may be particularly important in determining not only the likelihood of future engagement in a task, but also the *quality* of attentional processing during that future engagement. Findings revealed that the ease of attention switching between component tasks can be affected by differential task incentive values developed by the individual through prior performance outcomes. Thus, early patterns of success on various subcomponents of complex tasks may help shape a learner's attention during subsequent engagement. This suggests that, in addition to providing cognitive instruction during training, it may be important to enhance a learner's perceived value of key task components.

The persistence of early experience evidenced in the present research also points to the limitations of attention control mechanisms in overriding acquired motivational biases. On the whole, results suggest that voluntary attention control mechanisms can prevail over prior motivational dispositions, but only at a cost in efficiency and reliability of performance. In Experiment 1, participants were slower to intentionally switch to a previously low-incentive task, and in Experiments 4 and 5, participants appeared inconsistent in their ability to overcome prior motivational experience through voluntary strategies. Such findings may be related to the experience of performance blocks which prove resistant to revision by control strategies.

Finally, the experiential dynamics of skill acquisition and performance studied by Csikszentmihalyi and colleagues (Csikszentmihalyi & Rathunde, 1993; Csikszentmihalyi et al., 1993) fit well with the interpretation forwarded

in this thesis; namely, that acquired motivational biases serve primarily to guide voluntary, goal-directed behaviour and have little or no effect on automatized behaviour. Initial learning and performance is typically directed by explicit goals and instructions with few motivational cues to guide attention and action. Not surprisingly, such performance is often choppy and unsatisfying. Csikszentmihalyi and colleagues have found that once acquired skills are able to meet the challenges of the task, performers may begin to experience "flow" -- a phenomenological state characterized by feelings of intense involvement, effortless control of attention and action, intrinsic motivation, and positive affect. The underlying mechanisms linking these descriptive features of flow states have yet to be elucidated, but the results of this thesis suggest an intriguing possibility. It may be during such a flow state that performance is accompanied by acquired motivational signals that appropriately guide and reinforce attentional switching among component actions and their corresponding stimuli. Such signals would enhance both the fluidity of performance and the perception of a state of flow. Importantly, it is the fluidity of *control* processing during goal-directed performance that appears to be essential to the experience of flow. The fluidity of automatized action, present when an individual's skills surpass the challenge level of the task, instead engenders feelings of boredom or apathy. Thus, consistent with the present study, motivational and affective signals appear to accompany goal-directed activity, but not lower-level, automatized action. Csikszentmihalyi and colleagues (1993) argue that it is the desire to continue experiencing flow and avoid boredom that drives learners to seek increasingly

complex challenges and skills and advance to ever higher levels of achievement. Thus, motivational and affective modulation of attention and performance may play an important role in facilitating both the quality and progress of skill acquisition.

Future Directions

The results of the present set of experiments raise numerous issues and avenues for further investigation, some of which were explored in greater detail earlier in this section. Perhaps the most intriguing outcome of this study was the dissociation between motivational influences on control of attentional set switching versus basic task execution and inhibition of task set cuing. It was proposed that this may represent a broader underlying sensitivity of executive attention control processes to motivational signals, which presumably serve to guide the direction of attention during goal-directed behaviour. Automatic, stimulus-triggered behaviours, in contrast, appear relatively insensitive to motivational input. In the paradigm employed here, the primary goal toward which control processes were engaged was task-set switching. Future research could explore whether other attention control functions show similar sensitivity to motivational biases by employing paradigms whose behavioural goals emphasize different control processes. Also of great interest, and now facilitated by recent advances in cognitive neuroscience and neuroimaging techniques, would be the exploration of the underlying neural mechanisms speculatively proposed above.

Another major question that arises from these findings concerns the source of the reaction time difference between high- and low-motivated task switches. As discussed earlier, it would be useful to determine whether the motivationally-based differences in switch costs are due to difficulty in switching away from a high-valued task or to ease of switching to a high-valued task. In other words, is it the holding power or the attracting power of the high-motivated task that is primarily responsible for differential ease of switching? Such detailed analysis should shed further light on the mechanisms by which motivation affects attention processes.

Finally, the present experiments were limited to the study of positive incentives on performance. Given the important role also played by negative incentives in guiding behaviour, this research should be extended to investigate the influence of negative motivational stimuli on attention control, and the impact of both positive and negative feedback on motivation and attention.

To conclude, cognitive psychologists, through carefully controlled experimentation, have revealed many insights into the operation of attention control processes during performance. As illustrated by the present research, these paradigms can be fruitfully employed to examine on-line modulation of attentional processes by motivational and affective factors. Continued exploration into the close interaction between both cognitive and non-cognitive determinants of performance holds considerable promise for further advancements in our understanding of human learning.

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APPENDIX A

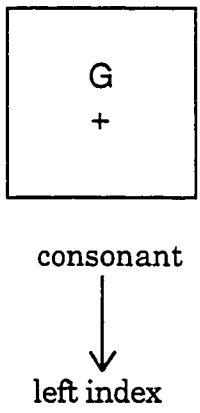
Sample of Instructions from Experiment 1

Training Instructions

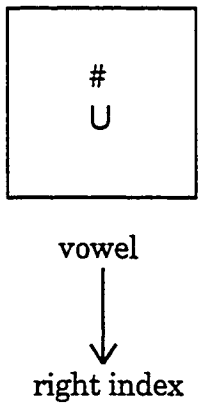
In a moment you will be shown a pair of characters in the centre of a square on the computer screen. Each character pair will be made up of either a symbol (#, +, &, %) and a letter, or a symbol and a digit.

For the **letter task**, you are to indicate if the letter is a consonant (G, K, M, R) or a vowel (A, E, I, U) while ignoring the other character. If the letter is a consonant, press the "<--" key with your left index finger. If the letter is a vowel, press the "-->" key with your right index finger.

Example 1:

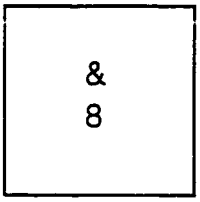


Example 2:



For the **digit task**, you are to indicate if the digit is even (2, 4, 6, 8) or odd (3, 5, 7, 9) while ignoring the other character. If the digit is even, press the "<--" key with your left index finger. If the digit is odd, press the "-->" key with your right index finger.

Example 1:

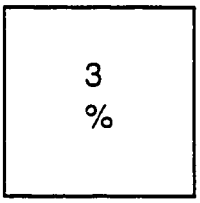


even

↓

left index

Example 2:



odd

↓

right index

You will alternate between 8 blocks of trials of the letter task and 8 blocks of trials of the digit task, with each block lasting about 2 minutes, for an approximate total of 30 minutes.

Please respond as quickly as possible without sacrificing accuracy. To ensure that you can respond quickly, please keep your fingers resting lightly on the keys at all times.

Do you have any questions?

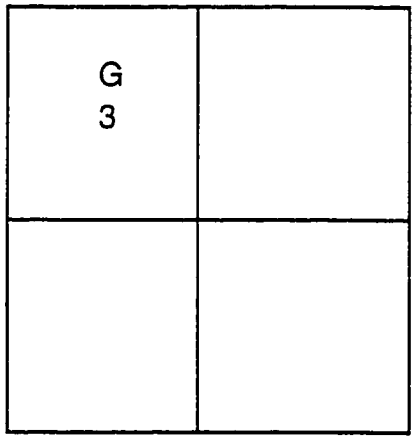
You may press any key to begin.

Instructions

In this part of the experiment, you will be shown a pair of characters in one of four quadrants on the computer screen. Each character pair will be made up of one of the following combinations: **either** a symbol (#, +, &, %) and a letter, **OR** a symbol and a digit, **OR** a letter and a digit. On successive trials, the position of the character pair will move clockwise to the next quadrant.

When the character pair is in either of the **two top quadrants**, you are to perform the **letter task**. As in training, you are to indicate if the letter is a consonant (G, K, M, R) or a vowel (A, E, I, U) while ignoring the other character. If the letter is a consonant, press the "<--" key with your **left** index finger. If the letter is a vowel, press the "-->" key with your **right** index finger.

Example1:

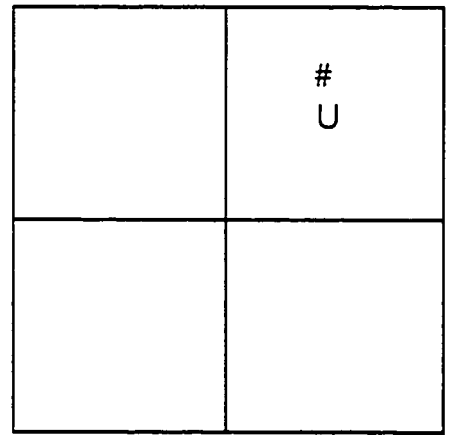


consonant

↓

left index

Example2:



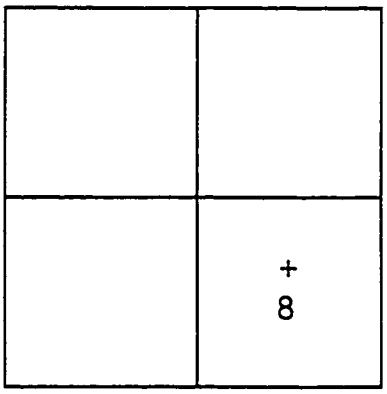
vowel

↓

right index

When the character pair is in either of the **two bottom quadrants**, you are to perform the **digit task**. As in training, you are to indicate if the digit is even (2, 4, 6, 8) or odd (3, 5, 7, 9) while ignoring the other character. If the digit is even, press the "<--" key with your **left** index finger. If the digit is odd, press the "-->" key with your **right** index finger.

Example 1:

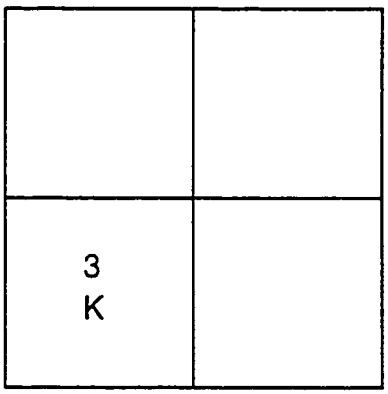


even

↓

left index

Example 2:



odd

↓

right index

Please respond as quickly as possible without sacrificing accuracy. To ensure that you can respond quickly, please keep your fingers resting lightly on the keys at all times.

Do you have any questions?

You may press any key to begin.

APPENDIX B

Tables of Mean RTs and Cost Indices for Experiments 1 through 5

Table B1

Mean RT (ms) and Costs (ms) by Tasks and Switch Task Session in Experiment 1 (N = 8)

	Session 1			Session 2			Average		
Trial Type/Cost	Letter task	Digit task	*M*	Letter task	Digit task	*M*	Letter task	Digit task	*M*
Switch	1011	1021	1016	782	779	780	897	900	898
Repeat	714	671	693	609	592	601	662	632	647
Switch Cost	297	350	323	173	187	179	235	268	251
Competing-foil	900	886	893	740	721	730	820	803	811
Congruent	921	878	899	761	725	743	841	801	821
Incongruent	879	893	886	718	716	717	799	804	801
Neutral-foil	789	767	778	608	615	612	699	691	695
Cue Inhibition Cost	111	119	115	132	106	118	121	112	116

Note. Apparent minor discrepancies in mean values are due to rounding.

Table B2

Mean Base RT (ms) and Costs (ms) by Prior Task Motivation and Switch Task Session for Differentially Motivated Participants in Experiment 2 (N = 16)

	Session 1			Session 2			Average		
Index	Low[a]	High[b]	L - H[c]	Low	High	L - H	Low	High	L - H
Base RT	574	546	28	504	500	4	539	523	16
CI Cost	77	112	-35	80	79	1	79	96	-17
SW Cost	358	265	93	203	159	44	280	212	68
SWCI Cost	469	404	65	372	287	85	421	346	75

Note. Apparent minor discrepancies in mean values are due to rounding.

[a] Low-motivated task trials (2 points/zap during training). [b] High-motivated task trials (6 points/zap during training).

[c] Difference between low-motivated and high-motivated task trials.

Table B3

Mean RT (ms) by Trial Type, Prior Task Motivation and Switch Task Session for Differentially Motivated Participants in Experiment 2 (N = 16)

	Session 1			Session 2			Average		
Trial Type[a]	Low[b]	High[c]	L - H[d]	Low	High	L - H	Low	High	L - H
Rep/NeutF	574	546	28	504	500	4	539	523	16
Rep/CompF	652	658	-6	584	658	-74	618	658	-40
Sw/NeutF	932	811	122	706	659	47	819	735	84
SW/CompF	1043	949	94	876	788	88	960	869	91

Note. Apparent minor discrepancies in mean values are due to rounding.

[a] Rep = Repeat; Sw = Switch; NeutF = Neutral Foil; CompF = Competing Foil. [b] Low-motivated task trials (2 points/zap during training). [c] High-motivated task trials (6 points/zap during training). [d] Difference between low-motivated and high-motivated task trials.

Table B4

Mean Base RT (ms) and Costs (ms) by Task and Switch Task Session for Equally Motivated Participants in Experiment 2 (N = 8)

	Session 1			Session 2			Average		
Index	Letter task	Digit task	L - D[a]	Letter task	Digit task	L - D	Letter task	Digit task	L - D
Base RT	535	500	35	466	461	5	501	481	20
CI Cost	91	104	-13	70	55	15	80	79	1
SW Cost	239	238	1	124	141	-17	182	190	-8
SWCI Cost	369	352	17	201	243	-42	285	298	-13

Note. Apparent minor discrepancies in mean values are due to rounding.

[a] Difference between letter and digit task trials.

Table B5

Mean RT by Trial Type, Task and Switch Task Session for Equally Motivated Participants in Experiment 2 (N = 8)

	Session 1			Session 2			Average		
Trial Type[a]	Letter task	Digit task	L - D[b]	Letter task	Digit task	L - D	Letter task	Digit task	L - D
Rep/NeutF	535	500	35	466	461	5	501	481	20
Rep/CompF	626	604	22	536	516	20	581	460	21
Sw/NeutF	774	738	36	590	602	-12	683	671	12
SW/CompF	904	852	52	667	704	-37	786	779	7

Note. Apparent minor discrepancies in mean values are due to rounding.

[a] Rep = Repeat; Sw = Switch; NeutF = Neutral Foil; CompF = Competing Foil. [b] Difference between letter and digit task trials.

Table B6

Mean RT (ms) by Trial Type, Task and Switch Task Session in Experiment 3 (N = 8)

	Number of preceding-trial feedback beeps		
Trial Type	0	2	6
Repeat/Neutral-foil	519	504	510
Repeat/Competing-foil	612	587	605
Switch/Neutral-foil	726	702	706
Switch/Competing-foil	847	837	836

Table B7

Mean Base RT (ms) and Costs (ms) by Current Task Motivation and Switch Task Session in Experiment 4 (N = 16)

	Session 1			Session 2			Average		
Index	Low[a]	High[b]	L - H[c]	Low	High	L - H	Low	High	L - H
Base RT	541	525	16	484	476	8	512	501	11
CI Cost	149	142	7	85	84	1	117	113	4
SW Cost	230	211	19	166	107	59	198	159	39
SWCI Cost	405	367	38	284	208	76	344	287	57

Note. Apparent minor discrepancies in mean values are due to rounding.

[a] Low-motivated task trials (2 points/zap during switch task). [b] High-motivated task trials (6 points/zap during switch task). [c] Difference between low-motivated and high-motivated task trials.

Table B8

Mean RT (ms) by Trial Type, Current Task Motivation and Switch Task Session in Experiment 4 (N = 16)

	Session 1			Session 2			Average		
Trial Type[a]	Low[b]	High[c]	L - H[d]	Low	High	L - H	Low	High	L - H
Rep/NeutF	541	525	16	484	476	8	512	501	11
Rep/CompF	690	667	23	568	560	9	629	613	16
Sw/NeutF	771	737	34	650	582	67	710	660	51
SW/CompF	946	892	54	767	684	84	857	788	69

Note. Apparent minor discrepancies in mean values are due to rounding.

[a] Rep = Repeat; Sw = Switch; NeutF = Neutral Foil; CompF = Competing Foil. [b] Low-motivated task trials (2 points/zap during switch task). [c] High-motivated task trials (6 points/zap during switch task). [d] Difference between low-motivated and high-motivated task trials.

Table B9

Mean Base RT (ms) and Costs (ms) by Current Task Motivation and Switch Task Session in Experiment 5 (N = 16)

	Session 1			Session 2			Session 3			Session 4			Average		
Index	L[a]	H[b]	L-H[c]	L	H	L-H	L	H	L-H	L	H	L-H	L	H	L-H
Base RT	568	533	35	535	494	41	501	456	45	547	455	92	537	484	53
CI Cost	94	92	1	86	54	32	71	61	10	65	40	25	79	62	17
SW Cost	262	212	50	225	131	94	143	100	43	98	77	21	182	130	52
SWCI Cost	392	359	33	336	234	102	267	229	38	248	197	51	311	255	56

Note. Apparent minor discrepancies in mean values are due to rounding.

[a] Current low-motivated task trials (6 points/zap during training; 2 points/zap during switch task). [b] Current high-motivated task trials (2 points/zap during training; 6 points/zap during switch task). [c] Difference between low-motivated and high-motivated task trials.

Table B10

Mean RT (ms) by Trial Type, Current Task Motivation and Switch Task Session in Experiment 5 (N = 16)

	Session 1			Session 2			Session 3			Session 4			Average		
Trial Type[a]	L[b]	H[c]	L-H[d]	L	H	L-H	L	H	L-H	L	H	L-H	L	H	L-H
Rep/NeutF	568	533	35	535	494	41	501	456	45	547	455	92	537	484	53
Rep/CompF	662	625	36	621	548	73	572	517	55	612	495	117	616	546	70
Sw/NeutF	830	745	85	760	625	135	643	556	87	645	532	113	719	614	105
Sw/CompF	959	892	67	871	728	143	767	685	82	795	652	143	848	739	109

Note. Apparent minor discrepancies in mean values are due to rounding.

[a] Rep = Repeat; Sw = Switch; NeutF = Neutral Foil; CompF = Competing Foil. [b] Current low-motivated task trials (6 points/zap during training; 2 points/zap during switch task). [c] Current high-motivated task trials (2 points/zap during training; 6 points/zap during switch task). [d] Difference between low-motivated and high-motivated task trials.

APPENDIX C

Sample of Instructions from Experiment 2

General Instructions

In the following experiment you will be asked to play a computer game involving simple letter and digit judgments.

The object of the game is to win as many points as possible by responding quickly and accurately to the stimuli presented. A good player is expected to score in the 100-120 point range.

There are two parts to this game. Part 1 should take about 15 minutes to complete. Part 2 lasts about 45 minutes. You will be given a short break approximately every 15 minutes.

Please take your time reading the instructions for both parts of the experiment. It is important to follow the procedures as indicated.

At the end of the game you will be asked to complete two brief questionnaires about your experience.

Thanks! You may now proceed to the instructions for Part 1.

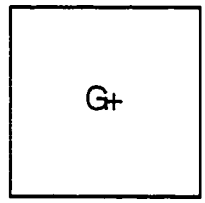
Instructions: Part 1

In a moment you will be shown a pair of characters in the centre of a square on the computer screen. Each character pair will be made up of either a symbol (#, +, &, %) and a letter, or a symbol and a digit.

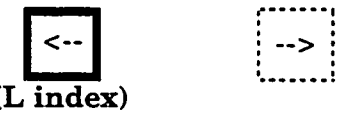
For the **letter task**, you are to indicate if the letter is a consonant (G, K, M, R) or a vowel (A, E, I, U) while ignoring the other character.

If the letter is a **consonant**, press the "<--" key with your **left** index finger.
If the letter is a **vowel**, press the "-->" key with your **right** index finger.

Example 1

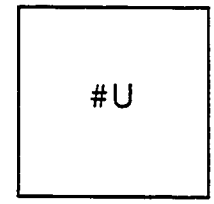


(consonant)



(L index)

Example 2



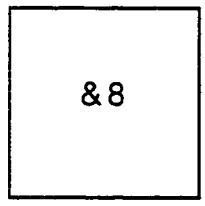
(vowel)

(R index)

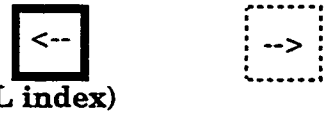
For the **digit task**, you are to indicate if the digit is even (2, 4, 6, 8) or odd (3, 5, 7, 9) while ignoring the other character.

If the digit is **even**, press the "<--" key with your **left** index finger.
If the digit is **odd**, press the "-->" key with your **right** index finger.

Example 1

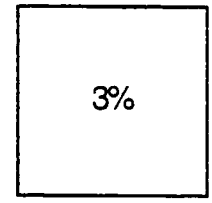


(even)



(L index)

Example 2



(odd)

(R index)

TASK SUMMARY CHART

	(left) <--	(right) -->
letter task:	consonant	vowel
digit task:	even	odd

POINTS

You will complete 8 blocks of trials, each consisting of a sequence of 24 letter trials followed by a sequence of 24 digit trials, or vice-versa.

After the first block of trials (a practice block), you will earn points for every response that is both CORRECT and FAST. These correct and fast responses are called zaps.

LETTER zaps will earn you 6 points each.
DIGIT zaps will earn you 2 points each.

Two or ***six*** beeps will sound each time you succeed in making a zap, indicating the number of points you have earned on that trial. If your response is CORRECT, but too SLOW, ***no*** points will be gained and you will hear ***no*** beeps.

If you make an INCORRECT response, you will hear a "boing" and will be given extra time to prepare for the next trial. ***Please try to make as few errors as possible.*** If you make fewer than 5 errors on a given block, a bonus of 10 points will be added to your total score for that block.

At the end of each block, you will receive a summary of your performance. Please record the number of points you earned on letter and digit zaps, your total number of errors, and your total score on the form provided and give it to the experimenter at the end of Part 1.

Note that this is a difficult task for which the challenge level is adjusted at the end of each block. ***A good player is expected to score in the 100-120 point range on each block.***

TIP: To ensure that you can respond quickly, keep your fingers resting lightly on the keys at all times!

Do you have any questions? You may press any key to begin. ***Good Luck!!***

Instructions: Part 2

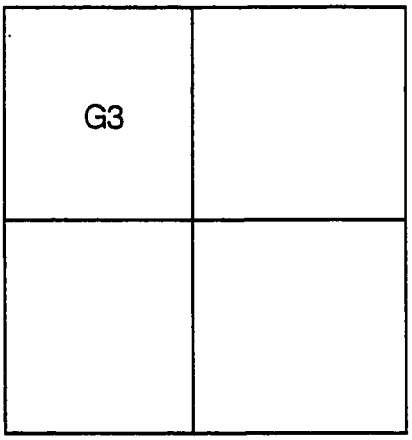
In Part 2, you will be shown a pair of characters in one of four quadrants on the computer screen. Each character pair will be made up of one of the following combinations: **either** a symbol (#, +, &, %) and a letter, **or** a symbol and a digit, **or a letter and a digit**. On successive trials, the position of the character pair will move clockwise to the next quadrant.

When the character pair is in either of the **two top quadrants**, you are to perform the **letter task**. As in Part 1, you are to indicate if the letter is a consonant (G, K, M, R) or a vowel (A, E, I, U) while ignoring the other character.

If the letter is a **consonant**, press the "<--" key with your **left** index finger.

If the letter is a **vowel**, press the "-->" key with your **right** index finger.

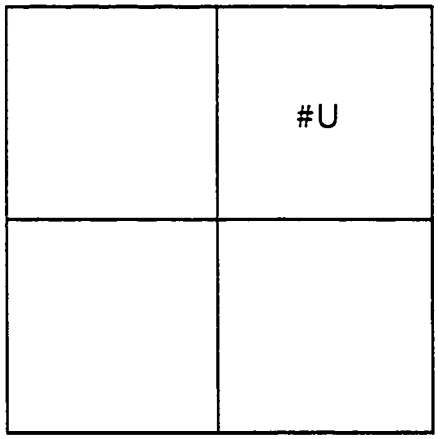
Example 1



(consonant)

(L index)

Example 2



(vowel)

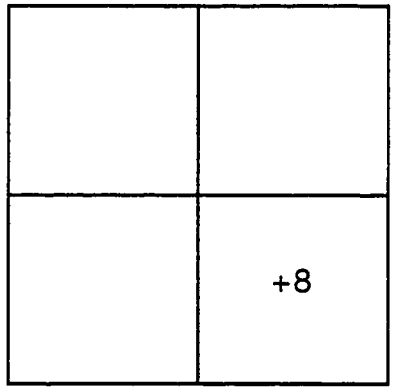
(R index)

When the character pair is in either of the **two bottom quadrants**, you are to perform the **digit task**. As in Part 1, you are to indicate if the digit is even (2, 4, 6, 8) or odd (3, 5, 7, 9) while ignoring the other character.

If the digit is **even**, press the "<--" key with your **left** index finger.

If the digit is **odd**, press the "-->" key with your **right** index finger.

Example 1



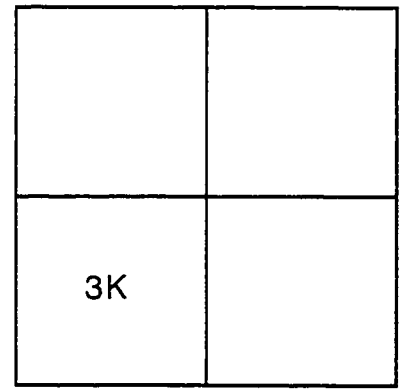
(even)

<--

-->

(L index)

Example 2



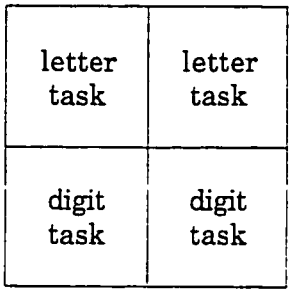
(odd)

<--

-->

(R index)

TASK SUMMARY CHART



	(left) <--	(right) -->
letter task:	consonant	vowel
digit task:	even	odd

POINTS

Part 2 is divided into two identical sections separated by a 10 minute break. Each section begins with a practice block of trials. This is followed by 8 game blocks during which you will earn points for every response that is both CORRECT and FAST. These correct and fast responses are called zaps.

Performance on both letter and digit responses will be of EQUAL worth.

Specifically: - **LETTER zaps** will earn you **4 points** each.

- **DIGIT zaps** will earn you **4 points** each.

Four beeps will sound each time you succeed in making a zap, indicating the number of points you have earned on that trial. If your response is CORRECT, but too SLOW, ***no*** points will be gained and you will hear ***no*** beeps.

If you make an INCORRECT response, you will hear a "boing" and will be given extra time to prepare for the next trial. ***Please try to make as few errors as possible.*** If you make fewer than 5 errors on a given block, a bonus of 10 points will be added to your total score for that block.

At the end of each block, you will receive a summary of your performance. Please record the number of points you earned on letter and digit zaps, your total number of errors, and your total score at the end of each block on the form provided and give it to the experimenter at the end of the experiment.

Note that this is a difficult task for which the challenge level is adjusted at the end of each block. ***A good player is expected to score in the 100-120 point range on each block.***

TIP: To ensure that you can respond quickly, keep your fingers resting lightly on the keys at all times.

Do you have any questions? You may press any key to begin. ***Good Luck!!***

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Understanding adolescent antisocial behaviour from attachment theory and coercion theory perspectives

Kirsten Voss

A Thesis

in

The Department

of

Psychology

Presented in Partial Fulfilment of the Requirements
for the Degree of Doctor of Philosophy at
Concordia University
Montreal, Quebec, Canada

August, 1999

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This is to certify that the thesis prepared

By: **KIRSTEN VOSS**

Entitled: **Understanding Adolescent Antisocial Behaviour from Attachment Theory and Coercion Theory Perspectives**

and submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY (Psychology)

complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the final examining committee:

Dr. D. Murphy — Chair

Dr. L. Pagani — External Examiner

Dr. V. Mann-Feder — External-to-Program

Dr. A. Schwartzman — Examiner

Dr. P. Seraganian — Examiner

Dr. D. Markiewicz — Thesis Supervisor

Approved by _____
Chair of Department or Graduate Program Director

October 25 1999

_____
Dean of Faculty

Understanding adolescent antisocial behaviour from
attachment theory and coercion theory perspectives

Kirsten Voss, Ph.D.
Concordia University, 1999

This study examined adolescent antisocial behaviour from two theoretical perspectives: attachment and coercion theories. Adolescents (N = 662, mean age: 15.8 years) completed measures of coping styles, attachment styles and coercive interactions (with mother and father), and rated their parents' use of hostile punishment and parental monitoring. They also reported involvement in delinquent activity and drug use, and sexual attitudes and behaviours.

According to attachment theory, insecurity may be related to behavioral maladjustment directly, or indirectly through dysfunctional ways of coping. Consistent with this view, two forms of insecure attachment (dismissing and fearful) were directly associated with more delinquency, experimentation with more drugs, and using drugs in response to strong emotions. Dismissing attachment was also related to riskier sexual attitudes. However, coping style did not mediate the attachment-antisocial behaviour link. Nonetheless, attachment styles were differentially related to ways of coping with stress. Secure teens used more constructive coping and less unhealthy strategies. Those who were more dismissing or preoccupied used more emotion avoidance, and those who were more fearful tended to be self-critical and to withdraw emotionally and behaviorally. A non-significant trend between fearful attachment and angry confrontation was also found.

According to coercion theory, ineffective parenting contributes to adolescent antisocial behaviour indirectly, through association with deviant peers. Consistent with

this model, results from structural equation modeling showed that teens who are monitored more associate with less deviant peers, and engage in less antisocial activity. Those whose parents use hostile punishment are more antisocial.

The combination of both theoretical perspectives, using path analysis, allowed a more complete understanding of adolescent antisocial behaviour. Insecure attachment was indirectly related to delinquency and substance use, through a contentious home environment (characterized by hostile punishment, coercive interactions, and poor monitoring). The link between insecure attachment with father and antisocial outcomes was also mediated by more frequent coercive interactions and teens' use of more angry confrontation. These findings highlight the relevance of considering both affective and social learning processes for understanding adolescent risk behaviour.

Acknowledgements

This project could not have been completed without the support and assistance of many significant individuals. I would like to begin by thanking the students who participated in the research. Because of your help, we now have a better understanding of what it is like to be a teenager during the 1990s. Your genuineness will be invaluable for helping others who experience difficulty during adolescence. I would also like to express my gratitude to the principals and teachers who made this work possible. I am particularly grateful to Dr. Gardner and Mrs. Barry, who were instrumental in helping this project run smoothly.

I would especially like to thank Dorothy Markiewicz, my supervisor, for her support, encouragement, and assistance over the years. Dorothy, I am very happy that you took me on as a graduate student. You have guided me and allowed me to pursue my own interests, which I have greatly appreciated. I have admired your positive attitude toward life and work, and your strength in times of challenge. Thank you.

I am also grateful to Anna-Beth Doyle for her help and constructive criticism. Anna-Beth, even though it was never official, you have essentially been a co-supervisor to me. The time you have given to me over the years has been greatly appreciated. I have learned a lot from you.

I would also like to thank Drs. Alex Schwartzman and Pete Seraganian - my committee members. Your comments have helped strengthen my dissertation, and given me many new things to think about. A special thank you to Bill Bukowski too, who went beyond the call of duty to give me pointers on structural equation modeling. Thanks also

to Dr. Linda Pagani, the external examiner, whose comments will be very useful when I write up the manuscript for publication.

Thanks to all my friends at Concordia, who knew what I was going through and helped me through it all. Thanks to mom and dad, and my brother Bruce, who believed in me and supported me all the way. And thanks to my spouse, Eric, who managed to put up with me through it all!

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Understanding adolescent antisocial behaviour from attachment theory and coercion theory perspectives

Interpersonal relationships play an important role in social-emotional development from the earliest stages of life and, in many ways, come to shape how individuals face life's challenges. Adolescence is considered to be a tumultuous and somewhat stressful period during which numerous physical, intellectual, and emotional changes take place (Peterson, Kennedy, & Sullivan, 1991). It is also a time when individuals face a variety of developmental challenges, including the difficult task of developing autonomy while maintaining connections with others. In order to successfully manage these various challenges, adolescents need effective emotion regulation skills and coping abilities. It is likely that development of such skills depends in part on the quality of adolescents' relationships with significant others and the learning experiences acquired in these relationships.

Adolescence is a time of exploration and discovery during which children attempt to further develop their own identities, and to experience themselves as distinct and independent individuals (Cooper, Grotevant, & Condon, 1983). A large number of adolescents test limits and experiment with risky behaviours, perhaps as a way of achieving status (Moffitt, 1993). For some, involvement in antisocial behaviour is limited, however for others, it is more problematic.

This study examines involvement in antisocial behaviour from two theoretical standpoints: attachment theory (Bowlby, 1969, 1973, 1980) and coercion theory (Patterson, 1982; Patterson, Dishion, & Bank, 1984; Patterson, Reid, & Dishion, 1992;

Reid & Patterson, 1989). The paper begins with a review of descriptive information regarding antisocial behaviour during the teen years. Next, coercion theory is presented and contrasted with attachment theory. Attachment theory is then reviewed, highlighting the role of attachment style in coping strategies and behavioral adjustment. Subsequently, a model is presented integrating the two theoretical perspectives. The introduction concludes with an overview of the hypotheses to be tested in the current investigation.

Antisocial behaviour during adolescence

A substantial number of adolescents engage in antisocial activities. Antisocial behaviour includes any behaviour which goes against society's established norms. Certain antisocial behaviours are of more concern than others, given their potentially harmful consequences. These include delinquent acts which violate the law (e.g., theft, fighting, vandalism), use and abuse of psychotropic substances (alcohol & drugs), and irresponsible sexual behaviours (e.g., early sexual intercourse, multiple partners, unprotected intercourse).

Typically, involvement in criminal activity is low in childhood, increases rapidly in adolescence, peaks around age 17 (Stevenson, Tufts, Hendrick, & Kowalski, 1998), then drops off rapidly between 17 and 30 (Farrington, et al., 1990). In non-clinical samples, researchers have found that by the age of 18, most adolescents report having engaged in some form of delinquent behaviour (Elliott, et al., 1985; Moffitt, 1993). By age 18, approximately 75-90% of adolescents also report having used alcohol (Adlaf, Ivis, Smart, & Walsh, 1995; King, Beazley, Warren, et al., 1988). Smaller proportions of adolescents have been found to abuse alcohol, and to use illicit drugs such as marijuana (Adlaf, et al.,

1995). Nonetheless, in 1988, 57% of Canadian youths in Grade 11 reported drinking 3 or more alcoholic drinks at a time when they did drink (King, et al., 1988). By age 18, approximately 60% of youths also report having had sexual intercourse (Moore & Rosenthal, 1993; King, et al., 1988). Furthermore, of those youths who are sexually active by this age, roughly 50% have had more than one partner, and most have engaged in unprotected intercourse (Moore & Rosenthal, 1993; King, et al., 1988). Research indicates that although these behaviours are highly interrelated, they are often sufficiently distinct to be examined independently (Capaldi, Crosby, & Stoolmiller, 1996; Rodgers & Rowe, 1990; Tubman, Windle, & Windle, 1996), suggesting the possibility of different etiological pathways.

Given the large proportion of adolescents who engage in antisocial behaviours, some authors have suggested that these acts can be viewed as normative, yet a consistent pattern of misbehaviour from early childhood is greater cause for concern (e.g., Elliott, et al., 1985; Moffitt, 1993). Despite the frequency of antisocial activity in adolescence, the deleterious impact of these behaviours on society in general, and on the adolescents themselves, underscores the need for further research regarding contributing factors. Adolescent delinquency creates numerous victims. Not only are members of society affected (e.g., victims of vandalism, theft), but adolescents who find themselves incarcerated will face many decreased opportunities (e.g, for positive peer interaction, for jobs). In addition, substance use can lead, in some cases, to abuse, dependency, and crime. Teenage pregnancy and/or infection with sexually transmitted diseases may also be consequences of irresponsible sexual activity, leading to negative outcomes for both the

adolescents concerned, and their children.

Coercion theory

To date, one of the most promising frameworks for understanding antisocial behaviour comes from the work of Patterson and colleagues at the Oregon Social Learning Centre (OSLC; e.g., Patterson, 1982; Patterson, et al., 1984; Patterson, et al., 1992; Reid & Patterson, 1989). According to coercion theory, training for antisocial behaviour begins in the family context with a breakdown of effective discipline practices (Patterson, et al., 1992).

Parental use of hostile punishment tends to elicit negative reactions from children (e.g., arguing, yelling). Mutually coercive patterns of interaction develop when children's reactions effectively modify their parents' behaviour and reduce hostility. Essentially, child disruptive behaviour is reinforced by changes in parental behaviour. Hostile punishment and coercive interactions between parents and children combined with poor parental monitoring contribute to the emergence of conduct problems in preadolesence (e.g., Conger, Patterson, & Ge, 1995; Dishion, Patterson, & Kavanagh, 1991) and association with deviant peers (e.g., Dishion, Patterson, & Skinner, 1989; Dishion, Patterson, Stoolmiller, & Skinner, 1991). During the teen years, poor parenting and membership in a deviant peer group continue to contribute to antisocial behaviour (Dishion, Patterson, Stoolmiller, & Skinner, 1991; Snyder, Dishion, & Patterson, 1986). In this way, parenting is indirectly associated with antisocial behaviour in the teen years, via association with deviant peers (Patterson, DeBaryshe, & Ramsey, 1989; see Figure 1). This theory has been empirically validated in numerous studies, conducted with different

samples by researchers at the OSLC (e.g., Dishion, Patterson, Stoolmiller, & Skinner, 1991; Patterson & Bank, 1989; Patterson, et al., 1984, 1992) and by independent researchers (e.g., Cashwell & Vacc, 1996; Metzler, Noell, Biglan, Ary, & Smolkowski, 1994).

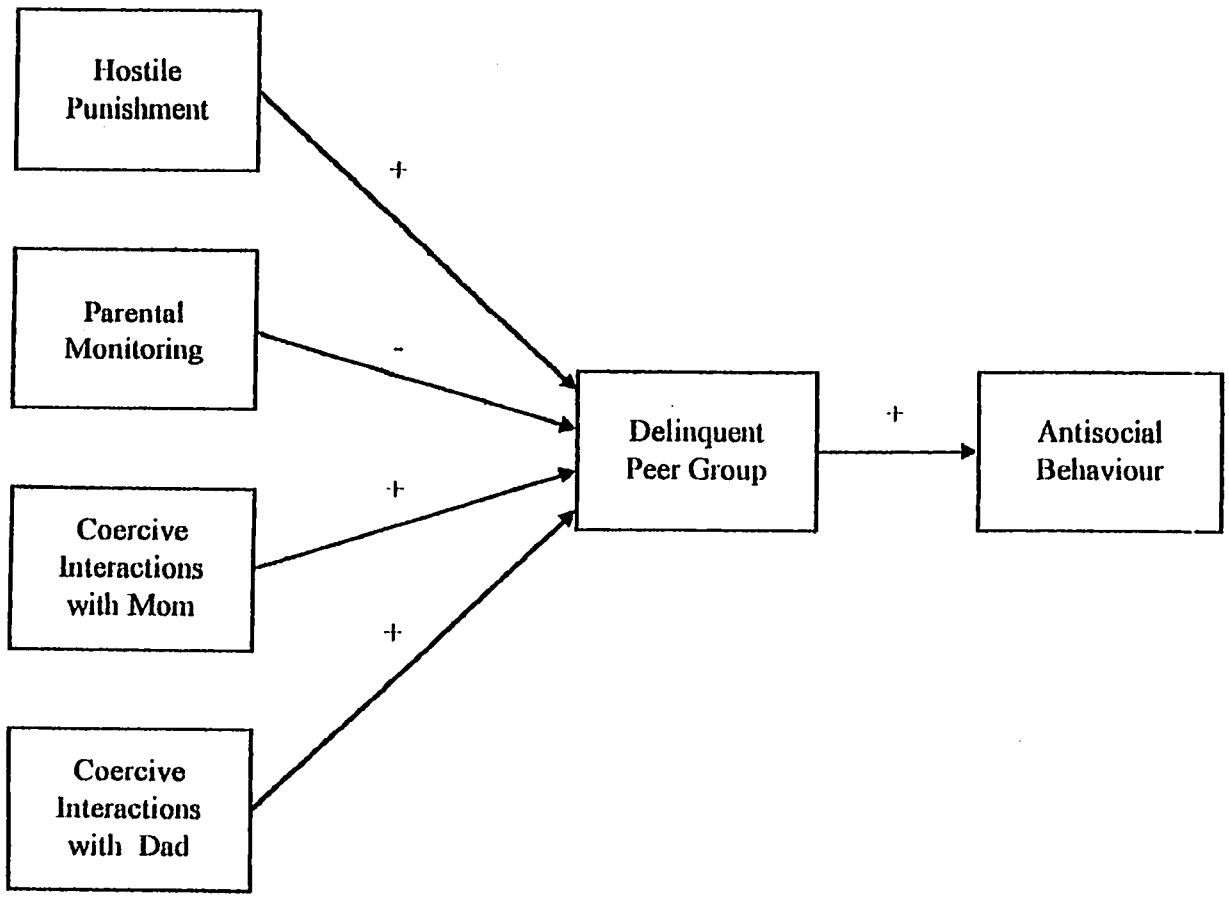

Figure 1. Hypothetical model predicting antisocial outcomes based on coercion theory.

Although coercion theory alludes to the affective quality of the parent-child relationship, this aspect of the theory is not well elaborated. Patterson, Reid, and Dishion (1992) discuss the potential importance of positive parenting for reducing antisocial behaviour, but focus on the more behavioral aspects of the relationship: parental reinforcement of prosocial behaviour, involvement, and problem-solving skills. Their findings suggest that although positive parenting contributes to prosocial behaviour, it does not play a critical role in reducing antisocial behaviour. However, such focus neglects the affective quality of the parent-child relationship, particularly with respect to the child's felt security in the relationship. Attachment theory (Bowlby, 1969, 1973, 1980) provides a complementary framework for conceptualizing the nature of the parent-child relationship. Given the role attachment quality plays in the development of emotion regulation and coping skills, use of an attachment theory framework may be particularly helpful in clarifying alternative processes which may lead to adolescent involvement in antisocial behaviour. In contrast to coercion theory, which emphasizes external factors in the development of antisocial behaviour, an attachment theory model places emphasis on internal factors, such as views of self and others and ways of regulating emotion.

Attachment theory

Bowlby (1969, 1973) argued that in their first year of life, infants begin to develop an attachment system which plays a critical role in their survival and influences personality development. According to attachment theory, children's early attachment relationships shape the way they begin to see themselves (in relation to others) and influence how children expect others to behave. Bowlby (1973) referred to these self and other

perceptions as Internal Working Models (IWMs). He argued that once developed, IWMs influence the appraisal of new situations and serve as a guide for future behaviour. Early attachment relationships also play a significant role in emotional development (Cassidy, 1994), and subsequent coping style (e.g., Mikulincer, Florian, & Weller, 1993). In particular, IWMs are believed to be activated in response to perceived stress. Although initial attachment relationships remain influential, as children experience new relationships, their IWMs are revised and updated (Bowlby, 1973, 1988). This process continues in adolescence and adulthood.

Mary Ainsworth (Ainsworth, Blehar, Waters, & Wall, 1978) conducted laboratory research regarding attachment theory with infants. Using a paradigm of successive separations and reunions between infants and their attachment figures in the presence of an unfamiliar adult, she identified three different patterns of attachment behaviour: secure, insecure-avoidant, and insecure-ambivalent. Although the manifestation of these styles changes over the life-course, similar behavioral and emotional patterns have been identified in adolescent (Kobak & Sceery, 1988) and adult samples (Collins & Reid, 1990; Hazan & Shaver, 1987; Main, Kaplan, & Cassidy, 1985).

Primary attachment style develops as a function of the relationship quality that exists between children and their early attachment figure (Bowlby, 1969). When attachment figures are warm and responsive, children develop a secure attachment style. These children develop IWMs of others as available and caring, and of themselves as worthy and capable of eliciting care (Bowlby, 1973). Thus their models of self and of others are positive. When their attachment system is activated in response to real or

perceived threat, secure children are able to express anxiety and discomfort in order to attract their caregivers and achieve felt security. As a result, secure children learn to regulate their emotions, and function well in interpersonal relationships (Cassidy, 1994; Sroufe & Waters, 1977).

When attachment figures are insensitive and rejecting however, children develop an insecure-avoidant attachment style (Ainsworth, et al., 1978). In this case, when the attachment system is activated, instead of expressing anxiety and discomfort, these children suppress their feelings and avoid contact, in order to not further alienate their caregivers (Bowlby, 1980; Renken, Egeland, Marvinney, et al., 1989; Shaw & Bell, 1993; Main, 1981). They are said to deactivate the attachment system, and to dismiss the importance of the attachment relationship (Bowlby, 1973). Nonetheless, the rejecting attitude of the attachment figure is believed to elicit anger and pain which is also suppressed (Renken, et al., 1989). Thus avoidant children develop IWMs of others as unavailable, uncaring, and undependable, and IWMs of themselves as unworthy and incapable of eliciting care (Bowlby, 1973).

Avoidant children do not learn how to cope effectively with negative emotions (Cassidy, 1994). They learn to deal with emotions by minimizing them and by deactivating the attachment system (i.e., by minimizing the importance of the relationship, Cassidy, 1994). These children develop a distrust of others and learn that, in order to function in a threatening world, they must be "compulsively self-reliant" (Bowlby, 1973; 1980). Their models of others are negative, whereas their models of self are defensively positive. Therefore, they are unlikely to seek help from others. Given their ineffective

coping strategies, their negative emotions are not adequately dealt with, and may surface again in other relationships (Renken, et al., 1989), or even unpredictably within the attachment relationship (Main & Weston, 1982).

In some cases, attachment figures are inconsistent: sometimes they are responsive and sometimes they are rejecting. Children with inconsistent attachment figures develop an insecure-ambivalent attachment style (Ainsworth, et al., 1978). In this case, when the attachment system is activated, these children appear to experience uncertainty about approaching an individual who is not always reliable. Conflict between the desire to approach the attachment figure to be consoled, and feelings of anger and anxiety toward an unreliable individual is experienced (Bowlby, 1973). These children are believed to attribute the unreliability of attachment figures to a fault in their own ability to elicit care. Since the attachment figure is occasionally responsive, these children may come to believe that their efforts to achieve a caregiving response are not always competent. As a result, they appear preoccupied with discovering ways in which to elicit care and are hypervigilant to sources of distress. Ambivalent children are said to develop positive IWMs of others and negative IWMs of themselves. They see themselves as ineffective yet incapable of functioning on their own.

Like avoidant children, ambivalent children do not learn to cope effectively with their emotions. However, rather than minimizing their emotions, these children maximize them and hyperactivate the attachment system in order to maintain contact with their attachment figures (Cassidy, 1994; Kobak & Cole, 1991). Furthermore, they are difficult to soothe (Ainsworth, et al., 1978) presumably out of fear of losing contact with an

unreliable caregiver.

The ineffective forms of emotion regulation associated with the insecure styles of attachment have implications for behavioral adjustment. In the following sections, research regarding the link between attachment style and adjustment in childhood, then in adolescence, will be reviewed.

Attachment style and behavioral adjustment in childhood

To date, most research linking attachment style and behavioral adjustment has examined mother-child relationships in preschool and elementary school samples. In these age groups, support for attachment theory is robust. Children who are securely attached with their mothers have been shown to engage in more prosocial behaviour and are described as more socially competent than insecure children (Maslin & Bates, 1982 in Greenberg & Speltz, 1988; Sroufe, 1983). Securely attached children are also rated by their teachers as more empathic and more compliant than insecurely attached children (LaFreniere & Sroufe, 1985). On the other hand, both insecure attachment styles have been linked with various forms of maladjustment.

Consistent with the theory that insecure attachment is related to poor emotion regulation, avoidant children are often found to engage in negative acting-out behaviour. Compared to secure children, they are more aggressive and more conflictual with their mothers (Main & Weston, 1982; Maslin & Bates 1982 in Greenberg & Speltz, 1988), and more aggressive, hostile, and distant with their peers (Sroufe, 1983, 1988). In elementary school-aged samples, some inconsistent results have been found. Renken and colleagues (1989) found that avoidant boys (but not girls) from families undergoing stress and

instability were rated as more aggressive by their teachers than boys with secure attachment styles. However, Fagot & Kavanagh (1990) found that avoidant girls (but not boys) from intact middle-class families were rated by teachers and observers as more difficult than their securely attached peers. Research has also shown that children with ambivalent attachment styles are more adult-oriented and emotionally dependent than securely attached children (Renken et al, 1989; Erickson, et al, 1985).

Attachment style and adjustment in adolescence

According to attachment theory, attachment style continues to influence personality, behaviour, and emotion regulation throughout the lifespan (Bowlby, 1973). Patterns of attachment similar to those observed in childhood have also been identified in adolescent (e.g., Kobak & Sceery, 1988) and adult samples (e.g., Collins & Reid, 1989; Hazan & Shaver, 1987; Main, et al., 1985). In the adolescent and adult literature two traditions have emerged (see Bartholomew & Shaver, 1998 for a more in depth review). Some researchers (e.g., Hazan & Shaver, 1987) use the parallel categories and the same terminology as found in child samples. However, others (e.g., George, Kaplan & Main, 1985; Bartholomew, 1990) use terminology which describes the predominant traits that characterize each style. As summarized in Table 1, the label "secure" continues to describe the secure attachment pattern, "preoccupied" is used to describe the preoccupation with relationships characteristic of ambivalent attachment, and "dismissing" is used to describe the dismissive pattern of an avoidant attachment style. Continuous measurement of attachment style is also more common in older samples.

Table 1

Parallel Attachment Styles in Childhood and Adolescence

Childhood	Adolescence
Secure	Secure
Ambivalent	Preoccupied
Avoidant	Dismissing
	Fearful

Bartholomew (1990) has also identified a fourth attachment style, characterized by negative working models of both self and other, which she refers to as fearful. According to Bartholomew, both dismissing and fearful styles are considered avoidant forms of attachment, although avoidance is believed to occur for different reasons. Bartholomew speculates that dismissing individuals avoid intimacy because they dismiss the importance of relationships, whereas fearful individuals, being hypersensitive to social approval, avoid intimacy out of fear of rejection. As summarized in Table 2, the dismissing and fearful styles share the common characteristic of negative views of others and the preoccupied and fearful styles share the common characteristic of negative views of the self.

Table 2

Working Models of Self and Other, According to Attachment Style

Attachment style	Model of self	Model of other
Secure	Positive	Positive
Preoccupied	Negative	Positive
Dismissing	Positive	Negative
Fearful	Negative	Negative

Despite the interest in attachment beyond childhood, comparatively little research has been conducted regarding the link between attachment and adjustment in adolescence. If internal working models (IWMs) do continue to influence emotion regulation and coping style throughout the lifespan, the link between attachment style and behaviour should also be evident in during the teen years. In fact, Allen and Land (1999:324) have argued that the multiple changes and challenges of adolescence "may all conspire to create a chronic state of activation of the attachment system".

As children age, they begin to form "secondary" attachments to individuals other than their primary caregivers (Bowlby, 1969). Exposure to a variety of relationships creates opportunities to revise IWMs of the self, of others, and of relationships, as these models are "tested" in the context of new relationships. Nonetheless, given that new information is assimilated into existing models, initial IWMs are relatively resistant to change (Bowlby, 1973).

Research has demonstrated considerable continuity in attachment behaviour from 12 to 18 months (e.g., Owen, Easterbrooks, Chasse-Lansdale, & Goldberg, 1984; Main & Weston, 1981), and from infancy to childhood (e.g. Main et al., 1985), and from childhood to adolescence (Urban, Carlson, Egeland, & Sroufe, 1991). There is also support for intergenerational associations between parents' attachment styles and their children's attachment styles (Lieberman, Doyle, & Markiewicz, 1999). However, instability in attachment style has also been shown (Baldwin & Fehr, 1995). Furthermore, children and adolescents have been found to have different attachment styles with their mothers and their fathers, and other individuals (e.g., Lamb, 1977; Main & Weston,

1981). Attachment style is also altered by changes in contextual or situational factors, particularly in response to stressful events (Thompson, Lamb, & Estes, 1982; Vaughn, Egeland, Sroufe, & Waters, 1979). Thus even within the same relationship, there can be shifts in attachment style.

Given the possibility of change in attachment style, and of different styles of attachment with different individuals, it appears appropriate to consider the possibility of various attachment styles in the same individual, particularly in older samples (Baldwin, et al., 1996), and to use continuous rather than categorical measures of attachment. It may also be important to evaluate attachment styles in different significant relationships. In particular, attachment with each parent should be considered separately. This is especially true during the teen years, when relationships with each parent appear to undergo different types of transformations. For example, Newman (1989) found that although mothers are recognized as models of cohesiveness throughout the transition from pre-teen to teen years, fathers become increasingly appreciated for their warmth and understanding as children enter the teen years. Fathers of adolescent children are also more satisfied with their parental role than those of younger children (De Luccie & Davis, 1990). There is also evidence that parents interact differently with sons and with daughters, with same-sex pairs having closer relationships (Youniss & Smollar, 1985). Although most research has examined attachment with mother, attachment with father may be particularly relevant for antisocial outcomes, given that antisocial behaviour is more common in men than in women (e.g., Kellner, 1997; Robins, 1986).

Although little research has been conducted regarding the link between attachment

style and specific behaviours during adolescence, researchers have examined personality correlates, and representations of self and other in this age group. Results support attachment theory. Compared to insecurely attached adolescents, adolescents who are classified as secure are rated by their peers as less anxious, less hostile, and more able to successfully regulate their feelings (i.e., more ego resilient; Kobak & Sceery, 1988). In problem-solving interactions with their mothers, secure adolescents are more capable of modulating their anger, and achieving a balance of assertiveness, suggesting functional emotion regulation (Kobak, Cole, Ferenz-Gillies, et al., 1993). Unlike insecurely attached individuals, secure individuals are also able to acknowledge both positive and negative self-attributes, and have been shown to have a coherent, well-organized self-structure (Mikulincer, 1995). These balanced self-perceptions may also contribute to a constructive coping style. Adolescents who report a positive relationship with their parents, and who feel comfortable turning to them for support, have been found to have a greater sense of mastery of their worlds (Paterson, Pryor, & Field, 1995). In addition, during their first year of college, they see themselves as more socially competent, and report less psychological distress than their peers, even if they are anxious regarding separation (Kenny & Donaldson, 1991). Securely attached adults and college students also tend to seek support from others in times of stress (Mikulincer, et al., 1993; Florian, Mikulincer, & Bucholtz, 1995; Ognibene & Collins, 1998).

Consistent with attachment theory, adolescents with a dismissing style are rated by their peers as more hostile than individuals in all other attachment groups (Bartholomew & Horowitz, 1991; Kobak & Sceery, 1988). In problem-solving interactions with their

mothers, dismissing boys (but not girls) have been found to exhibit more dysfunctional anger than secure subjects (Kobak, et al., 1993). Dismissing girls, on the other hand, appear to deactivate the attachment relationship, such that their mothers dominate the interaction (Kobak, et al, 1993). As predicted by attachment theory, dismissing individuals report less family support and more loneliness than their peers (Kobak & Sceery, 1988).

In terms of self-representations, dismissing subjects have been found to describe themselves positively and to acknowledge positive self-attributes while disregarding negative characteristics (Mikulincer, 1995). Although they believe that others have a more negative view of them than they have of themselves, they are nonetheless able to maintain a positive sense of self (Mikulincer, 1995). Consistent with this, in the Kobak and Sceery (1988) study, dismissing participants reported little distress and described themselves as equally socially competent as secure subjects, suggesting a tendency to disregard the negative affects attributed to them by their peers. In addition, their self-structure lacks balance and is poorly integrated: despite recognition of different self-attributes, dismissing people do not perceive connections between these various self-aspects, whereas secure people do (Mikulincer, 1995). Mikulincer (1995: 1213) speculates that the high positive self-esteem reported by dismissing subjects may be a "defensive armor" used to protect the self against negative feelings of rejection. This tendency to only acknowledge positive self-attributes may also reflect a sense of compulsive self reliance (Kobak & Sceery, 1988), and suggests a "nondifferentiated defensiveness" coping style, with an emphasis on distancing strategies (Mikulincer,

Florian, & Weller, 1993; Mikulincer & Orbach, 1995).

Different correlates of a preoccupied attachment style have also been identified in adolescence. Preoccupied subjects are rated by their peers as more anxious than all other attachment groups (Kobak & Sceery, 1988). These individuals have a negative view of themselves (Mikulincer, 1995) and see themselves as socially incompetent (Kobak & Sceery, 1988). In addition, they see others in a positive light and believe that they do not live up to the expectations others have of them (Mikulincer, 1995). Compared to other attachment groups, preoccupied subjects report more physical symptoms (Kobak & Sceery, 1988) and have difficulty regulating their distress (Mikulincer, 1995). Their self-structure is poorly integrated, and shows little differentiation, such that the impact of negative experiences has a greater impact on their well-being (Mikulincer, 1995). Kobak and Sceery speculate that this combination of subjective distress, and positive views of the support available to them may contribute to dependent, clingy relationships which do not successfully alleviate anxiety. These characteristics negatively impact preoccupied individuals' ability to cope effectively in stressful situations. In adult samples, preoccupied subjects have been found to use more emotion-focused coping (e.g., wish to change feelings, self-criticism; Mikulincer, et al., 1993) and support-seeking (Ognibene & Collins, 1998) in response to stress.

The fearful attachment style has received less empirical attention. The limited data available suggests that adults with a fearful attachment style are socially inhibited, lack appropriate assertiveness skills, and have a tendency to be exploited by others (Bartholomew & Horowitz, 1991). Ognibene and Collins (1998) found that this

attachment style was related to using more emotion avoidance and less support seeking in response to stress. There is also evidence which suggests that fearful individuals may react violently, in response to perceived rejection (Dutton, Saunders, Starzomski, & Bartholomew, 1994), most likely because they have not learned to regulate unpleasant emotions.

In sum, these findings underscore the differential association between attachment style and coping skills. As summarized in Table 3, secure attachment appears linked to constructive coping, including planful problem-solving skills and support seeking. A dismissing style, on the other hand, is more likely associated with an emotionally avoidant style of coping, combined at times with an angry confrontational style. A preoccupied style appears characterized by the tendency to blame oneself for one's problems combined with feelings of helplessness. Finally, a fearful style appears to be related to emotion avoidance and behavioral withdrawal. Fearful attachment may also be associated with coping styles characteristic of both dismissing attachments (both share negative views of others) and preoccupied attachment (both share negative views of the self). If this is true, fearful attachment would also be related to angry confrontation and self-blame.

Ineffective coping strategies likely contribute to adjustment difficulties, including antisocial behaviour. The emotion avoidance and disregard for others typical of dismissing and fearful attachment styles may reduce moral behaviour because of failures to understand the mental states of others or to take them into consideration (see Fonagy et al., 1998). Furthermore, rather than experiencing their anger, and coping with it internally, individuals with dismissing and fearful styles may act out their anger, by

engaging in antisocial activities. In the case of preoccupied attachment, the tendency to engage in self-criticism combined with feelings of helplessness may also lead to antisocial activity. Antisocial behaviour is often a peer group phenomenon (Emler, Reicher, & Ross, 1987). Because of their coping style and desire for acceptance, teens high in preoccupied attachment be may less likely to question the behaviour of their peers, and therefore commit antisocial acts themselves. The fear of abandonment typical of both fearful and preoccupied attachment styles, and reflected in their self-criticism and feelings of helplessness, may lead to violence aimed at increasing contact with others. Consistent with this, Roberts and Noller (1998) found positive correlations between anxiety over abandonment and violent behaviour in an adult sample. Similar results are reported by Bookwala & Zdaniuk (1998) who found that preoccupied and fearful attachment were more common for individuals in mutually aggressive dating relationships.

Table 3

Summary of research findings regarding attachment styles, and hypothesized coping styles.

Examples of Research Findings	Hypothesized Coping Style
Secure attachment	
Successful anger modulation (Kobak, et al., 1993) Greater sense of mastery (Paterson et al., 1995) Socially competent (Kenny & Donaldson, 1991)	Constructive coping
Dismissing attachment	
More hostility and dysfunctional anger (Bartholomew & Horowitz, 1991; Kobak & Sceery, 1988; Kobak et al., 1993) Tendency to dismiss negative characteristics (Kobak & Sceery, 1988; Mikulincer, 1995) Unbalanced self-structure (Mikulincer, 1995)	Emotion avoidance and angry confrontation
Preoccupied attachment	
Anxious (Kobak & Sceery, 1988) Negative self-perception (Mikulincer, 1995) See self as socially incompetent (Kobak & Sceery, 1988)	Self-criticism
Fearful attachment	
Inhibited, lack appropriate assertiveness skills, tend to be exploited (Bartholomew & Horowitz, 1991) Negative view of self and others (Bartholomew, 1990)	Emotion avoidance and behavioral withdrawal Angry confrontation and self-blame

Attachment and antisocial behaviour

Although Bowlby's early work was concerned with the family characteristics of child thieves (Bowlby, 1944), few studies have used his theoretical framework to examine the link between attachment style and antisocial behaviour in adolescence. This appears to be changing in recent years, yet the existing research is limited and has methodological flaws. Two groups of researchers have investigated this question using samples of participants with antisocial psychiatric histories, in which the issue of psychiatric comorbidity was not addressed. Rosenstein & Horowitz (1996) found that conduct disorder was strongly associated with dismissing attachment. Their results regarding substance abuse were somewhat less clear, suggesting the possibility of different influential pathways. Participants who were engaged in more antisocial behaviours (i.e., those who had comorbid substance abuse disorder and conduct disorder) were more likely to be dismissing. In contrast, those with substance abuse disorder and an affective disorder were equally likely to be preoccupied or dismissing. Attachment style was also examined in relation to personality disturbance. Consistent with attachment theory, dismissing individuals were more antisocial, narcissistic, and paranoid than preoccupied individuals. Preoccupied subjects, on the other hand, were more likely to report anxiety, dysthymia and an interest in others, combined with a fear of criticism and/or rebuff. A second group of researchers (Allen, Hauser, and Borman-Spurrell, 1996) also found that dismissing attachment in adolescence and more specifically, derogation of attachment, were associated with criminal behaviour and drug use in adulthood for patients who had been hospitalized for psychopathology during their teen years.

A recent study using a community sample of adolescents has also found links between insecure attachment styles and antisocial activity. Using categorical data based on the three category model of attachment, Cooper, Shaver and Collins (1998) found that, anxious-ambivalent adolescents were most likely to engage in risk behaviours: they were more truant relative to both avoidant and secure teens and committed more property crimes than avoidant teens. With respect to substance use, anxious-ambivalent teens reported more alcohol-related problems, and had used marijuana more frequently than teens in other groups. Finally with respect to sexual activity, anxious-ambivalent girls were more likely to report having been pregnant. Although avoidant teens were less likely to be sexually active than secure and anxious-ambivalent teens, both insecure groups engaged in more risky behaviours (e.g., sex with a stranger, casual sex). These authors also found that the relationship between anxious-ambivalent attachment and antisocial behaviour was mediated by high levels of hostility. It may also be that these teens are more susceptible to peer influence. (Note that in Bartholomew's (1990) model of four attachment styles, anxious-ambivalent adolescents would likely be divided into preoccupied and fearful styles; Brennan & Shaver, & Tobey, 1991.)

In general, most investigations which have examined attachment in relation to antisocial behaviour have been inspired by Hirschi's (1969) social-control theory. According to social-control theory, deviance is an innate characteristic, and involvement in antisocial behaviour is prevented through "attachment" or bonds to important socialization agents, such as family members or social institutions like school. Using this conceptualization of attachment (i.e., bonding), emphasis is placed on the control exerted

by socialization agents, particularly in terms of monitoring and supervision, rather than on the affective quality of the relationship and its role in emotion regulation. (For example, Patterson's coercion theory was inspired in part by social-control theory.) Occasionally, dimensions of warmth and rejection in the parent-child relationship have been considered, but to date no studies have examined the link between attachment with parents (using Bowlby's framework), coping style, and involvement in antisocial activity. Nevertheless, results from existing research suggest that this is a fruitful avenue for further research.

Delinquency. Adolescents who report close, accepting relationships with their mothers also report less involvement in delinquent activities (Aseltine, Jr., 1995; Smith & Krohn, 1995). When relationships with both parents are considered simultaneously, "low attachment" (i.e., poor communication and trust, combined with a feeling of alienation) has been associated with symptoms of conduct disorder, even in cases where attachment to peers is high (Nada Raja, et al., 1992). Official delinquency and teacher reports of delinquent activity have also been shown to correlate negatively with observations of loving and accepting mother-child interactions (Sampson & Laub, 1994). These effects appear particularly robust: they persist even after controlling for child IQ, age, attachment to delinquent peers, ethnicity, poverty, family size, parental deviance, supervision, and discipline (Sampson & Laub, 1994). In addition to direct effects, relationship quality with parents has also been associated with delinquent behaviour indirectly through parent-adolescent involvement and parental control (supervision and discipline; e.g., Smith & Krohn, 1995). Although it is likely that the link between attachment quality and behaviour is bi-directional, at least one longitudinal study has shown that parental rejection is a

stronger predictor of delinquency than the reverse (Simons, Robertson, & Downs, 1989).

Substance use. With respect to adolescents' use of psychotropic substances, some findings suggest that attachment to parents may play a role. According to self-derogation theory (Kaplan; 1975, 1980), individuals develop self-derogating attitudes as a result of negative self-perceptions and perceptions of negative evaluations from highly valued others, combined with a poor history of coping effectively with potentially self-devaluing experiences. It is likely that attachment history determines in part these perceptions and coping abilities. According to Kaplan's theory, in order to defend the self, individuals with self-derogating attitudes lose their motivation to conform to group norms (which they see as unattainable); acquire motivation to deviate from these norms (which are associated with painful experiences); and adopt a favourable attitude toward deviant behaviours (which may provide an opportunity to achieve self-accepting attitudes). Support for this theory has been found with respect to engagement in a variety of antisocial behaviours (Kaplan, 1980) and specifically with respect to substance use (Kaplan, Martin, & Robbins, 1984). Of particular interest from an attachment perspective is the finding that, in early adolescence, feelings of rejection by family members predict future alcohol, marijuana, and other drug use, as well as self-derogation and favourable attitudes toward deviance.

Other investigations also suggest that attachment quality may be related to substance use. Affectional quality, time spent and identification with both parents, and preference of parents over peers, have been negatively associated with teenage children's subsequent drug use, both directly, and indirectly through adolescents' conventional

attitudes (Brook, Whiteman, Brook, & Gordon, 1981; Brook, Whiteman, & Finch, 1993; Brook, Whiteman, Gordon, & Brook, 1984a, 1984b, 1986) and low sensation-seeking (Barnea, Teichman, & Rahav, 1992). Supportive parent-child relationships have also been linked to better self-regulation skills (i.e., self control, behavioral competence, and adaptive coping), and less affiliation with nonnormative peers, which in turn predict less substance use (Wills, DuHamel, & Vaccaro, 1995).

Adolescents' reported reasons for use also suggest that attachment theory may be a useful perspective for understanding substance use. High school students who use drugs on a regular basis report using drugs as a way of coping with stress, and also as a way of achieving pleasure (Novacek, Raskin, & Hogan, 1991). Both reasons appear to be associated with an effort to distance the self from stressful life experiences. Using drugs in response to negative emotions has also been linked to more problematic substance use (McKay, Murphy, McGuire, Rivinus, & Maisto, 1992). Teens who are higher in insecure attachment may be more likely to use drugs or alcohol in response to negative emotions, given their poorer emotion regulation skills.

Sexuality. Existing research suggests that attachment to parents may also be important for determining sexual behaviour. Adolescents who have warm, supportive relationships with their parents (Jessor & Jessor, 1977) and report that they can communicate effectively with their parents (Fox & Inazu, 1980) are less likely to be sexually active than adolescents who do not have such positive relationships. Parents who are generally open to communication are also more likely to discuss sexual issues with their late adolescent children (Fisher, 1991). Some data suggest that the link between

parent-child attachment and sexual activity is moderated by gender. Benda and DiBlasio (1994) found that closeness to both parents was negatively related to frequency of sexual activity for females only. Furthermore, it appears that at least part of parental influence on sexual activity is indirect. Cross-sectionally, low warmth and support in the parent-child relationship have been associated with increased sexually permissive attitudes, and association with sexually active peers, which both predict sexual activity (Whitbeck, Conger, & Kao, 1993).

To date, little is understood regarding the development of safe-sex practices. Numerous studies have shown that knowledge about sexually-transmitted-diseases, likelihood of pregnancy, and even about safe-sex does not predict safe-sex practice in adolescent and young adult samples (e.g., Rosenthal, Moore, & Brumen, 1991; Lowe & Radius, 1987). Safe-sex practices are more likely to be determined by the situational features of the encounter, and the assumptions of the parties involved (Moore & Rosenthal, 1992).

Effective interpersonal skills are essential to the adoption of safe-sex practices (Lowe & Radius, 1987). Given that secure attachment style is associated with effective emotion regulation, and prosocial skills, it is likely that security of attachment will be important for safe-sex. In contrast, insecure attachment may be linked with risky sexual behaviours (or attitudes) given poorer emotion regulation skills.

Poor parent-child relationships may contribute to irresponsible sexual activity indirectly through the expectations adolescents develop regarding intimate relationships. For example, individuals who are more dismissing may place more value on sexual acts

than on the relationship, given their disregard for others and their avoidance of intimacy (Fuhrman & Wehner, 1994), leading them to take greater risks. Consistent with this, Brennan, Clark and Shaver (1998) found that dismissing adults were more sexually promiscuous than adults with other attachment styles. Poor primary relationships may also contribute to the allure of sexual relationships, in the sense that they may be seen as potentially self-rewarding (Whitbeck et al., 1993), as a way of achieving closeness with another. Furman and Wehner (1994) speculate that individuals who are more preoccupied may be more concerned about pleasing their partner than expressing their own desires. Given their positive views of others, and their desire for intimacy, individuals high in preoccupied style may simply go along with their partner's wishes and be less likely to question their partner's sexual history.

Integrating the two theoretical approaches

Although Bowlby's attachment theory and Patterson's coercion theory conceptualize the development of antisocial behaviour differently, the two theoretical approaches are similar in many respects. Both theories can be viewed as social-interactional (Cairns, 1979): both place emphasis on the importance of early childhood relationships with caregivers in the etiology of antisocial outcomes and both focus on the qualitative nature of these interactions. However, attachment theory proposes that internal processes (i.e., emotion regulation and coping style) guide behaviour whereas coercion theory proposes that external factors (i.e., parental monitoring, hostile punishment, coercive interactions) are most central. Attachment theory argues that the link between parent-child interactions and child maladjustment is mediated by coping style.

In contrast, in coercion theory this link is believed to be indirect, through association with deviant peers (Patterson, et al., 1989). In fact, according to coercion theory, antisocial behaviour emerges from behavioral contingencies that are not necessarily mediated by cognitive process (Patterson, et al., 1992). In sum, an attachment theory model provides understanding of emotional processes leading to antisocial outcomes, whereas a coercion theory model provides information regarding social learning processes leading to antisocial outcomes.

Combining the two approaches is not as straightforward as considering the two processes (i.e., (1) attachment style → coping style → antisocial behaviour; (2) parenting → association with deviant peers → antisocial behaviour) simultaneously. The difficulty in doing so lies in the fact that attachment style and parental monitoring, punishment and coercive interactions are all likely to be intercorrelated. Given that attachment style begins to develop in infancy, it is likely that quality of attachment precedes daily interactions such as parental monitoring. One possible combination of the two approaches, presented in Figure 2 was tested in the current investigation. According to this model, attachment style is antecedent to day-to-day parenting. That is, the affective quality of parent-child relationships, based in part on early caregiving interactions, is believed to precede the daily interactions between parents and their adolescent children. Through parenting, insecure attachment is related to association with deviant peers and coping style, which in turn predict antisocial outcomes. It is anticipated that knowledge regarding the affective quality of parent-child relationships will add to the coercion theory model and provide greater understanding of adolescent antisocial behaviour.

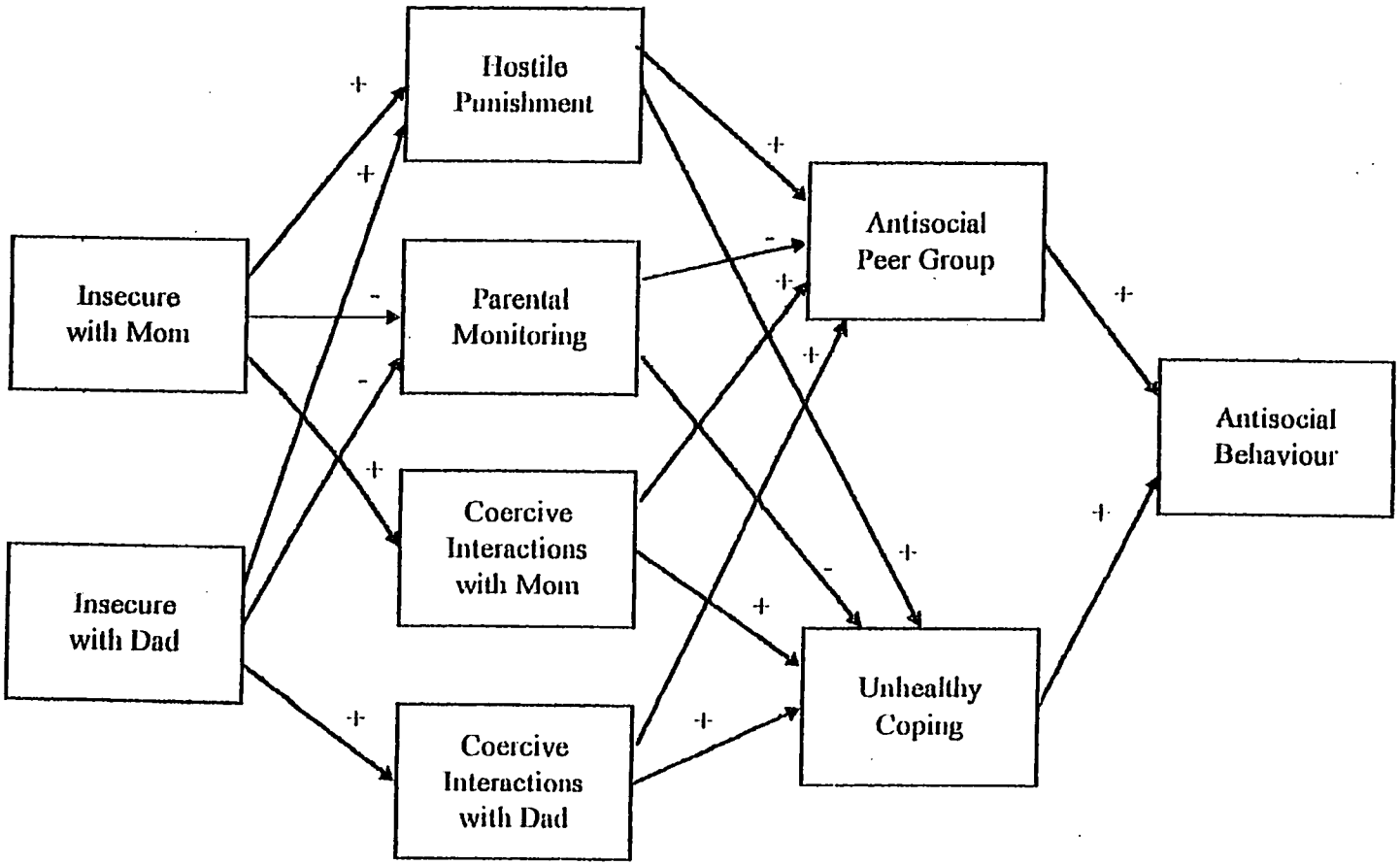

Figure 2. Hypothetical model predicting antisocial outcomes based on attachment and coercion theories.

The current investigation

The current study examined adolescent involvement in antisocial activities from two theoretical perspectives - attachment theory and coercion theory, using a community sample. Based on Bowlby's attachment theory, it was hypothesized that secure attachment would be negatively related, and insecure attachment positively related to adolescent involvement in antisocial behaviour. In particular, it was expected that the two avoidant styles, dismissing and fearful, would be most related to antisocial behaviour, given their common feature of negative views of others. These hypotheses were evaluated using correlational analyses.

It was further hypothesized that the link between attachment styles and antisocial outcomes would be, at least in part, mediated by coping skills. Specifically, it was anticipated that (1) adolescents who rated themselves high in secure attachment would use more constructive coping skills, (2) those who rated themselves high in dismissing style would be more likely to engage in emotion avoidance and angry confrontation and (3) those who rated themselves high on preoccupied attachment would be more likely to engage in self-criticism. Fearful attachment was also expected to be positively related to emotion avoidance and angry confrontation (because of negative views of others) and self-criticism (because of negative views of self). Finally, fearful attachment was expected to be positively related to behavioral withdrawal, given that this style is characterized by feelings of social inadequacy and fears of rejection. Constructive coping skills were expected to be negatively related to antisocial outcomes, whereas the remaining coping strategies (emotion avoidance, self-criticism, behavioral avoidance, angry confrontation)

were expected to be associated with greater involvement in antisocial behaviour. Once again these hypotheses were tested using correlational analyses.

Although all forms of insecure attachment were expected to correlate with substance use, different reasons for use were expected. Consistent with their emotionally avoidant coping style, it was hypothesized that subjects higher in dismissing or fearful styles would be more likely to report using substances in order to cope with unpleasant emotions and conflicts with others. Given the importance they place on others, participants high in preoccupied style were expected to report using drugs in response to peer pressure. Given their fears of social rejection, the same pattern was expected for participants high in fearful attachment. In order to test these hypotheses, correlations between each attachment style and adolescents' reasons for using drugs were examined.

Patterson's coercion theory was also evaluated in this sample, using structural equation modeling. This analysis examined whether parental monitoring, hostile punishment, and coercive interactions were related to antisocial behaviour indirectly through association with deviant peers. Finally, the combined model presented in Figure 2 was evaluated using structural equation modeling. This model was compared to the coercion theory model in order to determine whether it provided a more complete understanding of antisocial behaviour.

In order to examine the representativeness of the sample, demographic information (e.g., ethnicity and socioeconomic status) were compared with Canadian census data. Furthermore, levels of involvement in antisocial activity found in the current sample were compared to those found in other research.

Method

Sample and procedure

After obtaining ethical approval of the research project through Concordia's internal review boards (at both the departmental and university levels), three public school boards in the Montreal area were contacted regarding potential participation. Two boards approved the project, and suggested three potential schools for participation. Principals from these schools were then contacted, and sent a description of the research project. Permission to work with students from two Catholic high schools was obtained. At each school, meetings to discuss the research project and its implications were held with the teachers, who then agreed to allow data collection to proceed during class time. (The main reason offered by the school board and individual school that decided against the project was that timing and scheduling of the project may interfere with the curriculum.)

Participants were recruited from grades 10 and 11 in the two high schools. One month before official data collection, a brief presentation regarding the project was made to students in their classrooms. Students were then given a letter explaining the study and asked to complete a consent form, indicating whether or not they chose to participate (see Appendix A). All students who returned their forms (whether they chose to participate or not) had their names entered in a draw for various prizes (a portable compact disc player, a $50 gift certificate for a music store, movie passes, and passes for local amusement centres). Almost all students at both schools (96%) agreed to participate in the study. Data collection was carried out in two phases, conducted approximately two weeks apart. During Phase 1, adolescents completed measures regarding demographic information,

relationships and coping style. During Phase 2, they completed measures regarding their involvement in various antisocial activities (delinquency, drug use, reasons for drug use, sexual attitudes and behaviour). Each session lasted 50 minutes.

Once collected, data was entered twice (by two different individuals) into WordPerfect. The two data files were then compared and mistakes corrected. The final corrected file was then transferred to a mainframe computer, and analyses were conducted using the Statistical Package for Social Sciences (SPSS) and EQS.

Demographic information was available for 662 individuals who completed Phase 1. Equal numbers of boys and girls participated (mean age = 15.8 years, ranging from 14 to 19 years). A large proportion (52.9%) of participants reported European or North American ethnic backgrounds. The remaining were distributed as follows: 3.9% South American; 6.4% Asian; .8% African; 1.5% Arab; and 31.9% mixed ethnic backgrounds and 2.6% who did not report their ethnic background. This distribution closely matches data from the 1996 Canadian Census (53% European or North American, .4% South American, 6.9% Asian, .5% African, .7% Arab, and 35.8% mixed ethnic backgrounds, based on Statistics Canada, 1996), with individuals from mixed ethnic backgrounds being slightly under-represented (31.9% vs. 35.9% according to the 1996 Census), and individuals from South American, African, and Arab backgrounds being slightly over-represented. This distribution is also comparable to the ethnic background of the Montreal urban community (Statistics Canada, 1996), although participants in the current study reported more mixed ethnic backgrounds.

Mean socioeconomic status (SES) reported by students was 44.07 for mothers

(characteristic of supervisory clerical positions and sales occupations), and 49.56 for fathers (characteristic of sales management positions and aircraft mechanical occupations) based on the Blishen, Carroll, and Moore (1987) index of socioeconomic status. These levels are comparable to the average SES in the general population (based on the 1981 Census; Blishen et al., 1987).

The majority of participants came from two-parent families (n = 560, 84.6%, with 48 from step-families). Sixty-five lived with mom only, and 23 lived with dad only. Two boys lived alone, and the remaining 12 participants lived with adults other than parents (e.g., foster parents, aunts/uncles, grandparents, and older siblings). Approximately 86% of participants had brothers or sisters living with them.

Analyses for the current study are based on data from participants who completed questionnaires about relationships with mothers and fathers and who were present for Phase 2 (n = 636, 96%). However, due to missing data for some variables, the sample size does vary according to the analysis being conducted.

Measures

During the first testing session, adolescents provided general demographic information, listed their five best same-sex friends at school, and completed the Relationship Questionnaire, the Ways of Coping Scale, the Family Issues Questionnaire, and the Social Desirability Scale. During the second session, they completed the Self-Report Delinquency Scale, the Drug Use Severity Scale, the Inventory of Drug Taking Situations, and the Adolescent Sexuality Scale. (See Appendix B for copies of measures).

The Relationship Questionnaire (RQ). This self-report measure, developed by

Bartholomew and Horowitz (1991), provides continuous ratings of four attachment styles: secure, dismissing, preoccupied, and fearful. Participants rated the extent to which paragraphs describing each attachment style applied to their relationship with each of their parents, on a scale from 1 (Not at all like my relationship) to 7 (Very much like my relationship).

The RQ correlates with attachment styles determined by interview (Bartholomew & Horowitz, 1991), and provides a rapid assessment of attachment quality. Extensive validity data indicates that attachment styles assessed using the RQ correlate as expected with measures of self-concept, interpersonal functioning, and representations of family relationships (Bartholomew & Horowitz, 1991; Griffin & Bartholomew, 1994; Horowitz, Rosenberg, & Bartholomew, 1993).

The Ways of Coping Scale. The Ways of Coping Scale (WCS, Folkman & Lazarus, 1988) contains 50 items which tap various coping strategies. Respondents indicate the extent to which they use each strategy in response to stress, using a four-point scale ranging from "not used" to "used a great deal". Validity data from various sources (see Folkman & Lazarus, 1988) indicate that the measure is sensitive to changes in coping, and to situational appraisal of control. In one study, students' appraisals of stress, their emotions and their coping strategies were examined at three time points: two days before an examination, two days before they received their grades, and five days after they received their grades (Folkman & Lazarus, 1985). Results indicated that coping varied according to students' emotions and appraisals of stress. Furthermore, college students reported using a wide variety of ways of coping with stress, underscoring the importance

of multidimensional measurement of coping style.

The WCS was originally developed to assess coping strategies in response to a particular situation. However, the version used in the current study assessed the way subjects *typically* cope with stress. Subjects were primed with brief descriptions of stressful situations in relationships, and were then asked to describe a similar stressful experience. They subsequently indicated the extent to which they typically used the various coping strategies in response to similar stressors. Therefore, unlike Folkman and Lazarus (1988), the current study considered general styles of coping with stress rather than the use of particular strategies in a specific stressful situation.

The Ways of Coping scale was designed to tap eight coping strategies: planful problem solving, positive reappraisal, social support seeking, escape-avoidance, emotional distancing, confrontive coping, accepting responsibility (self-blame), and self-control. In the current study, 8 items tapping rumination (based on work by Nolen-Hoeksema & Morrow, 1991) were also incorporated to tap a wider range of coping styles. Internal consistency of the subscales for the current sample was generally in the alpha = .50 to .60 range, with a low of .47 for self-control to a high of .74 for seeking social support. Given these low reliability indices, and in an effort to reduce the number of scales, a factor analysis was conducted.

Factor analysis of responses, followed by varimax rotation, yielded five interpretable factors that explained 34.3% of the variance. Factor 1 contained 18 items which reflect *constructive coping* skills (e.g., problem solving, positive reappraisal, seeking social support; variance accounted for: 14.8%, alpha = .84). Factor 2 was

composed of 15 items reflecting *self-criticism* (e.g., "I realize I bring the problems on myself", variance accounted for: 7.4%, alpha = .80). Factor 3 contained 8 items tapping *emotion avoidance* (e.g, "I go on as if nothing happened", variance accounted for: 5.1%, alpha = .67). Factor 4 consisted of 6 items tapping *behavioral withdrawal and rumination* (e.g., "I go someplace alone and think about my feelings", variance accounted for = 3.8%, alpha = .72). Factor 5 was comprised of 7 items tapping *angry confrontational* coping (e.g., "I express anger to the person who caused the problem", variance accounted for = 3.2%, alpha = .62). Three items were deleted because of factor loading below .30, one item "I make myself feel better by eating, drinking, smoking, etc" was eliminated because it would be confounded with the antisocial behaviour variables. Using a sample of college students, Mikulincer and colleagues (1993) found a similar factor structure. Their problem-focused coping and social support-seeking factors appear to combine in this study to form the constructive coping factor. Their two other factors, emotion-focused coping and distancing, appear parallel to the self-criticism and emotion-avoidance factors in this study. Although Mikulincer and colleagues did not find an angry confrontational factor, this factor is essentially the same as Folkman and Lazarus' (1988) original confrontive coping scale.

The Family Issues Questionnaire. Based on the work of Patterson and colleagues (e.g., Capaldi & Patterson, 1989), the Family Issues Questionnaire assesses parental monitoring (10 items from Capaldi & Patterson, 1989 and Smith & Krohn, 1993; e.g., "How often do you tell your parents when you will be home?"); irritable, hostile punishment style (4 items from Haapasalo & Tremblay, 1994; "Do your parents punish

you by slapping or hitting you?"); and coercive interactions between the adolescent and each parent (5 items for each parent from Metzler, et al., 1994; "My mom/dad and I have arguments about little things"). Higher scores on each scale indicate higher levels of each parenting variable. In the current sample, all scales showed acceptable internal consistency (alpha = .76 for monitoring, alpha = .73 for punishment, alpha = .89 and .90 for coercive interactions with mother and father respectively).

Validity data from Capaldi & Patterson (1989) indicate that the child report of monitoring correlates (r = .42) with trained interviewers' impressions (based on observations of family interaction) and, to a lesser degree, with parental reports of monitoring (r = .10 with mother, r = .28 with father). Although Haapasalo and Tremblay (1994) did not provide correlations between child and other informant reports of punishment, their punishment scale did effectively distinguish boys who were physically aggressive over time from those who were not. Finally, Metzler and colleagues (1994) found that the coercive interaction scale was negatively related to family involvement (e.g., support, feeling of togetherness; r = -.53), and was linked to association with deviant peers (r = .29).

Social Desirability Scale. A seven item short-form of the Marlowe-Crowne Social Desirability Scale (Strahan & Gerbasi, 1972) was used in the current study. Respondents indicate whether they agree or disagree with socially desirable items such as "I'm always willing to admit it when I make a mistake". This measure correlates well (r = .90; Fraboni & Cooper, 1989; Strahan & Gerbasi, 1972) with the original scale and shows adequate psychometric properties (K-R 20 Reliability coefficient = .62 for college males, and .75 for

college females; Strahan & Gerbasi, 1972).

The Self-Report Delinquency Scale. Given that research has established that self-report questionnaires are as valid as interview reports regarding involvement in delinquent activities (Hindelang, Hirschi, & Weiss, 1981), a self-report measure was chosen for the current study. The original Self-Report Delinquency Scale (SDS, Elliott, et al., 1985) contains 38 items which assess both prevalence and frequency of involvement in general delinquency, as well as 15 questions about drug and alcohol use. Delinquency items include offenses ranging in severity from theft under $5, purchasing alcohol as a minor, and vandalism to drug trafficking, breaking and entering, and assault. In addition, four items were included for the purpose of the current investigation. A "taxing" item (e.g., group intimidation in order to obtain goods/money from others) was included given the local significance of this problem, and the lack of an equivalent item on the original scale. Three additional items were included to tap the severity of antisocial problems: stopped by police for questioning, being arrested, and being expelled from school. Based on pilot study data with the same age group, 3 items regarding sexual assault and 9 items regarding hard drug use were eliminated because no participants reported involvement in these activities. The final version therefore contained 39 items regarding delinquent activity and 6 items regarding drug use (alcohol, marijuana, amphetamines, barbiturates, hallucinogens, and tobacco).

In contrast to other self-report delinquency scales, this measure assesses a broad array of offenses and uses an open-ended response format for establishing frequency of involvement. The authors made an effort to use clear behavioral descriptions of

delinquent acts, and responses to individual items have been validated by having respondents describe the incidents they are thinking about in order to assess the appropriateness of their initial response. Furthermore, results from the National Youth Survey indicate that the SRD is internally consistent, and correlates with official delinquency rates and with teacher and parent reports of delinquent behaviour (Elliott & Ageton, 1980; Elliott & Huizinga, 1983; Elliott, et al., 1985).

For the purposes of this study, a General Delinquency index was created by summing the number of delinquent acts committed (ranging from 0 to 39; alpha = .89). Similarly, a substance use index was based on the sum of substances tried (ranging from 0 to 6 ; alpha = .69).

The Inventory of Drug Taking Situations. Developed by Annis and Martin (1985), the Inventory of Drug Taking Situations (IDTS) is a 50-item measure which assesses adolescents' reasons for using their drug of choice. Items are divided into eight scales of drug-use situations, three of which were relevant to the current study: Social Pressure to Use (5 items, alpha = .77; e.g., "I used ___ when others in the same room were using these drugs/alcohol and I felt that they expected me to join in"), Unpleasant Emotions (10 items, alpha = .92; "I used ___ when I started to feel guilty about something"), and Conflict with Others (10 items, alpha = .90; "I used ___ when other people rejected me or didn't seem to like me"). For each item, respondents indicate the frequency with which they would use their drug of choice in the situation described, using a four point scale ranging from "never" to "almost always".

The subscales show strong internal consistencies (McKay, et al., 1992). In

addition, they correlate positively (mean correlation $r = .53$) with frequency of use (McKay, et al., 1992). Clients who report drinking alcohol alone more frequently obtained higher scores on the Unpleasant Emotions scale (Annis, Turner, & Sklar, 1996; Turner, Annis, & Sklar, 1997). In contrast, those who drank with others obtained higher scores on the Social Pressure scale (Annis, et al., 1996; Turner, et al., 1997). Higher scores on the Unpleasant Emotions and Conflict with Others scales are also linked to more problematic substance use (Annis, et al., 1996).

The Adolescent Sexuality Scale. Developed specifically for this study, the Sexuality Scale begins by asking participants to indicate whether or not they have ever had sexual intercourse. Participants who are sexually active then complete 12 items assessing sexual risk taking behaviours (e.g., "Have you ever had sexual intercourse with someone you just met, without really getting to know them?"). Based on the work of Moore, Rosenthal and Brumen (1990; Moore & Rosenthal, 1992), items were coded for level of risk, with higher risk coded 3, moderate risk coded 2, and slight risk coded 1. For example, having had one sexual partner was coded as 1, having had two sexual partners was coded as 2, and having three or more sexual partners was coded as 3. A behavioral index of sexual risk was created, based on the weighted sum of the 12 items.

All participants were asked to complete 12 sexual attitude items, regardless of whether or not they were sexually active. Items on the attitudes subscale tapped avoidant attitudes regarding sexual risk (e.g., "The chances of me getting a sexually transmitted disease are pretty slim"), preoccupation with partner's wishes with regard to safe-sex practices ("I usually leave it up to my partner to decide whether we will use protection

when we have sex"), and responsible attitudes toward sexuality (e.g., "I think ahead, and carry a condom when I think I am going to have sex"). Respondents rated how true various statements were for them on a 3 point scale ranging from Never True (1) to Always True (3). An index of risky sexual attitudes was based on mean scores across these 12 items, with responsible attitudes reverse scored. This scale showed acceptable internal consistency (alpha = .75), and was positively correlated with the risky sexual behaviours index for those who were sexually active (r = .28).

Results

Description of participants

Antisocial activity: Table 4 summarizes delinquency (upper part) and substance use involvement (lower part), according to gender. Only delinquent activity reported by at least one third of participants is shown. Fewer participants had committed more serious offenses (e.g., theft over $50: 15.3%, gang fighting: 14%, selling marijuana: 14.4%). Total delinquency scores were significantly positively skewed, and subjected to a square root transformation for analyses. For ease of comprehension, original means are reported (although significance tests are based on transformed data).

Significant gender differences in antisocial activity were found. Boys were more delinquent than girls (M = 9.6, SD = 6.6 for boys; M = 8.1, SD = 6.4 for girls), whereas girls had tried more drugs than boys (M = 1.8, SD = 1.3 for boys; M = 2.3, SD = 1.4 for girls). Despite the overall gender difference in antisocial activity, more girls had committed certain behaviours than boys (e.g., failed to return extra change, been drunk in public, stolen from family; see Table 4). Although in general boys were more aggressive

than girls, girls were twice as likely to be aggressive at home than boys (19.2% vs 9%, $\chi^2(1) = 13.09$, $p < .001$). Although boys and girls were equally likely to have tried alcohol, girls were more likely to have tried tobacco, marijuana, hallucinogens and amphetamines. Nonetheless, for those who had used a particular substance, there were no gender differences in frequency of use (not shown).

With respect to sexual activity, girls and boys were equally likely to be sexually active (29.7% for boys, 35.7% for girls, $\chi^2(1) = 2.51$, ns). Furthermore, no gender differences were found with respect to risky sexual behaviours. However, girls held more responsible attitudes regarding safe sexual practices ($M = 1.39$, $SD = .30$ for girls, and $M = 1.55$, $SD = .33$ for boys with higher scores indicating more risk, $t(624) = -6.46$, $p < .001$).

Table 4

Per Cent Delinquency and Substance Use Involvement, According to Sex.

	Girls	Boys	Total
		Delinquency Involvement	
Disorderly conduct	56.0	61.1	58.6
Bought liquor as a minor	59.1	57.7	58.4
Failed to return extra change	59.1[a]	50.3[b]	54.7
Hit friends or strangers	44.4[a]	64.5[b]	54.5
Drunk in public	59.1[a]	50.3[b]	53.2
Theft under $5	49.5	56.0	52.8
Stopped for questioning	34.1[a]	46.6[b]	40.3
Avoided paying for things	41.2	36.9	39.0
Stole from family	42.7[a]	33.1[b]	37.9
Possession of stolen goods	29.7[a]	40.7[b]	35.2
Destroyed public property	21.7[a]	44.0[b]	32.9
Destroyed property at school	27.0[a]	37.1[b]	32.1
Theft between $5 and $50	28.2	32.0	30.1
		Substance use	
Alcohol	89.5	86.5	88.0
Tobacco	63.6[a]	45.8[b]	54.8
Marijuana	49.5[a]	34.5[b]	42.0
Hallucinogens	17.0[a]	9.5[b]	13.3
Amphetamines	9.6[a]	4.6[b]	7.1
Barbiturates	5.0	2.5	3.7

Note. Means with different subscripts in a given row differ significantly at the $p < .05$ level.

Antisocial activity was also examined as a function of parental status in order to compare adolescents in one-parent families versus those in two-parent families. Results from a one-way MANOVA indicate that teens in one-parent families were involved in more antisocial behaviour than those in two-parent families, $F(2,633) = 4.24$, $p < .05$: they were significantly more delinquent, $F(1,633) = 6.26$, $p < .05$, and had tried more drugs, $F(1,633) = 7.25$, $p < .01$. In addition, they were more likely to report having been arrested in the past year, χ^2 (1, $N = 633$) = 6.78, $p < .01$ (see Table 5).

Despite the mean difference in experimentation with drugs, teens in both parental status groups did not differ on various indices of severity (e.g., number of drinks at a given time, times drunk or high in the past year, times drunk or high at school, see Table 5). Nonetheless, findings suggest that, although adolescents may only use alcohol on average 6 times a year, when they do drink, they tend to drink to get drunk (e.g., average drinks at a time = 6.15, $SD = 7.35$). It should also be noted that the majority of teens in this sample who used alcohol did so illegally (under age).

Teens from one-parent families were not more likely to be sexually active, χ^2 (1, $N = 618$) = 2.22, ns, nor did they differ in risky sexual attitudes, t (611) = -.43, ns. Finally, of those who were sexually active ($n = 197$, 31%), no differences were found on various measures of sexual risk taking behaviour (e.g., engaging in casual sex, number of sexual partners, not using birth control) or in age at loss of virginity (see Table 5).

Table 5

Descriptive Information Regarding Teen Involvement in Antisocial Activity, According to Single vs. Two Parent Family Status.

Antisocial Behaviour	Single Parent	Two Parents
Delinquency	10.34 (6.23)[1 a]	8.47 (6.45)[b]
Arrested	21%[a]	11%[b]
Substance Use	2.45 (1.45)[a]	2.02 (1.35)[b]
# of drinks at a time	6.15 (7.35)	5.36 (6.85)
Times drunk (past year)	6.62 (4.39)	5.70 (4.67)
Times drunk at school	.98 (2.52)	.84 (2.42)
Times high (past year)	4.87 (4.97)	3.40 (4.61)
Times high at school	2.31 (3.95)	1.51 (3.36)
Sexually active	39%	31%
# of sexual partners	2.71 (2.04)	2.95 (7.79)
Casual sex	34.4%	32.7%
Not using birth control	45.2%	44.3%

Note. [1] Means, with standard deviations in parentheses. Values in a given row with different subscripts differ significantly at the $p < .05$ level.

Attachment style and parenting. As indicated in Table 6, on average, teens reported high attachment security in their relationships with mother and father. Mean levels of dismissing attachment style were in the moderate range, and preoccupied and fearful attachment styles received the lowest ratings across target figures. These results are consistent with previous research with categorical variables in which secure attachment is most common, followed by avoidant, and anxious styles (e.g., Mickelson, Kessler, & Shaver, 1997). Intercorrelations between attachment with mother and with father ranged from a low of $r = .37$ for secure ratings to a high of $r = .47$ for dismissing ratings. Significant skew was found for all attachment variables except for dismissing. Log transformations for preoccupied and fearful attachment, and square root transformations for secure attachment (reflected because of negative skew) were successful in reducing non-normality. Transformed variables were used in subsequent analyses.

In order to check for differences in attachment style according to parental status or gender, two 2 (Sex) by 2 (Parental Status) MANOVAs were conducted (one for each parent). The only significant multivariate effect was of Parental Status for attachment to father, $F(4,620) = 2.74$, $p < .05$. Examination of univariate effects revealed that adolescents living in one-parent families were more fearful with their fathers than those in two-parent families ($M = 3.28$, $SD = 2.26$ and $M = 2.61$, $SD = 1.83$ respectively, $F(1,620) = 5.61$, $p < .05$).

Another 2 (Sex) by 2 (Parental Status) MANOVA was conducted for parenting variables. Prior to this analysis, three variables were transformed using square-root

transformations to reduce skew: hostile punishment, and coercive interactions with both parents. Significant main effects of Sex, $F(4, 598) = 7.81$, $p < .001$, and Parent, $F(4, 598) = 5.25$, $p < .001$ were found. Univariate tests indicated that girls were more likely to be monitored than boys ($M = 2.01$, $SD = .44$ and $M = 1.69$, $SD = .51$ respectively, $F(1,598) = 26.53$, $p < .001$), and that teens in one-parent families were less likely to be monitored than those in two-parent families ($M = 1.72$, $SD = .49$ and $M = 1.98$, $SD = .47$ respectively, $F(1,598) = 17.47$, $p < .001$) .

Table 6

Mean Ratings of Attachment Styles (Standard Deviations) with Mother and Father

	Target figure	
	Mother	Father
Secure	5.20 (1.85)	4.33 (2.04)
Dismissing	3.33 (1.89)	3.81 (1.95)
Fearful	2.23 (1.63)	2.71 (1.91)
Preoccupied	2.29 (1.63)	2.37 (1.55)

Attachment and adjustment

In order to evaluate the link between attachment style, coping, and antisocial activity, partial correlations (controlling for sex and social desirability) were examined. Participants' reports of their parents' socioeconomic status were also considered as potential control variables, however they were not significantly related to any of the relationship, coping, or antisocial variables. Analyses were limited to two-parent families primarily because attachment to both mother and father were considered of interest and because of the differences in attachment style and antisocial outcomes (according to parental status) noted above. In addition, there were too few single parent families to examine separately (n = 65 mom only, n = 23 dad only).

Attachment and antisocial activity. The hypothesis that secure attachment would be negatively related to involvement in antisocial activity was supported. Teens who were securely attached with their father were less likely to be delinquent and less likely to experiment with drugs. Those who were more secure with their mothers were also less likely to experiment with drugs, and held less risky attitudes about sex (see Table 7).

That insecure attachment styles would be related to involvement in antisocial activity was partially supported. Both forms of avoidant attachment were associated with antisocial activity, however no evidence was found for a link between preoccupied attachment and these behaviours (see Table 7). As anticipated, dismissing attachment with both mother and father was positively related to delinquent behaviour, substance use, and risky sexual attitudes. Fearful attachment with mother was also associated with more delinquency and more substance use. A similar trend was found for fearful attachment

with father, and between fearful attachment and risky sexual attitudes, although effects did not reach significance. Contrary to prediction, no significant associations between attachment and risky sexual *behaviours* were found.

Table 7

Partial Correlations Between Attachment Style and Antisocial Activity, Controlling for Sex and Social Desirability.

Attachment Style	Delinquency (n = 514)	Substance use (n = 514)	Risky Sexual Attitudes (n = 495)	Risky Sexual Behaviour (n = 166)
SEC-M	-.08	-.13*	-.13*	-.13
SEC-F	-.17**	-.19**	-.11	-.09
DIS-M	.17**	.14*	.13*	.15
DIS-F	.18**	.13*	.12*	.14
PRE-M	.07	-.02	.01	.00
PRE-F	.05	.01	-.11	-.04
FEAR-M	.13*	.13*	.10	.12
FEAR-F	.10	.10	.09	.06

Note. SEC = secure, DIS = dismissing, PRE = preoccupied, FEAR = fearful, M = with mother, F = with father. * $p < .05$, ** $p < .01$ with Bonferroni correction. Sample size varies due to missing data. Correlations with risky sexual behaviour only apply to teens who are sexually active.

A second question concerning the link between attachment style and antisocial behaviour was whether different insecure styles would be associated with different reasons for using drugs. Results were strongest when attachment to father was considered (see Table 8). As anticipated, adolescents who were higher in dismissing and fearful attachment with their fathers (the two avoidant styles) were likely to use drugs in response to negative emotions and conflicts with others. This was in contrast to teens who reported more secure attachment with their fathers. As predicted, teens who were higher in fearful attachment with their fathers were also likely to use drugs in response to peer pressure although this was not the case for teens with higher preoccupied ratings.

Table 8

Partial Correlations between Attachment Style and Reasons for Drug Use, Controlling for Sex and Social Desirability.

Attachment	Reasons for Drug Use		
Style	Negative Emotions	Conflict with Others	Social Pressure
SEC-M	-.12	-.11	-.05
SEC-F	-.21**	-.21**	-.10
DIS-M	.10	.10	.09
DIS-F	.17**	.18**	.07
PRE-M	.07	.11	.01
PRE-F	.00	.03	.06
FEAR-M	.12	.15*	.03
FEAR-F	.16*	.21**	.13[a]

Note. n = 370. SEC = secure, DIS = dismissing, PRE = preoccupied, FEAR = fearful, M = with mother, F = with father. [a] $p < .10$ * $p < .05$, ** $p < .01$ with Bonferroni correction.

Attachment and coping style. As anticipated, secure attachment was positively associated with constructive coping, and negatively related to less healthy ways of coping (see Table 9). Adolescents who were more secure with their mother used more constructive coping and less emotion avoidance in response to stress. Those who were more secure with their father used less self-criticism, and were less likely to withdraw emotionally or behaviorally.

In general, both forms of avoidant attachment were also associated in expected ways with various coping strategies. Dismissing attachment with mother and with father was related to greater use of emotion avoidance in response to stress. However, contrary to prediction, this style was not significantly associated with angry confrontational coping. As anticipated, fearful attachment was related to greater use of self-criticism, and more behavioral avoidance.

Once again, predictions regarding preoccupied attachment style were not supported. Although preoccupied attachment within both relationships was positively correlated with self-criticism, the strength of association was not significant. However, being preoccupied with mother was linked to greater use of emotion avoidance in response to stress.

Table 9

Partial Correlations Between Attachment and Coping Styles, Controlling for Sex and Social Desirability.

	Constructive Coping	Self-criticism	Emotion Avoidance	Withdrawal/ Rumination	Angry Confrontation
SEC-M	.17**	.02	-.16**	-.02	.00
SEC-F	.05	-.15**	-.19**	-.17**	-.04
DIS-M	-.10	-.04	.13*	-.03	.06
DIS-F	-.07	.08	.15**	.10	.07
PRE-M	.01	.11	.16**	.04	.04
PRE-F	.02	.10	.09	.08	.01
FEAR-M	-.01	.15**	.10	.11	.11
FEAR-F	-.02	.15**	.07	.18**	.04

Note. n = 514. SEC = secure, DIS = dismissing, PRE = preoccupied, FEAR = fearful, M = mother, F = father. * $p < .05$, ** $p < .01$ using Bonferroni correction.

Coping and antisocial activity. Links between coping style and antisocial activity were not as strong as expected (see Table 10). Only angry confrontational coping was related to both delinquent behaviour and substance use. Although self-criticism and behavioral avoidance were positively related to experimentation with more drugs, effects failed to reach significance. Finally, none of the coping styles were associated with either risky sexual attitudes or behaviours. Nonetheless, a non-significant trend suggests that adolescents who use more constructive coping skills may be less likely to engage in risky sexual behaviour.

Given that none of the attachment styles were significantly related to the one coping style that was associated with antisocial behaviour, angry confrontation could not be considered a potential mediator of the attachment - antisocial behaviour link. As a result, testing of a mediational model (through coping) was not relevant.

Table 10

Partial Correlations Between Coping Style and Antisocial Activity, Controlling for Sex and Social Desirability.

Coping Style	Delinquency (n = 514)	Substance use (n = 514)	Risky Sexual Attitudes (n = 495)	Risky Sexual Behaviour (n = 166)
Constructive	-.04	.01	-.03	-.18[a]
Self-criticism	.05	.11	.09	.01
Avoidance	.00	-.04	.03	.04
Withdrawal	.06	.11	.05	.01
Confrontation	.20**	.20**	.05	.08

Note. Sample size varies due to missing data. [a] $p < .10$, ** $p < .01$, using Bonferroni correction.

Coercion theory

In order to evaluate the link between ineffective parenting and antisocial outcomes, partial correlations (controlling for sex and social desirability) were initially examined, followed by path analyses which tested the possibility of indirect effects from parenting to antisocial outcomes through association with deviant peers. Once again, child report of parental SES was not significantly related to parenting or outcome variables. Partial correlations and path analysis provide different types of information. Partial correlations indicate the degree of association between each parenting variable and each particular adjustment variable, in this case with the effects of sex and social desirability held constant. Path coefficients, on the other hand, indicate the unique contribution of a particular exogenous variable, controlling for the effects of all other exogenous variables on a given dependent (or endogenous) variable. Once again, for reasons outlined above, analyses were limited to two-parent families.

Indices of peer involvement in antisocial activity were created by summing the antisocial behaviour scores of each participant's five best friends. Sexuality data were examined separately due to large differences in sample size (since only 31% of participants were sexually active). Therefore, one index of antisocial peer activity was the sum of delinquency and substance use scores, and another index was the sum of risky sexual behaviour scores, for each participant's peer group. Both indices were positively skewed, and transformed with square-root transformation prior to analyses.

As predicted by coercion theory, hostile punishment and coercive interactions were positively related to all forms of antisocial activity (see Table 11). Also as expected,

higher parental monitoring was associated with less involvement in antisocial behaviour. Coercion theory also postulates a link between ineffective parenting and association with deviant peers. However, in this sample, only parental monitoring was related to association with delinquent peers or friends who engaged in sexually risky behaviours: teens who reported more parental monitoring had friends who were less involved in antisocial activity. Partial correlations between antisocial behaviour of the peer group and parental use of hostile punishment or coercive interactions were not significant.

Table 11

Partial Correlations Between Parenting and Antisocial Activity, Controlling for Sex and Social Desirability.

Parenting variable	Delinquency (n = 505)	Substance use (n = 505)	Sexual Attitudes (n = 495)	Risky Sexual Behaviour (n = 165)	Delinquent Peer Group (n = 505)	Sexually Risky Peer Group (n=323)
Hostile Punishment	.29**	.26**	.15**	.26**	.10	.07
Mom Coercive	.18**	.20**	.16**	.16	.05	.04
Dad Coercive	.19**	.17**	.13*	.12	.01	.04
Monitoring	-.32**	-.24**	-.21**	-.29**	-.13*	-.16*

Note. Sample size varies due to missing data. * $p < .05$, ** $p < .01$ with Bonferroni correction.

Structural equation modeling, using the EQS program (Bentler, 1995), was employed to test the coercion theory model presented in Figure 1. The model was evaluated twice - once with respect to delinquency and substance use (both were dependent variables, with the paths between the two constrained to be equal), and once with respect to risky sexual behaviour (for those who were sexually active; see Appendix C for correlation matrices and standard deviations). Based on the work of Patterson and colleagues, in the initial model, paths were specified from parenting variables to involvement with antisocial peers. Association with antisocial peers was in turn expected to predict delinquency and substance use or risky sexual behaviour. However, this model showed poor fit to the data, χ^2 (9, $\underline{n}$ = 505) = 108.45, $\underline{p} < .001$, NFI = .87, NNFI = .62, CFI = .88 [1] for the delinquency/substance use model, and χ^2 (4, $\underline{n}$ = 124) = 17.03, $\underline{p} < .01$, NFI = .83, NNFI = .43, CFI = .85 for the risky sexual behaviour model.

The revised model for delinquency and substance use is presented in Figure 3. This model shows only one significant path between parenting variables and association with antisocial peers: high parental monitoring is associated with a less antisocial peer

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Theoretically, a significant χ^2 statistic indicates that the model deviates from the null model (i.e., with all possible paths specified). However, this statistic is notoriously sensitive to sample size and, with large samples, is often significant simply because of sample size. As a result, other indices are also examined to evaluate model fit. NFI and NNFI refer to the Bentler-Bonett Normed Fit Index (Bentler & Bonett, 1980) and Non-Normed Fit Index (Bentler,1990) respectively. These indices represent the proportion of improvement of the tested model relative to the null model. The NNFI controls for model complexity. CFI refers to Bentler's (1990) Comparitive Fit Index which is interpreted the same way as the other fit indices, but is less affected by sample size. These indices range theoretically from 0 to 1. Values above .90 indicate acceptable model fit. Finally, if the χ^2/df ratio is equal to or less than three, this is considered favorable (Kline, 1998).

group. This model shows direct paths from hostile punishment to delinquency and substance use, between monitoring and delinquency, and between coercive interactions with mother and substance use. Fit indices show acceptable fit for the revised model: χ^2 (8, $\underline{n}$ = 505) = 13.49, $\underline{p}$ = .10, χ^2/df ratio = 1.68, NFI = .98, NNFI = .98, CFI = .99. This model accounted for 45.7% of the variance in delinquency and 29.4% of the variance in substance use. Next, using a multi-sample path analysis, the delinquency/substance use model was evaluated for girls ($\underline{n}$ = 253) and boys ($\underline{n}$ = 252) to determine whether model fit differed according to sex. This analysis constrains all paths to be equal across samples. The chi square statistic for this multi-sample analysis was non-significant, χ^2 (12) = 15.02, $\underline{p}$ = .24, indicating that model fit was comparable across sex.

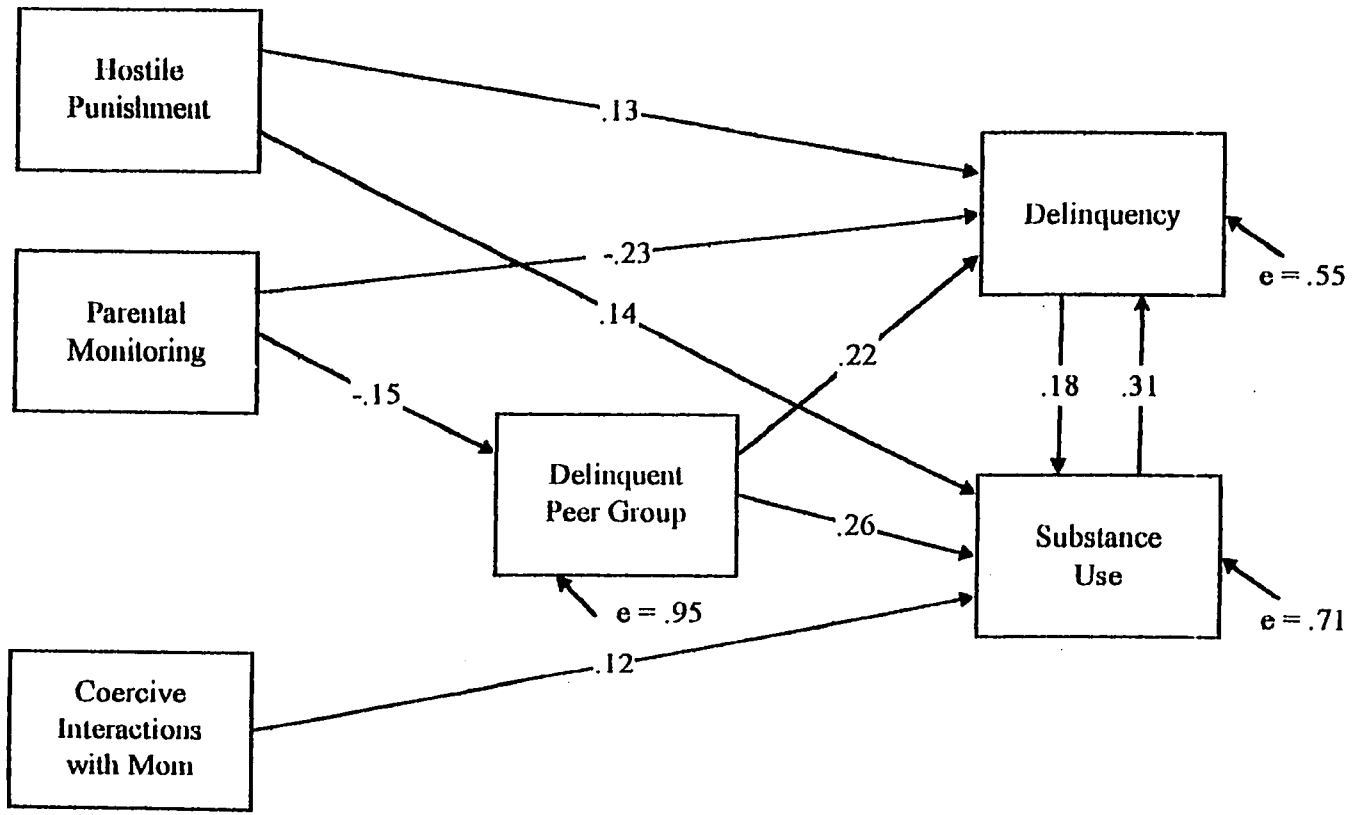

Figure 3. Path model predicting delinquency and substance use, based on coercion theory.

Note. Standardized path coefficients. Social desirability effects are not shown. Significant paths were found from social desirability to delinquent peer group (-.14) and to delinquency (-.23). All paths significant at $p < .05$

Figure 4 illustrates results for the revised sexual risk model. In this model, effects from social desirability and coercive interactions to risky sexual behaviour were not significant. Results indicate direct and indirect effects of parental monitoring on risky behaviour. Teens who report more parental monitoring engage in less risky behaviour. Furthermore, they are less likely to associate with friends who engage in risky behaviour. Less association with "risky" friends is in turn linked to less individual sexual risk behaviour. Another parenting variable, hostile punishment, was positively related to sexual risk taking. Model fit for this simplified model was acceptable, χ^2 (1, $\underline{n}$ = 124) = 1.39, $\underline{p}$ = .24, χ^2/df ratio = 1.39, NFI = .96, NNFI = .92, CFI = .99, although the model was not very complex. The model accounted for 16.7% of the variance in sexual risk taking. Once again, a multi-group analysis was conducted to examine the possibility of sex differences. Results suggest that the model applied equally well for boys ($\underline{n}$ = 51) and girls ($\underline{n}$ = 73), χ^2 (6) = 8.10, $\underline{p}$ = .23.

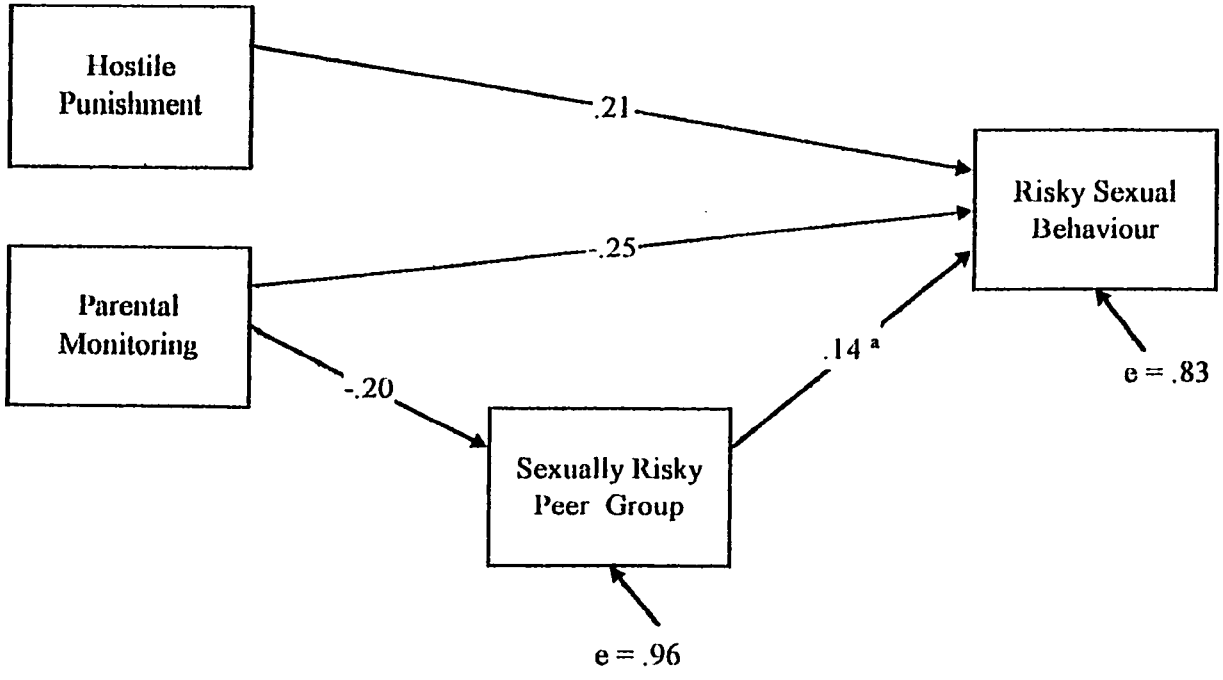

Figure 4. Path model predicting risky sexual behaviour, based on coercion theory.

Note. Standardized path coefficients. All paths significant at $p < .05$, except $^{a}\ p < .10$.

Test of the combined model

First, in order to reduce the number of variables used in the analysis, two latent variables - insecure attachment with mom and with dad - were evaluated. In the confirmatory measurement model, presented in Figure 5, each latent variable was composed of secure (reverse coded), dismissing, and fearful attachment styles (for each target figure separately; see Appendix C for correlation matrix and standard deviations). Correlated measurement errors were expected across target figures (e.g., error for secure attachment with mom would be correlated with error for secure attachment with dad). This model showed acceptable fit to the data, χ^2 (5, $\underline{n}$ = 502) = 4.85, $\underline{p}$ = .43, χ^2/df ratio = .97, NFI = .99, NNFI = 1.00, CFI = 1.00, indicating that the security variables could be combined to form correlated, but distinct, indices of insecure attachment with each parent.

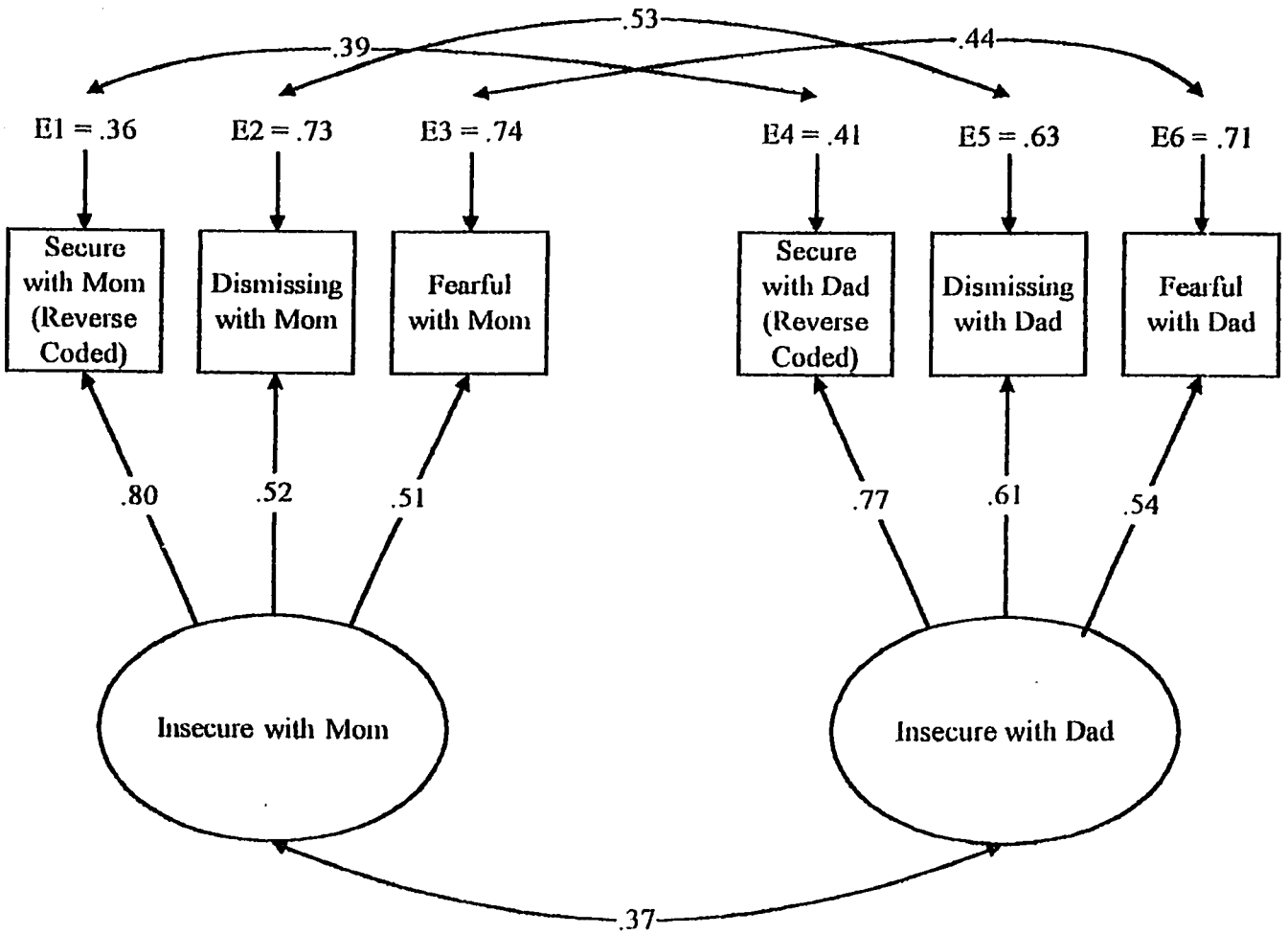

Figure 5. Latent model of insecure attachment with mother and father.

Note. Standardized path coefficients. All paths significant at $p < .05$

Next, structural equation modeling was used to test the combined attachment/coercion model (see Appendix C for correlation matrix and standard deviations). In this model, the factors obtained above were not re-estimated (in order to reduce the number of paths). Instead, the security scales were combined to create new variables to be used in the model. Correlated measurement error was also expected between hostile punishment and coercive interactions. The final model, which fit the data well, χ^2 (26, $\underline{n}$ = 502) = 41.85, $\underline{p}$ = .03, χ^2 /df ratio = 1.58, NFI = .97, NNFI = .97, CFI = .99, is presented in Figure 6. This model accounted for 50% of the variance in delinquency and 32% of the variance in substance use. Results indicate that insecure attachment with mother and father are related to delinquency and substance use indirectly, through parenting variables. Specifically, insecure attachment with mother and father are positively related to use of hostile punishment, and negatively related to parental monitoring. Hostile punishment is in turn related to more delinquency and more substance use, whereas parental monitoring is associated with less delinquency. Parental monitoring is also linked to less antisocial behaviour in one's peer group, suggesting that monitoring also has an indirect positive effect on antisocial behaviour, through the reduction of association with deviant peers. Insecure attachment with each parent is also associated with more coercive interactions with each respective parent. Coercive interactions with father are in turn positively related to angry confrontational coping, which is linked to more antisocial behaviour. In this model, the weak link between coercive interactions with mother and substance use (found in the coercion model) was not significant.

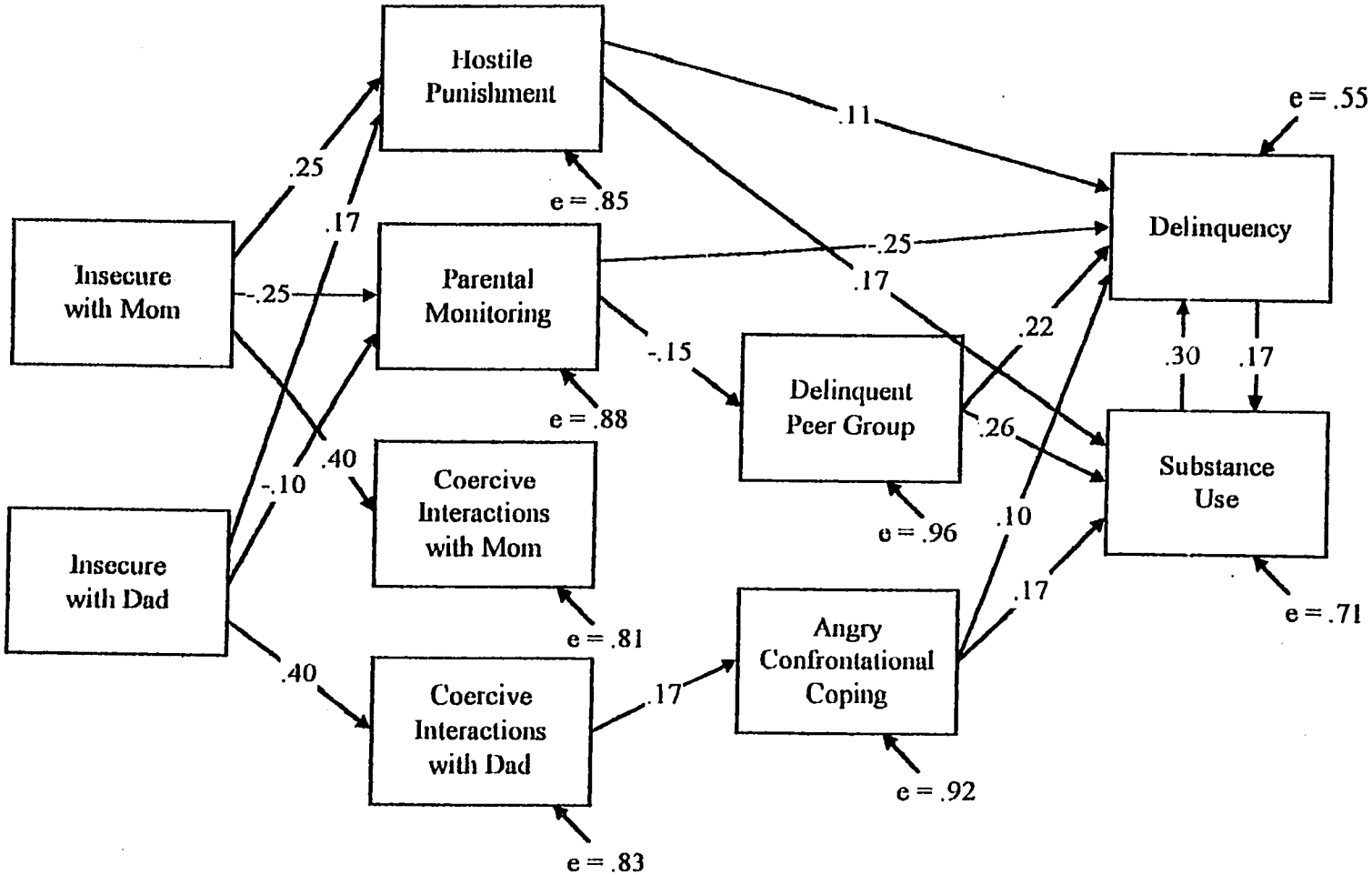

Figure 6. Combined model, based on attachment and coercion theories, predicting delinquency and substance use.

Note. Standardized path coefficients. Social desirability effects are not shown. Significant paths were found from social desirability to hostile punishment (-.12), monitoring (.15), coercive interactions with mother (-.19), coercive interactions with father (-.09), delinquent peer group (-.14), angry confrontation (-.20) and to delinquency (-.13). All paths significant at $p < .05$.

In order to determine whether the combined model offered an improved understanding of antisocial behaviour than the coercion theory model, the model AICs (Akaike's Information Criterion; Akaike, 1987) were compared. The AIC is similar to the χ^2 statistic but considers model complexity. Comparing AICs is more appropriate than examining the χ^2 difference between models when models are nonhierarchical. The model with the lowest AIC value is preferred. In this case, although the combined model was more complex than the coercion model, it also had the lowest AIC value (-10.82 vs. -2.51). Hence, the combined model is the preferred model.

Given the large number of paths in this model, and the sample size, a multi-group analysis comparing model fit for boys and girls was not possible. Nonetheless, the lack of gender differences in the attachment model and the coercion model suggest that gender differences would not likely be present in this combined model. For similar reasons, the combined model could not be evaluated with respect to risky sexual behaviour.

Discussion

This study examined adolescent involvement in antisocial behaviour from two theoretical standpoints: Bowlby's attachment theory and Patterson's coercion theory. This section begins by examining the representativeness of the sample. Results regarding attachment theory are then discussed, followed by results regarding coercion theory. Next, the combined model is considered. The section continues with a commentary regarding the limitations of the current study. Finally, general conclusions are presented.

Representativeness of the sample

In terms of involvement in antisocial activities, the teenagers in this sample were

similar in many ways to youths in other provinces and Canada as a whole. With respect to delinquency, results are comparable to previous research which shows that most teens have committed some form of delinquent act (see Moffitt, 1993) and that teens from one-parent families are likely to be more delinquent (Stevenson, Tufts, Hendrick, & Kowalski, 1999). Arrest rates reported by teens in this sample are higher than the national average of approximately 5% (Stevenson, et al., 1998). This may be because participants misinterpreted the meaning of "arrested". When they asked for clarification during data collection, they were told that the question referred to being apprehended and brought to the police station. Given that only approximately two thirds of youths apprehended by police are charged or recommended to be charged (Carrrington, 1998), the number reported in this sample may actually be representative. That is, the 11% of teens who reported they were "arrested" may be those who were "apprehended". This percentage is more comparable to the 15% figure based on Carrington's (1998) findings. In future studies, participants should be provided with a clearer definition of the terms. It should also be noted that this question was not an original item on the Elliott, et al. (1985) questionnaire. Finally, of the teens who reported being arrested, the most common offense reported was theft - which is consistent with Canadian Youth Court Statistics (Stevenson, et al., 1998).

With respect to substance use, the average number of drugs used by teens in the current study was similar to rates reported by grade 11 high school students in Ontario (Adlaf & Ivis, 1997). Rates for use of specific drugs found in this study were also parallel to those found by Adlaf and Ivis, with the exception of alcohol and tobacco use, which

were higher in this sample (alcohol use: 88% vs. 80%; tobacco use: 54.8% vs. 43.4%). Higher percentages of teens trying alcohol or tobacco in Quebec than in Ontario is consistent with the fact that rates of using these substances by adults in Quebec are higher than in Ontario (Kellner, 1997, Poulin, 1997). Furthermore, the legal age for purchasing alcohol in Quebec is lower than in Ontario. Adlaf and Ivis also found that girls were more likely to have used amphetamines, as in this study, although no other gender differences were reported.

The number of teens who were sexually active in this sample (31%) is lower than that found in the National Population Health Survey of a representative sample of adolescents (43.5%, Galambos & Tilton-Weaver, 1998). This may be because most participants in this study were 16 and 17-years-old and the national figures are based on 15 to 19-year-olds. Perhaps many of the adolescents in this study will become sexually active in the next year.

With respect to attachment style, results from this study are comparable to previous research using categorical data (e.g., Mickelson, et al., 1997). Specifically, highest ratings were found for secure attachment, followed by dismissing attachment and ratings for the fearful and preoccupied styles were lowest. Gender differences in parental monitoring are also consistent with previous research that finds girls are more monitored than boys (e.g., Chilcoat, Breslau, & Anthony, 1996). Finally, less parental monitoring in single-parent families relative to two-parent families is also a common finding (e.g., Chilcoat, et al., 1996).

When compared to data obtained from the Canadian Census (of 1996 and 1981),

this sample was also remarkably representative of the Canadian population in terms of ethnic background and socioeconomic status. Taken together, these findings suggest that this sample is, in many respects, representative of Canadian youth, thereby adding to the potential generalizability of the results. Nevertheless, the sample was drawn from Catholic high schools, and contains more intact families than found in the general population.

Attachment theory

As anticipated, attachment style was associated with antisocial activity. Teens who were more securely attached with their mothers and fathers were less likely to be delinquent, had tried fewer drugs, and held less risky attitudes regarding sexual behaviour. Being more secure with father, in particular, appeared to play a protective role with respect to delinquent behaviour and problematic substance use. Adolescents who were more secure with their fathers had engaged in less delinquency and were less likely to report using drugs as a way of dealing with unpleasant emotions and interpersonal conflict.

In contrast, teens who were higher in dismissing attachment with both parents were involved in more antisocial behaviour: they were more delinquent, had tried more drugs, and had riskier attitudes regarding sexuality. A similar pattern was found for adolecents higher in fearful attachment (although results only achieved statistical significance when attachment to mother was considered). It may be that these teens, who find it difficult to rely on their parents, attempt to assert their independence by acting out in antisocial ways. This is compatible with Moffitt's (1993) view that many teens engage in antisocial behaviour as a way of achieving "mature" status. These results are also

consistent with the hypothesis that avoidant attachment styles would be more strongly related to antisocial outcomes, given the shared characteristic of negative views of others.

Both fearful and dismissing styles were also related to using drugs in response to unpleasant emotions and conflict with others, with stronger effects for attachment with father versus mother. These findings suggest that avoidant attachment styles may be associated with more serious substance use, since similar reasons for use are reported by problematic drug users (Annis, et al., 1996; Turner, et al., 1997) although this possibility remains to be examined in future research. As expected, being more fearful with father was also linked to using drugs in response to social pressure. In a sample of young adults (mean age of 19 years), Brennan and colleagues (1991) found that fearful attachment was more common for participants whose parents were problem drinkers. It may be that the adolescents in the current study who rated themselves higher in fearful attachment (and perhaps those who were higher on dismissing attachment), were exposed to unhealthier substance use in the home. Since problematic substance use is more common in males than females in the general adult population (Kellner, 1997), it is also likely that fathers would be more likely to model dysfunctional usage patterns than mothers.

Contrary to prediction, the preoccupied style was not related to any of the antisocial outcomes assessed in this study. This may be because teens who are preoccupied in their relationships with parents may be more motivated to behave in ways that will be viewed positively by their parents and may also spend less time with antisocial peers. Preoccupation in peer relationships, particularly with deviant peers, may have different implications for adjustment. This possibility remains to be examined in future

research. It could also be that preoccupied attachment may be more strongly related to mood disorders rather than externalizing problems. For example, numerous studies have demonstrated a link between preoccupied attachment and depression (e.g., Murphy & Bates, 1997).

Interestingly, quality of attachment was not significantly related to risky sexual behaviour. This may be due in part to the relative sexual inexperience of the adolescents in this sample: only 31% were sexually active and of these, most had only recently had their first sexual encounter. The link between attachment and sexual risk-taking should be examined in future studies with older adolescents and/or participants with more sexual experience.

Attachment style was also differentially associated with adolescents' ways of coping with stress. As expected, secure attachment with mother was related to more constructive coping (e.g., problem-solving, positive reappraisal, social support seeking) and less emotion avoidance. Once again the possibility of a protective role of secure attachment with father was apparent. Although not more likely to use constructive coping, teens who felt closer and more able to rely on their fathers used less emotion avoidance and withdrawal, and were less likely to engage in self-criticism. Thus being able to depend on mother appears to promote positive coping skills, whereas being able to depend on father seems to reduce the likelihood of using less healthy coping strategies. This may be because, in contrast to their relationships with their fathers, teens' relationships with their mothers are closer and more focused on current events (Youniss & Smollar, 1985). As a result, mothers may be more helpful than fathers in teaching

constructive problem-solving skills to be used in the "here and now". Nonetheless, feeling secure with their fathers may help teens develop more effective emotion regulation skills, thereby decreasing the likelihood of using less healthy coping strategies.

The hypothesis that dismissing attachment would be positively related to emotion avoidance was supported. Thus it appears as though teens higher in this attachment style, who feel unable to depend on their parents, cope with stress by deactivating the attachment system and refusing to think about the stressful situation. Fearful attachment was more strongly related to behavioral withdrawal, self-criticism and feelings of helplessness than to emotion avoidance. Consistent with their negative self-perceptions, teens high in fearful attachment seem to blame themselves for the stressful situations they experience and feel they are unable to cope effectively. They also appear to cope with their discomfort by withdrawing from social contexts, perhaps because they feel unable to rely on others. Finally, a non-significant trend was found between fearful attachment with mother and the use of angry confrontation, suggesting the possibility that fearful teens may become aggressive in response to stress.

An unexpected finding showed that being high in preoccupied attachment was associated with greater use of emotion avoidance. According to attachment theory, these teens often experience high levels of emotion. In response to stress, it is likely that their attachment system is "hyperactivated", leading to hypervigilance with respect to indications of distress, and heightened levels of anxiety. Although it is difficult to assess in the current data set, it may be that the emotion avoidance associated with dismissing attachment is qualitatively different from the emotion avoidance associated with

preoccupied attachment. Although teens high in dismissing style may use emotion avoidance as a coping strategy, their emotions are probably less intense to begin with. In contrast, teens high in preoccupied style may simply have more intense emotions to cope with, thus making emotion avoidance particularly important for maintaining control. Future research considering subjective levels of distress may shed light on this question.

Coping styles were also examined in relation to antisocial behaviour. Contrary to prediction, only one coping style was significantly associated with antisocial outcomes. Teens who used more angry confrontation were also more delinquent and had tried more drugs. This coping style appears to reflect a lack of respect for others combined with an aggressive interpersonal style. It may also be an indication of poor impulse control.

Although it may be that the coping styles examined in this study are in effect unrelated to antisocial behaviour, alternative explanations are possible. For one, this study used a community-based sample of adolescents attending high school, in which antisocial problems and stressors were likely to be less severe than in more high risk groups. Investigations with clinical samples may find such links. It could also be that the link between coping style and antisocial behaviour is moderated by one's behavioral repertoire. For example, using emotion avoidance may only be related to antisocial outcomes for teens who have been exposed to aggressive or substance using models (in their peer group or in the home). Teens with more prosocial alternatives, who also use emotion avoidance, may simply involve themselves in other activities (e.g., sports). Other potential mediators, such as cognitive biases or negative expectations about others, should also be examined in future research. Dodge's work on social-information processing (e.g., Dodge, 1980;

Dodge & Frame, 1982; Dodge & Newman, 1981) may be of particularly relevance: avoidant teens may be more likely to have hostile attribution biases, which have been linked to aggression. A fourth possibility could be that the effects of coping on antisocial outcomes may only appear after more prolonged use of the particular coping style. Such effects would only be evident in longitudinal investigations.

A trend ($p < .10$) in the smaller sample of sexually active participants also suggested that constructive coping may reduce sexual risk taking. This possibility should be examined in future work with larger samples of sexually active adolescents.

These results, based on attachment theory, suggest that adolescents' views of their own competence in relationships, and the expectations they develop about others (i.e, trustworthy and dependable vs. uncaring and unreliable) through their experiences in relationships, may come to shape the way they cope with stressful situations and whether they act out in antisocial ways. Further examination of such links using longitudinal designs and different forms of measurement may help further understand the complex phenomenon of adolescent antisocial activity. These findings also suggest that attachment style may vary across attachment figures. Future work should continue to examine the role of attachment to different individuals in order to further understand differential contributions of relationships. During the adolescent years, attachment style with peers (including romantic partners) and other important adult figures (teachers, coaches, counsellors) may make different contributions to adjustment. In addition, examining discrepancies in attachment style across target figures may be important. For example, Fonagy and colleagues (1998) have suggested that the challenge posed by resolving

discrepancies in representations of self and other in relationships may lead to behavioral problems.

Coercion theory

Consistent with previous investigations, the coercion theory model provided a good understanding of adolescent antisocial behaviour. As in previous research, parental monitoring was associated with less antisocial activity (e.g., Dishion, et al., 1991). Teens who were monitored more frequently by their parents associated with less deviant peer groups, were less delinquent, had experimented with fewer drugs, held less risky sexual attitudes and had engaged in less sexual risk taking behaviour. Given the concurrent nature of the study, it is difficult to assess whether antisocial behaviour decreased in response to parental monitoring or whether parental monitoring changed as a result of adolescent misbehaviour. It is likely that both possibilities are true. Nonetheless, these results suggest that, even during the adolescent years, when teens spend more time with their peers and strive to achieve independence, parents still have a role to play in their social development. By setting limits and being aware of their adolescent children's activities and social contacts, parents may decrease the likelihood of antisocial behaviour. Parental monitoring may also reflect more security in the parent-child relationship. That is, parents who feel closer to their children may be more likely to monitor them and teens who feel able to depend on their parents may be more likely to tell their parents about their friends and their activities.

In contrast, adolescents who reported being victim to hostile punishment in their homes were also more delinquent and had tried more drugs. In addition, they held riskier

sexual attitudes and were more involved in risky sexual activity. Teens who argued more frequently with their mothers also experimented with more drugs. It is likely that, in their family environment, these teens have been exposed to more negative ways of interacting with others, increasing their likelihood of acquiring similar patterns through social learning processes. For example, parents who use hostile punishment do not model effective impulse control or emotion regulation. In addition, exposure to a general lack of respect for others conveyed through coercive interactions, may result in increased lack of regard for others both within the family context and elsewhere. Together these processes may enhance the likelihood of antisocial outcomes during the teen years. Yet it may also be that parents of difficult teens react to their child's misbehaviour by using hostile punishment.

The combined model

Combining Bowlby's attachment theory with Patterson's coercion theory permitted a more complete understanding of potential processes underlying the development of antisocial activity during adolescence. Although the combined model was more complex than the coercion model, comparison of the models using Akaike's Information Criterion (1987) suggested that the combined model was preferred. These results underscore the importance of considering both affective and social learning processes for understanding adolescent antisocial behaviour.

Findings from the combined model suggest that the affective quality of parent-child relationships can be linked indirectly to antisocial behaviour through day-to-day parenting behaviours. Consistent with attachment theory, insecure attachment relationships were

related to a more contentious home environment, characterized by hostile punishment, coercive interactions, and less parental monitoring.

Teens who were more insecure with their fathers argued more frequently with them and were also likely to use more angry confrontation in response to stress. This way of coping may reflect a combination of disregard for authority and lack of respect for others characteristic of the avoidant attachment styles and learned ways of interacting with others. Angry confrontation was also related to delinquency and substance use, highlighting the potential role of dysfunctional coping in adolescent antisocial activity. Although insecure attachment with mother was also related to more frequent arguments with her, coercive interactions with mother were not associated with coping style or antisocial outcomes. Perhaps such interactions with mothers do not reflect the same test of authority as they do with fathers.

Contrary to expectation, hostile punishment and parental monitoring were not significantly related to use of angry confrontation (the only coping style associated with antisocial outcomes). This may be because hostile punishment does not necessarily involve a counter-reaction on the part of the adolescent. In contrast, adolescents who are involved in coercive interactions with their fathers seem to be already using angry confrontation patterns in the home. Given that parental monitoring appears to be an indication of security in parent-child relationships, it may be related to other more adaptive ways of coping, such as constructive problem-solving.

Limitations

One major limitation of this study is the fact that data was collected at one point in

time, thereby limiting conclusions about the directionality of effects. This is particularly true with respect to the link between attachment and parenting. In the combined model presented here, attachment style was seen as antecedent to daily interactions. However, it is likely that a reciprocal relationship exists between the affective quality of the parent-child bond and the more behavioral aspects of parent-child interactions (e.g., punishment, monitoring). Observational research of parents and adolescents may help further understand the way in which these two facets of their relationship interact. With the current data, it is also difficult to say whether attachment quality and parenting vary in response to adolescent misconduct or whether they are precursors to antisocial activity. While theoretically it can be argued that relationship factors precede coping abilities and teen behaviour, this question can only truly be answered with prospective, longitudinal research which considers processes over time.

Another important limitation of this study is the sole reliance on adolescent self-reports. Although efforts were made to collect parental reports of attachment style, marital relationship quality (including conflict resolution style), ways of coping, monitoring, coercive interactions with their child, and use of hostile punishment, the response rate was so low ($\underline{n}$ = 42 mother-father pairs, 26 mother only, and 6 father only, 12%) that analyses using this data were not feasible. Nonetheless, for the sample for which such data was available, adolescents' reports of monitoring and coercive interactions were significantly correlated with parental reports. (Discrepancies were found between adolescent and parent reports of hostile punishment, although this may be due to a social desirability bias on the part of the parents.) Parent participation was solicited

through their adolescent children, and it is possible that many parents never received the letter inviting them to participate. The use of multiple informants and of multi-method assessment of the variables examined in this study would be recommended in future research.

This study was limited to a sample of adolescents attending high school. Despite the representativeness of the sample, it is likely that this is relatively healthy sample. Although continued work with high school students is necessary (especially given the level of antisocial activity that is typical of this population), research examining the link between attachment and antisocial activity should also be conducted with more deviant populations (e.g., clinic samples, officially delinquent samples, etc.). Furthermore, given the small number of single-parent families, analyses were limited to the larger sample of two-parent families. It is difficult to say whether similar patterns of findings would be evident in single-parent households. Future research with single-parent families and/or families in transition, may reveal different processes or highlight particularly important factors in parent-child relationships which could trigger antisocial activity.

Conclusions

These results suggest that attachment theory offers a useful framework for understanding antisocial behaviour and coping strategies during adolescence. In particular, avoidant attachment styles with both parents are linked to more risk taking behaviours and secure attachment with father appears to act as a protective factor. Despite the fact that attachment styles could be differentially related to coping strategies, many of the ways adolescents coped with stressful situations were not associated with

their antisocial activity. The exception, angry confrontation, was not related to attachment style and therefore could not be viewed as a potential mediator of the attachment - antisocial behaviour link. It may be that links between coping style and antisocial outcomes would be more evident in clinical samples. Future research should also consider other potential mediating factors.

As predicted by coercion theory, parenting practices were also related to adolescent antisocial behaviour. Parental monitoring, in particular, appeared to be a possible deterrent for all forms of antisocial behaviour examined, including association with deviant peer groups (although given the concurrent nature of the study, it is possible that monitoring occurred in response to child misbehaviour). The negative interaction patterns characteristic of a contentious family environment were also associated with acting out behaviour, perhaps because teens have acquired disrespect for others and coercive ways of interacting through social learning processes.

Finally, combining attachment theory and coercion theory perspectives helped understand potential processes leading to antisocial outcomes. The affective quality of the parent-child bond was reflected in daily parent-child interactions. Parental monitoring appeared to reflect, in part, a secure parent-child relationship whereas hostile punishment and coercive interactions were associated with insecure attachment. Findings from the combined model suggest that the link between insecure attachment and delinquency and substance use is mediated by use of more hostile punishment and less parental monitoring. The association between insecure attachment with father and antisocial outcomes was also mediated by more frequent coercive interactions and teens' use of more angry

confrontation. This combined model highlights the possible joint contribution of affective and social learning processes for adolescent antisocial outcomes, which remain to be examined further in prospective longitudinal research.

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Appendix A

Concordia
UNIVERSITY

CENTRE FOR RESEARCH IN HUMAN DEVELOPMENT
tel: (514) 848-2240 fax: (514) 848-2815

Dear Student:

We are writing to ask you to participate in a study about relationships, coping, emotions, and behavior. We would like to know what this time of your life is *really* like for you. Your participation will involve completing questionnaires about your relationships, the ways you cope with stress, and how you deal with rules, alcohol, drugs, and sex. We will ask you about your relationship with your parents, your friends, and your perceptions about your parents' relationships. We will also ask about your involvement in a variety of different activities, including rule breaking behaviour, alcohol and drug use, as well as your attitudes about sexual behaviour. Finally, we will ask you about your mood, and about how you feel about yourself in general.

We think you will find the project interesting, and your participation would greatly help us understand the kinds of experiences people your age go through. The study will take place during class, and be completed in two sessions of approximately 50 minutes each. We would like to remind you that **all information you provide will be completely confidential**. That means NO ONE will see the information you give us, except the members of the research project team.

If you are interested, we will also be pleased to send you a report of the study once completed. And of course, you are free to discontinue at any time, although we think you'll enjoy participating in the study.

Please complete the enclosed consent form and give it to your teacher. We want to hear from you **whether or not** you wish to participate. **Everyone returning the form (whether the answer is Yes or No) will have their name entered in a draw.**

YOU COULD WIN ONE OF THE FOLLOWING:

1) a Cineplex Odeon movie passes for two,

2) 4 passes for two to Laser Quest,

3) a $50 gift certificate for HMV Music Stores,

or A GRAND PRIZE OF **4) a Sony Disc Man!!**

7141 Sherbrooke Street West
Montreal, Quebec H4B 1R6

If you have any questions about the study, please call Kirsten Voss at 848-7560. We look forward to hearing from you.

Sincerely,

Kirsten Voss, M.A., Graduate Student (848-7560)	Anna-Beth Doyle, Ph.D. Professor of Psychology (848-7538)	Dorothy Markiewicz, Ph.D. Associate Professor of Applied Social Science and of Psychology (848-2215)

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Concordia
UNIVERSITY

CENTRE FOR RESEARCH IN HUMAN DEVELOPMENT
tel: (514) 848-2240 fax: (514) 848-2815

October 1997

CONSENT FORM TO PARTICIPATE IN RESEARCH (Form A)

Check where applicable:

_____ I agree to participate in the study conducted by Kirsten Voss, Dr. Dorothy Markiewicz, and Dr. Anna-Beth Doyle of the Centre for Research in Human Development. I have been informed that the study is about relationships, coping, emotions, and behaviour.

_____ I am not sure if I want to participate and I want to be called to discuss the project.

Please indicate your name and phone number:

_____

_____ I do not agree to participate in this study and do not wish to be called. Please indicate your name (so we can put your name in the draw):

_____

7141 Sherbrooke Street West
Montreal, Quebec H4B 1R6

IF YOU AGREE TO PARTICIPATE, please complete the following:

I have been informed that the purpose of the research is to study the link between relationship quality, coping style, emotions, and behaviour. Participation will be at my school, and will involve two sessions of approximately 50 minutes, during which I will be asked to complete questionnaires about my relationship with my friends, my parents, my perception of my parents' relationships, the ways I cope with stress, my mood and feelings about myself, and involvement in rule-breaking behaviour, use of alcohol and drugs, and attitudes regarding sexual behaviour. I understand that ALL INFORMATION WILL BE CONFIDENTIAL to the research team, and identified only by number. I understand that I may withdraw my consent and may discontinue participation at any time.

I HAVE READ THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND AGREE TO PARTICIPATE IN THIS STUDY.

Name (please print): _____

Street Address: _____

City and Postal Code: _____

Phone Number: _____

Signature: _____ Date: _____

School: _____ Grade: _____

Teachers' name/class: _____

Please return this form to your teacher.

Appendix B: Measures

Appendix B

This appendix contains copies of the measures used in data collection. They are presented in the following order:

PHASE 1

1. General Information

2. Relationships at School - Peer nomination of friends and non-friends

2. The Relationship Questionnaire (Bartholomew & Horowitz, 1991)

    - versions for father and mother

3. The Ways of Coping Questionnaire (Folkman & Lazarus, 1988)

4. The Family Issues Questionnaire

5. The Social Desirability Scale (Strahan & Gerbasi, 1972; page entitled "Attitudes Questionnaire")

6. General Information for Parents - Adolescent Report

PHASE 2

1. The Self-Report Delinquency Scale (Elliott, et al., 1985)

2. The Inventory of Drug-Taking Situations (Annis & Martin, 1985)

3. The Adolescent Sexuality Scale

4. A comments and suggestions page

Participation # _____ O=A

GENERAL INFORMATION FORM

The information provided in this form will help us describe the range of participants in our study.

1. Age: _____

2. Date of birth: _____

3. Sex: _____

4. Grade: _____

5. School:_____

6. What is your mother tongue (first language)?_____

7. What languages do you speak at home?_____

8. Who lives in your house with you?

Mom _____ Dad _____

Stepmom _____ Stepdad _____

Sisters (specify ages) _____ Brothers (specify ages) _____

Other adults (please specify)_____

9. My mom is (check one):

_____ Single _____Married _____Divorced _____ Widowed

10. My dad is (check one)

_____ Single _____Married _____Divorced _____ Widowed

10. My ethnic/cultural background is:_____
(e.g., Italian, Hispanic, African, ...)

RELATIONSHIPS AT SCHOOL

Please name your **best same-sex friends** in grades 10 and 11 at your school ***(first & last names)***. **BEGIN WITH YOUR <u>VERY BEST</u> FRIEND.**

You can name as many or as few friends as you like (you don't have to fill all the lines).

1. _____
2. _____
3. _____
4. _____
5. _____

Please name same-sex students in grades 10 and 11 at your school that <u>you don't like to spend time with.</u>
(You don't have to fill all the lines)

1. _____
2. _____
3. _____
4. _____
5. _____

If you have one or more best friends of the **opposite sex** at your school, name them here. DO NOT include a romantic partner (someone you are dating).
(You don't have to fill all the lines)

1. _____
2. _____
3. _____
4. _____
5. _____

RELATIONSHIP WITH FATHER

If you don't have a dad or stepdad, just leave this blank and go to the next questionnaire.

Please tell us who you are thinking of when you fill out this questionnaire (check one):

_____ Dad OR _____ Stepdad

Think about your relationship with your father. Now read each paragraph below and indicate to what extent **each** paragraph describes your relationship with your father. **Circle the number** that is true for you.

1. It is easy for me to become emotionally close to my father. I am comfortable depending on my father and having my father depend on me. I don't worry about being alone or having my father not accept me.

Not at all **Very Much**

1.....2.....3.....4.....5.....6.....7

2. I am comfortable not having a close emotional relationship with my father. It is very important to me to feel independent and self-sufficient, and I prefer not to depend on my father or have my father depend on me.

Not at all **Very Much**

1.....2.....3.....4.....5.....6.....7

3. I want to be completely emotionally intimate with my father, but I often find that my father is reluctant to get as close as I would like. I am uncomfortable not having a close relationship with my father, but I sometimes worry that he doesn't value me as much as I value him.

Not at all **Very Much**

1.....2.....3.....4.....5.....6.....7

4. I am uncomfortable getting close to my father. I want to be emotionally close to my father, but I find it difficult to trust him completely, or to depend on him. I worry that I will be hurt if I allow myself to become too close to my father.

Not at all **Very Much**

1.....2.....3.....4.....5.....6.....7

RELATIONSHIP WITH MOTHER

If you don't have a mom or stepmom, just leave this blank and go to the next questionnaire.
Please tell us who you are thinking of when you fill out this questionnaire (check one):

_____ Mom OR _____ Stepmom

Think about your relationship with your mother. Now read each paragraph below and indicate to what extent **each** paragraph describes your relationship with your mother. **Circle the number** that is true for you.

1. It is easy for me to become emotionally close to my mother. I am comfortable depending on my mother and having my mother depend on me. I don't worry about being alone or having my mother not accept me.

Not at all **Very Much**

1.....2.....3.....4.....5.....6.....7

2. I am comfortable not having a close emotional relationship with my mother. It is very important to me to feel independent and self-sufficient, and I prefer not to depend on my mother or have my mother depend on me.

Not at all **Very Much**

1.....2.....3.....4.....5.....6.....7

3. I want to be completely emotionally intimate with my mother, but I often find that my mother is reluctant to get as close as I would like. I am uncomfortable not having a close relationship with my mother, but I sometimes worry that she doesn't value me as much as I value her.

Not at all **Very Much**

1.....2.....3.....4.....5.....6.....7

4. I am uncomfortable getting close to my mother. I want to be emotionally close to my mother, but I find it difficult to trust her completely, or to depend on her. I worry that I will be hurt if I allow myself to become too close to my mother.

Not at all **Very Much**

1.....2.....3.....4.....5.....6.....7

WAYS OF COPING

Take a few moments and think about the most stressful situation that you have experienced in the past few weeks. By "stressful" we mean a situation that was difficult or troubling for you, either because you felt distressed about what had happened, or because you had to use considerable effort to deal with the situation. It might have been a discussion or confrontation with someone close to you, a problem with a teacher at school or with a co-worker, a separation from someone you care about.

Briefly describe the incident you are thinking about:

_____

_____

_____

_____

_____

We would like to know how you **typically** deal with stressful situations when they occur. Use the following scale to indicate the frequency with which you use the strategies listed below:

0	1	2	3
Does not apply Not used	**Used Somewhat**	**Used quite a bit**	**Used a great deal**

1. I just concentrate on what I have to do next - the next step.	0	1	2	3
2. I do something that I don't think will work, but at least I do something.	0	1	2	3
3. I try to get the person responsible to change his or her mind.	0	1	2	3
4. I talk to someone to find out more about the situation.	0	1	2	3
5. I criticize or lecture myself.	0	1	2	3
6. I try not to burn my bridges, but leave things open somewhat.	0	1	2	3
7. I hope for a miracle.	0	1	2	3
8. I go along with fate; sometimes I just have bad luck.	0	1	2	3
9. I think "Why can't I get going?"	0	1	2	3
10. I go on as if nothing happened.	0	1	2	3

Remember to use this scale:

0	1	2	3
Does not apply Not used	**Used Somewhat**	**Used quite a bit**	**Used a great deal**

11. I try to keep my feelings to myself.	0	1	2	3
12. I look for the silver lining, so to speak; I try to look on the bright side of things.	0	1	2	3
13. I sleep more than usual.	0	1	2	3
14. I express anger to the person(s) who caused the problem.	0	1	2	3
15. I accept sympathy and understanding from someone.	0	1	2	3
16. I think "Why do I always react this way?"	0	1	2	3
17. I am inspired to do something creative about the problem.	0	1	2	3
18. I try to forget the whole thing.	0	1	2	3
19. I get professional help.	0	1	2	3
20. I go away by myself and think about why I feel this way.	0	1	2	3
21. I change or grow as a person in a good way.	0	1	2	3
22. I apologize or do something to make up.	0	1	2	3
23. I make a plan of action and follow it.	0	1	2	3
24. I let my feelings out somehow.	0	1	2	3
25. I realize I bring the problems on myself.	0	1	2	3
26. I write down what I am thinking and analyze it.	0	1	2	3
27. I come out of the experience better than when I went in.	0	1	2	3
28. I talk to someone who can do something concrete about the problem.	0	1	2	3
29. I try to make myself feel better by eating, drinking, smoking, using drugs or medication, etc.	0	1	2	3
30. I take a big chance or do something very risky to solve the problem..	0	1	2	3

Remember to use this scale:

0	1	2	3
Does not apply Not used	**Used Somewhat**	**Used quite a bit**	**Used a great deal**

31. I try to not act too hastily or follow my first hunch.	0	1	2	3
32. I find new faith.	0	1	2	3
33. I rediscover what is important in life.	0	1	2	3
34. I change something so things will turn out all right.	0	1	2	3
35. I avoid being with people in general.	0	1	2	3
36. I don't let it get to me; I refuse to think too much about it.	0	1	2	3
37. I ask a relative or friend I respect for advice.	0	1	2	3
38. I keep others from knowing how bad things are.	0	1	2	3
39. I go someplace alone to think about my feelings.	0	1	2	3
40. I make light of the situation; I refuse to get too serious about it.	0	1	2	3
41. I go over and over the details of what happened.	0	1	2	3
42. I talk to someone about how I am feeling.	0	1	2	3
43. I stand my ground and fight for what I want.	0	1	2	3
44. I take it out on other people.	0	1	2	3
45. I draw on my past experiences; I have been in similar situations before.	0	1	2	3
46. I think "I won't be able to concentrate if I keep thinking this way."	0	1	2	3
47. I know what has to be done, so I double my efforts to make things work.	0	1	2	3
48. I refuse to believe that it happened.	0	1	2	3
49. I make a promise to myself that things will be different next time.	0	1	2	3

Remember to use this scale:

0	1	2	3
Does not apply Not used	**Used Somewhat**	**Used quite a bit**	**Used a great deal**

50. I come up with a couple of different solutions to the problem.	0	1	2	3
51. I try to keep my feelings from interfering with other things too much.	0	1	2	3
52. I change something about myself.	0	1	2	3
53. I wish that the situation would go away or somehow be over with.	0	1	2	3
54. I sit at home and try to understand the situation.	0	1	2	3
55. I have fantasies or wishes about how things might turn out.	0	1	2	3
56. I pray.	0	1	2	3
57. I go over in my mind what I will say or do.	0	1	2	3
58. I think about how a person I would admire would handle the situation and use that as a model.	0	1	2	3

FAMILY ISSUES

The following questions ask about the rules some families have at home, and about the consequences for breaking those rules. Please read each question carefully and circle the number which best describes your experience. Tell us about the parents you live with.

1. How important is it to your parents to know where you are?

0	1	2	3
Not Important	Somewhat Important	Very Important	Extremely Important

2. In the course of a day, how often do your parents actually know where you are?

0	1	2	3
Never	Sometimes	Often	Always

3. How important is it to your parents to know who your friends are?

0	1	2	3
Not Important	Somewhat Important	Very Important	Extremely Important

4. How often would your parents know who you are with when you are away from home?

0	1	2	3
Never	Sometimes	Often	Always

5. How often do your parents follow through with a punishment after you're told to stop doing something but you don't stop?

0	1	2	3
Never	Sometimes	Often	Always

6. How often do you get away with things?

0	1	2	3
Never	Sometimes	Often	Always

7. When you are punished, how often does the punishment work?

0	1	2	3
Never	Sometimes	Often	Always

8.. Once your parents decide on a punishment, how often can you get out of it?

0 ..... 1..... 2 3
Never Sometimes Often Always

9. When you do something wrong, how often do your parents ignore it?

0 ..... 1..... 2 3
Never Sometimes Often Always

10.When you do something that your parents like or approve of, how often do they ignore it or not say anything about it?

0 ..... 1..... 2 3
Never Sometimes Often Always

11. Do your parents punish you by slapping or hitting you?

0 ..... 1..... 2 3
Never Sometimes Several Times Often

12. Do your parents punish you by not letting you do things you would like to do?

0 ..... 1..... 2 3
Never Sometimes Several Times Often

13. Do your parents punish you by arguing?

0 ..... 1..... 2 3
Never Sometimes Several Times Often

14. Do your parents punish you by saying you cause them distress?

0 ..... 1..... 2 3
Never Sometimes Several Times Often

15. Do your parents punish you by calling you names?

0 ..... 1..... 2 3
Never Sometimes Several Times Often

16. Is there a rule at home about the time to come home in the evenings?

_____ YES or _____ NO

17. Do your parents supervise week *night* curfew?

0 ..... 1..... 2 3
Never Sometimes Often Always

18. Do your parents supervise *weekend* curfew?

0 ..... 1..... 2 3
Never Sometimes Often Always

19. Is there a rule at home about how much time you can spend in front of the TV?

_____ YES or _____ NO

20. Is there a rule at home about having to do your homework?

_____ YES or _____ NO

21. Is there a rule at home that you cannot spend time with certain people?

_____ YES or _____ NO

22. Is there a rule at home that requires you to have dinner with the family?

_____ YES or _____ NO

23. How often do you tell your parents when you will be home?

0 ..... 1..... 2 3
Never Sometimes Often Always

24. How often do you leave a note about where you are going?

0 ..... 1..... 2 3
Never Sometimes Often Always

25. How often do you check in after school?

0 ..... 1..... 2 3
Never Sometimes Often Always

26. How often is there an adult at home one hour after school?

0 ..... 1..... 2 3
Never Sometimes Often Always

27. How often do you know how to reach your parents if they're out?

0	1	2	3
Never	Sometimes	Often	Always

28. How often do you talk to your parents about daily plans?

0	1	2	3
Never	Sometimes	Often	Always

For the following questions, please indicate how true each statement is for you. Use the following scale.

1	2	3	4	5
Never True	**Seldom True**	**Sometimes True**	**Often True**	**Always True**

29. My mom and I have big arguments about little things.

1.....2.....3.....4.....5

30. My mom and I get angry with each other at least once a day.

1.....2.....3.....4.....5

31. My mom and I get angry with each other at least three times a week.

1.....2.....3.....4.....5

32. When my mom and I talk, it is frustrating.

1.....2.....3.....4.....5

33. My mom and I rarely argue.

1.....2.....3.....4.....5

34. My dad and I have big arguments about little things.

1.....2.....3.....4.....5

Remember to use this scale:

Never True	Seldom True	Sometimes True	Often True	Always True
1	2	3	4	5

35. My dad and I get angry with each other at least once a day.

1.....2.....3.....4.....5

36. My dad and I get angry with each other at least three times a week.

1.....2.....3.....4.....5

37. When my dad and I talk, it is frustrating.

1.....2.....3.....4.....5

38. My dad and I rarely argue.

1.....2.....3.....4.....5

39. We fight a lot in our family.

1.....2.....3.....4.....5

ATTITUDES QUESTIONNAIRE

For the following questions, please circle "T" for True and "F" for False	True	False
1. I'm always willing to admit it when I make a mistake.	T	F
2. I have never been annoyed when people expressed ideas very different from my own.	T	F
3. I have never deliberately said something that hurt someone's feelings.	T	F
4. I like to gossip at times.	T	F
5. There have been occasions when I took advantage of someone.	T	F
6. I sometimes try to get even rather than to forgive and forget.	T	F
7. At times I have really insisted on having things my own way.	T	F

Participation # _____

We would like to know a little more about your parents. Please complete the following as best you can.

MOM INFORMATION:

Please fill this out about the person who lives with you (check one):

_____ **Mom** **OR** _____ **Stepmom**

1. What level of education does your mother/stepmother have (highest grade completed)?

   Elementary School _____ High School _____

   CEGEP/Technical school: _____

   University: Bachelor's _____
   Master's _____
   Doctorate _____

2. Mom/Stepmom's ethnic/cultural background:_____
   (e.g., Italian, Hispanic, African, ...)

3. Is your mom/stepmom working now at a paid job?:_____ YES or _____ NO

If your mother is not currently working at a paid job, go to question # 8.

4. Does she work: _____ Full-time (35+ hours a week) or _____ Part-time?

5. What is your mother's/stepmother's usual job?_____

6. What are the main activities of this job?_____

7. What industry is this in (e.g. what does the employer sell or make)?

_____

8. **If your mother is not currently working at a paid job,** would you say she was looking for work, keeping house, or unable to work (check one only)?

   _____ Looking for work _____ Keeping house _____ Unable to work

DAD INFORMATION:

Please fill this out about the person who lives with you (check one):

_____ **Dad** **OR** _____ **Stepdad**

1. What level of education does your father/stepfather have (highest grade completed)?

   Elementary School _____ High School _____

   CEGEP/Technical School _____

   University: Bachelor's _____
   Master's _____
   Doctorate _____

2. Dad/Stepdad's ethnic/cultural background: _____
   (e.g., Italian, Hispanic, African, ...)

3. Is your dad/stepdad working now at a paid job?: _____ YES or _____ NO

If your dad is not currently working at a paid job, go to # 8.

4. Does he work: _____ Full time (35+ hours a week) or _____ Part time?

5. What is your father's/stepfather's usual job?_____

6. What are the main activities of this job?_____

7. What industry is this in (e.g. what does the employer sell or make)?

_____

8. **If your dad is not currently working at a paid job,** would you say he was looking for work, keeping house, or unable to work (check one only)?

   _____ Looking for work _____ Keeping house _____ Unable to work

Participation # _____

This section asks about different behaviours that teenagers are sometimes involved in. Your answers are very important to us: we want to know what really happens for people your age so please answer all questions **honestly**. Remember, **ALL YOUR ANSWERS ARE CONFIDENTIAL.**

For each question,

- First indicate whether or not you have **ever** done what is described (check YES or NO).

- Then, if you answer YES, indicate how many times in the last year you have done each behaviour.
  (If you have done something more than 10 times, just write 10+. If in the last year you have never done what is described, even though you have done it before, just write 0.)

Have you ever...? (If Yes, please indicate how many times in the *last year.)*

1. Purposely damaged or destroyed property (includes vandalism/graffiti) belonging to your parents or other family members?

YES _____	Number of times in the last year _____	NO _____

2. Purposely damaged or destroyed property (includes vandalism/graffiti) belonging to your school or employer?

YES _____	Number of times in the last year _____	NO _____

3. Purposely damaged or destroyed other property (includes vandalism/graffiti) that did not belong to you, not counting family, school, or work property?

YES _____	Number of times in the last year _____	NO _____

4. Stolen or tried to steal a motor vehicle such as a car or motorcycle?

YES _____	Number of times in the last year _____	NO _____

5. Stolen or tried to steal something worth more than $50.00?

YES _____	Number of times in the last year _____	NO _____

6. Knowingly bought, sold or held stolen goods or tried to do any of these things?

YES _____	Number of times in the last year _____	NO _____

7. Purposely set fire to a building, car, or other property or tried to do so?

YES _____	Number of times in the last year _____	NO _____

8. Carried a hidden weapon other than a plain pocket knife?

YES _____	Number of times in the last year _____	NO _____

9. Stolen or tried to steal things worth $5.00 or less?

YES _____	Number of times in the last year _____	NO _____

10. Attacked someone with the idea of seriously hurting that person?

YES _____	Number of times in the last year _____	NO _____

11. Been involved in gang fights?

YES _____	Number of times in the last year _____	NO _____

12. Used checks illegally or used phony money to pay for something (includes intentional overdrafts)?

YES _____	Number of times in the last year _____	NO _____

13. Sold marijuana or hashish (weed, pot, grass, hash)?

YES _____	Number of times in the last year _____	NO _____

14. Hitchhiked where it was illegal to do so?

YES _____	Number of times in the last year _____	NO _____

15. Stolen money or other things from your parents or other members of your family?

YES _____	Number of times in the last year _____	NO _____

16. Stolen money, goods, or property from school or from the place where you work?

YES _____	Number of times in the last year _____	NO _____

17. Hit or threatened to hit one of your parents?

YES _____	Number of times in the last year _____	NO _____

18. Hit or threatened to hit your teacher, your supervisor or another employee?

YES _____	Number of times in the last year _____	NO _____

19. Hit or threatened to hit anyone else (e.g., friends, strangers)?

YES _____	Number of times in the last year _____	NO _____

20. Been loud, rowdy, or unruly in a public place (disorderly conduct)?

YES _____	Number of times in the last year _____	NO _____

21. Sold hard drugs such as cocaine, LSD (acid), heroin (or others)?

YES _____	Number of times in the last year _____	NO _____

22. Tried to cheat someone by selling them something that was worthless or not what you said it was?

YES _____	Number of times in the last year _____	NO _____

23. Taken a vehicle for a ride or drive without the owner's permission?

YES _____	Number of times in the last year _____	NO _____

24. Bought liquor as a minor?

YES _____	Number of times in the last year _____	NO _____

25. Used force or "strong arm" methods to get money or things from people?

YES _____	Number of times in the last year _____	NO _____

26. Avoided paying for such things as movies, bus or metro rides, and food?

YES _____	Number of times in the last year _____	NO _____

27. Been drunk in a public place?

YES _____	Number of times in the last year _____	NO _____

28. Stolen or tried to steal things worth between $5.00 and $50.00?

YES _____	Number of times in the last year _____	NO _____

29. Broken into or tried to break into a building (including an abandoned building) or vehicle to steal something or just to look around?

YES _____	Number of times in the last year _____	NO _____

30. Begged for money or things from strangers?

YES _____	Number of times in the last year _____	NO _____

31. Failed to return extra change that a cashier gave you by mistake?

YES _____	Number of times in the last year _____	NO _____

32. Used or tried to use credit cards without the owner's permission?

YES _____	Number of times in the last year _____	NO _____

33. Made obscene telephone calls (such as calling someone and saying dirty things)?

YES _____	Number of times in the last year _____	NO _____

34. Snatched someone's purse or wallet or picked someone's pocket?

YES _____	Number of times in the last year _____	NO _____

35. Used money or funds entrusted to your care for some purpose other than that intended (embezzled money)?

YES _____	Number of times in the last year _____	NO _____

36. Ganged up with friends, and used force or intimidation to get money or things from people (taxing)?

YES _____	Number of times in the last year _____	NO _____

37. Been stopped by the police for questioning?

YES _____	Number of times in the last year _____	NO _____

38. Been arrested?

YES _____	Number of times in the last year _____	NO _____

If "Yes", what were you charged with?

_____

39. Been expelled from school?

YES _____	Number of times in the last year _____	NO _____

Read each of the following questions and indicate the age you first did what is described. If you never did what is described, just write N/A and move on to the next question.

How old were you when you first...

Purposely damaged or destroyed property that did not belong to you? ..... _____

Stole something worth $5.00 or less? ..... _____

Stole something worth between $5.00 and $50.00? ..... _____

Stole something worth more than $50.00? ..... _____

Purposely set fire to a building, car, or other property? ..... _____

Attacked someone with the idea of seriously hurting them? ..... _____

Got involved in a gang fight? ..... _____

Broke into a vehicle or building to steal something? ..... _____

Used force or strong arm methods to get money or things from strangers? .. _____

Sold drugs such as marijuana, hashish, heroin, cocaine, LSD? ..... _____

The next questions ask about your use of alcohol, drugs, and other substances. As you did before, first indicate whether or not you have ever done what is asked. Next, indicate how many times you have done the behaviour in the last year.

Have you ever...? (If Yes, please indicate how many times in the *last year.)*

1. Used alcoholic beverages (beer, wine, liquor)?

YES _____	Number of times in the last year _____	NO _____

2. Used marijuana, or hashish (mari, weed, grass, pot, hash)?

YES _____	Number of times in the last year _____	NO _____

3. Used hallucinogens (LSD, acid, mescaline, peyote, magic mushrooms)?

YES _____	Number of times in the last year _____	NO _____

4. Used amphetamines (uppers, speed, pep pills, bennies, dexies, diet pills) that were not prescribed by a doctor?

YES _____	Number of times in the last year _____	NO _____

5. Used barbiturates (downers, reds, yellows, blues, rainbows, goof balls, sleeping pills) that were not prescribed by a doctor?

YES _____	Number of times in the last year _____	NO _____

6. During the past year, have you used tobacco?

Yes _____ No _____

7. When using tobacco, how much do you usually use?

_____ cigarettes a day OR _____ cigarettes per month

8. Have you ever used any other drugs? If so, please specify the drug, and the number of times last year.

Name of drug	Number of times in the last year

9. How old were you when you first tried (if you have never tried these substances, move on to the next page)

Alcohol? _____

Marijuana? _____

Other drugs? _____

10. If you drink alcohol, how many drinks do you typically have at one given time? (one drink = 1 beer OR 1 glass of wine OR 1 ounce of liquor)

_____ drinks

INVENTORY OF DRUG TAKING SITUATIONS

Listed below are a number of situations or events in which some people use alcohol or drugs. Read each item carefully, and answer in terms of your own use over the **PAST YEAR.** Circle the number which corresponds to your choice.

Please indicate whether or not you have used drugs or alcohol over the past year

YES, I have _____ NO, I have not _____

If you have not used drugs or alcohol in the past year, skip to the next questionnaire.

Use the following scale to indicate your answer:

0 = Never, 1 = Rarely, 2 = Sometimes, 3 = Frequently,4 = Almost Always

I used _____
(tell us which substance you are thinking about; e.g. alcohol, marijuana...)

1. When I was depressed about things in general.	0	1	2	3	4
2. When I felt shaky, sick, or nauseous.	0	1	2	3	4
3. When I was happy.	0	1	2	3	4
4. When I felt there was nowhere left to turn.	0	1	2	3	4
5. When I wanted to see whether I could use these drugs/alcohol in moderation.	0	1	2	3	4
6. When I was in a place where I had used or bought these drugs/alcohol before.	0	1	2	3	4
7. When I felt uneasy in the presence of someone.	0	1	2	3	4
8. When I was invited to someone's home and felt awkward about refusing when they offered me these drugs/alcohol.	0	1	2	3	4
9. When I met some old friends and we wanted to have a good time.	0	1	2	3	4
10. When I was unable to express my feelings to someone.	0	1	2	3	4
11. When I felt I had let myself down.	0	1	2	3	4

Remember the question is: **I used** _____

The scale is:**0 = Never, 1 = Rarely, 2 = Sometimes, 3 = Frequently, 4 = Almost Always**

12. When I had trouble sleeping.	0	1	2	3	4
13. When I felt confident and relaxed.	0	1	2	3	4
14. When I was bored.	0	1	2	3	4
15. When I wanted to prove to myself that these drugs/alcohol were not a problem for me.	0	1	2	3	4
16. When I unexpectedly found some of these drugs/alcohol or happened to see something that reminded me of these drugs/alcohol.	0	1	2	3	4
17. When other people rejected me or didn't seem to like me.	0	1	2	3	4
18. When I was out with friends and they kept suggesting we go somewhere and use these drugs/alcohol.	0	1	2	3	4
19. When I was with an intimate partner, and we wanted to feel even closer	0	1	2	3	4
20. When other people treated me unfairly or interfered with my plans.	0	1	2	3	4
21. When I was lonely.	0	1	2	3	4
22. When I wanted to stay awake, be more alert, or be more energetic.	0	1	2	3	4
23. When I felt excited about something.	0	1	2	3	4
24. When I felt anxious or tense about something.	0	1	2	3	4
25. When I wanted to find out whether I could use these drugs/alcohol occasionally without getting hooked.	0	1	2	3	4
26. When I had been drinking and thought about using these drugs/alcohol.	0	1	2	3	4
27. When I felt that my family was putting a lot of pressure on me or that I couldn't measure up to their expectations.	0	1	2	3	4

Remember the question is: **I used** _____

The scale is:**0 = Never, 1 = Rarely, 2 = Sometimes, 3 = Frequently, 4 = Almost Always**

28. When others in the same room were using these drugs/alcohol and I felt that they expected me to join in.	0	1	2	3	4
29. When I was with friends and wanted to increase my enjoyment.	0	1	2	3	4
30. When I was not getting along well with others at school or at work.	0	1	2	3	4
31. When I started to feel guilty about something.	0	1	2	3	4
32. When I wanted to lose weight.	0	1	2	3	4
33. When I was feeling content with my life.	0	1	2	3	4
34. When I felt overwhelmed and wanted to escape.	0	1	2	3	4
35. When I wanted to test out whether I could be with drug/alcohol-using friends without using these drugs/alcohol.	0	1	2	3	4
36. When I heard someone talking about their past experiences with these drugs/alcohol.	0	1	2	3	4
37. When there were fights at home.	0	1	2	3	4
38. When I was pressured to use these drugs/alcohol and felt that I couldn't refuse.	0	1	2	3	4
39. When I wanted to celebrate with a friend.	0	1	2	3	4
40. When someone was dissatisfied with my work or I felt pressure at school or on the job.	0	1	2	3	4
41. When I was angry at the way things had turned out.	0	1	2	3	4
42. When I had a headache or was in physical pain.	0	1	2	3	4
43. When I remembered something good had happened.	0	1	2	3	4

Remember the question is: **I used** _____

The scale is:**0 = Never, 1 = Rarely, 2 = Sometimes, 3 = Frequently, 4 = Almost Always**

44. When I felt confused about what I should do.	0	1	2	3	4
45. When I wanted to test out whether I could be in places where these drugs/alcohol were being used without using any.	0	1	2	3	4
46. When I began to think about how good a rush or a high had felt.	0	1	2	3	4
47. When I felt that I needed courage to face up to someone.	0	1	2	3	4
48. When I was with a group of people and everyone was using these drugs/alcohol.	0	1	2	3	4
49. When I was having a good time and wanted to increase my sexual enjoyment.	0	1	2	3	4
50. When I felt that someone was trying to control me and I wanted to feel more independent.	0	1	2	3	4

ADOLESCENT SEXUALITY SCALE

The following questions ask about your sexual behaviour and attitudes.
Remember **ALL YOUR ANSWERS ARE CONFIDENTIAL.**

1. Are you currently in a steady romantic relationship?

YES _____ NO _____

2. If so, how long have you been in this relationship? _____

3. Have you ever had sexual intercourse?

YES _____ NO _____

If YES, please answer the following questions. If NO, continue with number 13 on page 16.

4. How old were you when you first had sexual intercourse?

_____ years old

5. Are you currently sexually active?

YES _____ NO _____

6. How many times in the last 6 months have you had sexual intercourse?

Number of times: _____

7. How many sexual partners have you had in your lifetime?

Number of partners: _____

8. Have you ever had sexual intercourse with someone you just met, without really getting to know them?

YES _____ NO _____

9. Do you use birth control?

YES _____ NO _____

If yes, what do you use?_____

10. When you think about having sex with a new partner, how often do you ask about:

	Never	Sometimes	Always
a) previous sexual partners?	1	2	3
b) intravenous drug use?	1	2	3
c) homosexual or bisexual experiences?	1	2	3

11. When you are planning to have sex with a new partner, how often do you discuss:

	Never	Sometimes	Always
a) condom use?	1	2	3
b) whether he/she has been tested for AIDS?	1	2	3
c) previous history of sexually transmitted diseases?	1	2	3

	Never	Sometimes	Always
12a). When you have sexual intercourse with a **new or casual partner**, how often do you use a condom?	1	2	3
12b). When you have sexual intercourse with a **regular** partner, how often do you use a condom?	1	2	3

For the following questions, please indicate how often the statement is true for you. If you have never had sexual intercourse, just answer what you think you would do in the situations described.

Circle the number which corresponds to your choice.	Never True	Sometimes True	Always True
13. I usually leave it up to my partner to decide whether we will use protection when we have sex.	1	2	3
14. I think ahead, and carry a condom when I think I am going to have sex.	1	2	3
15. If someone really loves you, you don't need to protect yourself: they will tell you if they are infected.	1	2	3
16. If my partner doesn't want to use protection, I will have sex anyway.	1	2	3
17. A person who won't use protection is not worth sleeping with.	1	2	3
18. It is important to protect yourself against sexually transmitted diseases even if you have been in a steady relationship for several months.	1	2	3
19. I am more concerned about how my partner feels than about using protection.	1	2	3
20. The chances of me getting a sexually transmitted disease are pretty slim.	1	2	3
21. I don't need to worry about protection; I know my partner is faithful.	1	2	3
22. It is unlikely that the person I have sex with would have a sexually transmitted disease.	1	2	3
23. I'm a pretty good judge of character, so I can tell if someone can be trusted.	1	2	3
24. If I am going to have sex, I insist that a condom be used.	1	2	3

Comments and Suggestions

The questions we have asked you over the last few weeks (about family, friends, rules, drugs, alcohol, and sex) may remind you of concerns you have about these issues. There are a variety of people at your school who are available if you wish to discuss any of these issues. They include Dr. Gardner (the school psychologist), Mrs. Shari Eisenberg (the school social worker), Mr. Fung-A-Ling and Mrs. Darbyson (guidance counsellors), and Peer Helpers (other students you can talk to).

Please indicate below if you would like to talk with someone about your concerns. (If you say **yes**, Dr. Gardner will arrange it for you.)

- ❑ Yes, I would like to talk to Dr. Gardner.
- ❑ Yes, I would like to talk to a peer counsellor.
- ❑ No, I don't need to talk.

If you have any comments or concerns about the Relationships and Behaviour project, please let us know by mentioning them below, or by speaking to one of us at the end of the session. We appreciate your feedback!

Please turn your paper over when you are finished.

THANKS FOR YOUR HELP!

Appendix C: Correlation matrices for path models

Table 1

Correlation matrix for the coercion model predicting to delinquency and substance use.

Variable	1	2	3	4	5	6	7	8
1. Social desirability	1.00							
2. Delinquent Peer Group	-.16	1.00						
3. Hostile Punishment	-.15	.12	1.00					
4. Monitoring	.17	-.17	-.18	1.00				
5. Coercive with mom	-.22	.07	.53	-.17	1.00			
6. Coercive with dad	-.10	.02	.46	-.14	.37	1.00		
7. Delinquency	-.29	.40	.30	-.38	.20	.20	1.00	
8. Substance use	-.19	.35	.28	-.21	.24	.20	.59	1.00

Note. n = 575. Standard deviations: Social desirability: 1.64, Delinquent Peer Group:1.88, Hostile Punishment: .42, Monitoring: .48, Coercive with mom: .33, Coercive with dad: .35, Delinquency: 1.04, Substance use: 1.36.

Table 2

Correlation matrix for the coercion model predicting to risky sexual behaviour.

Variable	1	2	3	4	5	6	7
1. Social desirability	1.00						
2. Hostile punishment	-.06	1.00					
3. Monitoring	.17	-.19	1.00				
4. Coercive with mom	-.19	.53	-.13	1.00			
5. Coercive with dad	-.16	.42	-.12	.26	1.00		
6. Sexually risky peer group	-.04	.14	-.20	.03	-.01	1.00	
7. Sexual risk index	.01	.28	-.32	.15	.14	.22	1.00

Note. n = 124. Standard deviations: Social desirability: 1.47, Hostile punishment: .42, Monitoring: .49, Coercive with mom: .35, Coercive with dad: .37, Sexually risky peer group: 15.79, Sexual risk index: 4.77.

Table 3

Correlation matrix for the latent model of insecure attachment with mother and father.

Variable	1	2	3	4	5	6
1. Secure with mom	1.00					
2. Secure with dad	.37	1.00				
3. Dismissing with mom	.42	.10	1.00			
4. Dismissing with dad	.20	.45	.47	1.00		
5. Fearful with mom	.40	.17	.28	.18	1.00	
6. Fearful with dad	.15	.43	.07	.33	.43	1.00

Note. n = 502. Standard deviations: Secure with mom: .53, Secure with dad: .55, Dismissing with mom: 1.88, Dismissing with dad: 1.94, Fearful with mom: .28, Fearful with dad: .30.

Table 4

Correlation matrix for the combined model.

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Social desirability	1.00										
2. Insecure with mom	-.08	1.00									
3. Insecure with dad	-.03	.40	1.00								
4. Hostile punishment	-.14	.32	.30	1.00							
5. Monitoring	.17	-.30	-.20	-.18	1.00						
6. Coercive with mom	-.22	.41	.22	.53	-.17	1.00					
7. Coercive with dad	-.10	.14	.42	.46	-.14	.37	1.00				
8. Delinquent peer group	-.16	.06	.08	.11	-.17	.07	.02	1.00			
9. Angry confrontation	-.22	.06	.05	.20	.04	.17	.19	.05	1.00		
10. Delinquency	-.29	.19	.20	.30	-.38	.20	.20	.40	.22	1.00	
11. Substance use	-.18	.16	.18	.28	-.21	.24	.20	.35	.25	.59	1.00

Note. n = 502. Standard deviations: Social desirability: 1.64, Insecure with mom: .75, Insecure with dad: .76, Hostile punishment: .42, Monitoring: .48, Coercive with mom: .33, Coercive with dad: .35, Delinquent peer group:1.89, Angry confrontation: .53, Delinquency: 1.04, Substance use: 1.36.

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Developing Meaningful Learning with Grade Four Students: Using PEEL Procedures to Improve My Teaching Practice

by

David R. Turner

A thesis submitted to the Faculty of Education

in conformity with the requirements for

the degree of Master of Education

Queen's University

Kingston, Ontario, Canada

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Abstract

This study has its roots in my desire to investigate and incorporate new teaching practices that would help develop my students' skill and ability to make conscious personal connections to their learning. Teaching procedures that were integrated into my practice originated with the Project to Enhance Effective Learning (PEEL), and address specific concerns about student learning behaviours. Venn diagrams were used to help my students build understanding of place value in mathematics. Concept maps were used to help my students build comprehension and understanding of material they read, and to develop deeper personal connections to story characters and events. Topic and task questions were used to help students develop reflective thinking skills by creating connections between lessons and topics in mathematics. This study demonstrates that making changes to my practice can help my students develop meaningful learning.

This study took place during the 1997-1998 school year with my Grade 4 class at Percy Centennial Public School in Warkworth, Ontario. Twenty-one of my students participated in this study. The data include students' Venn diagrams, concept maps and "Thinking Linking Logs," in which students recorded their responses to the topic and task questions. The student data together with the procedures I incorporated into my practice are analyzed within the context of recent literature on teacher change (Briscoe, 1994; Guskey, 1986; Richardson, 1990), reflective practice (Osterman, 1998) and constructivist learning theory (Grennon Brooks and Brooks, 1993; Edwards, 1994).

The study suggests that (a) teachers can incorporate new procedures into their practice if these changes are perceived to address teachers' specific concerns about observed student learning behaviours and (b) students can develop meaningful learning if teachers integrate procedures into their practice that encourage students to develop good learning behaviours.

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I would like to thank my thesis supervisor, Dr. Tom Russell, for his guidance and support through both the data collection and writing phases of this thesis. I appreciate all of his suggestions, encouragement and patience throughout the project. I also thank Dr. Howard Smith, a valued member of my thesis committee, for all of his insights, comments and suggestions that went into the final version of the thesis.

Thanks are extended to Dr. Ian Mitchell, of Monash University, for spending a cold February afternoon with me to discuss PEEL and my research. He contributed greatly to my understanding of PEEL and data collection techniques in the action research cycle.

I am grateful to my principal, Peter Chrisomalis, for supporting and encouraging me in my quest to improve my practice. Thanks also to the students and families of the participating students from my Grade 4 class at Percy Centennial Public School during 1997-1998. Their co-operation in sharing their data with me and their interest in my work are greatly appreciated.

Without the support of my family, this thesis would not have been possible. Thank you, Linda, for your ever-present support, patience and encouragement.

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CHAPTER 1

INTRODUCTION

This study has its roots in my desire to develop and implement new teaching practices and procedures that would help develop my students' skill and ability to make conscious connections between new learning and their existing knowledge. This study was undertaken to improve my teaching practice by including specific procedures and strategies that will help build a deeper understanding of school knowledge by my students. My goal was to increase my students' skill in reflective thinking about what they are learning and their understanding of how this new learning can connect with what they already know. Encouraging students to consciously identify the internal connections they make between lessons could lead to a greater understanding of those lessons and to more meaningful learning.

Grennon Brooks and Brooks (1993) claim that understanding is constructed when students combine new information or learning with the knowledge they already have. This is an internal process of finding connecting points between the existing and the new knowledge. The extent to which this process of assimilating new information occurs for individual learners can vary widely.

Teachers have observed in their classrooms students who excel at learning new skills sitting next to students who struggle to grasp a basic understanding of the same skill. The success or failure of a student to learn something new depends upon that student's ability to make the connections and to integrate the new learning with his or her existing knowledge. Students who seem to learn easily appear to have developed specific skills that help them learn. The decisions a student makes during a lesson have some influence over that student's success in

learning during that lesson. When learners make poor or inadequate decisions, consciously or unconsciously, then incomplete or inadequate learning is the likely result.

Teachers may develop procedures for their practice that not only encourage students to make connections between new learning and their existing knowledge, but also help students recognize, develop and consciously choose good learning behaviours. Thus students may develop the understanding that learning is an individual and internal process, and by developing good learning behaviours, their ability to learn may be improved.

Purpose of the Study

This is a study of my own teaching practices. My aim is to seek out and implement specific teaching procedures that will help my students develop good learning behaviours during lessons and that will help my students make conscious connections between new learning and their existing knowledge.

Outline of the Study

The procedures that were selected as practice improvements were chosen from the Project for Enhancing Effective Learning (PEEL) (Baird & Northfield, 1992). This project, begun in Australia in 1985 at Monash University, undertook to explore ways to change teaching practice in a collaborative forum so that students would understand more clearly the learning process and be able to connect more deeply with their school work.

To help my students build their understanding of school knowledge, I introduced two PEEL procedures early in September, 1997: Venn diagrams and concept maps. In February, the students began recording the links they were making between mathematics lessons in a "Thinking Linking Log." Students' "Thinking Linking Logs," concept maps and Venn diagrams

were collected as part of the regular activities of mathematics and reading classes. A summary of the procedures used as well as the time lines and data collected is presented in Table 1.

Table 1

Overview of the Procedures Used, Time Lines and Data Collection in this Study

Procedure	Time Line	Data Collected
Venn Diagrams used with Place Value	Term 1	Tens and Ones Hundreds and Tens Hundreds and Ones
Concept Maps used as reading response	Term 1 Term 3	Short Stories Tiger Skin Rug Dinner at Alberta's Mountain Rose Novels A Friend Like Zilla Titanic Crossing Devil's Bridge
Venn Diagrams used as reading response	Term 1 Term 3	Short Stories Mountain Rose The Case of the Mysterious Tramp Chocolate Fever/Chocolate Touch Novels A Friend Like Zilla Devil's Bridge
Topic and Task Questions (Thinking Linking Log) used in mathematics	Term 2 Term 3	Thinking Linking Logs Division Fractions and Decimals Quadrilaterals and Symmetry Perimeter and Area

Chapter Two continues the discussion of various models to improve teaching practice, and PEEL in particular. Chapter Three describes in detail the introduction of Venn diagrams into my practice of teaching place value of hundreds, tens and ones in mathematics. This part of the study occurred early in the school year (September), and was the first PEEL procedure attempted

by me and the students. The Venn diagram procedure helped channel the students' thinking about place value, allowing them to focus on specific components of the concept as they completed the tasks each day. The student work also acted as a formative-type evaluation, providing me with specific information about each student's understanding of each place holder in the place value system.

Chapter Four describes the use of concept maps and Venn diagrams as reading response organizers. These procedures were introduced to the students with several pieces of short fiction in the first term (September). During the third term, several students participated in novel studies that also used these two procedures. Chapter Four provides a summary of each story used for this study to familiarize the reader with the content to which the students were responding. Data collected from students' reading responses indicate the ability of each of these procedures to allow students to demonstrate their understanding of the connections they have made between the characters and the story events, as well as between the characters and themselves.

Chapter Five describes how topic and task questions were used with the "Thinking Linking Log" in mathematics to help students develop deeper connections to their work. During three units of study (division, fractions and decimals, and quadrilaterals), the students were directed through questions to consider the connections they could make to their learning. Students were making personal links to these lessons, developing connections between lessons, and making links between mathematics topics.

Conclusions are presented in Chapter Six. The usefulness of the PEEL procedures to address teacher change in general is discussed. Also summarized are the improvements these procedures have made both to my practice and to the development of meaningful learning with my students.

Research Setting and Participants

Percy Centennial Public School is located in a predominantly rural setting in a small village in eastern Ontario. There are about 360 students attending this Junior Kindergarten to Grade 8 school. About 90% of the students travel to and from school by bus. My grade four class consisted of 31 students, 17 male and 14 female.

I teach all subjects to this class with the exception of French, which is taught 40 minutes every day by another teacher. In March of the school year of this study (1997-1998), I was appointed Acting Vice-Principal at my school, and this reduced my teaching time with the class to 50%. I continued to teach mathematics, reading and music, while another teacher taught the rest of the curriculum for the remainder of the school year.

Permission to undertake this project was obtained from my principal early in September 1997. I informed my students' parents of the project informally through my September newsletter, and again during Open House in mid-September. An Official Letter of Consent was sent home for parents to sign and return if they were willing to grant permission for their child's work to be collected to become part of the study. Twenty-one families gave consent for the use of their children's work in this study.

All of the 31 children in my class participated in the PEEL procedures used for this study. All of the students' work was collected and assessed for school reporting purposes. Only the work from the 21 students for whom consent was given to participate in this study was collected and examined as part of this research. The work of the 10 children whose parents did not give consent to be part of the study or who did not return the consent form was not collected for use in this project. Children whose work did not become part of this project suffered no academic penalty for not participating. Names of the children involved have been changed to ensure the anonymity of the participants.

CHAPTER 2

THEORETICAL FRAMEWORK

This chapter reviews a number of studies on the general nature of teacher change. The Project for Enhancing Effective Learning (PEEL) is also reviewed in the context of the research on teacher change. This study is discussed in the context of teacher change and PEEL.

Controlling Change in Teachers' Practice

A common thread throughout the literature on teacher change is the source of the change that the researcher intends to see implemented. Much of the literature examines the degree to which innovations have been successfully implemented (Guskey, 1986; Richardson, 1990). Researchers involved in assessing teacher change with these innovations have expressed their frustration at teachers' unwillingness or inability to implement their suggestions (Briscoe, 1994). Teachers often reject or discount research findings that support intended changes in practice, claiming them to be impractical or inapplicable in their situations. In the teacher's experience of the classroom, research holds little validity. Most of these studies report failure to create the changes in practice that they had intended (Guskey, 1986). The most useful consideration in predicting or determining successful implementation of a change in practice is the origin of the change. The research indicates that teachers have not implemented innovations that originate from outside the classroom, nor have innovations external to teachers' experience become integrated into teachers' practice (Guskey, 1986; Richardson, 1990).

In contrast to these findings, recent studies show that teachers actually are changing their practice, and that the changes are being made almost continuously (Briscoe, 1994). Accommodations for student needs, new curricula and changes in school administration all

contribute to the need teachers see to develop new procedures and strategies for their practice. Indeed, this research indicates that for changes in teacher practice to be lasting and meaningful, the teacher must initiate the change (Briscoe, 1994; Guskey, 1986; Richardson, 1990).

Reflective Practice and Teacher Change

Reflective practice as a strategy to improve professional practice was developed by Schön (Osterman, 1998). Reflective practice is the reorganization and restructuring of knowledge based on experience, leading to new understandings of teaching. Osterman (1998) identified four separate stages that together constitute a cycle of reflective practice: experience, assessment, re-conceptualization and experimentation. A specific teaching experience begins the cycle. As the teacher reflects on the experience, he or she considers the intended or expected outcomes, what actions were taken by the teacher and the students to achieve the outcomes, and what the actual outcomes were. If, through this reflective analysis, the teacher discovers a discrepancy between what was intended and what actually occurred, the teacher must consider how to change his or her actions to align more closely the intended and the actual outcomes. The search for explanations to and resolution of the discrepancy brings the teacher in contact with new ideas and new strategies. The teacher then experiments with the new strategies. Successful experiences are likely to become integrated into the teacher's practice. Teachers construct meaning from their experiences by reflecting on those experiences.

Edwards (1994) suggests that problems arising from practice create intellectual dissonance. Teachers' efforts to correct the dissonance lead to the construction of new knowledge or practice. Changes in practice result from teachers reflecting on the nature of the dissonance and then restructuring their understanding and knowledge as solutions are sought.

Both Osterman's reflective practice model and Edwards' constructivist model are based on Cobb's (1988) idea that learning is rooted in the active construction of knowledge by learners. Knowledge and beliefs are formed within the learner and require the active involvement of the learner. Each learner constructs new knowledge and understanding as he or she makes sense of personal experiences. Through reflection, the learner compares new knowledge to existing knowledge. Learning occurs when the learner attempts to integrate the new with the current, creating new understanding.

While much of the literature about teacher change identifies an intransigence on the part of teachers asked to implement change, this intransigence has been attributed to the intended changes being initiated by parties from outside the school or classroom. More recent studies of teacher change indicate that teaching practice is fluid, changing frequently according to the decisions made by individual teachers to meet the needs of their students, school and community. Successfully implemented innovations that become integrated into teachers' practice must originate with the teacher and must be viewed as a necessary improvement to practice to increase the effectiveness of student learning.

Teachers have generally viewed the results of education research as impractical and inapplicable to their situations and experience. Traditional research has examined and measured teaching practice using theory as the guide. Reflective practice is a strategy that teachers themselves can use to examine and improve their own practices. From this perspective, teachers' personal theories about learning are examined and measured using practice as the guide.

Origins and Foundations of PEEL

The Project to Enhance Effective Learning (PEEL) seeks to improve the way teachers teach and students learn. PEEL is a response of teachers and researchers to three general concerns in education: schools do not meet the needs of society, schools are not as effective as was originally thought, and theories of learning and ability have changed (White, 1997).

Schools teach students facts and skills, yet student understanding of these facts and skills is often inadequate (White, 1997). Students may know how to add, multiply or divide, for example, but they may not recognize which particular operation to apply to specific problems. PEEL was begun to help develop new teaching practices that would address the concerns and problems that teachers recognized through their experiences in their classrooms. The aim of PEEL is to improve practice as a means to improve the effectiveness of student learning.

The mission of schools is to create life-long, independent learners. The Ontario Ministry of Education and Training released a new elementary school curriculum in 1997 and 1998 that seeks to "prepare students for a lifetime of learning" (1997a, p. 3). Baird (1997) suggests that the process for creating life-long learners is not well defined, and that although the difference between good and poor achievement is measurable, the difference between good and poor learning is not quite so clear. PEEL endeavours to identify specific student behaviours that act as impediments to learning. Teaching procedures were developed to teach students how to improve their learning by using behaviours that would affect learning.

In the past, a student's school performance was linked closely to his or her assumed ability. Traditionally, ability was considered an innate trait, a fixed trait from birth. The amount of ability a person had could not be changed. Ability was equated with intelligence, something a person was born with. Variations in school achievement were attributed to variations in the amount of ability each student possessed. Consequently, schools and teachers did not try to

teach students to be more able or more effective learners. More recent theories view ability as a combination of a number of specific information-processing skills that can be taught and learned (White, 1997). PEEL teachers sought teaching procedures that would help students learn information-processing skills that would lead to improved ability to learn.

PEEL began as a joint project between researchers at Monash University and a group of teachers at Laverton High School in Melbourne, Australia. Unlike traditional staff development programs, PEEL began with teachers' concerns about student learning in their classrooms. Using the teachers as researchers, and using a reflective practice model of collaborative action research, the teachers examined their classroom experiences. The findings of PEEL studies are consistent with a constructivist view of learning. Students who were taught to relate new knowledge to existing beliefs generated new personal meanings, and they achieved better understanding of the material than did a second group of students who completed question-and-answer tasks with the same material. Poor learning was found to be related more closely to poor information-processing skills and habits than to intellectual ability (Baird, 1992). Poor learners were ones who were not actively engaged in the learning process. Through observation by teachers, nine poor processing habits were identified, called poor learning tendencies. These are listed in Table 2. This list of poor learning tendencies led to the creation by PEEL teachers of a corresponding list of good learning behaviours that teachers could encourage.

Learning, the integration of new knowledge with existing knowledge, cannot be directly observed. Learning is a process that occurs in the mind of the learner. However, Mitchell (1992a) recognized that students who were actively engaged with their learning would display a number of behaviours that could act as indicators that meaningful learning was happening.

Table 2

Some Poor Learning Tendencies Identified in PEEL

1. Superficial Attention
   No processing of information to generate personal meaning.

2. Impulsive Attention
   Some parts of the learning are attended to, others are ignored.

3. Premature Closure
   Finishing work, believing it to be finished, when it is not finished.

4. Inappropriate Application
   Application of a memorized action where it does not apply.

5. Staying Stuck
   No strategy to cope with being stuck except to call the teacher.

6. Non-Retrieval
   No attempt to connect current lesson or new knowledge to previous lessons, existing knowledge, or own views.

7. Ineffective Eradication
   Persistent use of seemingly changed misconceptions.

8. Lack of Internal Reflective Thinking
   Learner is not thinking reflectively about the current topic.

9. Lack of External Reflective Thinking
   Does not make links among subjects or with the outside world.

(adapted from Mitchell, 1992a, p. 179)

Some good learning behaviours are listed in Table 3. The teacher-researchers developed specific procedures to integrate into their practice to help students learn and practice good learning behaviours.

Table 3

Some Good Learning Behaviours Identified in PEEL

A MONITORING BEHAVIOURS
1. Seeks Assistance
2. Checks Personal Progress
3. Plans and Anticipates
B CONSTRUCTING AND RECONSTRUCTING BEHAVIOURS
4. Reflects on the Work
5. Links to Beliefs and Experiences
6. Assumes a Position
(adapted from Mitchell, 1992b, p. 63)

Research Design: Why PEEL?

PEEL incorporates all the criteria identified in the literature to encourage lasting, effective and meaningful change in teaching practice. The need for a change in practice is identified by teachers from their observations and experiences in the classroom. The change does not originate from outside the classroom. Teachers construct new meaning and new understandings of their practice and of student learning. New procedures, developed in response to the recognition of problems in student learning (poor learning tendencies), are tested in the classroom and measured against improvements in student achievement. Procedures that successfully generate good learning behaviours and improved learning in students become integrated into practice.

Research Design: Action Research

Action research is one strategy available to teachers who want to study their own practice and its effects on student learning (Burch, 1993; Halsall & Hossack, no date; Henry & McTaggart, 1998; McNiff, Lomax & Whitehead, 1996; Torres, 1996). One action research model involves five steps: problem formation, planning an intervention, gathering data, analyzing and reflecting on the data, and reporting the findings of the project (McNiff, Lomax and Whitehead, 1996). At this point in the cycle, the teacher-researcher may reflect on the outcomes of the intervention and start re-examining practice to develop a new research project, beginning a new cycle of research. As teachers review the successes and failures of each lesson and activity and modify lessons to overcome perceived failures, they engage in a cycle of revision. It is the small revisions with each activity and lesson that together constitute improvement of practice. Teachers actually are continually revising and changing their practice. Within a formal action research project such as the present study, teaching experiences and their interpretation are documented, analyzed, and reported to other teachers.

Context

The central objective of this study is to modify my own teaching strategies to encourage students to develop deeper understanding of the work and to link new knowledge to previous knowledge and experience. Two of Baird's (cited in Mitchell, 1992a) poor learning tendencies summarize my concerns in my classroom: the non-retrieval of one's existing beliefs and understandings that are related to the current lesson, and the lack of reflective thinking (an inability to make connections between and among lessons, topics, ideas and personal experience). Table 4 illustrates the relationships among the targeted poor learning tendencies, good learning behaviours, and the specific procedures chosen for this study.

Mitchell and Mitchell (1992) describe in detail a wide range of classroom procedures that are consistent with PEEL objectives and contribute to the enhancement of learning. The procedures have been classified according to each of the poor learning tendencies as well as more general concerns about learning. I incorporated Venn diagrams, concept maps and topic and task questions in my practice in an attempt to improve the ability of my students to seek links between lessons and activities within three topics in mathematics, and to seek links between schoolwork and their personal experiences in reading. Documenting these changes to my classroom practice to address these concerns and collecting and analyzing data as students respond to my changes is the central focus of this study.

Neither concept maps nor Venn diagrams are new procedures to teaching. Concept mapping has been the focus of several studies of teaching practice (Hyerle, 1995-1996; Prater & Terry, 1988; Rafferty & Fleschner, 1993). Marino (1996), Rivers (1996) and Sullivan (1996) report their individual experiences in incorporating concept mapping into their practices as a result of their participation in PEEL Similarly, studies of teaching and learning in mathematics have included Venn diagrams as important procedures (Dodridge, 1973; Gray & Sharp, 1996; McGinty & Van Beynen, 1985; Van Dyke, 1995).

The PEEL Procedures Used in this Study

Concept Mapping

In creating a concept map, students arrange a series of keywords on a sheet of paper, drawing lines to connect words together. Students also indicate how any two connected words are related. This activity is designed to encourage students to make links in their knowledge. Concept maps can be used to link ideas in a single lesson, in a number of lessons, or across an entire unit of study, or concept maps may link a lesson or unit to the "real" world.

Venn Diagrams

Venn diagrams display relationships between two or more different ideas, objects, characters, or concepts. The diagram is of two or more interlocked and overlapping circles. Each circle is assigned a specific descriptor. The students fill in the circles with examples that fit each descriptor. Examples that fit two or more of the descriptors would be placed inside the overlapping areas of the circles. Developing Venn diagrams requires the learner to become precise in his or her understanding of the descriptors.

Table 4

Connecting Specific Teaching Concerns with Poor Learning Tendencies, Good Learning Behaviours and PEEL Procedures

Concern	Poor Learning Tendency	Good Learning Behaviour	Related PEEL Procedures
Students should develop deeper understanding of the work	Superficial attention	Seek links between activities, ideas	Venn Diagrams Concept Maps
Students should link new knowledge to previous experience	Non-retrieval of existing beliefs, understanding	Seek specific links between schoolwork and personal life	Venn Diagrams Concept Maps
	Lack of reflective thinking internal to the subject	Seek links between activities, ideas	Topic and Task Questions

Topic and Task Questions

This procedure is the basis of the Thinking Linking Log used with mathematics. The procedure helps students link lessons and topics together. At the close of a lesson, students are asked to respond to questions such as, "What do you think the main point of the lesson was?" or

"What did today's lesson have to do with yesterday's lesson?" Task questions require students to relate to what they did during the lesson: "What was the main thing you had to do, and why do you think we had to do it?"

Data Collection

Data collection for this study centres on reading and mathematics. Concept maps and Venn diagrams were used as reading response with novel study projects in April, May and June. In mathematics, our first topic was number sense and numeration. Students constructed Venn diagrams to demonstrate their understanding of place value. These Venn diagrams were collected in the first term. During the second and third terms, students used a reflective journal in math to record their responses to topic and task questions designed to create links between lessons in the topics of division, fractions and quadrilaterals. All materials collected were dated to provide a chronology of the students' demonstrations of the development of their skills and connections.

Analyzing the Data

Participating students were assigned a student number to help with computerized data organization. In reading, all possible links were identified for the concept map for each story. The links each student made between terms were entered into a computer database file. Mathematics Thinking log entries were also entered into a computer database. These entries were linked to a description of the specific lesson or activity for that day and the specific "linking question" for that day's work. These entries were then sorted by date and by student to achieve a linear time line for each student.

Concept maps and Venn diagrams were sorted into categories using a four-point scale

designed to assess each student's level of understanding of each story read. The scale, shown in Table 5, is modeled after the Ontario Ministry of Education and Training Achievement Level chart for Language (1997a, p. 9).

The students' Thinking Linking Log entries were sorted into categories based on the type and nature of the connections they made for each lesson. A four-point scale developed for this purpose was modeled after the Ontario Ministry of Education and Training Achievement Levels chart for Mathematics (1997b, p. 9). This scale is shown in Table 6.

Table 5

Assessing Concept Maps and Venn Diagrams as Indicators of Understanding in Reading

1	2	3	4
- limited understanding of concepts or knowledge	- limited understanding of concepts or knowledge	- general understanding of concepts or knowledge	- thorough understanding of concepts or knowledge
- reasoning is inconsistent	- consistent reasoning	- consistent reasoning	- consistent reasoning
- partially complete, but inappropriate explanations	- incomplete but appropriate explanations	- complete and appropriate explanations	- complete and appropriate explanations
- uses a few simple ideas	- uses several simple related ideas	- uses ideas of some complexity	- uses complex ideas
- communication is unclear, imprecise	- communication shows some clarity and precision	- communication is clear and precise	- communication is clear, precise and confident

Table 6

Assessing Topic and Task Question Responses as Indicators of Personal Connections

1	2	3	4
- limited links - inconsistent reasoning - explanations incomplete, not related to topic -uses a few simple ideas	- limited links - consistent reasoning - explanations incomplete, related to topic - uses several simple ideas	- links are general - consistent reasoning - explanations are complete, connected to topic - uses ideas of some complexity	- thorough links - consistent reasoning - explanations are complete, connected to topic - uses complex ideas

Summary

The literature indicates that meaningful and enduring change in practice is more likely to occur when teachers consider the change to be practical and applicable in their classrooms (Briscoe, 1994). Teachers themselves, in their role as classroom leaders, are in a position to recognize the type of changes needed in practice to satisfy the needs of the students and the curriculum. Reflective practice and action research are models of inquiry (McKernan, 1991; McNiff, Lomax and Whitehead, 1996) that provide a framework for teachers wanting to initiate and monitor change in their practice.

PEEL is a collaborative action research project that seeks to improve the quality of student learning. By identifying poor learning tendencies that are barriers to learning, PEEL has attempted to show teachers what poor learning looks like. Integrating new teaching procedures into practice not only discourages poor learning tendencies but also teaches students good

learning behaviours that can improve learning. Teachers can train students in information-processing skills to improve their ability to learn.

While I engage in reflective practice to improve my teaching, I am teaching my students to be more reflective in their learning. I am also teaching my students ways to construct new knowledge. Both teacher and students are constructing new knowledge in the same manner. I have identified specific poor learning tendencies and good learning behaviours that are the focus of this study. I have also listed and described specific procedures I incorporated into my practice.

CHAPTER 3

USING VENN DIAGRAMS TO BUILD UNDERSTANDING OF PLACE VALUE IN MATHEMATICS

Place Value and Grade Four Mathematics

Place value is the foundation of our number system. Relationships between and among numbers are understood using place value. Recognizing how and why numbers are represented using place value is essential to achieving greater understanding of number operations and relationships. The National Council of Teachers of Mathematics developed a series of standards for the teaching of mathematics in elementary schools. The Council stated that "understanding place value is a critical step in the development of children's comprehension of number concepts" (NCTM, 1989, p. 39), and that "children must understand numbers if they are to make sense of the ways numbers are used in their everyday world" (NCTM, 1989, p. 38).

The Ontario Ministry of Education and Training curriculum guide, The Common Curriculum (1995), which specified outcomes for student learning with respect to place value, was in effect at the time of data collection. This curriculum specified that by the end of Grade 3 students would be able to "apply the concept of place value and use whole numbers and simple fractions" (Ontario Ministry of Education and Training, 1995, p. 73). In the new Ontario Curriculum (1997), Grade 4 students are expected to know how to represent the place value of whole numbers to ten thousand and of decimal numbers to hundredths (Ontario Ministry of Education and Training, 1997, p. 22).

Defining and Assessing the Problem

Place value tends to be a difficult concept for children to grasp. In my classroom, several students struggled with the construction of three-digit numbers. When asked to write a number with seven tens, nine ones and two hundreds, students recorded the numerals in the order they were given in the problem (792) rather than reorganizing them according to their named place value (279). There was a need to address the difficulty these students had in demonstrating an understanding of place value.

Re-Conceptualization of my Practice

Students having difficulty understanding place value exhibited a poor learning tendency. They were not actively processing the lessons and concepts to generate personal meaning. This is the tendency of superficial attention. My goal was to change my practice so that the students would learn how to focus their attention and to generate meaning with place value.

One PEEL procedure well-suited to this situation involves Venn diagrams. Given two specific descriptors (one for each circle), the students would direct their attention to numbers that fit the descriptors and fill in each section of the diagram. The Venn diagram acts as a lens for a student to focus thinking on one specific task: presenting numbers that fit the descriptors.

Implementing the Procedure: Observations

Mathematics class occurred in the first period of the day. The Venn diagram exercises were presented at the beginning of the period, to be completed upon arrival in the class. Parallel to these activities, the students worked through other place value activities using manipulatives and textbook exercises. The students were given a Venn diagram of two linked circles each day. Each circle was labeled with a specific place value descriptor. Selected samples of student work

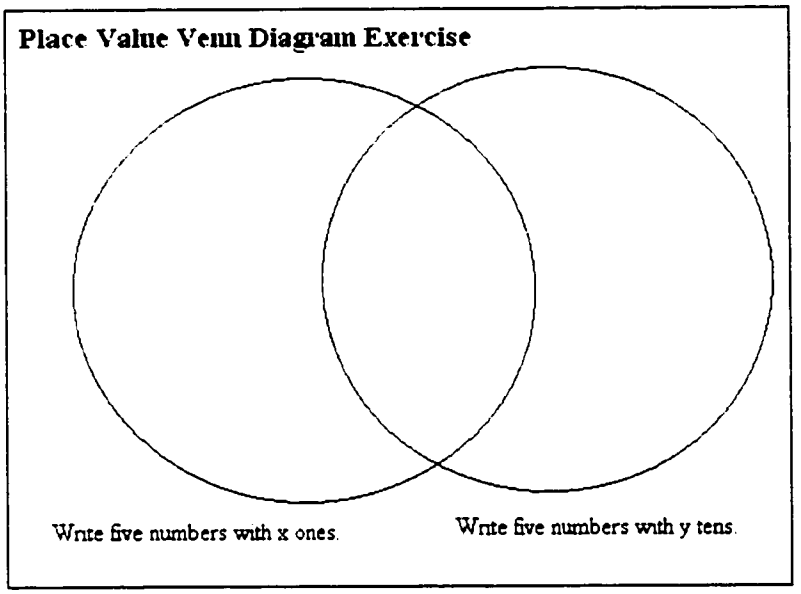
with Venn diagrams and place value concepts are included in Appendix A.

Working with Tens and Ones

During the first week one circle was labeled "Numbers with x tens" and the other circle was labeled. "Numbers with y ones." (Figure 1). The values of x and y changed each day. The students' task was to complete the outer sections of the diagram with at least 5 numbers, and to complete the centre section with at least 3 numbers.

Figure 1

Venn Diagram Procedure Using Tens and Ones



The first Venn diagram in this series used nine ones and seven tens. One circle was labeled "Write 5 numbers with 9 ones." The other circle was labeled "Write 5 numbers with 7 tens." Nineteen Venn diagrams were collected. All students filled the "9 ones" section with correct numbers (9, 19, 29, etc.). Seventeen students recorded numbers with seven tens in the

outer section of the "tens" circle (70, 71, 170, etc.). Two students recorded incorrect numbers in the "tens" section. Julie identified numbers with seven "ones," rather than numbers with seven "tens" (17, 27, 37, etc.). Tania recorded the number "7," then continued with a list of numbers in the seventies. The centre section required students to identify and record numbers with both nine ones and seven tens. Seventeen students accurately completed this section of the diagram. Two students had difficulty with this task. Both Caroline and Tania realized that numbers in the centre of the diagram must have both a nine and a seven, but did not position these digits correctly. Caroline identified five numbers using the digits 7 and 9. Two were correct (179 and 279). Three numbers were incorrect (197, 917, and 719). It appears that Caroline took the first number in her list, 179, and rearranged the digits in random order to create other numbers. Neither Caroline nor Tania recognized their errors until they were guided to correct responses.

The next Venn diagram activity asked the students to focus on numbers with 2 tens and numbers with 5 ones. Caroline's performance improved with this diagram. She wrote three numbers in the centre section, two of which met the criteria: 25, 225, (correct) and 145 (incorrect). Caroline preserved the ones digit correctly (5) in creating numbers for this section. In completing the first activity, Caroline used the two identified digits (7 tens, 9 ones) in random order to produce numbers for the centre section (197, 917 and 719). In the second activity (2 tens, 5 ones), the numbers that did not fit the centre section were not produced by rearranging digits. Caroline demonstrated a stronger connection to place value concepts with the second activity.

Tania's performance also showed improvement with the second activity. She recorded four numbers in the centre section, two of which were correct: 25, 225, (correct), and 250 and 25000 (incorrect). Her response to this diagram appears similar to her response to the first diagram. In both, Tania used zeros to generate new numbers. In the first diagram, the zeros

appear to be placed at random. In one instance, she inserted a zero in the tens place of her original number (79) to create a three-digit number (709). In a second instance, Tania added zeros to the right side of her original number (7900). In the second diagram, Tania's numbers reveal an attempt to use a pattern to help her find more than one correct number. She did not insert zeros into the middle of her numbers this time. The first number on her list was 25, a correct response. The next number on the list was 225, created by adding a hundreds digit to 25. The next two numbers on her list were created by adding zeros to the right side of her first number (25). This produced numbers that did not match the descriptions, but Tania's use of a patterning strategy appears to be an important step forward in her construction of new understandings of place value and number.

Of the 17 students who completed the diagram accurately, Julie demonstrated confidence in her understanding of place value. She filled her diagram with 38 numbers, all in their correct sections of the Venn diagram. Eleven students wrote numbers in the margins of the page. These numbers did not fit descriptions for either circle. When asked about these "extra" numbers, Neil explained that "you can use all the numbers. Some numbers go in one circle, some go in the other circle, some go in the middle. All the rest can go outside the circles."

Working with Hundreds and Tens

The next series of Venn diagrams directed the students to think about the hundreds place and the tens place. The first diagram of this series used "numbers with 8 hundreds" and "numbers with 2 tens." I collected 17 responses to this exercise and found that 9 students successfully completed the diagram. Confident students filled the diagram with many numbers. Margot recorded 17 numbers, Olivia recorded 27 numbers, and Glenda entered 66 numbers in the diagram. Bill used a repeating pattern to ensure he was writing different numbers. For

numbers with 8 hundreds, he wrote 10,800, 11,800, 12,800, 13,800 and 14,800. Similarly, he wrote 10,020, 10,120, 10,220, 10,320 and 10,420 for numbers with two tens. For numbers that fit both descriptors, he wrote 10,820, 11,820, and 12,820.

Anne, Caroline, David and Tania were able to identify numbers for the outer sections of the diagram, but they did not correctly identify numbers for the centre section. Fay was able to correctly fill in the hundreds section only. Caroline and Tania successfully completed the outer sections of the diagram. Neither student successfully identified any numbers for the centre section. Caroline wrote 802, 803 and 804 in the centre section. Tania left the centre section blank.

More students had difficulty completing this task than the previous diagram using tens and ones. One student, Fay, successfully completed only one section of this diagram. All of the other students were able to fill in both outer sections of this diagram. Twelve of the 17 students were also able to accurately complete the centre section.

Working with Hundreds and Ones

With the third series of Venn diagrams, I used the hundreds place and the ones place. Even though the tens place is not mentioned as part of this activity, the students would have to think about its role as a placeholder as they generate three-digit numbers to complete the diagram. This, I felt, created a more difficult problem. Students were asked to identify numbers with three hundreds and numbers with six ones.

Caroline, David, Peter and Olivia completed all sections of the diagram accurately. Identifying numbers for the centre section was problematic for Ian, who had successfully completed all previous diagrams. He listed 326, a correct response, but then added 36 and 116 to his list. While both of these numbers are incorrect, all three numbers have six ones, one of the

required descriptions.

Caroline correctly filled in all sections of the diagram. For numbers with three hundreds, she wrote 305, 307, 306, 304, and 309. For numbers with six ones, she wrote 66, 76, 86, 96 and 36. In the centre section, she wrote 316, 306 and 356. I noted that Caroline wrote 306 in both the hundreds circle and the centre section. This number should only appear in the centre section, because it has both three hundreds and six ones.

Tania also demonstrated an improvement in her understanding with this diagram. She correctly identified numbers to fill both outer sections. While Tania did not list any numbers in the centre section of the previous diagram, in the centre section of this diagram she recorded three numbers: 706, 716, and 726. Although none of these numbers has the digit three in the hundreds place, they all have six ones. Tania also used a pattern of counting by tens to generate similar numbers. This strategy preserved the digit in the both the hundreds place and the ones place. Even though the hundreds digit is incorrect, there is evidence of an increase in Tania's processing of the problem information as she searches for correct solutions. Tania has demonstrated an increase in her ability to construct meaning of numbers and place value.

Summary

This was the first PEEL procedure I attempted and the first PEEL procedure the students encountered. At this early stage in the project, I was working on faith in the evidence from the PEEL teachers in Australia. Using Venn diagrams to build understanding of place value was a new approach to a concept sometimes confusing to students. Students were directed to focus their thinking on two specific values at a time (tens and ones, for example). Much of my prior teaching relied on textbook exercises. Students were able to complete the textbook work, but when confronted with place value in other contexts (regrouping with addition and subtraction,

for example), students could not call upon a clear understanding of how to use place value. The information the Venn diagrams provided to me about the areas of strength and weakness of the students in my class was immediate and compelling. By beginning the school year with this procedure, I was able to identify quickly the students who displayed poor learning tendencies and who had weak information-processing skills in mathematics.

CHAPTER 4

USING CONCEPT MAPS

AS READING RESPONSE TO BUILD UNDERSTANDING

My reading program began with the students reading and responding to short stories found in the Grade 4 reading anthology, Cross the Golden River (Booth, 1986). Five stories were presented and read during September and October. I introduced two PEEL procedures as reading response activities with these stories: the concept map and Venn diagram. The objective was to help students build their understanding of characters, settings and story events from their reading by constructing meaningful connections. During the third term I introduced novel studies to small groups of students. As part of the written component for this work, the students worked with either Venn diagrams or concept maps or, with some novels, both procedures. Three groups of students participated in the research component of this novel study during which the students were not sorted into reading groups according to reading ability. Instead, the students were free to choose the story that interested them most, and reading groups developed based on topical interest.

Summaries of the Short Stories and Novels

Background information about the stories is helpful for the reader to understand the student responses to the follow-up procedures. In this section I provide short summaries of the stories the students read. It is my intent that this information will allow the reader to place the student responses in context, providing a common starting point for the discussion that follows.

Short Stories

The Tiger Skin Rug (Rose, 1986). The main character of this story is a hungry tiger who traded places with the Rajah's tiger skin rug when Rajah's servant was cleaning it outdoors. In this way, the tiger got into the Rajah's palace, so that he could eat the table scraps after the Rajah's meals and never be hungry again. No one in the palace realized that the switch had occurred. One night three robbers broke into the palace to steal the Rajah's gold and silver. The tiger, still posing as the rug, faced a dilemma: keep still and quiet and not reveal himself, or scare the robbers away. The tiger decided he had to protect the Rajah and scare the robbers away. The Rajah, after getting over his own scare from finding a live tiger in his palace, befriended the tiger to repay him for saving his riches. The tiger lived a long life in the palace and was never hungry again.

Dinner at Alberta's (Hoban, 1986). In this story, a young crocodile named Arthur needs to improve his table manners to impress a young female crocodile named Alberta. Arthur's parents and his younger sister Emma work with him to improve his manners, with limited success. When Arthur's family has dinner with Alberta's family, Alberta's younger brother, Sidney, mimics Arthur's attempt to use his new manners. As the dinner progresses, the antagonism escalates. After dinner, Sidney invites Arthur outside on the pretense of showing him his tree fort. When they come back inside, both boys' clothes are torn, Arthur has a bump on his head and Sidney has a fat lip. This part of the story is written to imply the boys were fighting. The reader must infer that these two characters were fighting outside based on this evidence.

Mountain Rose (Stren, 1986). When Rose was a baby, her parents left her with a kindly aunt and sent her twin brother to live with another relative. During a high school wrestling match, Paddy Flanagan, a famous wrestling coach, offers to coach Rose in her quest to become the Ladies Wrestling Champion of the World. Rose ultimately became a prize-winning wrestler, winning the world title. As champion, Rose is challenged to a wrestling match by Gardenia Gus, the Men's Wrestling Champion of the World. During this match, Rose discovers that Gus has an elephant-shaped birthmark that looks just like her own. Rose realizes that Gus is her long-lost brother, separated from her at birth.

The Case of the Mysterious Tramp (Sobol, 1986). This is an Encyclopedia Brown mystery. All Encyclopedia Brown stories are written with enough clues for the reader to be able to solve the mystery. In this story, Mr. Clancy was hit on the head with a pipe and robbed as he was working on the engine of his stalled truck. The main suspect, Mr. Clancy's assistant, John Morgan, was in the truck at the time of the attack and provided an eye witness account of the event to Encyclopedia Brown. According to John Morgan, while Mr. Clancy was attending to his truck, a tramp came out of the woods, attacked and robbed Mr. Clancy before Morgan could get out of the truck to stop him. Encyclopedia Brown did not believe Morgan's story and accused Morgan himself of committing the crime. The student's responsibility was to determine whether Encyclopedia Brown was correct, and how it could be proved.

The actual solution to this mystery is related to the engine trouble Mr. Clancy was trying to fix at the time of the robbery. John Morgan was in the cab of the truck when he said he saw the tramp attack Mr. Clancy. However, because the hood of the truck was up and Mr. Clancy was in front of the truck, John Morgan could not have seen anyone attack Mr. Clancy. This was the flaw in John Morgan's story that the students needed to discover.

Chocolate Fever (Smith, 1986). Chocolate Fever is about Henry Green, who came down with an unknown illness that covered his body with brown spots. After being inspected by the school nurse and an odd doctor, he was diagnosed with "Chocolate Fever." When the brown spots began popping, it became clear that the spots were full of chocolate. The excerpt ended without finding a resolution for this boy's illness and dilemma.

Read Aloud Story: The Chocolate Touch (Catling, 1952). In September I began reading this story aloud to the students. This is a variation of the story of King Midas and the golden touch. The Chocolate Touch featured a young boy called John Midas who liked to eat chocolate. He found a magical candy store and purchased a piece of special chocolate with a strange coin he found on the sidewalk. When he ate this special chocolate, he found that everything that he put to his lips turned to chocolate. Eventually, he only had to touch an object for it to turn to chocolate. At first, he thought this was a good gift, but soon came to regret having this "touch". His lesson learned, especially after he kissed his mother and turned her into chocolate, John found the magical candy store again and was able to have the "touch" and its effects reversed.

Novels

The three novels that these students read were Titanic Crossing (Williams, 1995), A Friend Like Zilla (Gilmore, 1995), and Devil's Bridge (DeFelice, 1992).

Titanic Crossing (Williams, 1995). This novel combines factual information about the sinking of the Titanic with a fictional story about two families as they cross the Atlantic on the doomed ship. The Trask family was returning to America after the death of the father,

accompanied by an uncle. The family had lost its wealth and was reliant upon Grandmother Trask in America for support. Grandmother was not fond of her daughter-in-law and wanted the children to live near or with her. She used her power to force her daughter-in-law to comply with her wishes. Albert Trask, the son, faced a conflict with his mother regarding his schooling. On arrival in America, Albert was supposed to go to military school. He wanted to go to art school, an idea which his mother, uncle and grandmother opposed.

On board the ship, Albert befriends Emily Brewer, a girl his age who is also travelling with her family to America. On the evening of the sinking, Albert's mother disappears in third class, visiting a friend she met earlier in the day. When the ship struck the iceberg, Albert's mother did not make it out of third class, leaving Albert to look after his younger sister, Virginia. Albert and Virginia survived the sinking due to Albert's quick thinking and maturity in the absence of their mother. On board the rescue ship, Albert and Virginia were reunited with Emily, who had lost her entire family in the disaster.

Once in America, Albert had to face his grandmother over the issue of his schooling. His experience on the Titanic had caused Albert to grow up quickly, giving him the strength to stand up to his grandmother, who finally allowed him to attend art school.

A Friend Like Zilla (Gilmore, 1995). In this story, a young girl (Nobby) and her family travel to Prince Edward Island for a vacation and family reunion. The family that owns the rental cottages where Nobby and her family are staying has a 17 year-old daughter, Zilla. Zilla is mentally disabled, making her different from other 17-year-olds, in Nobby's eyes. Nobby and Zilla soon become good friends. Nobby's Uncle Chad and Aunt Audrey arrive for the reunion. Nobby and her Uncle Chad do not get along because he continually corrects and belittles her. When Uncle Chad met Zilla and realized that Zilla is mentally disabled, he teased her and made

fun of her. One morning Uncle Chad went out for a run and did not return. The families organized a search party to look for him. Zilla and Nobby went out looking, even though Nobby was not keen to find him. Zilla followed the sound of seagulls to a drop-off near the cliffs by the sea and found Uncle Chad in a gully with a broken ankle. After he was rescued, Uncle Chad softened his attitude toward both Nobby and Zilla. The story ends with Nobby and Zilla becoming better friends, and Uncle Chad offering to start a new friendship with both girls.

Devil's Bridge (DeFelice, 1992). This is a story about a young boy, Ben, who enrolled in the town's annual striped bass fishing derby. Ben's father, known as Pop, holds the Derby record for catching the biggest striped bass. Pop is dead, and Ben lives with his mother, who is dating a man called Barry Lester. Ben does not like Barry because he feels that Barry is trying to step into his father's place. While scouting out good fishing locations, Ben overhears that Freddy Cobb and another man plan to cheat to win the Derby and beat Pop's record. The rest of the story is about Ben trying to stop these men from getting away with their plan. On the day of the Derby, Ben himself caught a fish that would beat his father's record and win the Derby, so long as Freddy Cobb was disqualified. However, Ben decided that it was more important to let the fish live free in the ocean than to win the Derby, so he let the fish go. Barry caught Freddy cheating and so preserved Pop's record. Ben started to see Barry differently after this and thought that they may become friends after all.

Concept Maps and Reading Response

Reading response activities are meant to help students consolidate their understanding of what they have read. These activities may also be used by the teacher to assess, in either a formative or a summative way, student comprehension skills. I introduced concept mapping into

my practice for reading response to help my students improve their comprehension by increasing their ability to create and identify connections among characters, events and settings of the stories they read.

Completing a concept map requires students to consider a number of relationships that may exist among key elements or concepts taken from a piece of writing. Students create as many connections as possible among the terms, and then physically connect pairs of terms by drawing lines between them on paper. Each student then writes the explanation or reason for the connection on the line. With careful selection of the terms used in the map, students are directed to examine, identify and explain key relationships within a story. Samples of the students' concept maps are included in Appendix B.

Short Stories

Tiger Skin Rug. This was the first story for which students were presented with a concept map as a response activity. I used six terms with the map - four characters (Rajah, Robbers, Tiger, Servant) and two concepts (friendship and being afraid). Nineteen maps were collected. The data in Table 7 show how many students made connections for each pair of terms. The students' explanations for their connections indicated the strength of each connection, and to what extent each student understood the story.

The students were able to create connections among the major characters. All of the students were able to create a connection between the tiger and the robbers. Sixteen students created connections between the tiger and the Rajah. Eleven students created connections between the Rajah and the servant. Eight students created connections between the Rajah and the robbers. Six students created connections between the servant and the tiger. The students

used story events to explain the connections they made among the characters. The tiger saved the Rajah from the robbers. Seventeen students responded that either the tiger scared the robbers away or the robbers were afraid of the tiger. Julie and Evan recognized the dilemma the tiger faced. Julie wrote, "the Rajah would find out that he [the tiger] was not a real tiger skin rug." Evan explained that "the tiger was afraid when the robbers broke in." The students used the concept map procedure to create and explain the relationships among the main characters in the story.

Table 7

Concept Map Connections Matrix for The Tiger Skin Rug. (19 Respondents)

	Rajah	Robbers	Tiger	Servant	friendship	afraid
Rajah	X	8	16	11	12	4
Robbers	X	X	19	0	2	19
Tiger	X	X	X	6	11	2
Servant	X	X	X	X	5	0
friendship	X	X	X	X	X	0
afraid	X	X	X	X	X	X

The mapping exercise focussed the students' thinking on these relationships and provided a way for them to express the connections they made while reading the story. The students' responses gave me specific information about each student's comprehension of the events of the story. By examining the links and the written explanations, I was able to determine the extent of each student's comprehension of the interactions among the characters as well as their understanding of the story events. The concept mapping activity stimulated the students to think about the story as a whole rather than as a series of disconnected events.

Dinner at Alberta's. This story revolved around a single theme: the effect of good table manners. There were more characters in this story than there were in The Tiger Skin Rug, and the characters interacted in different ways at different points in the story. This was the second concept map exercise for both my students and me. I used the six characters for this concept map: Arthur, Alberta, Sidney, Emma, Mr. Crocodile and Mrs. Crocodile. I was pleased with the students' work with the map from the first story, and I looked forward to seeing what the students would do with this one. I expected the students to expand upon the relationships and interactions among these characters as Arthur attempted to improve his manners to impress Alberta. Seventeen concept maps were collected from this exercise. Table 8 shows the possible combinations of terms together with the number of student responses for each pair of terms.

Table 8

Concept Map Connections Matrix for Dinner at Alberta's (17 Respondents)

	Arthur	Sidney	Alberta	Emma	Mrs. Crocodile	Mr. Crocodile
Arthur	X	10	16	15	9	10
Sidney	X	X	9	1	0	0
Alberta	X	X	X	10	0	0
Emma	X	X	X	X	11	10
Mrs. Crocodile	X	X	X	X	X	10
Mr. Crocodile	X	X	X	X	X	X

All of the students created connections among these characters. Links were created between Arthur and Alberta by all of the students, explaining that they were friends, or that

Arthur liked Alberta. Fifteen students created connections among the characters that were based solely on familial relationships. The students recognized that Arthur and Mrs. Crocodile were son and mother. Similarly, Arthur and Emily were connected because they were "brother and sister." Mr. Crocodile and Arthur were connected because they were father and son. Sidney and Alberta were connected because they were brother and sister. Mrs. Crocodile and Emma were connected because they were mother and daughter. Mr. Crocodile and Emma were connected because they were father and daughter. None of these students used the story events to explain the relationships among these characters.

David and Neil were the only two students to use supporting evidence from the plot to explain the connections they created among the characters. David wrote that Mrs. Crocodile, Mr. Crocodile and Emma were trying to teach Arthur how to eat. Neil also realized that Emma and Mrs. Crocodile were "helping Arthur with his manners."

While the students correctly identified the family relationships among these characters, many did not explain their links using story events. From this experience, I discovered that some of the terms I must include on the concept map must tie the characters to their feelings or to other story elements such as main plot points or settings.

Mountain Rose. This was the first story for which the students responded with both a concept map and a Venn diagram. After my experience with the mapping activity for Dinner at Alberta's, I chose four characters and two concepts to include on the concept map: Rose, Gus, Paddy, Desdemona, family and famous.

I collected five concept maps. The possible combinations and links among these terms are identified in Table 9. The students were able to make strong connections with the main character, Rose. All of the students were able to create connections between Rose and Paddy,

explaining that Paddy was Rose's coach. The students also created connections between Rose and Desdemona, indicating that Rose wrestled Desdemona for the championship title. All of the students were able to create connections between Rose and Gus, explaining that they were both famous wrestlers. David and Olivia made the additional connection that Rose and Gus were sister and brother. There were fewer connections among the other terms. None of the students created connections between Paddy, Gus and Desdemona. There was no interaction between these characters in the story, making links among these terms difficult for the students to create.

Table 9

Concept Map Connections Matrix for Mountain Rose (5 Respondents)

	Rose	Gus	Paddy	Desdemona	family	famous
Rose	X	3	5	5	5	4
Gus	X	X	0	0	1	4
Paddy	X	X	X	0	0	1
Desdemona	X	X	X	X	0	0
family	X	X	X	X	X	0
famous	X	X	X	X	X	X

Novel Studies

The longer stories provided the students with more and varied information about the characters and their actions. When the relationship and interaction among the characters were strong, the students were better able to identify how characters could be linked. Examples of events and actions from the story were plentiful, and students used these to justify the links they made.

Titanic Crossing. The concept map for this story was assigned after the students had read the entire story. I chose three characters and three concepts to include on this map: Emily, Albert, Virginia, brave, scared and spoiled. Four students (Holly, Julie, Caroline and Scott) read the novel, and I collected four concept maps.

Holly did not write explanations for her connections between the terms. Instead, she indicated the strength of the connection by the number of lines she drew between the terms. For example, she drew two lines between Albert and brave, which may indicate a stronger connection than between Albert and scared, which she connected with only one line. She connected Emily and brave with 17 lines, and Virginia and spoiled with seven lines.

Julie and Caroline recognized Albert's bravery because he did not board the first available life boat. Scott also recognized Albert's bravery, although he did not specify an explanation. None of the students linked bravery with Virginia. This is consistent with the story, in which Virginia did not display specific acts of bravery.

The students reported the connections between scared and the characters in the story. Julie and Caroline noted that Albert was scared when he discovered he did not know where his mother was. Holly indicated a connection between Albert and scared without explaining how these terms are connected. Scott did not make a link between Albert and scared. Julie also identified the point when Virginia did not know where her mother was as a point of fear. Caroline noted that Emily was scared when the boat was going down. Holly did not explain her connections, but she made a connection between Emily and scared.

A Friend Like Zilla. Two students read the novel A Friend Like Zilla. The students completed a concept map using three characters (Zilla, Nobby, and Uncle Chad) and three

concepts from the story (judge, mean and forgive). Uma created links among the six terms but did not write explanations for the links. Anne included her explanations for the links she created among the terms.

The connections the students made between Chad, Zilla and Nobby are not clear. Both students created a link between Nobby and Zilla. Anne explained that these girls are friends. Uma created a link between Nobby and Uncle Chad, but Anne did not. Anne did not create a link between Zilla and Uncle Chad while Uma created a connection without explanation.

Similarly, the students did not make strong connections to the concept terms. Anne did not create a link between Nobby and being mean, while Uma made this connection without explanation. Uma also created a link between Zilla and being mean. Anne did not make this link. Both students linked Uncle Chad with being mean. Anne wrote that "he was yelling at Nobby and Zilla." The connections with forgiveness were also mixed. Both students linked forgiveness with Nobby, and forgiveness with Zilla, but it is unclear why the students found Nobby and Zilla forgiving. Anne did not link Uncle Chad and forgiveness. Uma made this connection, but did not explain her thinking.

Devil's Bridge. Four students read the novel Devil's Bridge. The students completed a concept map using two characters from the story (Ben and Freddy), one character who was not present in the story but who had influence over the other characters (Pop - Ben's father), and three key story events (Ben's big striper, Pop's record, and the Derby). I left the students to reflect on the circumstances that linked these characters to these specific events.

To guide the students to consider Ben's conflict with his image of his father, I included the terms Ben, Pop, Pop's record, and Ben's big striper. Both students recognized that Pop and Ben are related as father and son. Peter and Neil reported that Ben caught a bigger fish that

would beat Pop's record. Neil also noted that Ben did not enter his fish in the Derby. Both students also created connections among Ben, Freddy, Pop's record and the Derby. While Neil noted that Ben had overheard Freddy talking, both Peter and Neil explained that Freddy cheated to try to win the Derby. Both students recognized Freddy's illegal attempt to break Pop's record.

Summary: Concept Maps as Reading Response

Completing a concept map exercise directs student thinking about characters, their actions and story events in specific ways. While narrowing students' thinking to a specific concept, the activity broadens student thinking about the story as a whole as the students considers each character's relationship to the selected concept. In completing the concept map, the student creates a complex visual rendering of the interconnections within the story. The activity allows students to record any rationale they can use from the story to support the connections they make. The nature of each explanation becomes the measure of the depth of understanding of the story. For example, with The Tiger Skin Rug, all students who connected the terms "afraid" and "tiger" noted that the robbers were afraid of the tiger and that the tiger scared the robbers away. These are obvious, yet important observations in developing an understanding the story. Two students also considered being afraid from the tiger's perspective, noting that the tiger was afraid of being discovered while posing as the rug. This connection is equally important in understanding the story, although it was treated more subtly in the text.

The responses recorded on a concept map show each student's understanding of the relationships in the story. Traditional question-and-answer responses may also provide the teacher with an accurate measure of a student's understanding of a specific point in the story, but answers to comprehension questions may not provide the student with a view of the complex and varied ways the characters and themes interact in a story. The completed concept map provides

a student with a graphic representation of the complexity of the story. Although students construct the map by considering one pair of terms at a time, as the map grows the student is able to visualize how the characters and concepts fit together to create the whole story.

Teachers need to set the terms for each concept map carefully. Using the characters alone, as I did with Dinner at Alberta's, produced unsatisfactory results. Few students used story events to report relationships between pairs of characters beyond family or friend. Carefully selected terms may lead students to report connections and relationships that would be difficult to obtain from question-and-answer responses. The concept map procedure directs the students to reflect and report on the story rather than reflecting and reporting on questions about the story.

Some of the parameters that I set up for this procedure may have limited the student responses. I prepared a standardized "concept map response" form, consisting of two columns of three boxes for the students to write the terms for each map. Generally, students drew more connections between terms in adjacent boxes than they did between terms that were in boxes that were farther away from each other. A more open-ended approach may encourage students to consider all pairs of terms. By providing students with a list of the terms and a blank piece of paper, the students would be able to locate the terms in the map so that each could visualize the connections between each pair of words.

Concept mapping as reading response was introduced into my practice as an alternative to a more traditional question-and-answer strategy. Concept mapping activities helped students build connections among main story elements - characters, events and settings. By practising the construction of such connections, students may improve their comprehension and understanding of what they read. The evidence presented in this chapter suggests that not only did my students' ability to create connections improve over time, the nature of the connections they made also improved.

CHAPTER 5

USING VENN DIAGRAMS

AS READING RESPONSE TO BUILD UNDERSTANDING

I introduced Venn diagrams into my practice with reading as an aid to help students build understanding of what they read. Students listed similarities and differences between characters, settings, or events from their stories. The Venn diagram procedure provides a vehicle different from the concept map that helps students build understanding of what they have read. The activity directs students to reflect on two specific story elements. While creating a concept map helps students to create links among several terms or concepts, completing a Venn diagram guides students to examine the similarities and differences between only two terms.

Students completed Venn diagrams for three different types of reading response. At the beginning of the year, to coincide with our Venn diagram work with place value in mathematics, students used Venn diagrams to compare characters from the same story. Students also compared characters from two different stories. Students completed Venn diagrams to examine point of view. The viewpoints of both Mr. Clancy and Mr. Morgan from The Case of the Mysterious Tramp were examined. Later in the year, as part of our novel studies, Venn diagrams were used to help students make personal connections to the characters in their stories. All of these activities encouraged students to sort information from their reading and to use the information to improve their understanding of the characters in their stories. Samples of the students' Venn diagrams used as reading response are included in Appendix C.

Comparing Characters Using Venn Diagrams

A Venn diagram was first used to help students compare Rose and Gus, two characters from Mountain Rose. Rose and Gus, siblings separated at birth and reunited at the end of the story, provided a rich supply of similarities and differences. I collected 16 Venn diagrams from this exercise. The exercise was designed to help students increase their understanding of the sibling relationship between Rose and Gus, who shared many similarities that the students noted: they both liked wrestling and both were wrestling champs, both their parents had died, and they both liked to eat. All students recognized that a major difference between Rose and Gus was their training diets. Gus's training diet consisted mostly of junk food while Rose ate only healthy foods. Although David, Julie, Bill and Scott were the only students to record that Rose and Gus were family, Uma, Holly, Olivia, Fay and Margot noted the birthmark that both Rose and Gus shared. As a first attempt using Venn diagrams for reading response, most students were able to recognize major similarities and differences between these two characters.

The next reading response Venn diagram activity was to compare two characters from two different stories: Henry Green from Chocolate Fever and John Midas from The Chocolate Touch. Both stories were about boys who loved chocolate. The students were asked to record at least five characteristics that made the two boys different, and at least three characteristics that made the boys similar. I collected responses from 14 students.

All of the students noted that the diseases were different, that John's disease was affecting his touch and Henry's disease was more measles-like with the spots. Julie and Richard both noted that while Henry did not know why or how he got his disease, John's disease developed from him eating a magic candy. Bill indicated that both boys had spots. Glenda wrote that John had spots just on his nose, while Henry had spots all over his body. Nine students indicated that both boys went to see a doctor. Richard also noted that John went with

his dad and Henry went with his mom. Four students recognized that the doctors were different. Neil went further with his response, indicating that the doctors in both stories were "nut cases."

Part of the written work for Devil's Bridge involved completing a Venn diagram to help students explore Ben's feelings for his mother's boyfriend, Barry Lester, and his father, Pop. The two descriptors were Barry and Pop. Neil wrote some obvious differences between the two characters: Barry was living and Pop was dead, Pop won a record and Barry did not, Pop was a great fisher and Barry knew little about fishing, and Pop had a boat while Barry did not. The only similarities that Neil described were that both were "boys" and that they both sat in Pop's chair. Ben thought that, by sitting in Pop's chair, Barry was trying to replace Pop. Peter only identified that Barry was not a good fisher, and that Pop was a great fisher. Peter provided more information about their similarities: both Pop and Barry liked Ben and his sister Kate, both men were heroes, and both men were smart.

Comparing Point of View Using Venn Diagrams

The Case of the Mysterious Tramp presented a different opportunity to use a Venn diagram to help students build the understanding of the story. This was a mystery story. Several different versions of the crime story were told, each told by a different character. Each character had a specific point of view regarding the crime, and John Morgan in particular tried to hide his involvement in the crime by altering his story. The students used a Venn diagram to examine both Mr. Clancy's and John Morgan's versions of the crime. There were several similarities in the two versions of the crime, but the differences led the students to understand what really happened.

This was the students' first attempt to discern different points of view. The students

were able to identify several facts common to both characters' stories. Julie and Kevin recorded that in both stories the motor of the truck overheated. Anne wrote that both men acknowledged that Mr. Clancy was hurt. Richard and Neil recorded that in both stories somebody hit and robbed Mr. Clancy. Glenda wrote that both stories related that Mr. Clancy was working on his truck and that he was hit on the head with a piece of pipe. Tania wrote that both men knew each other. Richard and Neil wrote that Mr. Clancy did not see a tramp. Tania wrote, "Mr. Clancy got hit by John Morgan." Although this actually happened, Mr. Clancy would not know this, since he was hit from behind. In this exercise, Tania demonstrated her understanding of what happened in the story, but did not report the events from Clancy's point of view. Tania has shown understanding of the story, but not of point of view. Anne, Richard, Glenda and Neil wrote that Morgan said he saw the tramp come out of the woods with a pipe.

Many students demonstrated their understanding of the solution. Julie knew that John Morgan "stole his walet [sic]." Kevin wrote that John Morgan "stels [sic] mony. [sic]" Glenda wrote that, "John Morgan hit him (Clancy) on the head" and that Mr. Clancy "had a peice [sic] of pipe out of the truck." Tania wrote that John Morgan "robbed Mr. Clancy."

Making Personal Connections to Characters Using Venn Diagrams

In the third term, when the reading program focussed on longer chapter book stories, the students prepared Venn diagrams to compare a character to themselves. These activities helped students create personal connections to the characters and events of their stories.

The students who read A Friend Like Zilla completed a Venn diagram comparing themselves to Nobby. Uma noted that she had "nice uncles" while Nobby had a "mean uncle." The other obvious difference between them was their age: Nobby was eight and Uma was ten. Both Uma and Nobby had friends, brown hair, brown eyes and nice aunts. Anne noted that both

she and Nobby were girls, kind and nice. Anne wrote that she was nine and small, while Nobby was a teenager and big. In fact, Zilla was the teenager, not Nobby.

Students who read Devil's Bridge completed a Venn diagram designed to explore their personal connections with Ben. Neil found that he was quite different from Ben. There were two similarities between Ben and him: they both have a bike, and their hair is brown. There were more differences than similarities: Ben loved fishing while Neil "feels so-so about fishing." Ben's mom worries too much while Neil's mon doesn't worry too much. Ben's dad was dead while Neil's dad is alive, and Neil hasn't had poison ivy while Ben had.

Peter also made direct connections between himself and Ben. He wrote that Ben's father was a great fisher, and that Ben had Barry in his life. Peter noted that he was the same as Ben, because both had adults other than their fathers living with them. He noted that he was similar to Ben because they both like fishing, they both have someone living with them they don't like, and both their fathers had died.

Summary: Using Venn Diagrams for Reading Response

The Venn diagram exercises support the students' work with concept maps. Both procedures were introduced to help students create more meaningful connections to the material they read. The procedures appear to help students improve their understanding and reading comprehension by directing their thinking and reflection to identifying relationships among the characters, events and settings of the stories they read.

Venn diagrams as reading response narrow student thinking to consider relationships that exist between two story elements. I chose this procedure to help students improve their understanding in three ways. First, students used Venn diagrams to compare the actions of the characters from their stories. Second, students completed a Venn diagram to help them identify

point of view. Third, students used Venn diagrams to help them make personal connections to the characters in their novels.

The students showed little trouble identifying similarities and differences between characters. They recognized major similarities and differences between Rose and Gus from Mountain Rose. They were able to differentiate between the two characters from Chocolate Fever and The Chocolate Touch, and their separate illnesses. The students who completed the Venn diagram for Devil's Bridge were able to compare Pop and Barry, noting the differences and similarities between these two men in Ben's life.

Students were presented with a Venn diagram to describe an event from The Case of the Mysterious Tramp from two points of view. Most students were able to identify the elements common to the two sides of the tale. Most students were able to identify the parts of the story that were told differently from contrasting points of view, although some were not able to report the differences from the different viewpoints.

Late in the year, as part of the novel study, some students completed Venn diagrams that compared themselves to characters in their novels. This exercise was designed to help students make personal connections to their reading. Anne and Uma, who read A Friend Like Zilla, were able to identify basic differences. Peter and Neil, who read Devil's Bridge, made strong personal connections to Ben.

As with the concept mapping exercise, the responses the students wrote to complete the Venn diagrams were open-ended. Each student was given the flexibility to report the connections or relationships that they could generate. Some students were able to generate basic connections, while others developed skill in identifying deeper personal connections. Venn diagrams were useful to me as diagnostic tools. I was able to assess the student responses to determine the degree to which the students attended to the story and how much of the story they

understood.

Venn diagrams focused student thinking on the relationships between two story elements. The internal questioning and reflecting that occurred as students considered how two characters were the same or different helped each student build a connection between the two characters. The students used the Venn diagrams to explore and report the relationships between characters.

Using Concept Maps and Venn Diagrams Together as Reading Response

Mountain Rose was the only story for which the students responded with both a concept map and a Venn diagram. The students used a Venn diagram to compare Rose and Gus. All of the students were able to report major similarities and differences between these two characters. Interestingly, while only one student identified the brother-sister relationship in the concept map, nine students noted it on the Venn diagram. Uma, Holly, Olivia, Fay and Margot noted that both Rose and Gus shared the same birthmark, a connection none recorded on the concept map. David, Julie, Bill and Scott noted that Rose and Gus were family. This information was not included on their concept maps. David was the only student to record this fact on both the concept map and the Venn diagram.

If the concept map was examined in isolation, it could be concluded that these nine students did not make this important connection while reading the story and that they missed this key piece of understanding. The Venn diagram provided a second opportunity for these nine students to report what they knew about the story. The Venn diagram activity served as a cross-reference for the concept map connections.

Progressing Toward Creating Meaningful Learning

Producing concept maps and Venn diagrams helped my students improve their information-processing skills by directing them to reflect upon the relationships that exist among the characters and events. These exercises focused student attention on establishing relationships, rather than on identifying a sequence of events. This illustrates the power of these procedures. Rather than considering a story in a linear fashion as a sequence of events, students who create relationships within the story start to recognize the complexity of the story.

As my students began to work with concept maps and Venn diagrams in September, they started to create connections and visualize the relationships within the stories. Characters were being connected to their actions, thoughts and feelings. For example, with Tiger Skin Rug, all students recognized how the characters were connected to each other. The tiger became part of the Rajah's life. The tiger worked to protect the Rajah by scaring away the thieves. The tiger was afraid he might lose his preferred life, while the Rajah was afraid of the thieves. The story became more than a series of events as the characters were linked to each other in more complex ways. Similarly, students were able to examine the detailed similarities and differences between Rose and Gus with a Venn diagram.

The exercise with Dinner at Alberta's helped me to understand that concept maps must contain terms that relate to story themes or concepts for my Grade 4 students. Whether because of their age or because this type of response work was new to them, most students had difficulty connecting characters to story events without the presence of terms that identified plot themes. Yet two students were able to create connections to the story. David and Neil used information from the story to explain the connections they made among Arthur, Emma and Mrs. Crocodile.

Creating connections using concept maps required the students to focus their thinking on specific characters, events, times, and places. When completing the map, the students had to

reflect on each pair of terms and find a way to link them together. With the exercise for Titanic Crossing, for example, the students had to consider how and when Albert displayed bravery. The concept map gave them the criteria with which to assess each episode involving Albert. Was he brave at the beginning of the story? Was he brave at the end of the story? When in the story did Albert display bravery? What did Albert do to demonstrate his bravery?

Creating connections with Venn diagrams required students to practice similar skills. The exercise focussed their thinking to consider the relationship between two characters or, as with the novel studies, the relationship between themselves and a character. The students who read A Friend Like Zilla focussed their attention on the ways Nobby was similar to them. Those who read Devil's Bridge considered their connections to Ben. The internal questioning as students completed these activities focussed their thinking.

At the same time, these activities allowed for open-ended responses. Students were able to record any rationale they could find to support each connection. The explanations the students gave to support the connections they created are the key to assessing the improvement of comprehension. As in the case of Dinner at Alberta's, most students explained their connections in a superficial way: Arthur was Mrs. Crocodile's son. Emma was Arthur's sister. These basic explanations do not link the characters to the story but rather to each other. David and Neil created links that were supported with evidence from the story, indicating with their explanations that Emma and Mrs. Crocodile were helping Arthur with his manners. These students made (or at least reported) links that were more relevant and contextual to the story. David and Neil demonstrated a deeper connection to the story than did the other students. They also demonstrated deeper reflection about the connections they were making. The explanations the students provide to support the connections they create are indicators of the development of meaningful learning.

CHAPTER 6

USING TOPIC AND TASK QUESTIONS IN MATHEMATICS TO DEVELOP REFLECTIVE THINKING

I developed a general strategy with the class that required the students to be specific in telling me what they didn't understand. Many usually approached me for help, stating, "I don't get this." or "I don't know what to do." I found myself automatically going over the entire lesson, paraphrasing and using different examples. I soon realized that I could not do this individually for each student in one period. I then began to ask them to tell me specifically which part of the problem they did not understand. Initially, they would immediately reply, "All of it" or "the whole thing." My instruction to them was to read the question or problem over again carefully and find the part that was giving them trouble. They were to come back to me when they could tell me exactly their problem so I would be better able to help them better. Interestingly, many students did not reappear with the requested specific question. What was happening, I discovered, was that upon careful rereading of the problem, the students were generally able to find a solution to the problem that was troubling them. This gave me more time to help the students who genuinely needed additional help.

Topic and Task Questions in Mathematics

The topic and task procedure was developed to help students reflect on and become more aware of their own learning. The procedure requires students to reflect on the day's lessons and their work, as well as the previous day's lesson and work. The goal is to create a link between the current and the previous lesson. To begin working with this procedure, the students started a math journal that we called the "Thinking Linking Log," the purpose of which was to record

responses to questions that were designed to help the students make connections between mathematics lessons. This journal was used exclusively with mathematics. Selected samples of student entries in the Thinking Linking Log are included in Appendix D.

The questions for the procedure were chosen to help students create three different types of connections. The first set of questions helped students make personal connections to each day's lessons and activities. Students were asked to reflect upon the main purpose of the day's lesson, what they had to do, and why they thought they had to do it. The second set of questions helped students create connections between the day's lesson and previous lessons. The questions were designed to help students recognize the continuity between adjacent lessons and ideas, and recognize the relationship between the lessons. The third set of questions helped the students recognize and develop an understanding of how the current topic related to other topics in mathematics.

The Thinking Linking Logs were introduced in March 1998 and were used with three separate mathematics topics: division, fractions and quadrilaterals. The questions used for each of the three types of connections intended are shown in Table 10.

Student responses were assigned a value from one to four, based on the quality of the link established by the student and of the reasoning the student used to create the link. Responses that used complex ideas and complete explanations scored higher than those that used simple ideas or incomplete explanations. All of the student responses were entered into a computer database and linked to a description of the lesson of the day, the date, and the specific question for which the student was to write a response.

These records were sorted by the lesson topic, the question asked and the response rank for that particular question.

Table 10

Topic and Task Questions Used with the Thinking Linking Log

Questions to Create Links to Personal Experience What was the main point of today's lesson? What was the main thing you had to do today? Why do you think you had to do this? Explain division as if you were telling someone how to do it who didn't know anything about division. What is perimeter?
Questions to Create Links Between Lessons What do you think today's lesson had to do with yesterday's lesson? How does this lesson connect to our current topic of study?
Questions to Create Links Between Topics in Mathematics How are perimeter and area different? How are perimeter and area similar? How does (a geometric figure) show symmetry?

Using Topic and Task Questions to Help Students Make Personal Connections to Lessons

The construction of knowledge requires learners to connect new information and experiences to the knowledge they already have. I chose the topic and task questions procedure from PEEL because it provided a framework for my practice to help my students generate awareness of the connections they made to their math lessons and activities. The questions directed the students to reflect on their work and its relevance to them.

The procedure was first introduced during the division unit in March. The students were briefed on how to think about responding to the questions, since they were not accustomed to replying to this type of question. Their skill in thinking and reflecting developed as they continued to write in their logs during our work with fractions and quadrilaterals.

Dividing Large Numbers

Grade 4 is the year that students are introduced to dividing larger, two- and three-digit numbers by a single-digit divisor. In the past, I have noted that children generally have more difficulty learning the division algorithm than learning how to add, subtract or multiply. One strategy for helping students construct meaningful understanding of division is to encourage them to think and reflect on what they are doing and why they are doing it. These topic and task questions were used throughout our lessons on division.

The first entry in the log was after an introductory lesson about remainders. The activities involved sorting various numbers of photographs into groups of either eight or six so they could be placed into photo album pages. The students needed to determine how many photographs were left over after all pages have been filled, and how many pages were required to include all the photos. At the end of the lesson students were asked to identify the main point of the lesson. I had stated directly five times that this lesson was meant to help the students consider the meaning of the remainder.

Eighteen responses were collected. Seven students replied that the main point of the lesson was to sort photos. Five students stated that the lesson was about dividing by eight and by six. Three students reported that the main point was to work with the hundreds chart to help with division. One student claimed the lesson was to "make us smart" and another stated that the purpose was to write a sentence for the answer. One student reported that what to do with a remainder was the main purpose of the lesson. This was the first time the logs were used, and I was hopeful that responses would improve with time.

The second lesson involved estimating when dividing numbers less than 100. There is a large emphasis on estimating in the Grade 4 program, and we had much practice estimating sums, differences, products and measurements prior to this unit. The students used Valentine

materials to estimate the number of craft items that could be produced from a known quantity of raw materials. The students wrote to explain the main thing they had to do and why they thought they had to do it. The student log entries reflect their connection with their prior experience with estimating. Ten of the 19 students responded that they were estimating. Six of these 10 stated that the lesson would help them learn how to estimate with division. Two stated that the work was for practice. One student said that estimating could be useful.

Long division, or dividing two- and three-digit numbers, was introduced as repeated subtraction. The demonstration activity involved distributing books either four at a time, or by multiples of four. Each time a group of books was distributed, the students subtracted that number of books from the total, and made note of which multiple of four we used to take away from the total. An integral part of this lesson was the introduction of the use of the "long division" symbol. At the end of the exercise, the students were asked to write a response to what they thought was the main point of the lesson. Julie, Olivia, Ian and Glenda all claimed the lesson was about putting books away. Holly, Margot, Neil, Quentin, and Tania stated that the lesson was about dividing. Holly, Margot and Neil explained that the lesson was about dividing big numbers. Evan indicated that this lesson presented a new way to divide.

The next lesson also involved dividing numbers in the hundreds, but this lesson stressed using the traditional long division approach. After this lesson students again reflected on the main thing they had to do in the lesson. Olivia, Fay, Margot and Tania all related they were doing long division with numbers in the hundreds. Tania also added that this work was very hard for her.

The final division entry in the Thinking Linking Log culminated a week of review after the March Break. We had practised long division of numbers in the tens and the hundreds using three different methods. We also examined remainders and what a remainder might mean in

specific problems. This entry was the precursor to the summative test for this unit on division. The students were asked to explain how to divide as if they were telling someone who knew nothing about division.

Fourteen students responded to this task. Eight students indicated that division was about sharing or putting things into equal groups. Two students did not actually explain division, but stated that they would explain it step-by-step. They did not identify the steps they would use. One student reported that division is the opposite of multiplication and another student used the long division symbol to help explain his thinking.

Fractions and Decimals

The next topic in which the linking logs were used in mathematics was fractions and decimals, in April. The first lesson involved using four parallel number lines, all divided into hundredths. We labelled the first number line in tenths using fractions, the second number line in tenths using decimals, the third number line in fourths using fractions, and the fourth number line in fourths using decimals. The objective of the lesson was to demonstrate equivalence between specific fraction and decimal numbers (1/10 = 0.1 = 0.10). At the end of the period, students were asked to respond to the question, "What was the main point of today's lesson?"

Sixteen students responded to this question. All indicated that the lesson was about fractions and decimals. Neil, Holly and Quentin linked this fractions and decimals exercise to working with number lines. Glenda stated that the lesson helped her connect fractions and decimals together. Olivia stated that the lesson helped her compare fractions to decimals. David, Ian and Margot reported that the lesson helped them to see how fractions and decimals can mean the same amount.

During the second lesson, the students compared two fractions with different

denominators to find which is larger. The exercise compared a specific number of pieces of one pizza with a specific number of pieces of another pizza. Each pizza was cut into a different number of pieces (e.g.., Which is more: three pieces of a pizza cut into five pieces, or five pieces of a pizza cut into eight pieces?)

After the lesson, the students were asked to describe the main thing they had to do, and why they thought they had to do it. Ian wrote that his work was about who got more pieces of pizza, and that this work would help him learn to compare fractions and decimals. Evan and Peter both identified the concept of comparing the number of pieces of pizza, but the purpose of this work to Peter was to help him pass the grade. Evan's purpose was to become smarter so he could be able to do fractions and decimals in high school.

One of the lessons was designed for students to order and compare decimals. Much of this work involved comparing distances measured in metres to determine which distance was either the farthest or the shortest. Students were invited to respond to the same questions that were posed when they were comparing fractions (pizza activity): What was the main thing you had to do today, and why do you think you had to do it?

Seven students responded. All indicated that the activity was about comparing decimals. David, Uma, Margot and Olivia stated that comparing decimals was the focus of the work. Bill stated that he was finding out who got the farthest distance. Neil indicated that he was comparing numbers. Quentin declared that he was measuring people kicking Kleenexes, which was one of the activities of this exercise. When asked why they thought they had to do this work, David and Bill stated that they were trying to see who got the highest number or the "most of decimals." Quentin's purpose was to learn how to measure decimals. Neil and Olivia wrote that they were learning to compare decimals, or working to get better at comparing decimals. Scott wrote that the main thing he was doing during this activity was picking the highest

decimal. His purpose in doing this was learning to do it in his head. Both Caroline and Tania indicated that the main work they were doing was measuring so they could get better at measuring.

When the class used the pattern blocks (triangles, trapezoids and rhombuses) to cover hexagons to demonstrate improper fractions and mixed numbers, they were again asked to identify the main point of the activity. Nineteen responses were collected, and 16 students indicated that the main point was working with pattern blocks to form either improper fractions or mixed numbers. Uma wrote that the focus was how many ways one hexagon could be made with the other pattern blocks. Holly wrote that the main point was to determine how many ways one whole could be made using 1/6, ½ and 1/3.

Quadrilaterals

This was the last unit of the year. Begun in May, it followed our work with fractions and decimals. The first quadrilateral lesson had the students create four-sided shapes using elastics and geoboards to meet specific criteria: two sides longer that the other two sides; all sides the same length; all sides different lengths; all square corners; two square corners; no square corners; two sides parallel; and no sides parallel. When the figures had been created on the geoboards, the students drew the shapes on dot paper and labelled each shape with its name: square, rectangle, parallelogram, rhombus, irregular quadrilateral and kite. The thinking-linking question for this exercise was "What the main point of today's lesson?"

Fifteen students wrote responses to this question, and all of them indicated that the lesson had to do with making shapes. Nine students either used the term "quadrilateral" or indicated the shapes were four-sided in their responses.

Summary

I chose to introduce topic and task questions into my practice to help make the students more aware of the connections they were making during mathematics lessons and activities. The students had not had much experience thinking about their learning. Initially, they had difficulty identifying the main ideas or concepts in our math lessons and articulating their ideas and thoughts clearly. Throughout the division unit students expressed their ideas of what they were to do and what the lessons were about in general terms. The connections they reported were also general, noting that the lessons were simply about division. Some students recorded even more generally that they thought the lessons and activities were to make them smart.

With practice and experience, the students responded with greater attention to specific detail. During the work with fractions and decimals, students wrote with more confidence. Entries included notations that the work was to help them compare fractions to decimals and to understand the meaning of a decimal number and a fraction. Mathematical language also began to appear in several of their responses. Students used terms such as "improper fraction" and "mixed number" in their log writing.

As we began to study fractions and decimals, the students demonstrated improved ability in thinking and writing reflectively. When asked to comment on the main idea behind the number line activity, 8 of 16 students related their responses directly to the activity of using number lines to identify decimal and fraction equivalents. One student claimed that the lesson had helped her compare fractions and decimals, and three students reported that the lesson helped them see how fractions and decimals can mean the same amount. These responses align directly with the objective and the expectation of the lessons. Compared to the earliest responses in the division unit, these students had started to develop their critical reflective thinking skills, and were making better connections to their lessons. The students' ability to articulate their ideas

about what they were learning was also improving. Some students were starting to think about the context of the lesson as well as its content.

By modifying my practice to include the opportunity for the students to write about what they were doing and learning, the students improved their ability to communicate their thoughts and reflections about the meaning of mathematics. Fay demonstrated improvement in both her information-processing ability and her awareness of her learning. Math had been a particularly difficult subject for Fay, and she needed much practice with manipulative materials before she could begin to grasp mathematical concepts. She had particular difficulty understanding fractions, especially equivalent fractions and how whole numbers could be represented by fractions. Fay worked with several activities using pattern block shapes to help her visualize fraction equivalence. With one activity, she was to cover the hexagon blocks with trapezoid, rhombus and triangle blocks to show that one whole could also be written as a fraction: 2/2, 3/3 or 6/6. With another activity Fay explored the relationships between one trapezoid (½ a hexagon) and three triangles (3/6 of a hexagon) to help her understand equivalence between different fractions that mean the same amount. This work was later extended to help her improve her understanding of improper fractions and mixed numbers. Two and three hexagon blocks were used in these activities, in which she would cover two hexagon blocks with trapezoids, rhombuses or triangles to indicate that two wholes could also be written as 4/2, 6/3, and 12/6. In a similar way, Fay modelled mixed numbers with the pattern blocks to show that three trapezoid blocks could also mean one and one-half hexagon blocks.

Fay wrote daily to explain what she was doing and why she was doing it. In her first entry she wrote, "the main thing I had to do was fractions with blocks. I did this so that I could learn how to work with fractions and pattern blocks." After completing an activity that helped her explore the relationship between fractions and whole numbers larger than one, Fay wrote,

"Today we are learning about fractions, with shapes like 12/6, 2 ½, 3 1/3." In this entry Fay wrote both an improper fraction and two mixed numbers, the exact concepts with which she had been working. This was considerably more specific that her earlier entry about working with fractions and pattern blocks.

Using Topic and Task Questions to Help Students Make Connections Between Lessons

One objective in teaching division is to introduce the students to different methods to "do long division." I used topic and task questions in my practice to help students make conscious connections between the day's work and the previous day's work. By recalling last day's work, students would be able to identify the similarities and differences between different methods and approaches to "long division." As the students progressed through the unit, they regularly wrote in their logs, building connections between previous knowledge and the current work.

The unit on dividing larger numbers began with the demonstration of division of a two-digit number using books, described earlier. The next lesson also focussed on dividing two-digit numbers. These lessons introduced the students to the same concept (long division) from two different approaches. This provided an opportunity to direct the students to think about how each lesson was linked to the previous lesson. Fifteen of the 17 responses noted only that both lessons involved division. David's entry, while still quite general, revealed that David recognized that both lessons were about the same kind of dividing. Bill, Holly, Fay Margot and Neil wrote more specifically that both lessons involved dividing larger numbers. Uma and Glenda recognized that both lessons used the long division symbol. Similarly, Tania, Anne, and Ian wrote that both days they did long division.

The next two lessons focussed on developing the traditional approach to long division using the closest multiple of the divisor to divide three-digit numbers. After the first lesson, students wrote about what they thought the lesson had to do with last day's lesson. The previous day's lesson involved dividing two-digit numbers using the repeated subtraction method. Eleven of 13 students recognized the general link that both lessons were about division. David, Uma, Olivia, Ian and Tania wrote more specifically that both lessons were about long division, and Fay and Margot wrote that both lessons were about dividing with hundreds. Similarly, Holly wrote that both lessons were about dividing with big numbers.

Using Topic and Task Questions to Help Students Make Connections Between Topics

The last mathematics unit featured quadrilaterals and was begun in May. The students had been using their logs since March and were familiar with the type of questions they were being asked to reflect upon. One specific activity in this unit required the students to recall and use symmetry, a topic that was taught and practiced during the fall term as part of a unit about transformational geometry (slides, flips and turns). This presented me with an opportunity to direct the students' thinking toward making connections between topics.

The first connection to be explored was between quadrilaterals and symmetry. In one activity, the students followed oral directions to create an origami frog from a square piece of paper. When the task was complete, the students were asked to reflect on their work and respond to two questions. The first question was about symmetry. I was interested to see which students could recognize connections to previous work with symmetry and our work with quadrilaterals. Seventeen students wrote to explain how the frog showed symmetry. Fourteen students identified at least one line of symmetry on the frog, and explained that the frog was the same on

both sides of the line of symmetry. Eight supported their written response with a diagram to show the line of symmetry.

The second question asked the students to describe how this activity could be linked to our work with quadrilaterals. The same 17 students wrote responses to this second question. Seven students connected the shape of the starting paper (a square) to quadrilaterals. Five students identified quadrilateral shapes in the frog. Peter, Margot and Ian wrote that both the frog and quadrilaterals have lines of symmetry. Evan and Fay connected both lessons by the amount of difficulty they had with both topics. Fay wrote that both the frog and the quadrilateral work were easy, while Evan claimed that making the frog was hard, just like our "other math."

Measuring the perimeter and the area of various quadrilaterals was the final topic of this unit. The first activity involved the students measuring the perimeter of quadrilateral shapes using centimetre rulers. When the students had completed the perimeter activities, they responded in their logs to the question, "What is perimeter?" Nineteen responses were collected, with 16 students noting that perimeter is a measure of the distance around an object. The three remaining students wrote inaccurate descriptions that indicated incomplete understanding of perimeter. Bill wrote that "perimeter is something big or small." Holly replied that "perimeter is something you can measure with." Tania did not complete her sentence: "perimeter is a."

The second group of activities focussed on measuring the area of quadrilaterals. The lesson involved measuring the area of quadrilateral shapes using square centimetres and centimetre graph paper, as well as geoboards and elastics. For the first exercise, the students used centimetre grid paper and counted the number of squares found inside each quadrilateral shape. They paid special attention to counting and estimating the number of part-squares and half-squares so they could calculate an accurate measure of the number of squares in each shape.

The following day, the students were introduced to the concept of the square centimetre. On this day, the areas of shapes were measured using squares that were exactly one square centimetre. Final activities were designed for students to recognize relationships between area and perimeter. The students created quadrilateral shapes that conformed to specific perimeter and area criteria. For example, students were challenged to create three different rectangles so that each rectangle had an area of 12 square centimetres. Similarly, students endeavoured to create pairs of quadrilaterals that either shared the same perimeter but had different areas, or shared the same area but had different perimeters.

At the end of the perimeter and area activities, the students wrote responses to two related questions. My objective for these questions was to determine the degree to which students were able to make connections between perimeter and area. The first question asked the students, "How are perimeter and area different?" Eighteen students responded to this question, and 8 were able to make a solid connection between the perimeter and the area of an object. Neil wrote, "Area and perimeter are different because perimeter is the space around an object while area is the space an object takes up." Ian wrote, "Area and perimeter are similar because perimeter is outside area is inside. If there is perimeter there is area. Perimeter is outside area inside." Glenda wrote, "They are different because area is the inside and perimeter is the outside." Margot wrote, "They are different because area is space and perimeter is the distance around."

Ten students indicated poor understanding of the connection between the two measurements. Caroline wrote, "They are different because perimeter means square, area means round." Tania wrote, "Perimeter has to do with shapes and area doesn't." Uma, Bill, Holly, Olivia, Caroline, Evan, Peter and Tania recognized generally that area and perimeter are both related to measurement. Tania wrote that "Area and perimeter are similar because both you have

to measure." Caroline wrote, "Area and perimeter are the same because they both mean length." These students were better able to describe how perimeter and area are similar than they were in describing how they were different. By asking both questions, I was able to gain a more complete picture of the level of understanding of these students.

Neil and Ian made the strongest connections between the two concepts. Neil wrote, "Area and perimeter are similar because area is the space inside the perimeter." Ian wrote, "Area and perimeter are similar because perimeter is outside area is inside. If there is perimeter there is area. Perimeter is outside, area inside." Kevin was also able to make a good connection between the two measurements: "Perimeter is the outside of a shape. The other one is the inside."

Summary

The students had been recording their reflections in their logs for three months when they began to think about identifying the connections between topics. When asked to relate the nature of quadrilaterals to symmetry, the students accurately remembered the concept of symmetry and successfully applied it to the current activity, the origami frog. They were able to make a successful connection between these two topics.

After working with perimeter calculations, 16 of 19 students were able to write an accurate explanation of perimeter. After working through several activities that explored the relationship between area and perimeter, the students responded to two questions: How are area and perimeter different? and How are area and perimeter similar? Eight students were able to provide a clear understanding of the two concepts in their logs. More interesting, though, are the responses from the students who did not have a clear idea. In previous entries for previous units and lessons, students who did not fully understand a topic wrote generally or vaguely in their journals. With the perimeter and area questions, however, the students who did not completely

understand the relationship wrote clear descriptions of how they understood these concepts. Caroline wrote, "They are different because perimeter means square and area means round." Tania wrote, "Perimeter has to do with shapes, area doesn't."

While both students show an inaccurate understanding of the relationship between perimeter and area, they show increased ability to explain their thinking in writing. I was more interested in these students' ability to articulate their understanding and their thinking about perimeter and area than in whether they had the correct idea or not. The students who wrote these ideas clearly were students who struggled with mathematics all year. Even the students who did not grasp the concepts clearly were able to explain their thinking in a clearer fashion than they could during the division lessons.

This chapter and the previous three chapters describe three different ways in which I extended my teaching practices with a view to improving the quality of my students' learning. Each of these teaching procedures is taken from the PEEL project. By introducing significant new elements into the ways I teach language arts and mathematics, I created significant challenges for my students and for myself. It was one thing to read a range of PEEL procedures and to select those that seemed most appropriate to my Grade 4 classroom. It was quite another to experience these personally and to be challenged myself as I also sought to offer my students greater challenge in their classroom learning experiences. I had to make PEEL my own, and so did the children.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

Much literature on changing teacher practice suggests that meaningful change can occur and endure only when it develops within the classroom situation of individual teachers. Each teacher recognizes specific and unique problems in the classroom, arising from the changing needs of students or curriculum. The identification of a need as a result of the teacher's reflection on experiences with students in the classroom is the beginning of the learning cycle identified in both reflective practice and action research models. Teachers begin to re-conceptualize their practice as they work to create solutions to an identified problem. Solutions are tested in the classroom, and those that the teacher deems successful are incorporated into practice. The method used in this study is based on this reflective practice/action research learning cycle recognized in the literature. This study was initiated to examine my teaching practice as I implemented new procedures that seemed likely to help my students improve the quality of their learning. In reflecting on my own practice and my students' behaviours and work, I felt that I needed to change the way I taught to help the students improve their information-processing skills. Further analysis, coupled with an introduction to PEEL during one of my courses at Queen's University, helped me identify two poor learning tendencies that I used as targets for this study. Students paid only superficial attention to the work, with little demonstrated ability to generate personal meaning from their work. The students also demonstrated a lack of ability to reflect on and make conscious connections between lessons and topics.

The objective of this study, therefore, is to document and examine the impact of introducing into my practice teaching procedures that would help students develop good learning

behaviours. My initial premise was that these procedures would help students improve their abilities to link new learning to their experience and knowledge and to reflect on and identify the connections that exist between lessons, concepts and topics in their studies. Implementing changes in my practice to improve the students' ability in these two areas could lead to the development of more meaningful learning.

The improvement I was seeking in my practice mirrors the improvement I was seeking in the learning of my students. Its foundation lies in constructivist learning theory, in which new knowledge is created by the learner as new information or experience is incorporated into the learner's existing knowledge and understandings. I was developing a new knowledge of teaching as I brought the PEEL philosophy and procedures into my practice. Simultaneously my students were developing new knowledge on two levels. They were increasing their awareness of their own learning, while also increasing their comprehension of what they were reading and improving their understanding of the content of their lessons.

I chose to concentrate my study on two core subjects of the elementary curriculum, language arts and mathematics. I selected three PEEL procedures that I thought I could incorporate into my practice in these subjects, that also addressed the poor learning tendencies I had identified. Concept maps were used in the reading program to help the students recognize connections between characters, story events and settings, in both short stories and chapter books. Venn diagrams were introduced for students to make connections between the similarities and differences of story characters, not only from each story, but also from different stories. Students also used Venn diagrams to create personal connections between themselves and story characters. In mathematics, students kept a journal to record their reflections about the links they could make between their own knowledge and new lessons, as well as connections between lessons and concepts. Samples of student work were collected throughout the year to

assess the success of each procedure in developing good learning behaviours and improve student learning.

PEEL Procedures as Agents of Change

PEEL began in Australia in 1985 with a group of teachers seeking solutions that would improve student learning. These teachers identified barriers to meaningful learning and then developed improvements to their practice to not only remove those barriers but to enhance effective learning. The students involved in the original PEEL project increased skill in learning and their demonstration of good learning behaviours led to corresponding improvements in their learning.

This study indicates that when I introduced three specific PEEL procedures into my practice, my students were led to develop good learning behaviours that indicate more effective understanding and deeper connections with lessons and concepts. Learning occurs when the student can reconcile new knowledge with existing knowledge. The PEEL procedures encouraged students to make these connections with lessons and reading material in a conscious way, contributing to the internal reconstruction of knowledge.

The goal of my practice is to develop independent learners who are able to derive meaning from all facets of the world around them. By adding the PEEL procedures to my practice, I am better able to teach my students how to make the connections necessary for them to construct meaning. The PEEL procedures began as innovations to my practice. Through practising the procedures regularly with lesson activities, the students' learning began to improve. The noticeable improvement in student learning was the evidence that helped maintain the momentum in changing my practice. Over the course of this study, I have come to believe that it is possible to change students' ability to learn by helping them become more aware of

making the connections that are necessary to improve learning. PEEL principles and procedures acted as effective agents to change not only my practice but also the quality of my students' learning.

PEEL Procedures as Improvements to my Practice

This study is about how I changed my practice to improve the quality of my students' learning. There is much debate (Guskey, 1986; Richardson, 1990) about whether changing teacher practice involves changing teachers' beliefs before introducing new practices, or changing teachers' practices first, with the hope that the new practices will change teachers' beliefs. This is a fundamental question, and one that I have considered during this study. I believe that teachers trying something new ask such basic questions as "Will it work?" or "Will this change produce the desired result?" The PEEL research indicates that the procedures are effective in improving specific aspects of student learning. But do teachers trust the research? The literature (Guskey, 1986; Richardson, 1990) suggests that they do not, or at least they do not consider the research valid for their situation or classroom.

This is the dilemma of heart and head. The head holds the knowledge of the procedures and the rationale, based on research, that justifies using them. The heart holds the belief that the procedures will produce the desired change in the students. I began this study by selecting and incorporating specific PEEL procedures into my practice in response to the needs I perceived in my students. The evidence provided by PEEL teachers who had already worked with the procedures was the basis of my faith that the procedures would lead my students to improved learning. As the school year progressed and as I began to see student responses that suggested improved connections to learning, my faith evolved as my belief in PEEL and the procedures strengthened.

One fundamental aspect of the PEEL research is that students everywhere exhibit some of the identified poor learning tendencies at some time during their school careers. This was one connection I was able to make between my situation and the PEEL research. I recognized that my students exhibited some poor learning tendencies. This common starting point in problem identification made it easier for me to consider applying PEEL to my practice. I was interested to see if the PEEL procedures would improve the quality of learning of my students.

I began this study by changing my practice to include just these three PEEL procedures. It was faith in the research, together with my curiosity about the results, that kept me going during the school year, especially at the outset. The early Venn diagram work with place value showed me that this procedure was effective in focusing student attention. It also allowed me to identify students who needed extra help with number sense concepts. Venn diagrams were perhaps the easiest of the three procedures to integrate into my practice, especially in mathematics. The place value activity became a "bell work" exercise, as I would have the Venn diagram for the day on everyone's desk as they entered the room at nine o'clock.

Incorporating Venn diagrams into reading response was also not a difficult task. Choosing two characters, either from the same story or from different stories, and letting the students complete the diagram was relatively simple. Assessing these activities was also fairly straightforward, using the characteristics the students chose to include as a measure of their understanding. When the students started to include differences the characters had in their beliefs, or actions or motivations, that indicated to me that they were focussing on the characters and thinking in a deeper way.

Using Venn diagrams in reading was not as challenging as developing the concept maps. I devised a form with six boxes aligned in two columns of three. The students were good at connecting pairs of boxes that were across the column from each other and at connecting boxes

that were either immediately above or below each other. There were characteristically fewer connections made between the terms in the boxes at the top and bottom of each column and in opposite corners. The students seemed to be locked visually by the placement of the boxes and by the placement of the terms in those boxes. It perhaps would have been better to give the students a list of the terms and have them create the map on a piece of plain paper, placing the terms in the map in places of their own choosing rather than using a pre-designed form that seemed to indicate some hierarchical relationship among the terms.

Another challenge for me was to devise the terms for the maps. I discovered that I must include terms that refer to the story themes or characteristics of the characters. When I used only characters' names in the map for Dinner at Alberta's, the students responded with the family relationships among the characters and did not relate any information about how the characters interacted in the events of the story. For concept maps to work effectively with reading response, the teacher must be very careful in deciding which terms to include.

To summarize my personal sense of the beliefs vs. practices debate in relation to teacher change, I believe this study shows that it has been a combination of beliefs and practices in interaction with each other that offered me both specific procedures and supporting beliefs. I changed my actions as a teacher and I have documented here the results of those changed actions. Yet only by reflecting constantly on my own beliefs in relation to old and new practices could I sustain the changes and link them to other relevant elements of my teaching.

PEEL Procedures and the Development of Meaningful Learning

This study documents the development of specific good learning behaviours by my Grade 4 students. In reading, this study documents my students' development of understanding of what they have read. In addition, I have recorded the development of my students' skill in

reporting the connections they could make between characters, story events and setting. In mathematics, I have demonstrated the development of my students' skill in reflecting on their personal connections to the lessons, as well as their skill in reflecting on connections they could make between lessons and topics.

The data show that my Grade 4 students improved their information-processing skills to demonstrate meaningful learning in language arts and mathematics. These skills developed as a result of incorporating new teaching procedures into my practice. While the students' initial responses to each procedure were vague and the connections they reported were general, the quality of student responses to lessons during the third term showed steady improvement. Responses were more articulate and connections were more definite. The study shows that, over time and with practice, not only did my skill and ability to embed the procedures into lessons and activities improve, but also the connections students were making between lessons and concepts became more articulate and specific to the topic or concept being taught. The data suggest that the students' thinking was redirected and refocused as they practiced the selected procedures throughout the school year and that the quality of the students' responses improved with practice.

This study demonstrates that by incorporating PEEL procedures into teaching practice, students can be taught to improve their ability to learn by exhibiting the good learning behaviours that encourage reflection upon learning and making personal connections. This study is the beginning of an awareness that as teachers we hold the key to developing and implementing procedures that can transform our practice. Before change can occur, teachers must recognize poor learning tendencies among their students and be willing to teach those students the good learning behaviours necessary to increase their success with learning.

Next Steps

The learning cycle of reflective practice for this project is complete. A problematic experience was identified; a solution was sought, found, and incorporated into my practice; and data were gathered to assess the effects of the new practices. In the process of analysing the findings, my practice has changed. I have become more of a risk-taker in exploring and attempting new procedures with my students. I have adjusted my teaching so that the students have more time to use the procedures to construct knowledge, and less time listening to directed lessons.

The PEEL procedures incorporated into my practice as a result of this study have been evaluated. Upon reflection on this project and its implications, one must consider the next steps. What will the reflective practitioner take from this study? What will the next steps be? The answer, in part, lies with PEEL.

PEEL began as a collaborative project in response to teachers' concerns about students' poor learning tendencies. Through collaborative work, PEEL teachers were able to identify, analyze and interpret their concerns about student learning. In addition, they were able to confer and share their successes and failures as they worked to incorporate into their practice procedures that would help students demonstrate behaviours necessary for good learning to occur. One of the strengths of PEEL is its collaborative component, which is not present in this study. Working independently to incorporate PEEL procedures into my practice was challenging. One course of future action and research would be to introduce PEEL to at least one of my colleagues at school so that collaboration between teachers can occur.

In this study I chose to address two poor learning tendencies in my classroom. I chose three PEEL procedures, and worked with them until they became a natural part of my practice. These procedures have become part of my regular daily routine of teaching. To build on the

success of this project, it is sensible and appropriate to continue this work. In the next years, I shall continue to improve my practice by choosing other poor learning tendencies and integrating new learning procedures to continue to enhance the effective learning of my students.

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Appendix A

Using Venn Diagrams to Build Understanding of Place Value in Mathematics

Selected Samples of Student Work

Using the Rating Rubric to Score Selected Venn Diagrams

	2 tens, 5 ones	9 ones, 7 tens	8 hund, 2 tens	3 hund, 6 ones
Caroline	3	2	2	4
Ian	4	4	4	2
Olivia	4 (note numbers outside circles)	XXXXXXXX	4	XXXXXXXX
Tania	2 (note numbers outside circles)	2	2	3

Appendix A

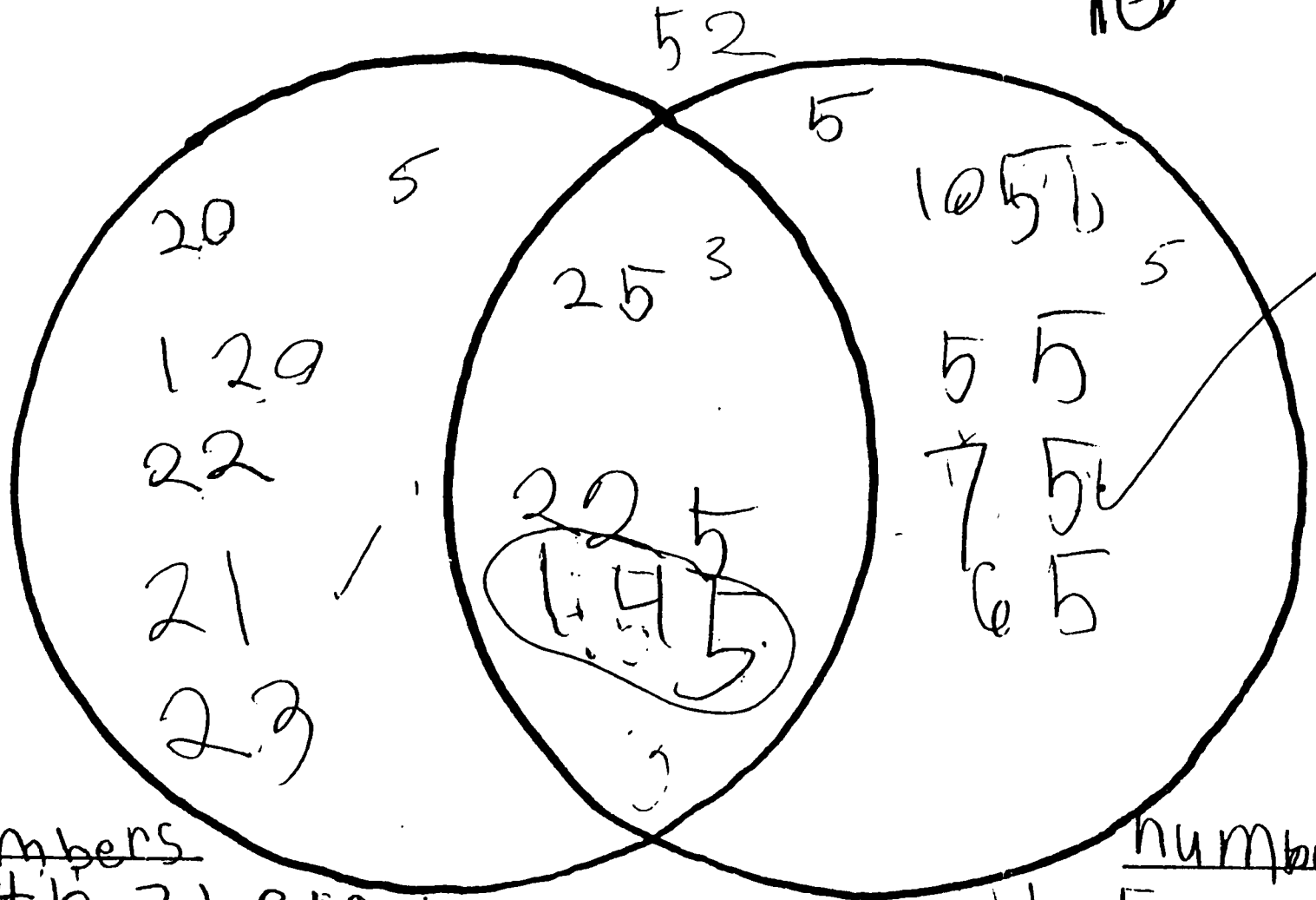
Using Venn Diagrams to Build Understanding of Place Value in Mathematics

Selected Samples of Caroline's Work

Caroline

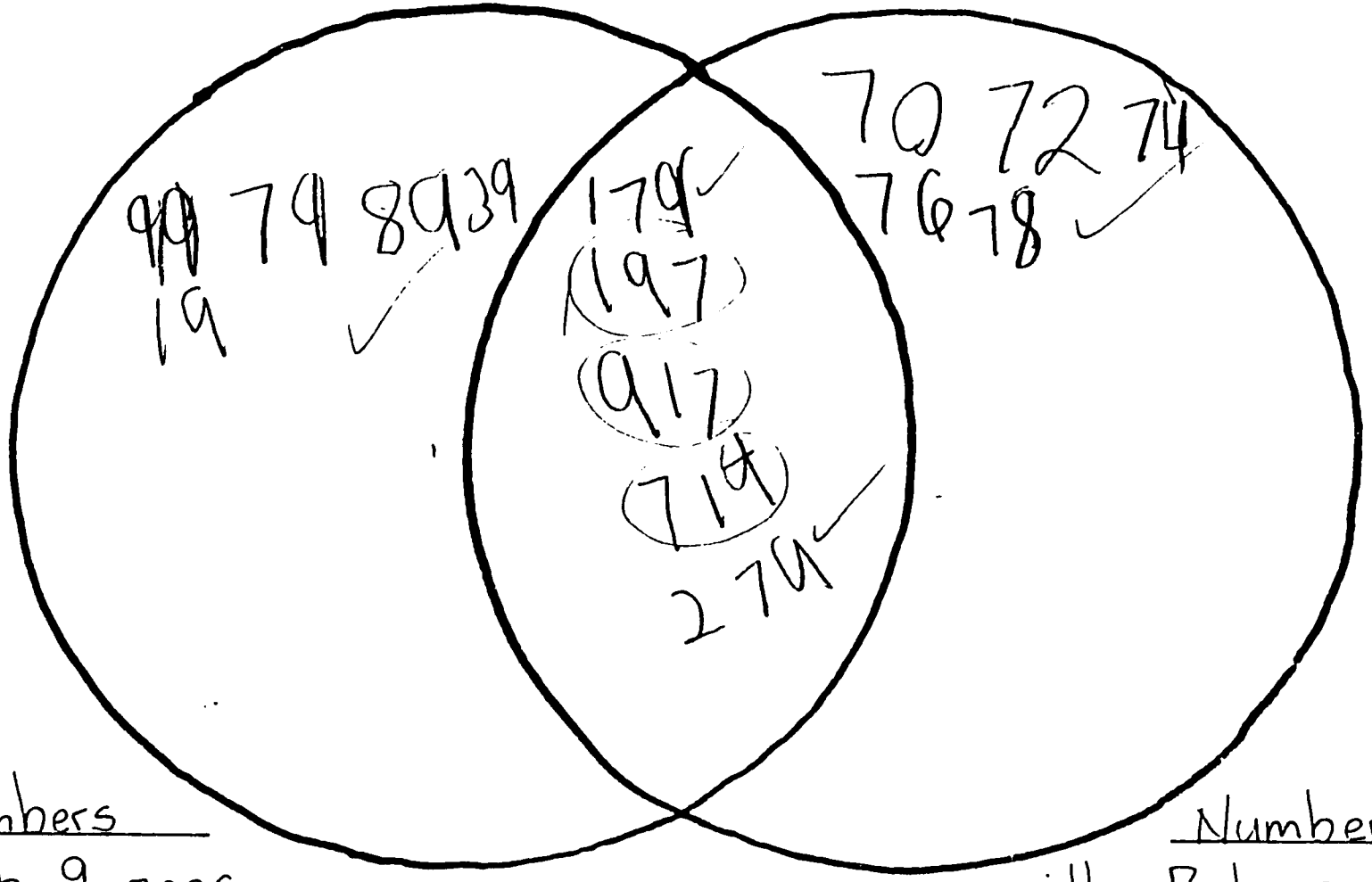
12

10



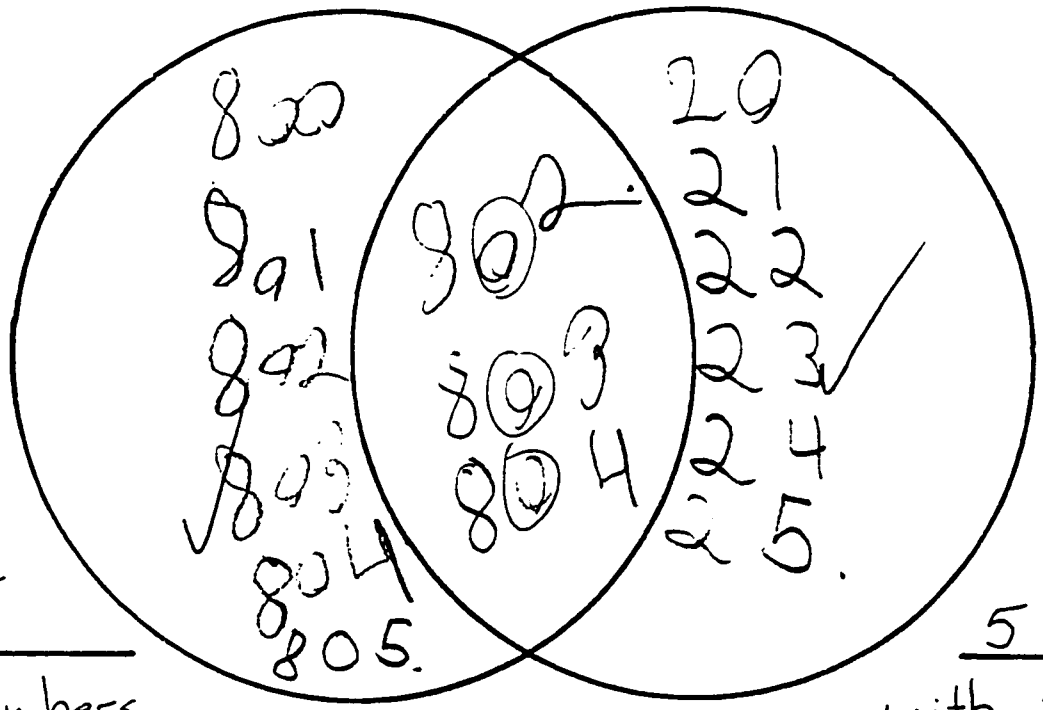
Caroline

Sept 8/97



Nam Caroline

Date:

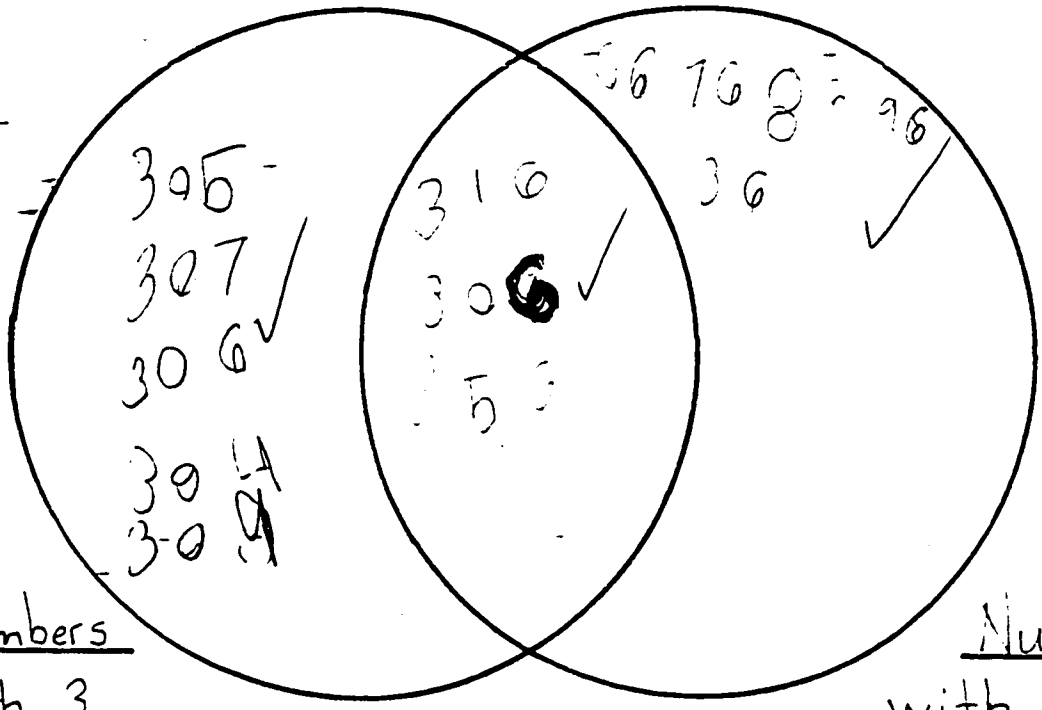


5 numbers with 8 hundreds.

5 numbers with 2 tens.

Nan Caroline

Date: Tue Sept [illegible] 17



Numbers with 3 hundreds.

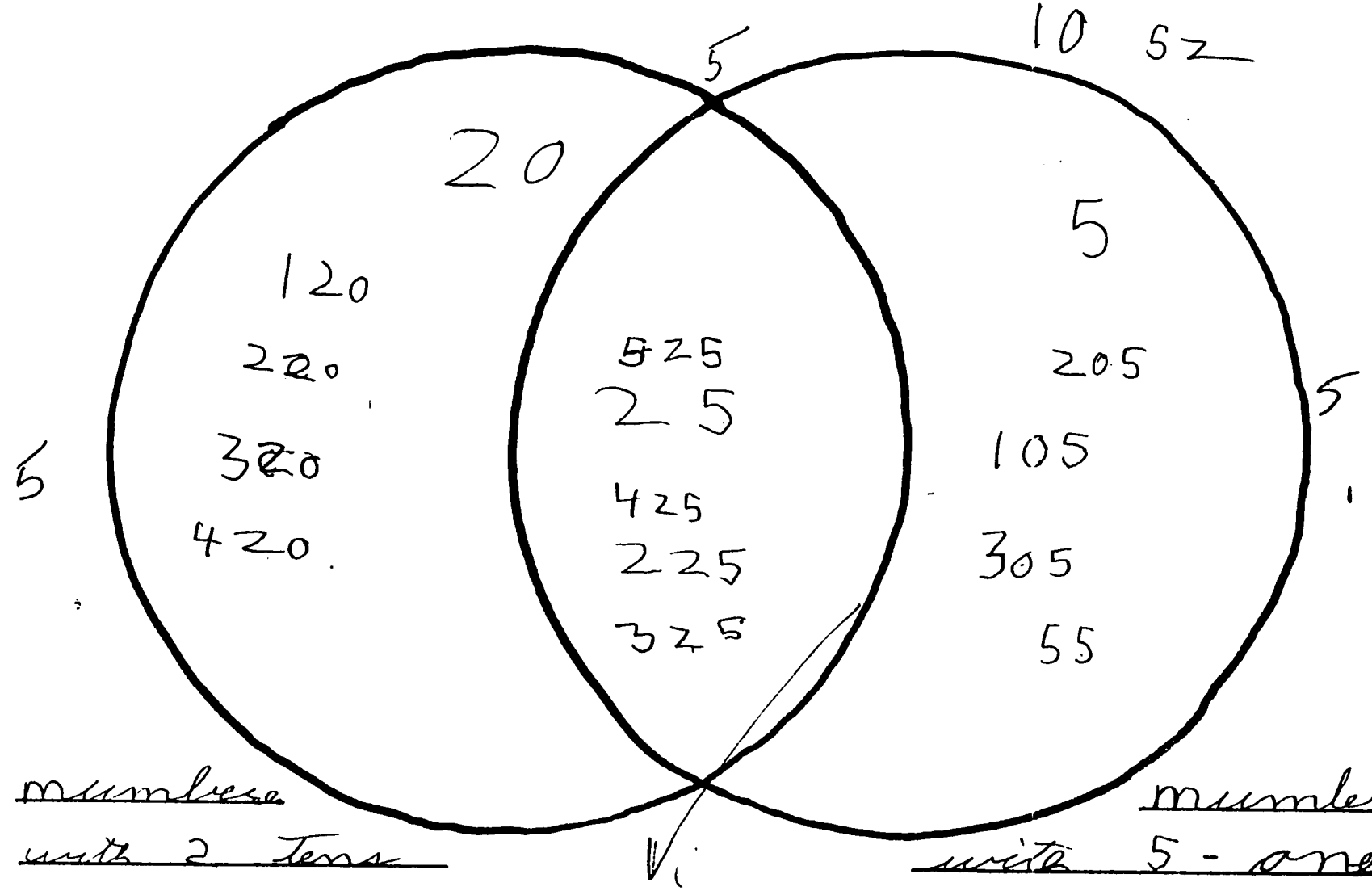
Numbers with 6 ones.

Appendix A

Using Venn Diagrams to Build Understanding of Place Value in Mathematics

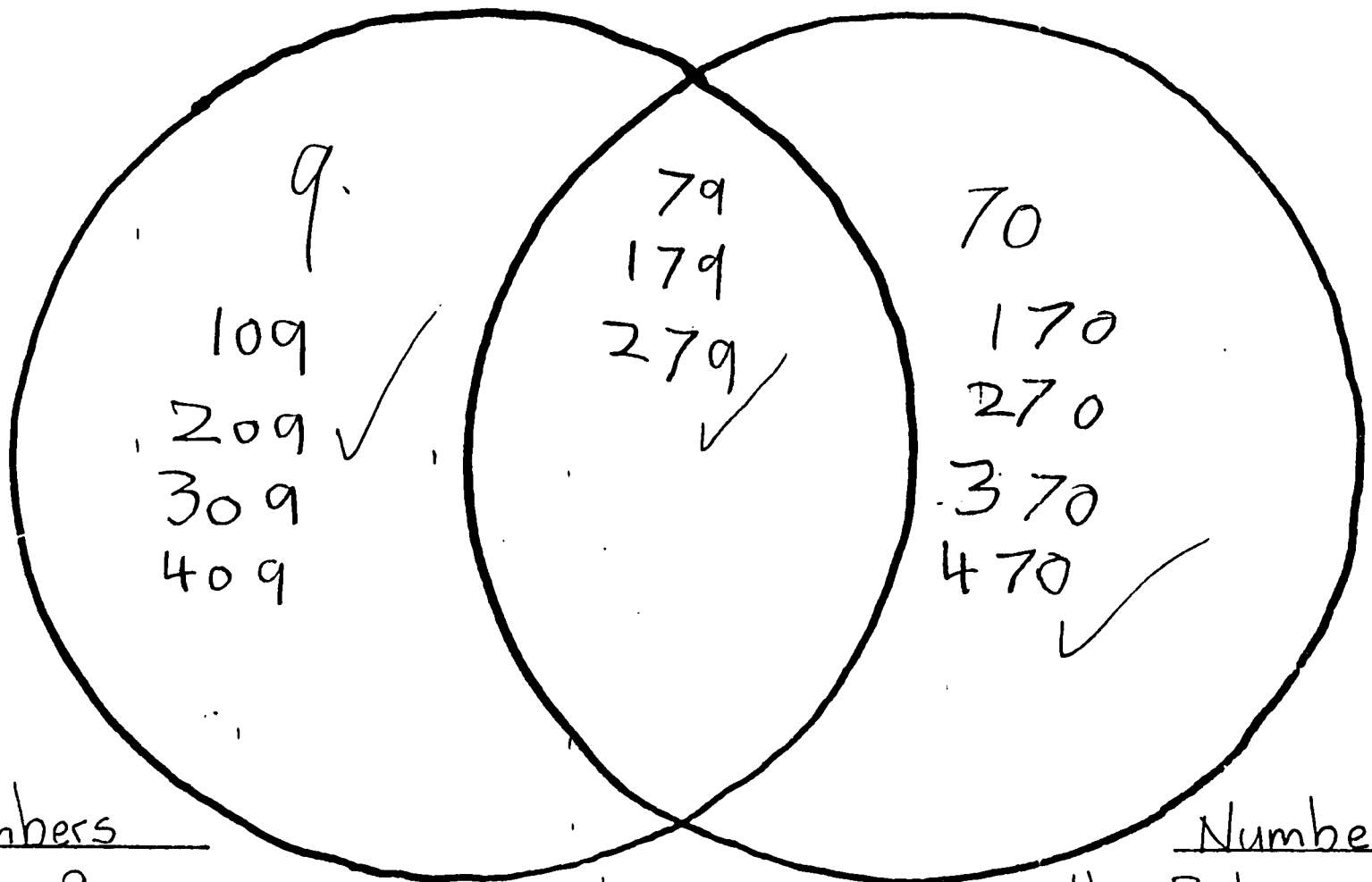
Selected Samples of Ian's Work

Ian


5
10
5z
20
5
120
220
320
420
525
25
425
225
325
205
105
305
55
5
5
numbers with 2 Tens
numbers with 5 - ones

Sept 8/97

Ian

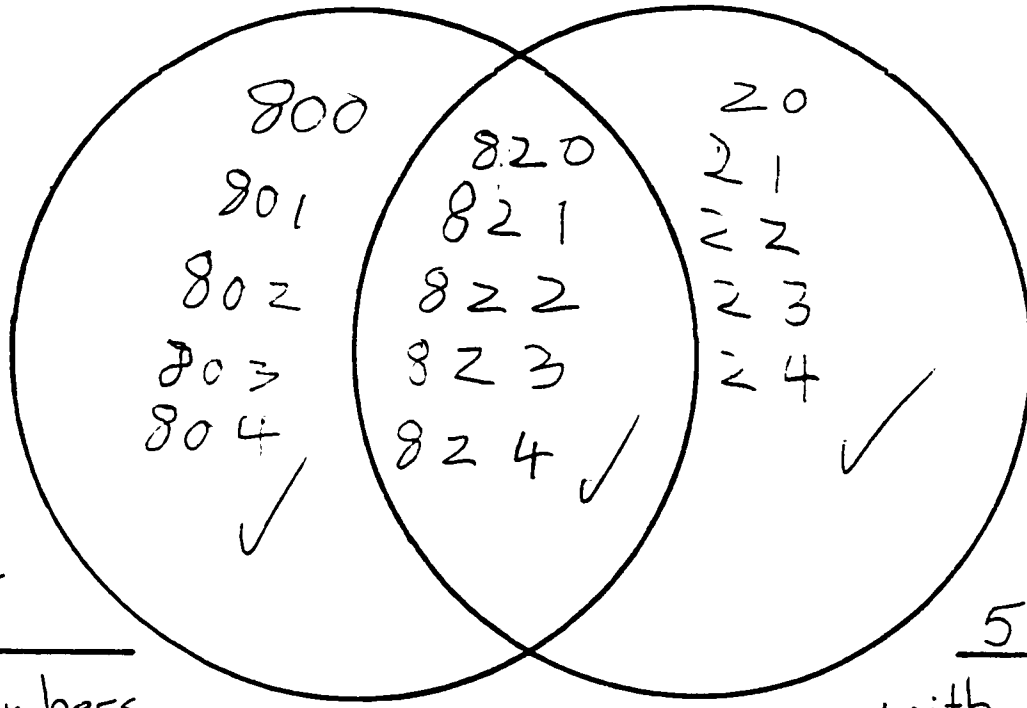


Numbers with 9 ones

Numbers with 7 tens

Name: Ian

Date:

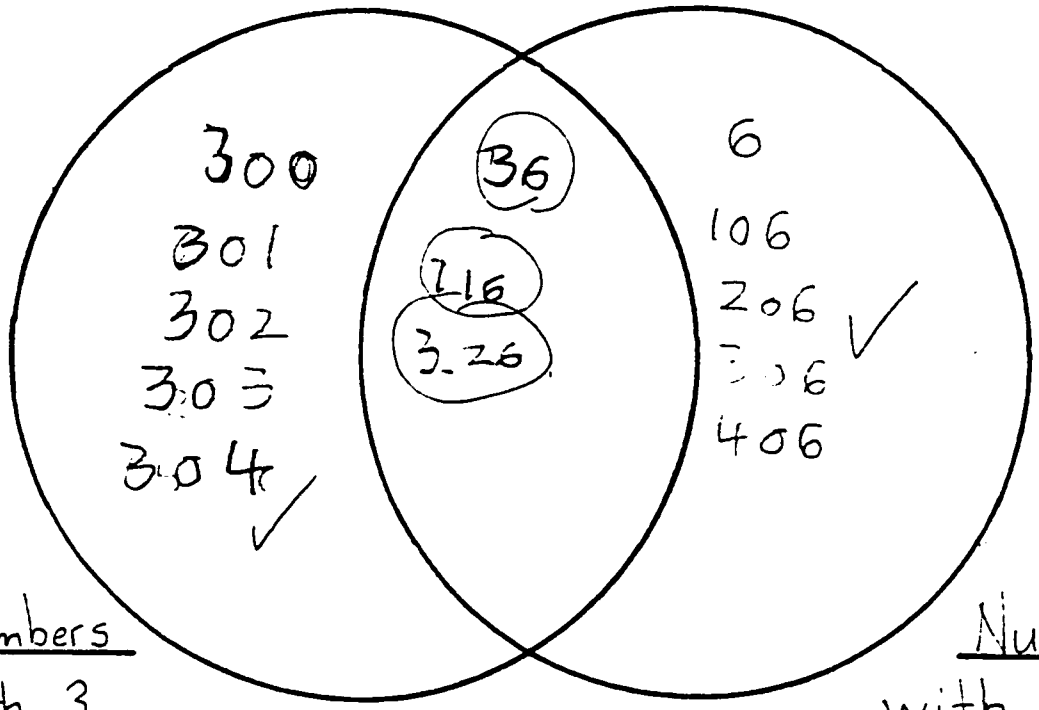


5 numbers with 8 hundreds.

5 numbers with 2 tens.

Name: Ian

Date: Sept 9/17



Numbers with 3 hundreds.

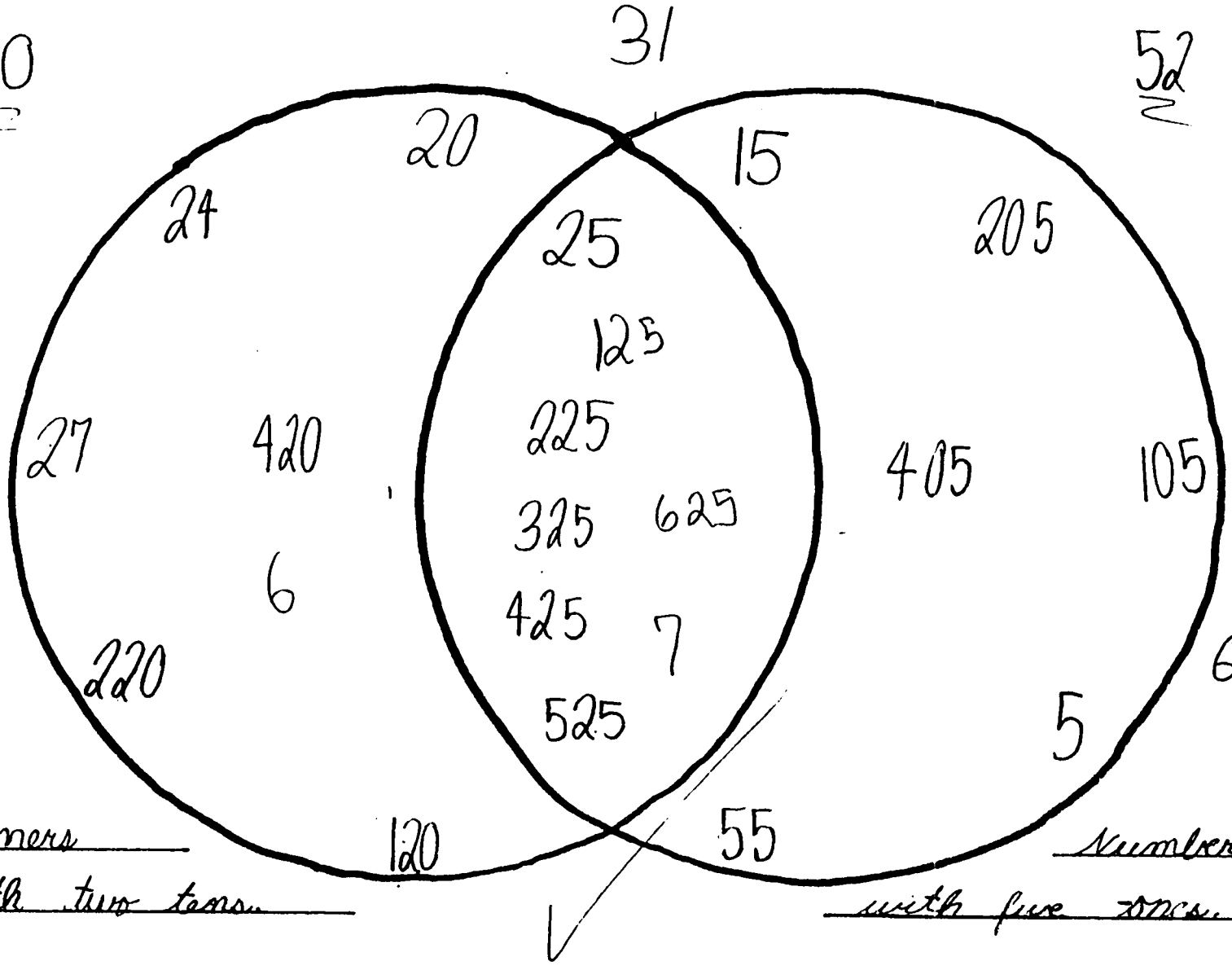
Numbers with 6 ones.

Appendix A

Using Venn Diagrams to Build Understanding of Place Value in Mathematics

Selected Samples of Olivia's Work

Olivia

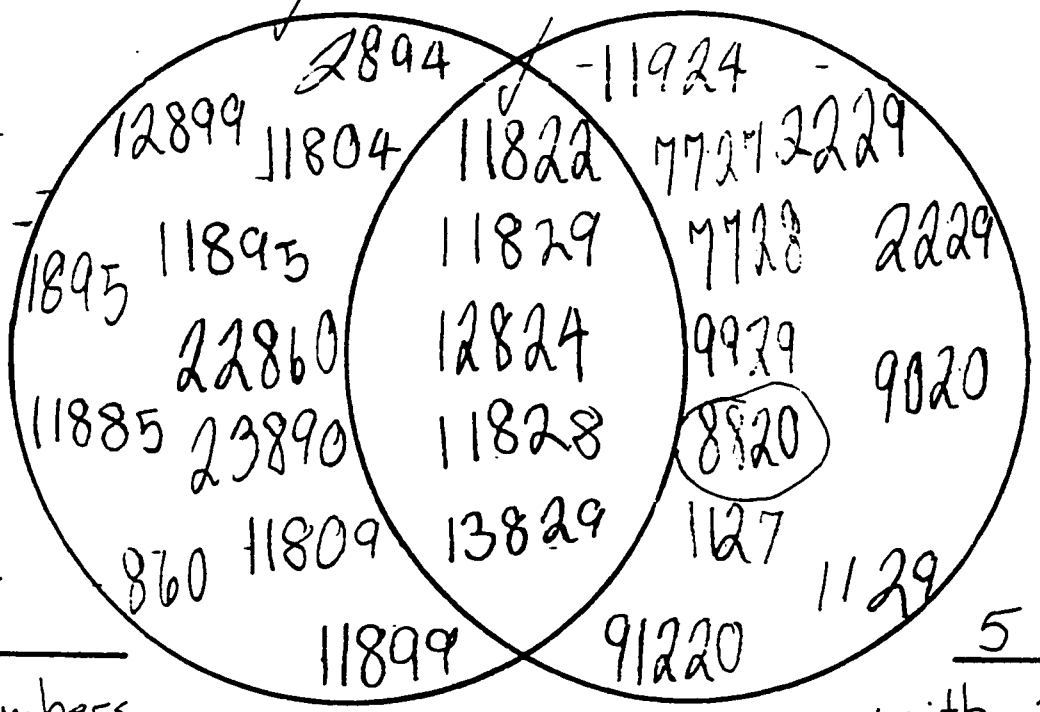


Numers with two tens.

Numbers with five tens.

Name: Olivia D

Date: Sept. 10/2015



5 numbers with 8 hundreds.

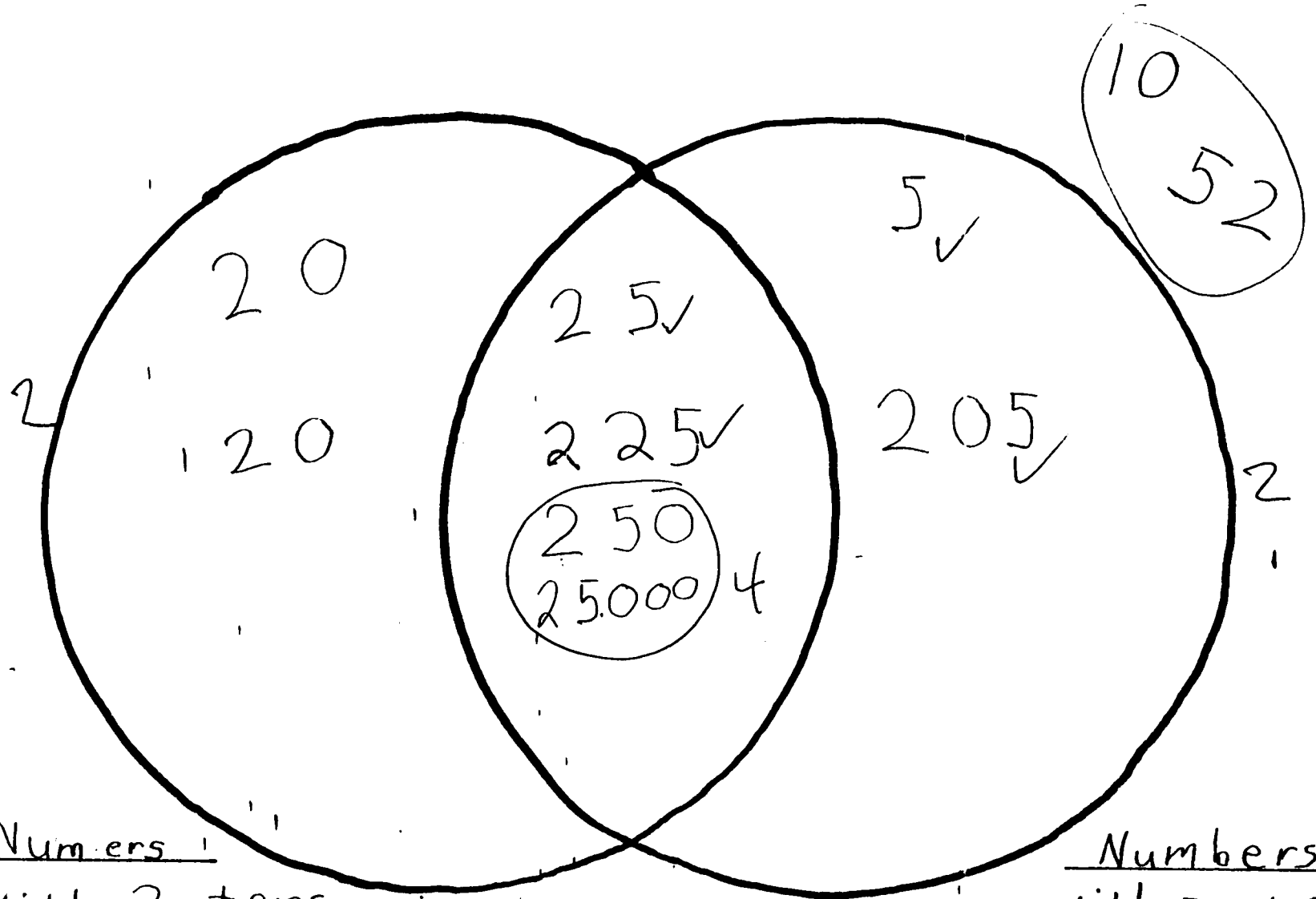
5 numbers with 2 tens.

Appendix A

Using Venn Diagrams to Build Understanding of Place Value in Mathematics

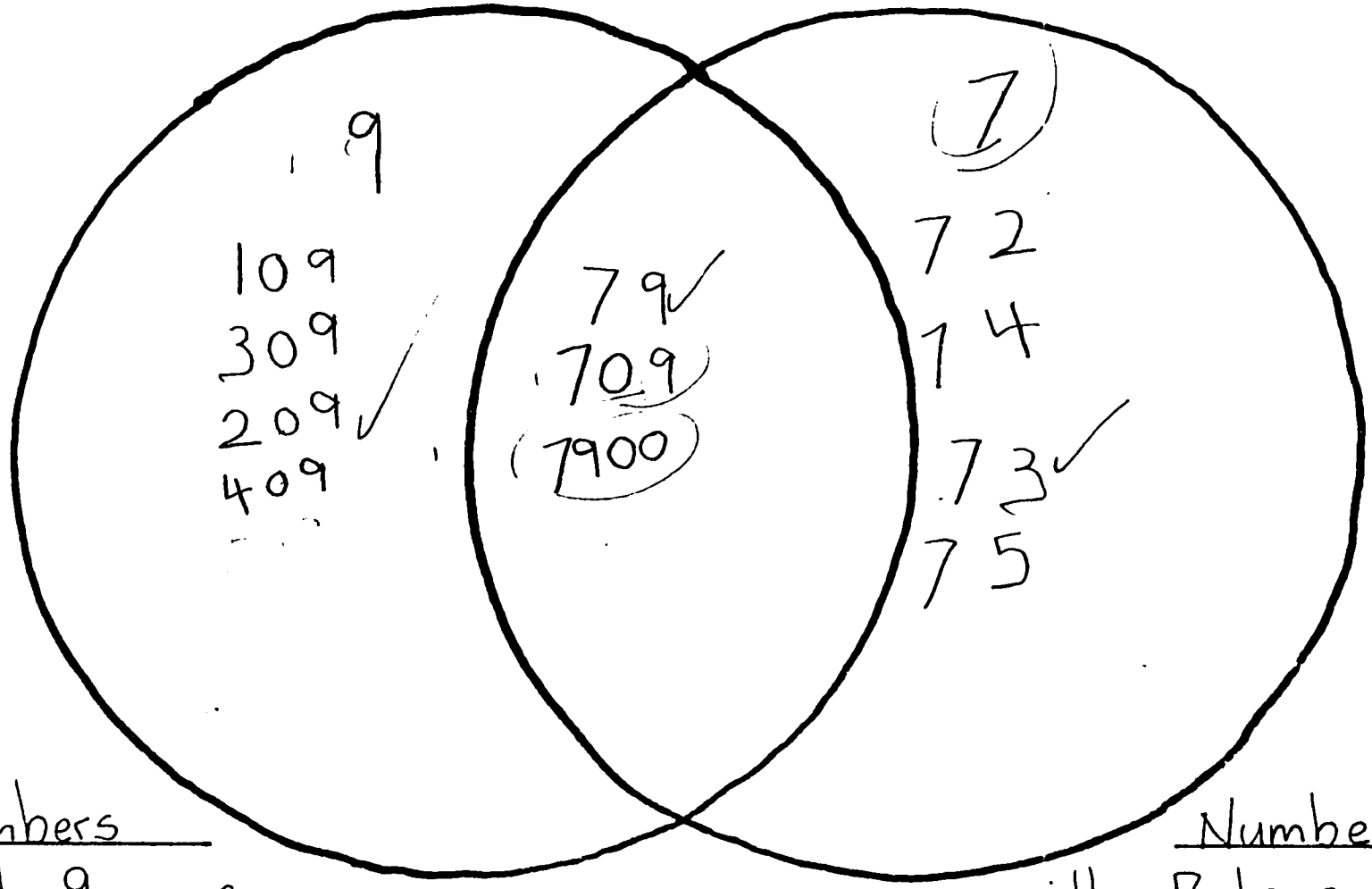
Selected Samples of Tania's Work

Tania


10
52
20
25✓
5✓
2
120
225✓
205✓
250
25.000
4
2
Numbers with 2 tens
Numbers with 5 ones

Tania

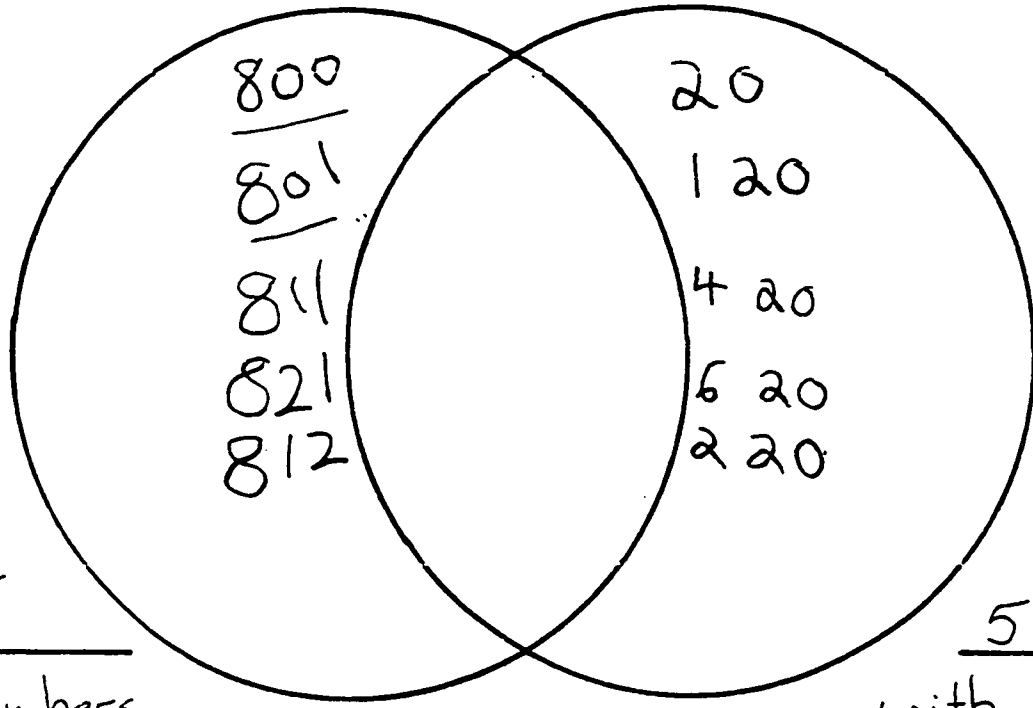
Sept 8/97



30

Name: Tania

Date: wed. sept. 10/97

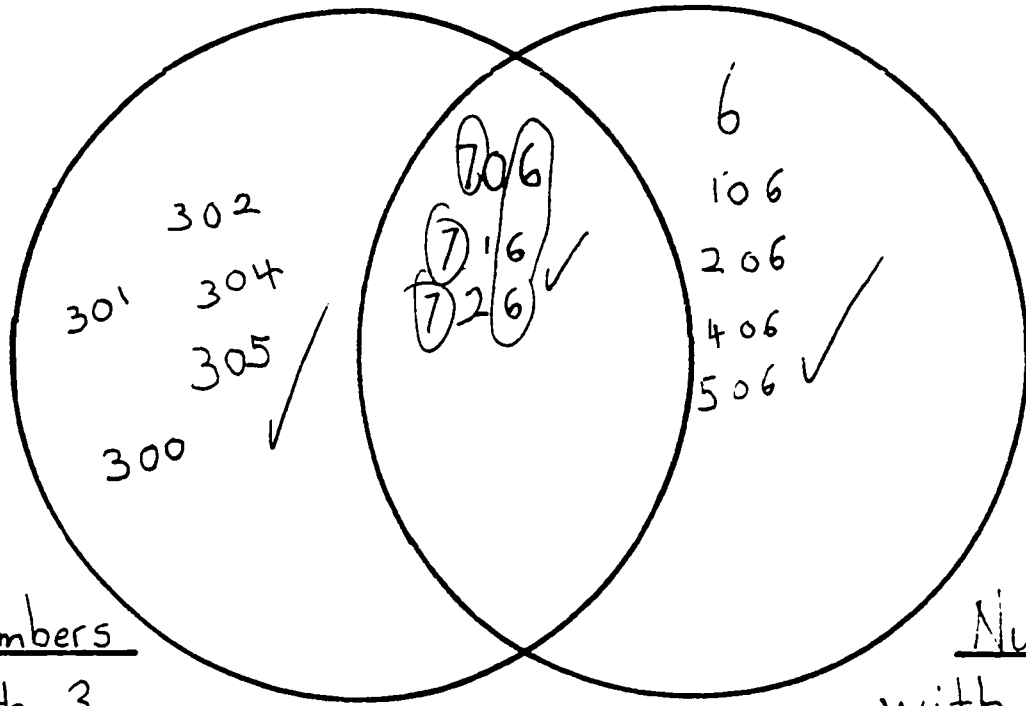


5 numbers with 8 hundreds.

5 numbers with 2 tens.

Name: Tania

Date: Sept 9/97



Numbers with 3 hundreds.

Numbers with 6 ones.

Appendix B

Using Concept Maps as Reading Response to Build Understanding

Using the Rating Rubric to Score Selected Concept Maps

and Venn Diagrams as Reading Response

	Tiger Skin Rug	Dinner at Alberta's	Mountain Rose (Map)	Mountain Rose (Venn)	Devil's Bridge
Anne	3	2	XXX	XXX	XXX
David	3	3	3	3	XXX
Neil	XXX	2	XXX	XXX	4
Olivia	XXX	XXX	3	3	XXX
Peter	2	2	XXX	XXX	3
Caroline	1	2	XXX	XXX	Titanic Crossing 3

Appendix B

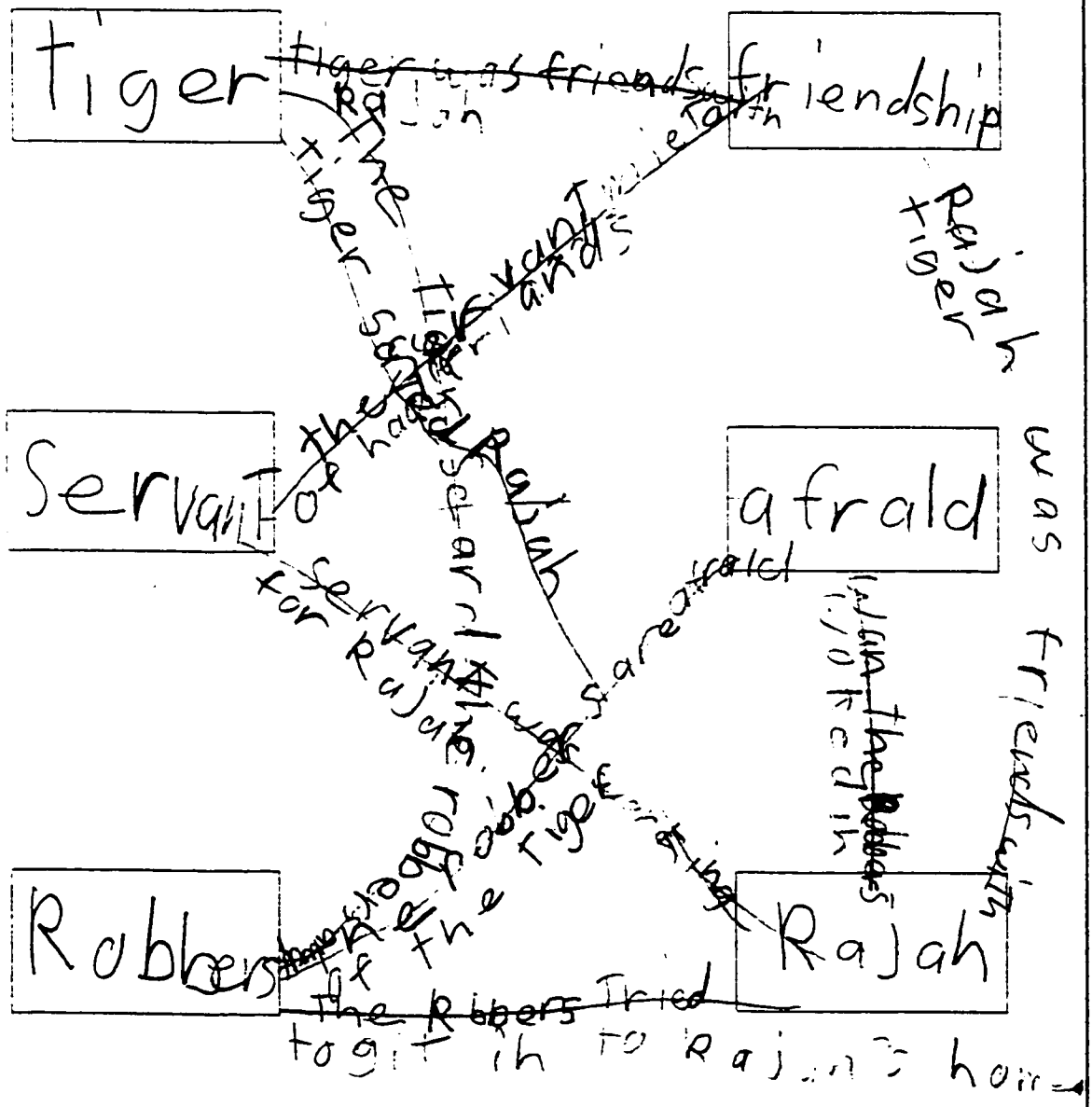
Using Concept Maps as Reading Response to Build Understanding

Selected Samples of Anne's Work

Concept Map

Topic: Tiger Sink Rug Name: Anne

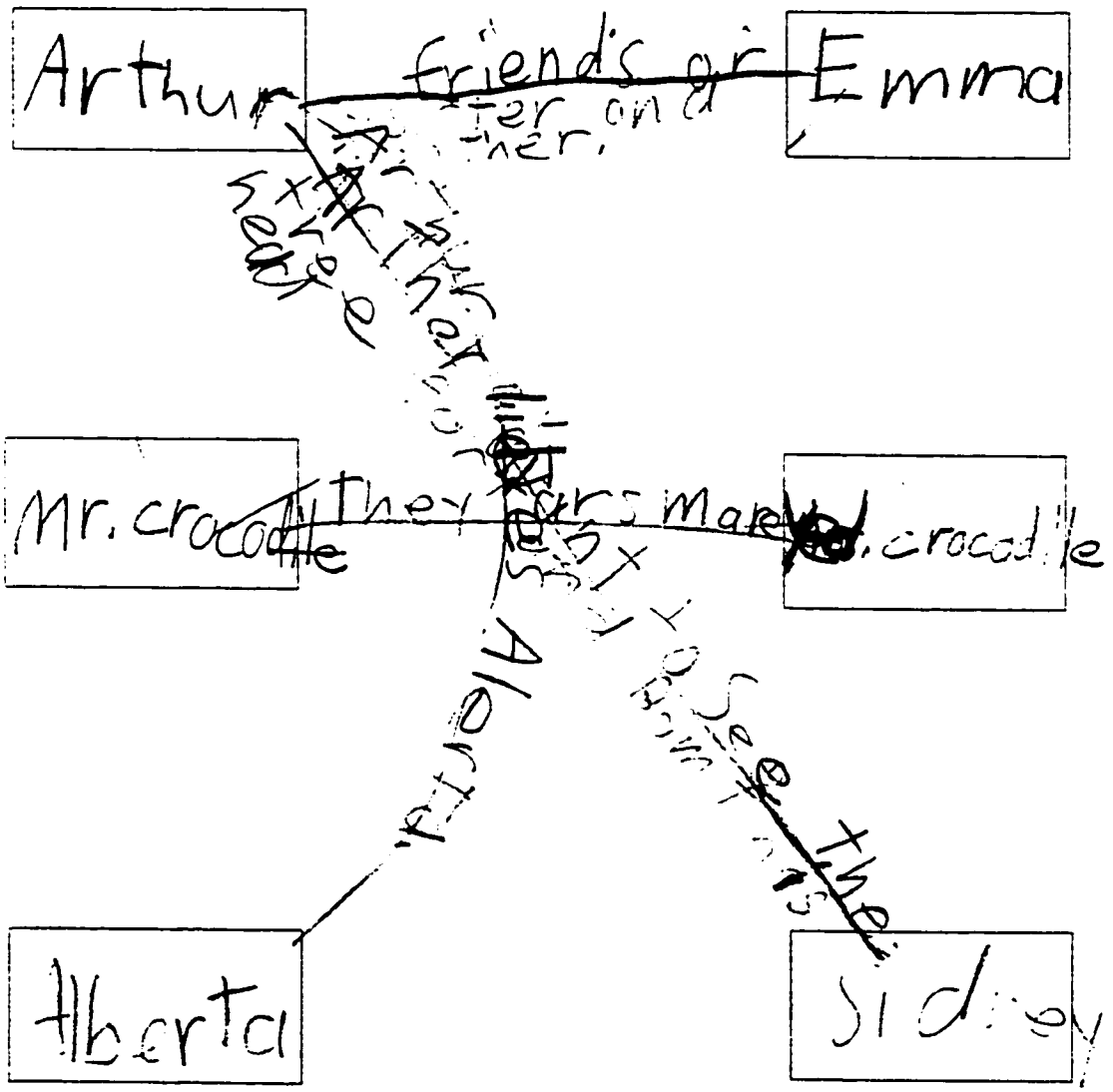
Terms: Tiger Rajah Servant
Robbers friendship afraid



Concept Map

Topic: DiNWerCaTAlberta's Name: = Anne ?

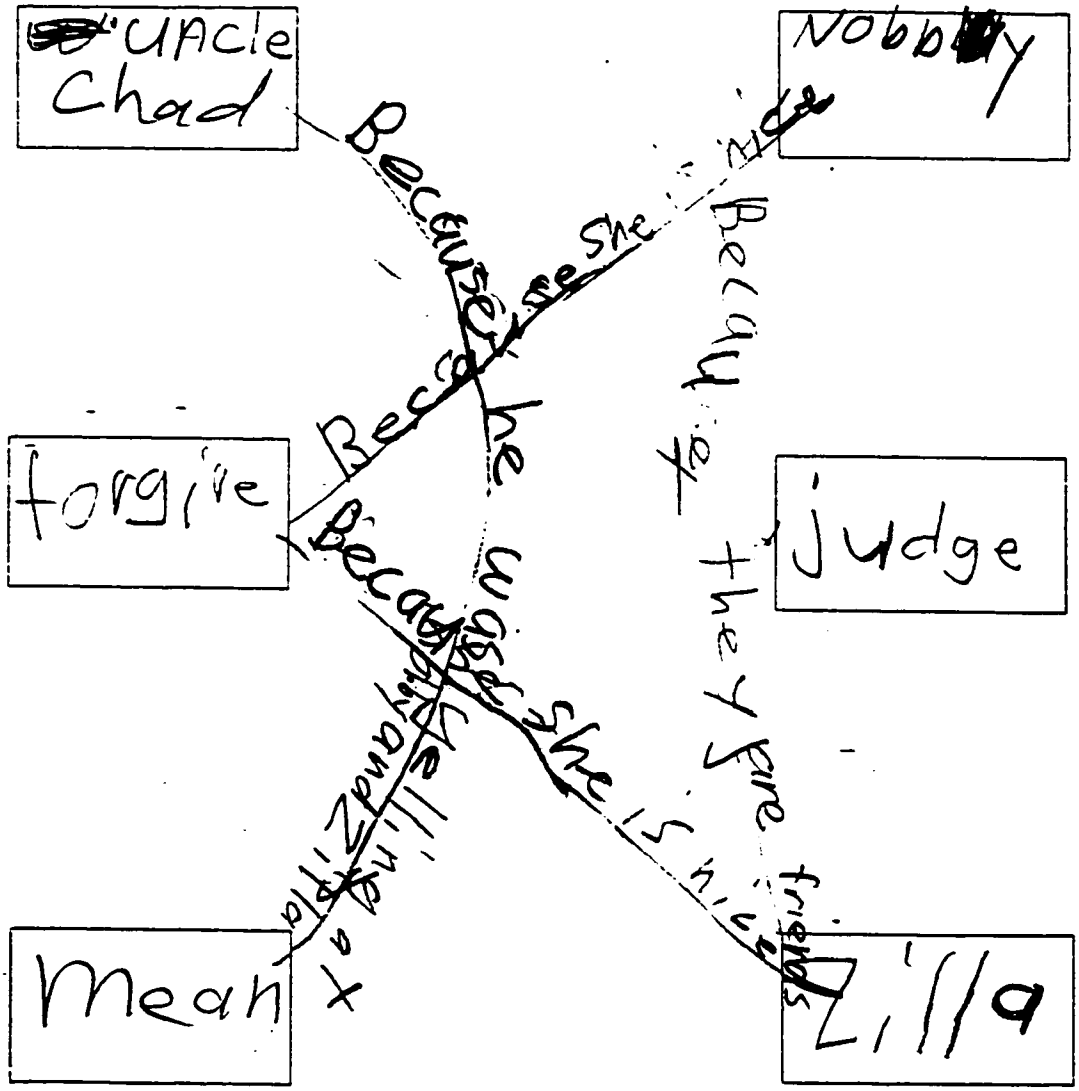
Terms: ArThur Emma Mrs. Crocodile
Mr. crocodile tiperta sidney



Coneept Ma[illegible]

Topic: A. Friend Like Zilla Name: Anne

Terms: ~~Nobby~~ Uncle Chad ~~mean~~
Zilla ~~judge~~ ~~forgive~~



ok.

Appendix B

Using Concept Maps as Reading Response to Build Understanding

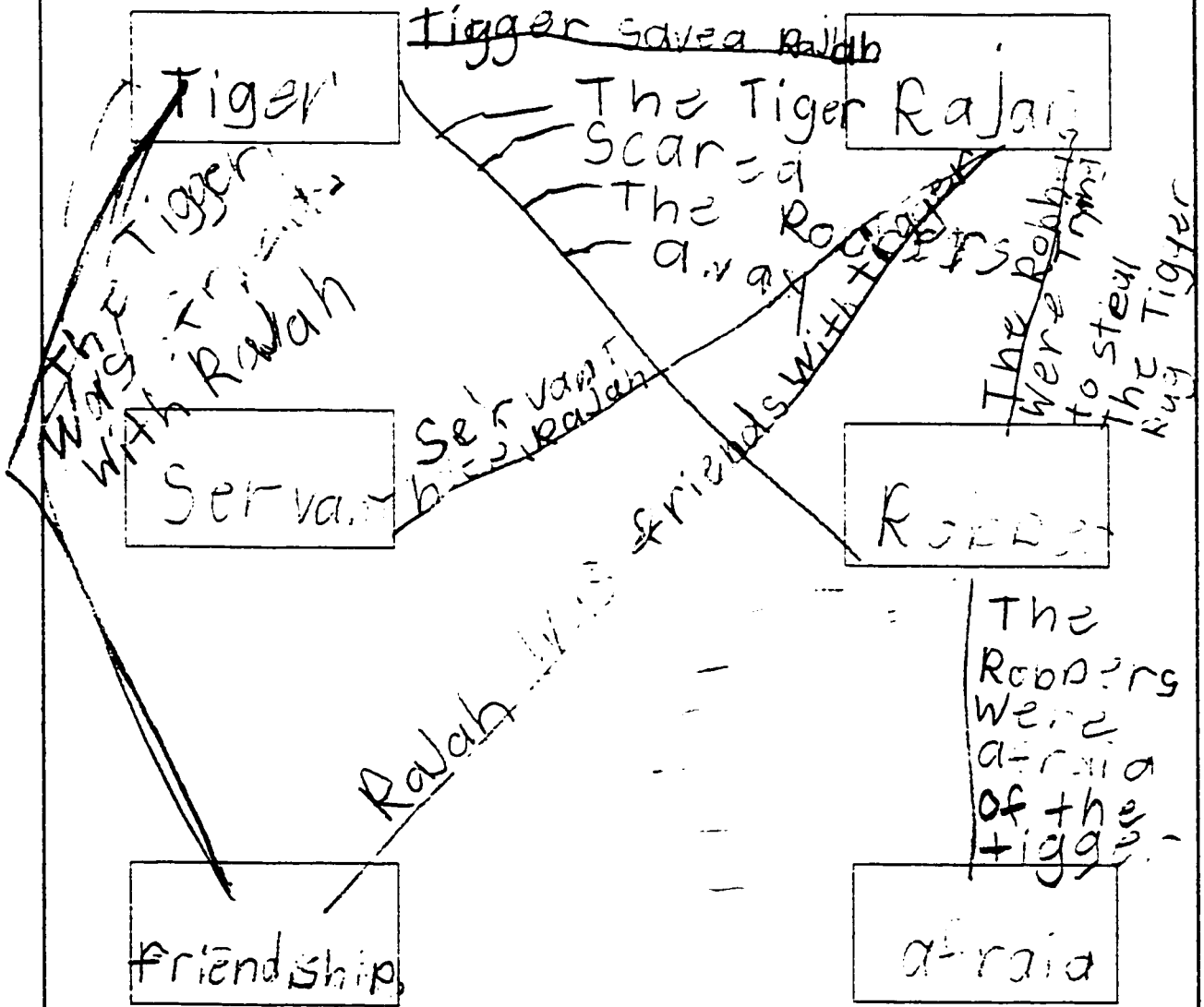
Selected Samples of David's Work

(T)

Concept M--

Topic: Tiger Skin Rug Name: David

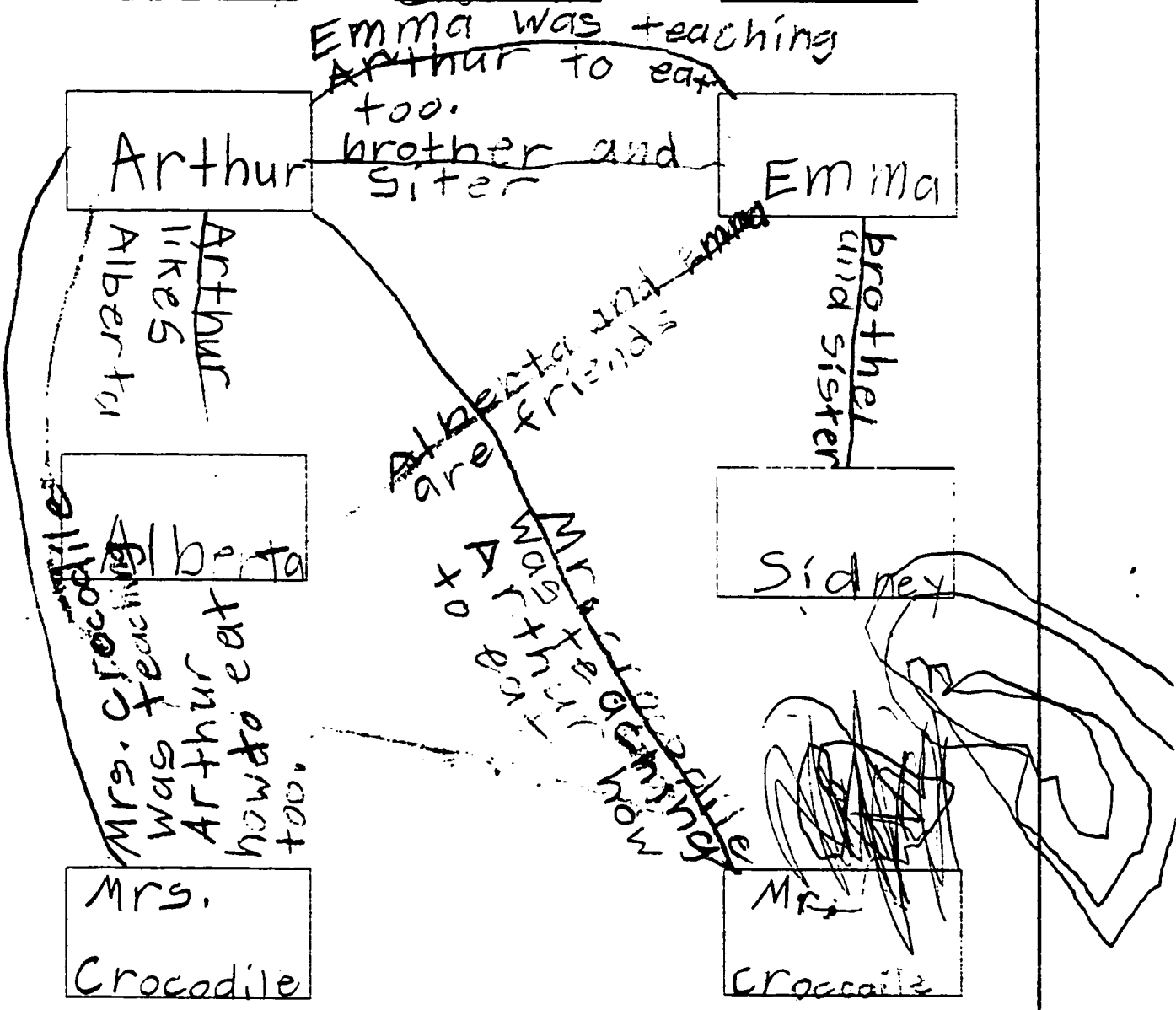
Terms: Tiger Rajah Servant
robbers friendship afraid



Concept Map

Topic: Dinner at Alberts Name: David

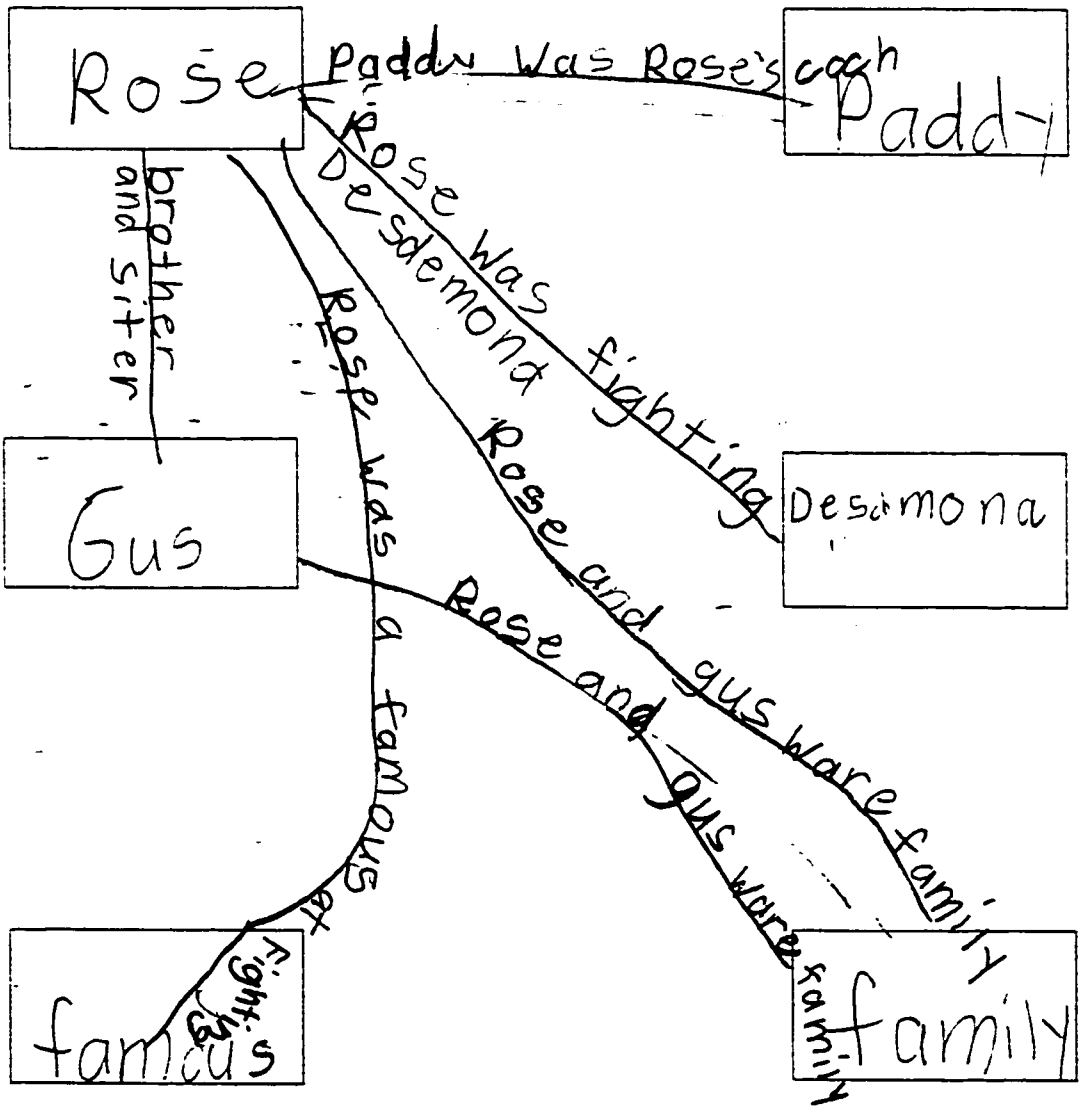
Terms: Arthur, Emma, Alberta, Sidney, Mrs. crocodile, Mr crocodile



Coneept Map

Topic: mountain Rose Name: David

Terms: Rose Gus family
Paddy Desdemona famour



Appendix B

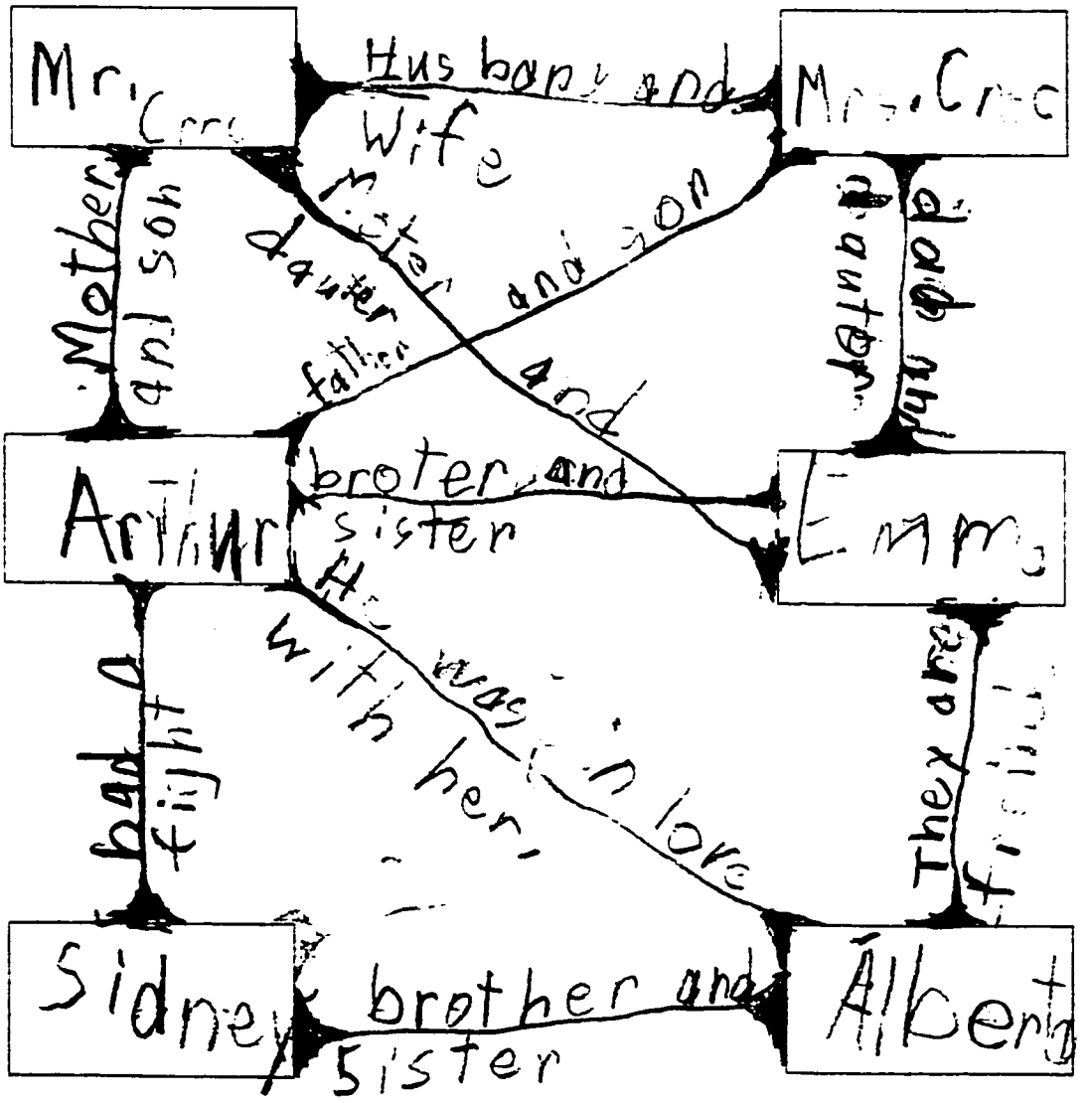
Using Concept Maps as Reading Response to Build Understanding

Selected Samples of Neil's Work

Concept M:

Topic: Dinner at Albert's Name: Neil

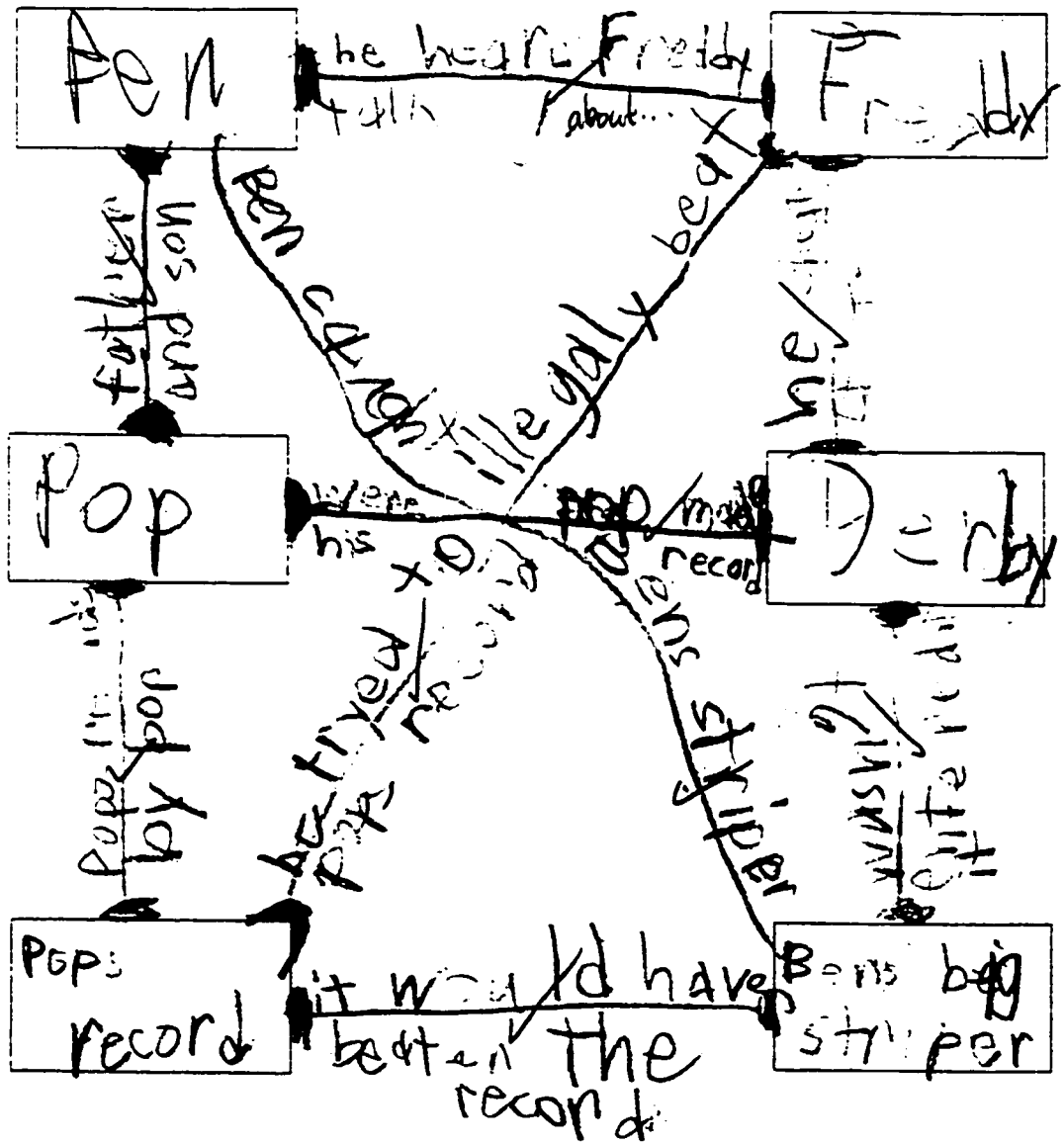
Terms: Mrs. Croc, Mr. C..., Sidney, Arthur, Emm..., Albe...



Coneept M:

Topic: Devil's Bridge Name: Neil

Terms: Ben, Ben's big striper, Derby, Freddy, Pop's record, Pop



Appendix B

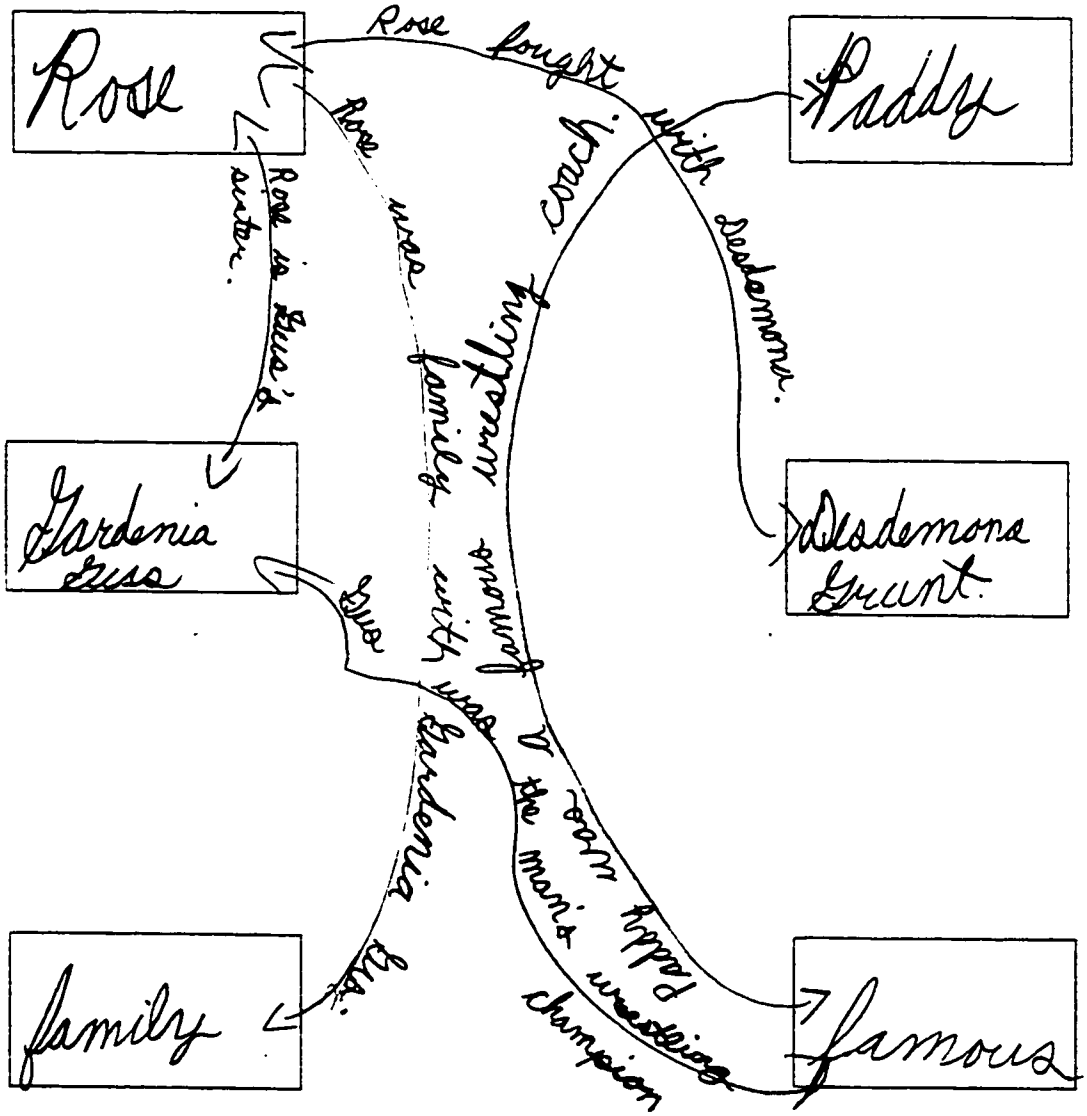
Using Concept Maps as Reading Response to Build Understanding

Selected Samples of Olivia's Work

Coneept Map

Topic: Mountain Rose Name: Olivia

Terms: Rose, Paddy, Gardenia Gusa, Desdemona Grunt, family, famous



Appendix B

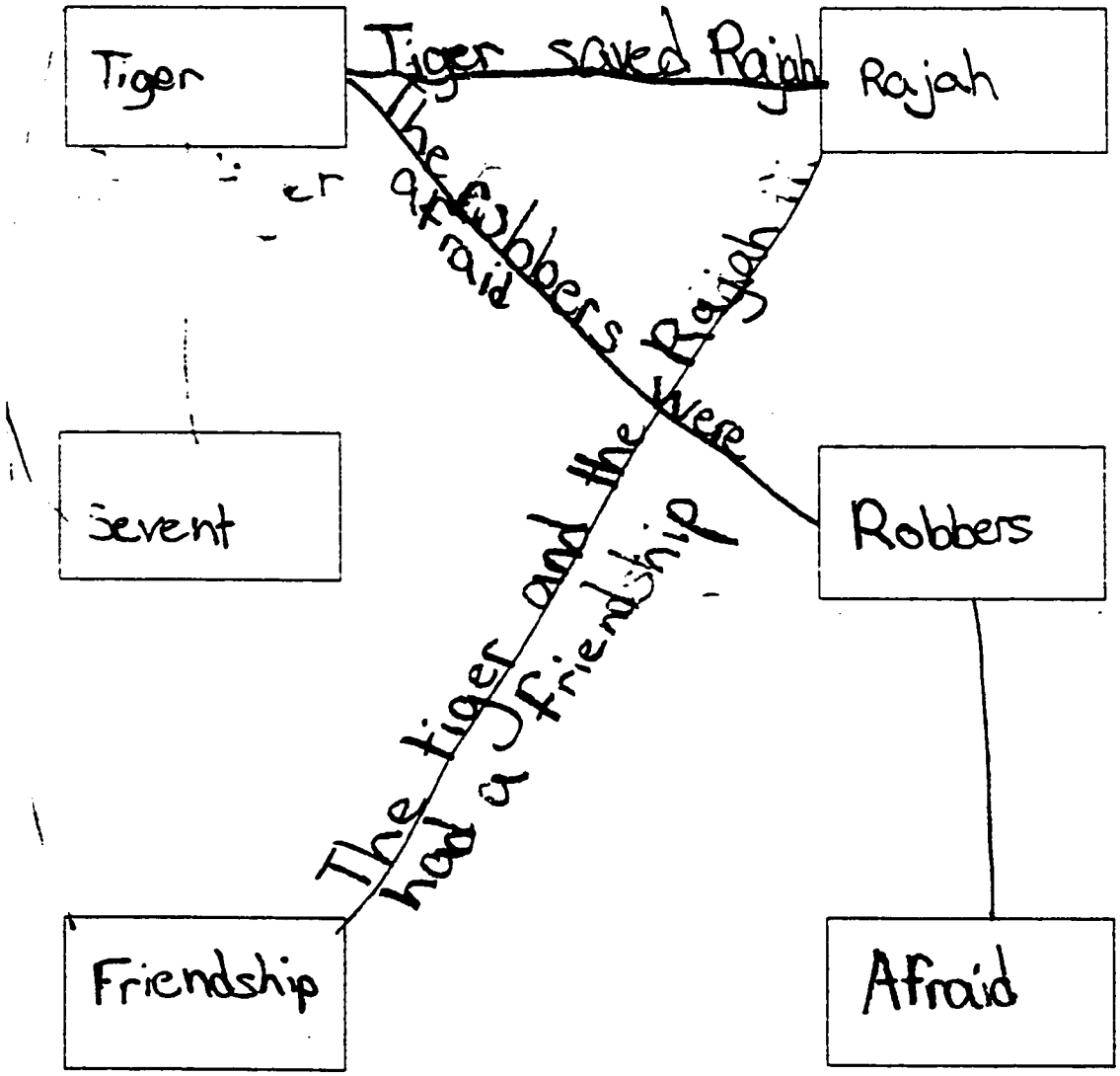
Using Concept Maps as Reading Response to Build Understanding

Selected Samples of Peter's Work

Concept Map

Topic: Tiger skin rug Name: Peter

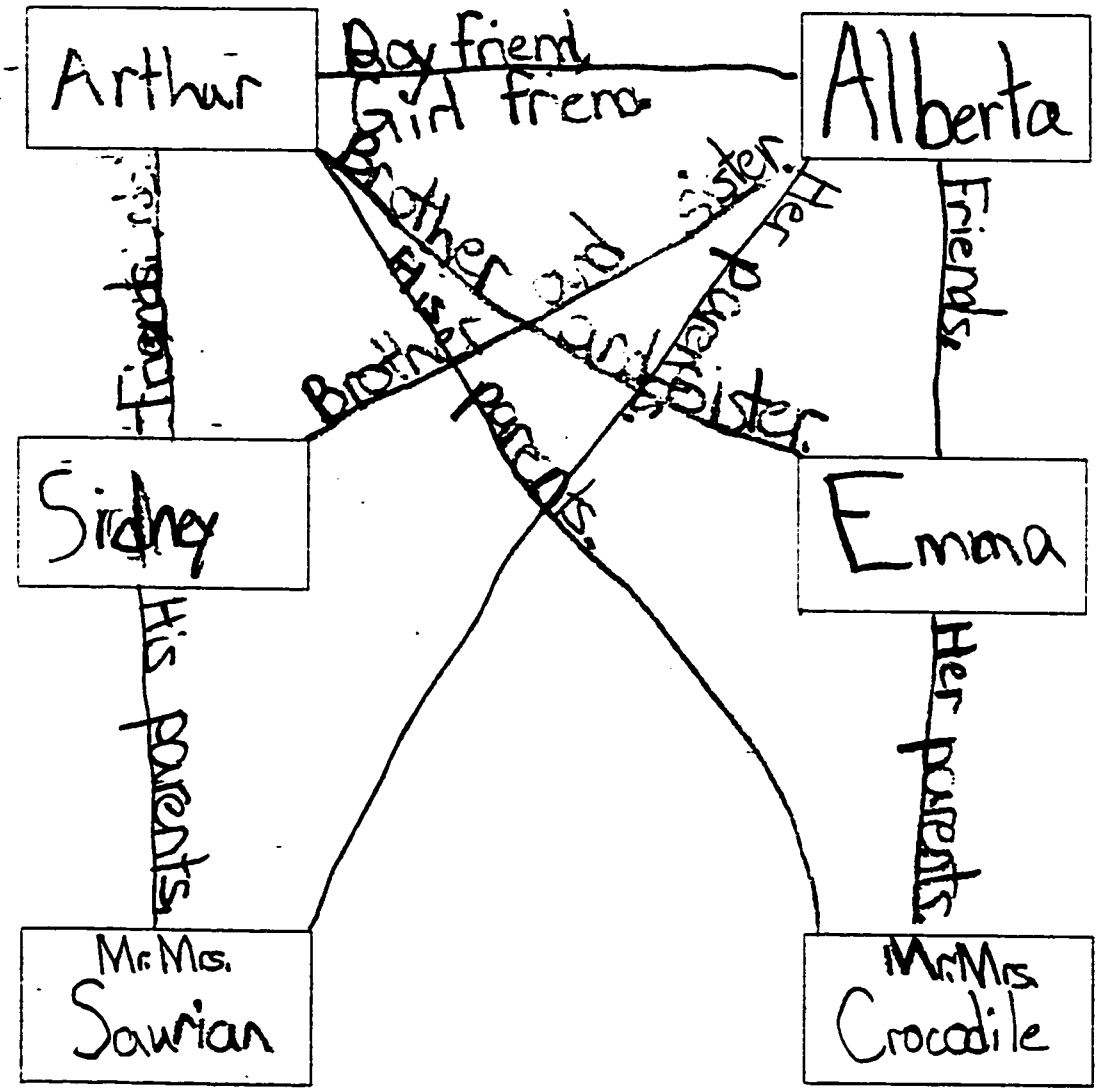
Terms: Tiger, Rajah, servent, Robber, Friendship, Afraid



Concept Map

Topic: Dinner at Alberta's Name: Peter

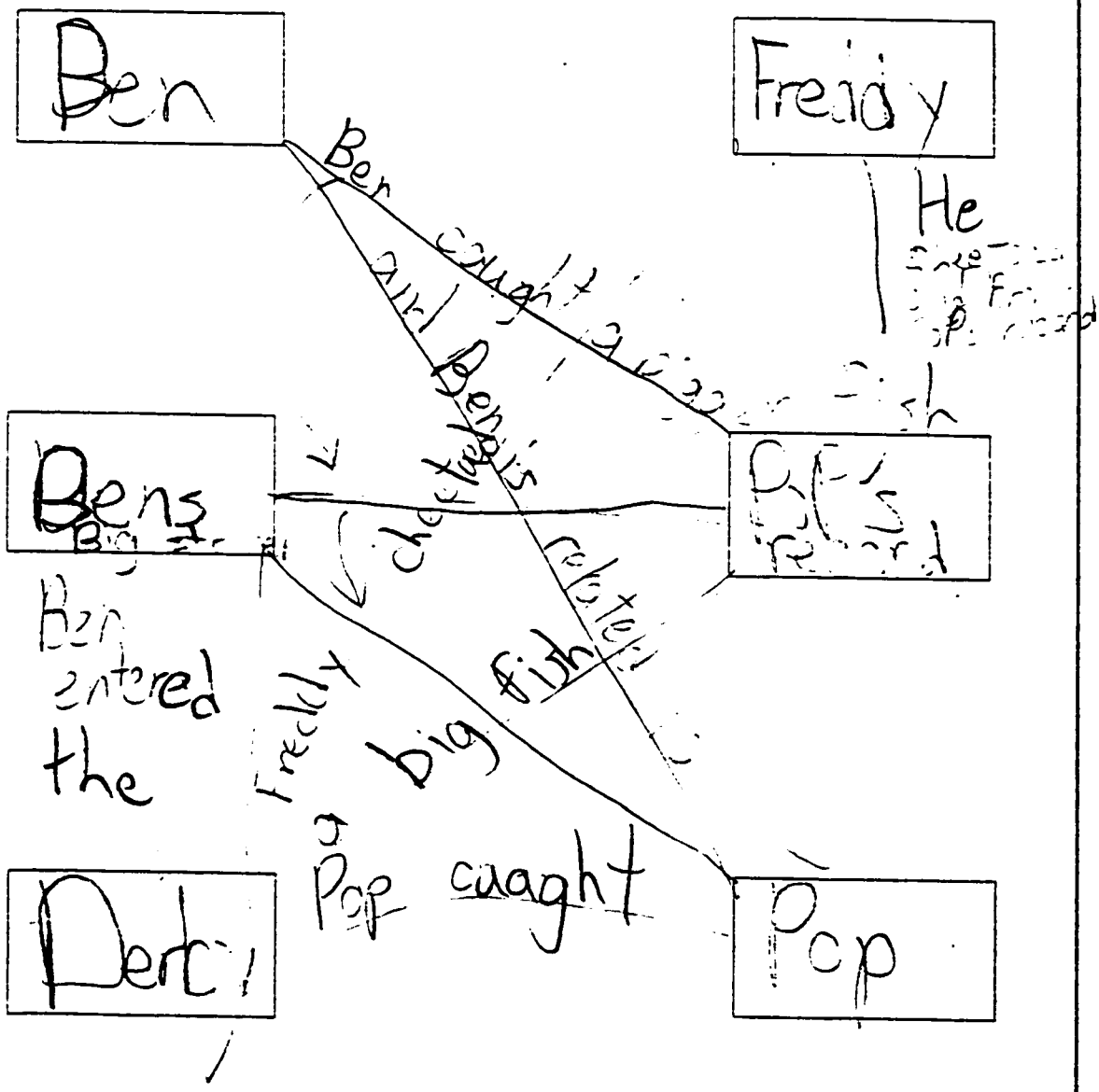
Terms: Arthur ↔ Alberta Emma
Sidney Mr. Mrs. Crocodile Mr. Mrs. Saurian



Coneept Map

Topic: Devil's Bridge Name: Peter

Terms: Ben | Ben's big striper | Derby | Freddy | Pop's record | Pop



Appendix B

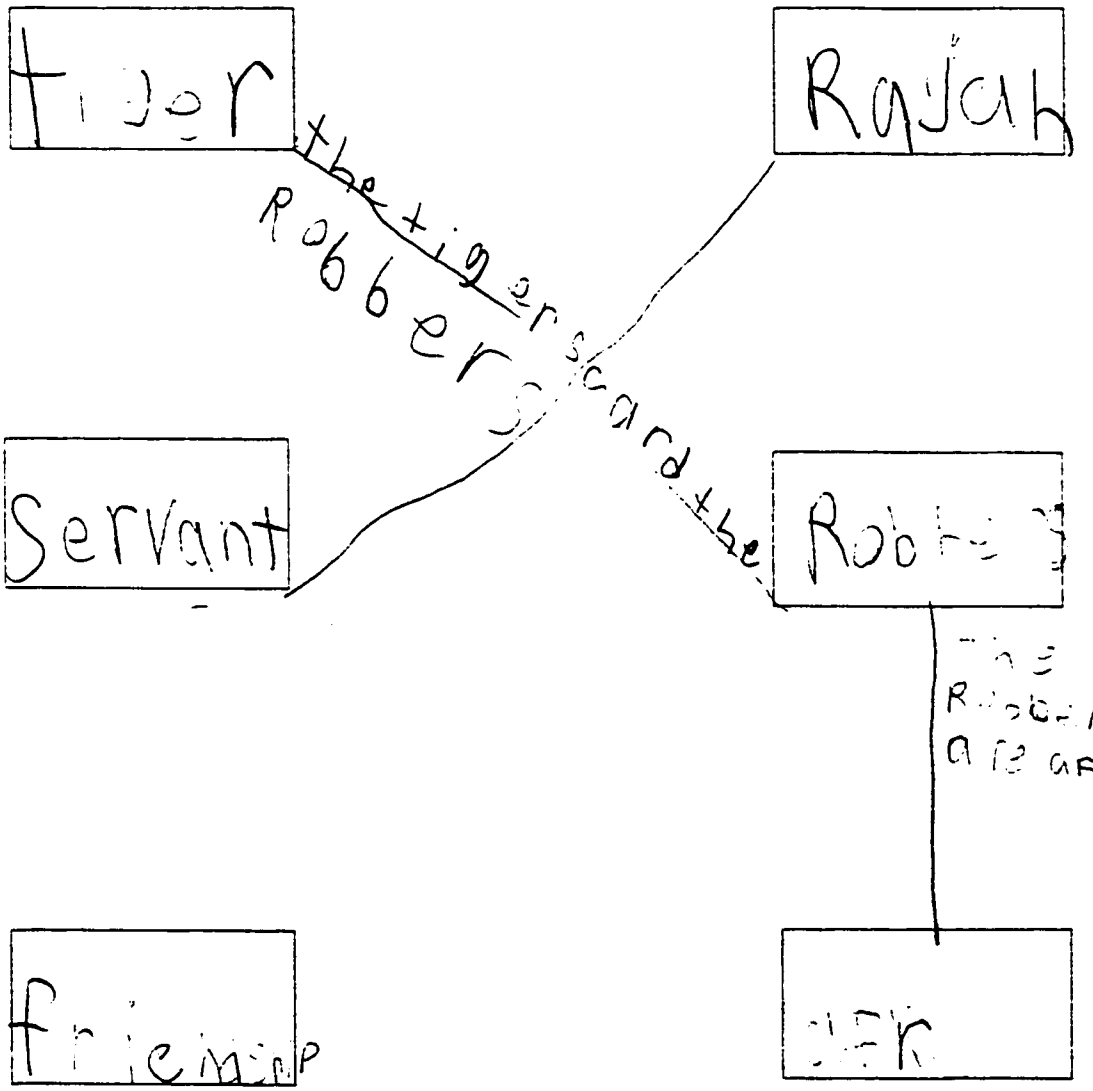
Using Concept Maps as Reading Response to Build Understanding

Selected Samples of Caroline's Work

Concept Ma

Topic: [illegible] Name: Caroline

Terms: tiger, Rajah, servant, Robbers, friendship, afraid



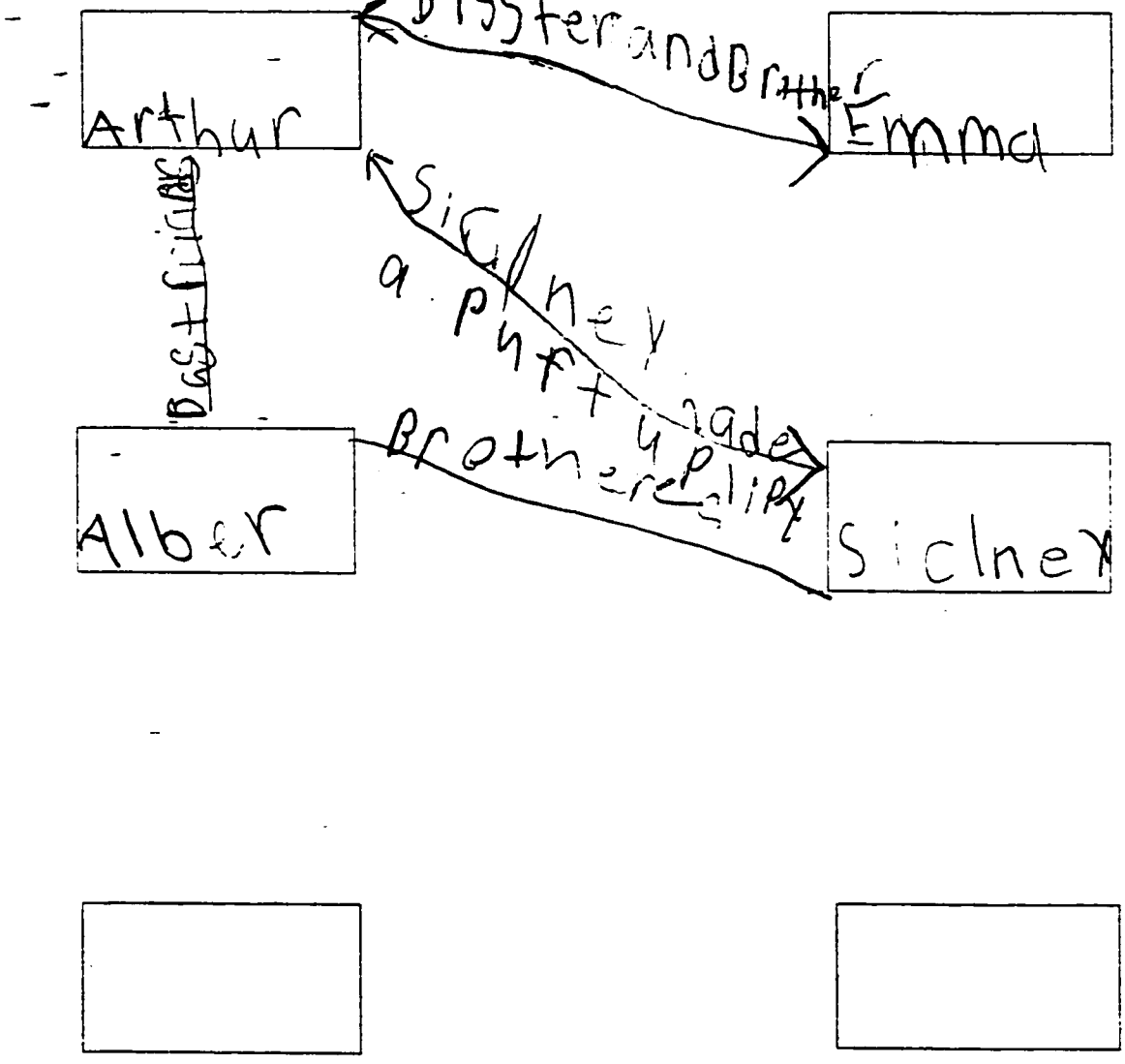
Concept Map

Topic: Dinner at Albert's Name: Caroline S.

Terms: _____ _____ _____

Arthr Emma Alber

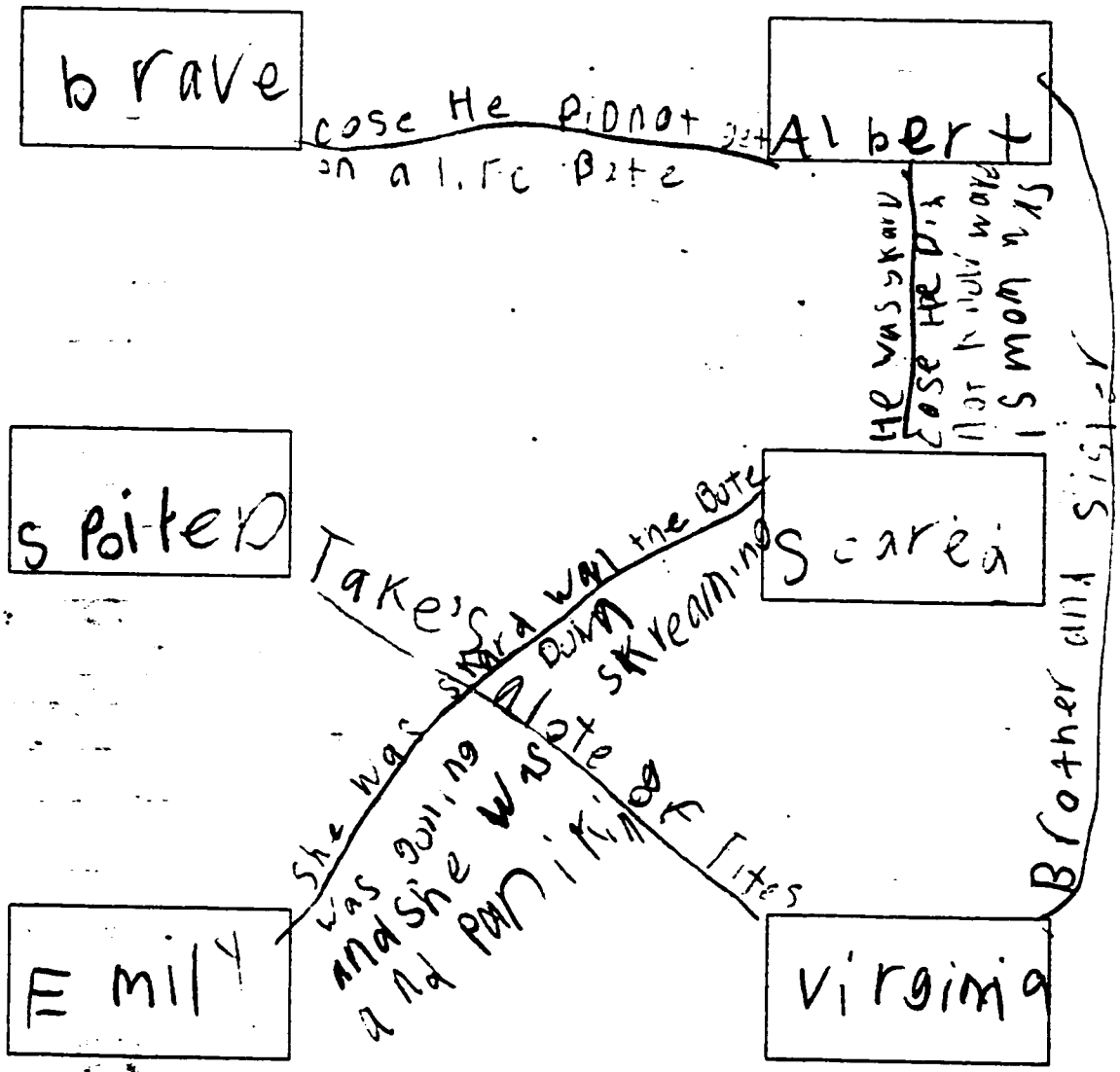
mrs. croc. mr. croc.



Coneept Map

Topic: Titanic Crossing Name: Caroline

Terms: brave spoiled Albert
scared Emily Virginia



Appendix C

Using Venn Diagrams as Reading Response to Build Understanding

Using the Rating Rubric to Score Selected Venn Diagrams

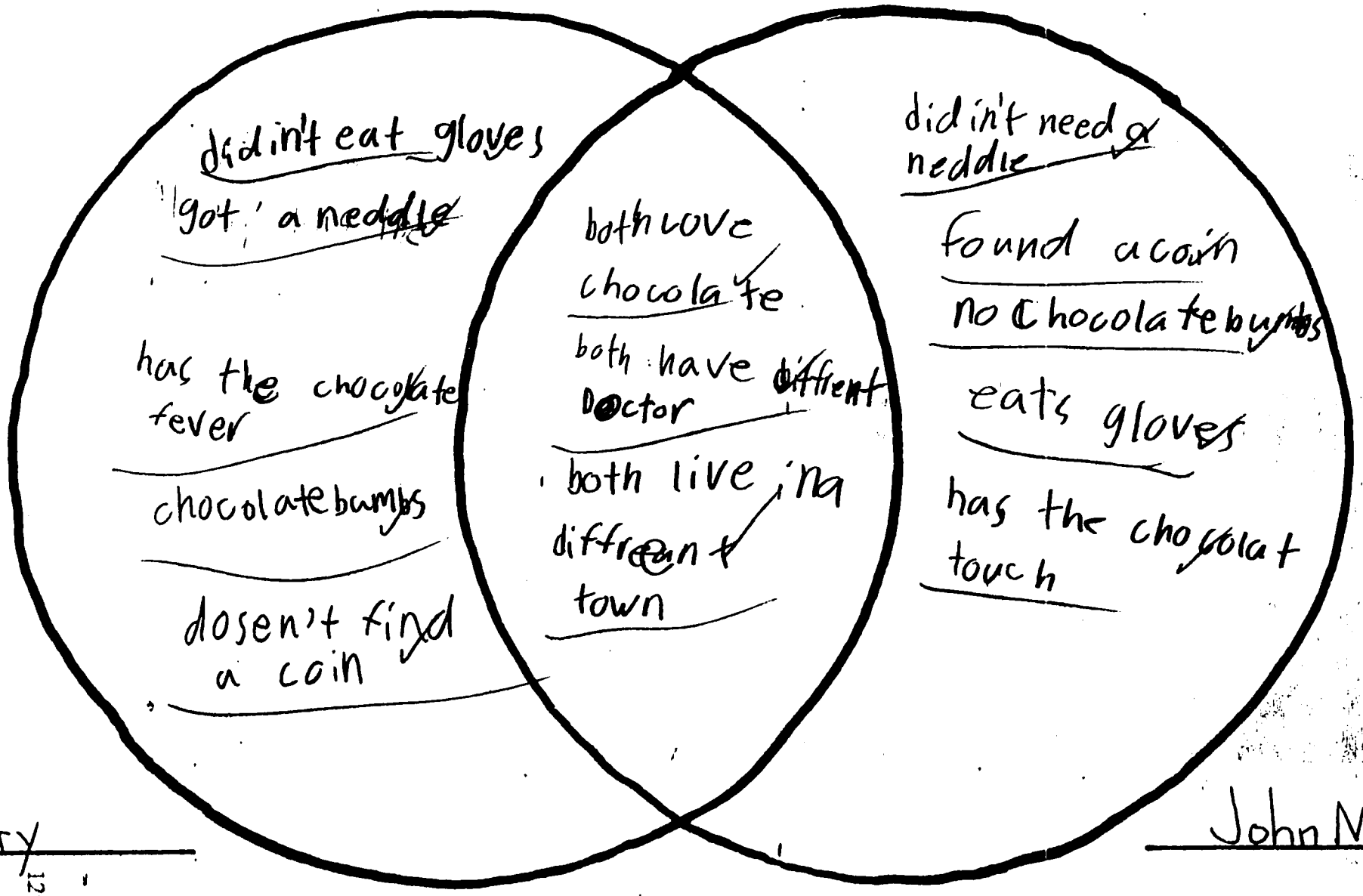
	Mysterious Tramp	Chocolate Fever and Chocolate Touch	Devil's Bridge (Characters)	Devil's Bridge (Personal)
Evan	XXX	3	XXX	XXX
Kevin	1	XXX	XXX	XXX
Neil	XXX	3	3	3
Peter	XXX	3	2	3
Tania	2	2	XXX	XXX

Appendix C

Using Venn Diagrams as Reading Response to Build Understanding

Selected Samples of Evan's Work

Compare: Chocolate Touch + Chocolate Fever — Evan



Henry Green 125

John Midas

Appendix C

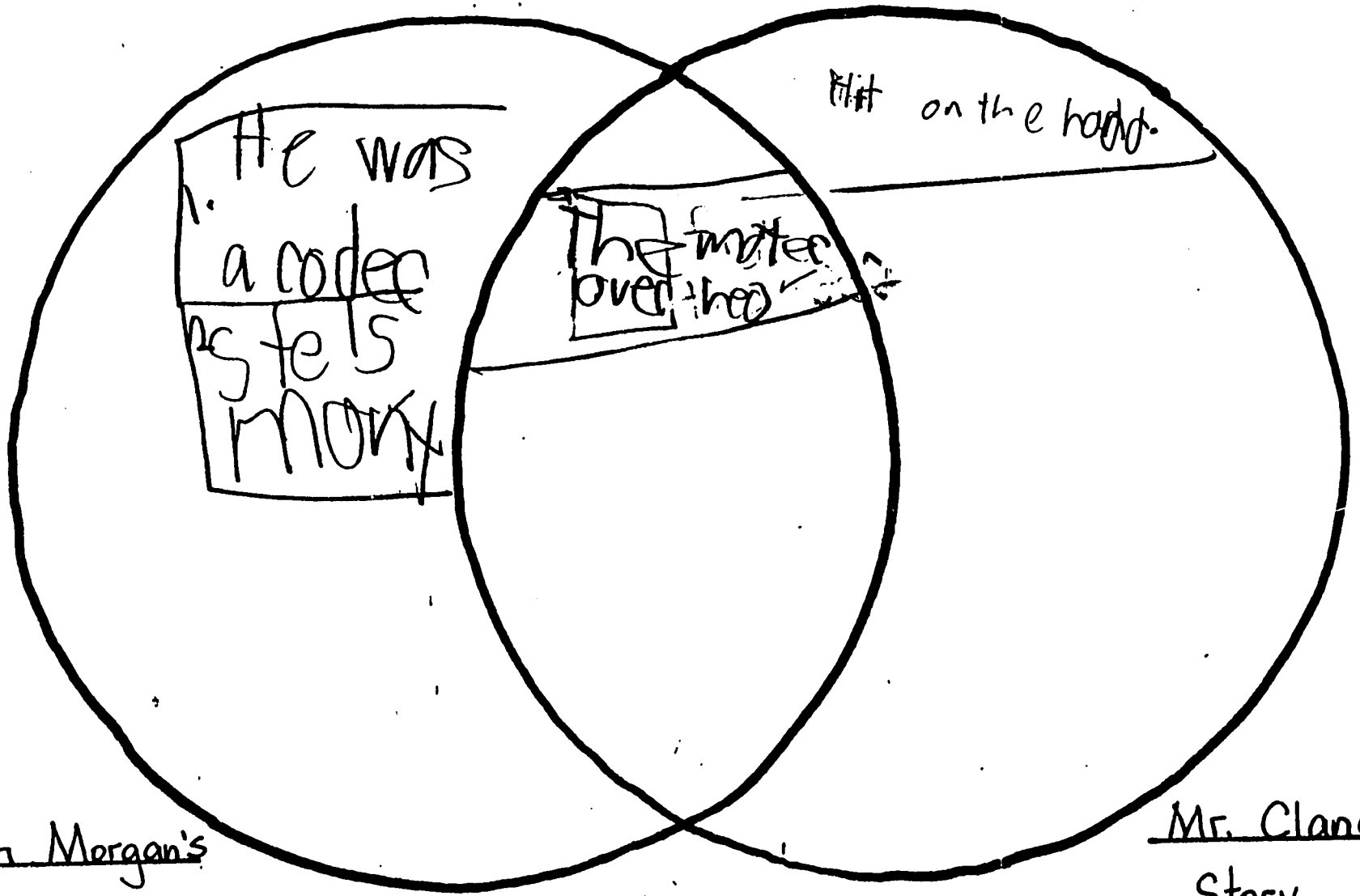
Using Venn Diagrams as Reading Response to Build Understanding

Selected Samples of Kevin's Work

The Case of the Mysterious Tramp

Name: Kevin

15



John Morgan's Story

Mr. Clancy's Story

Appendix C

Using Venn Diagrams as Reading Response to Build Understanding

Selected Samples of Neil's Work

Compare: Chocolate Touch + Chocolate Fever

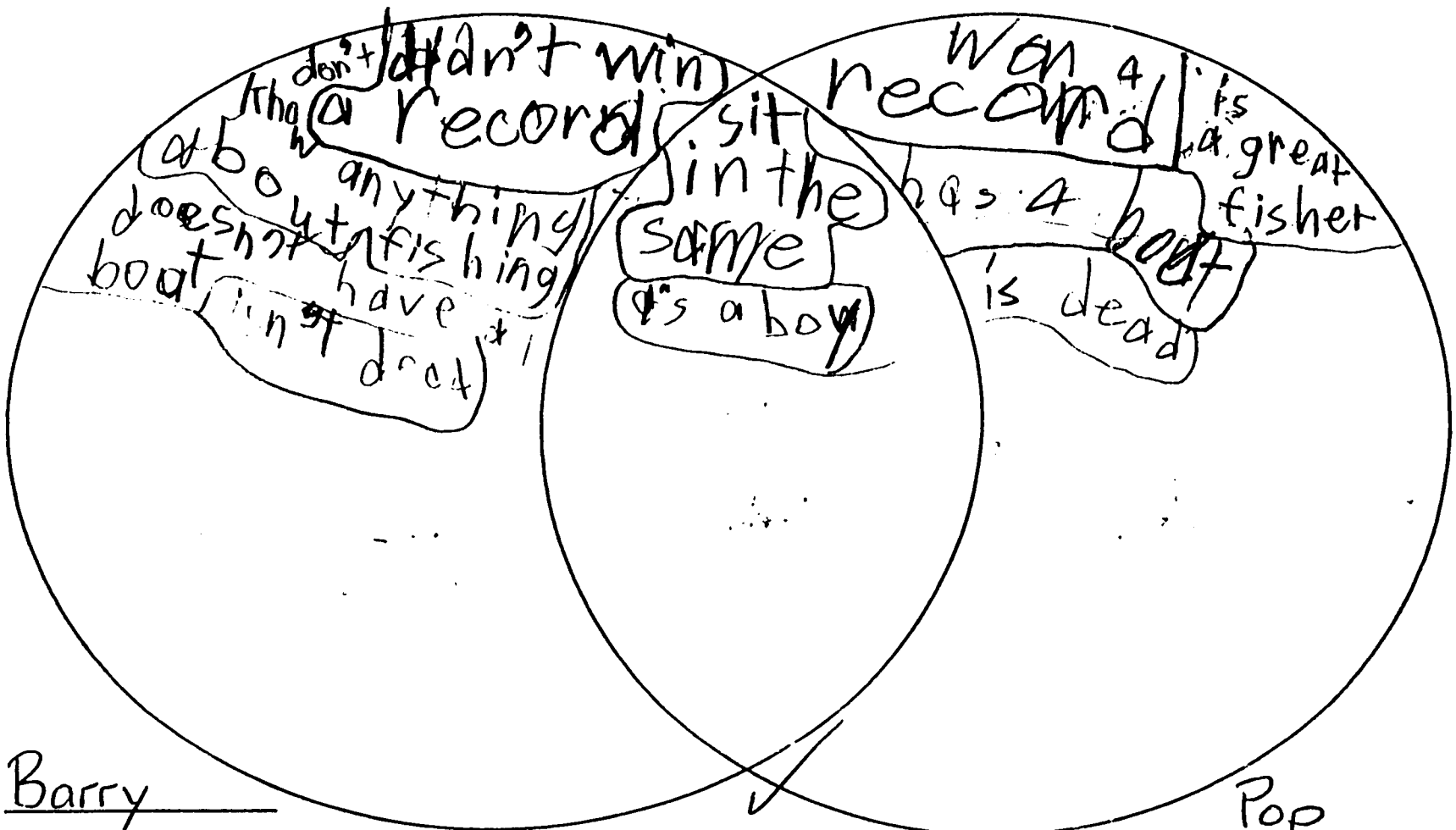
Neil

Was turning into chocolate
got Spots
went to wash
was scared
got chocolate
went to prison
got chocolate
Was Worried
Was Worried
Had Problems
Had worries
Had chocolate

Title Devil's Bridge

Author: Cynthia DeFelice

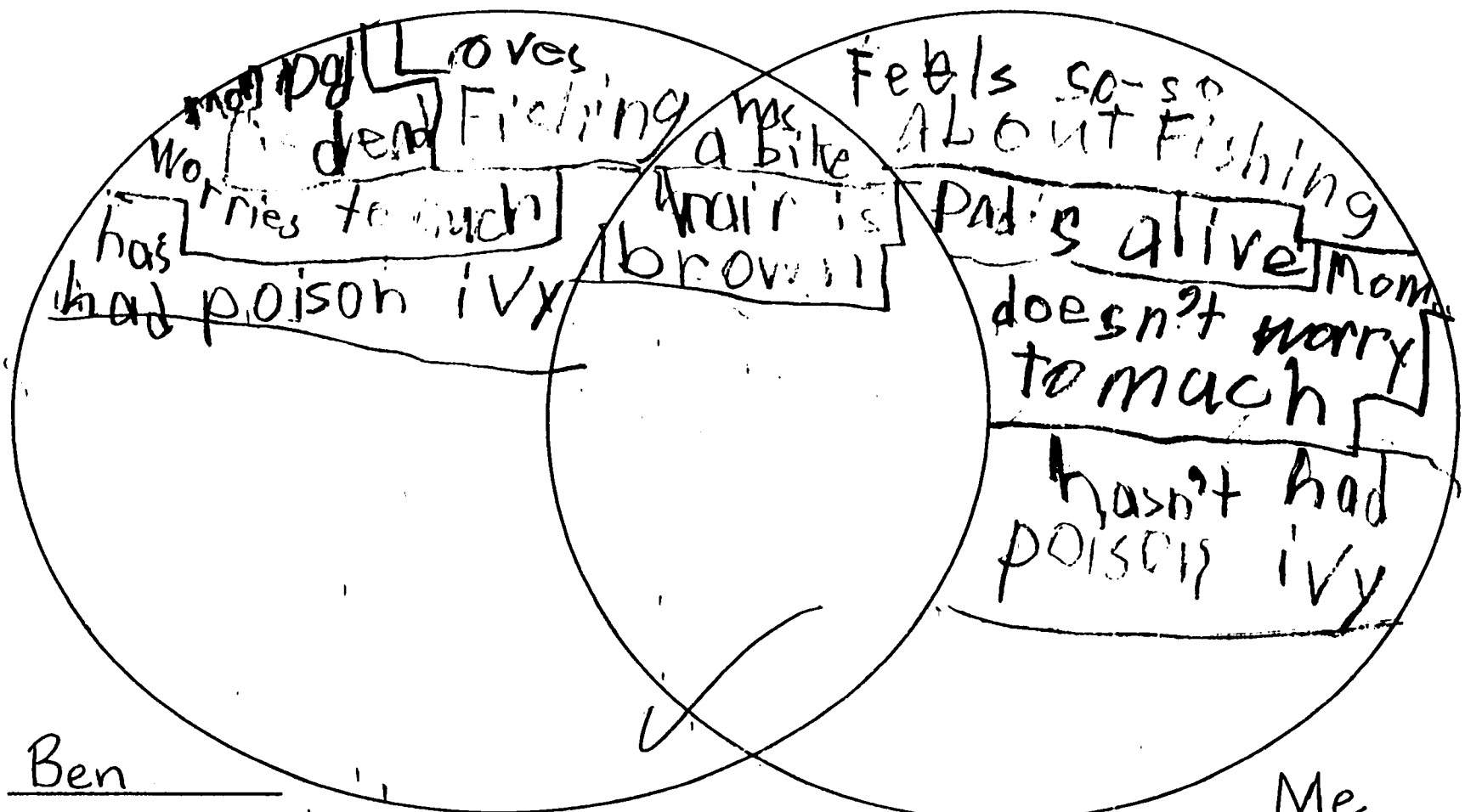
Name Neil Date



Title Devil's Bridge

Author: Cynthia DeFelice

Name Neil Date



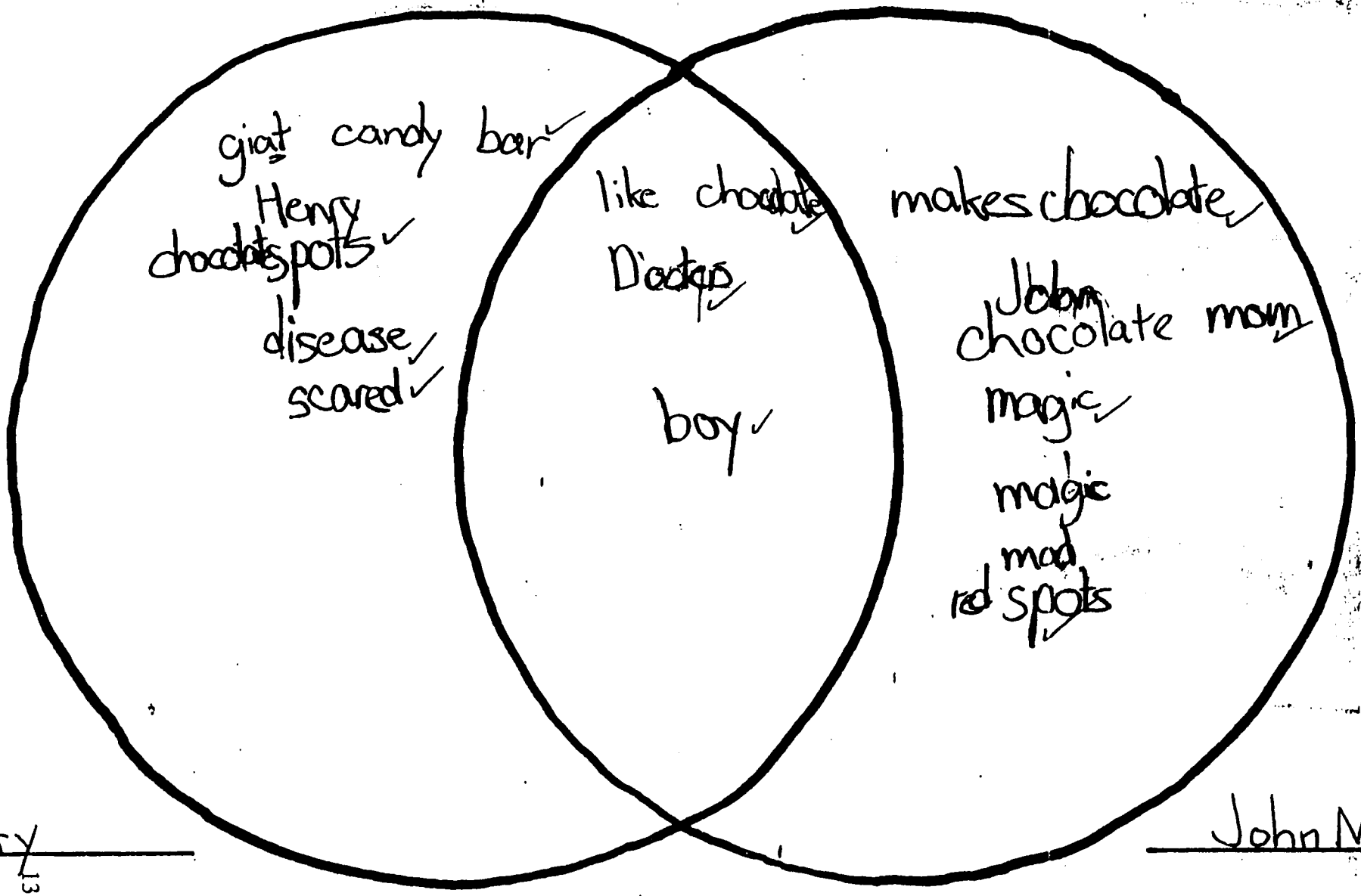
Appendix C

Using Venn Diagrams as Reading Response to Build Understanding

Selected Samples of Peter's Work

Compare: Chocolate Touch + Chocolate Fever

Peter



Henry

Green

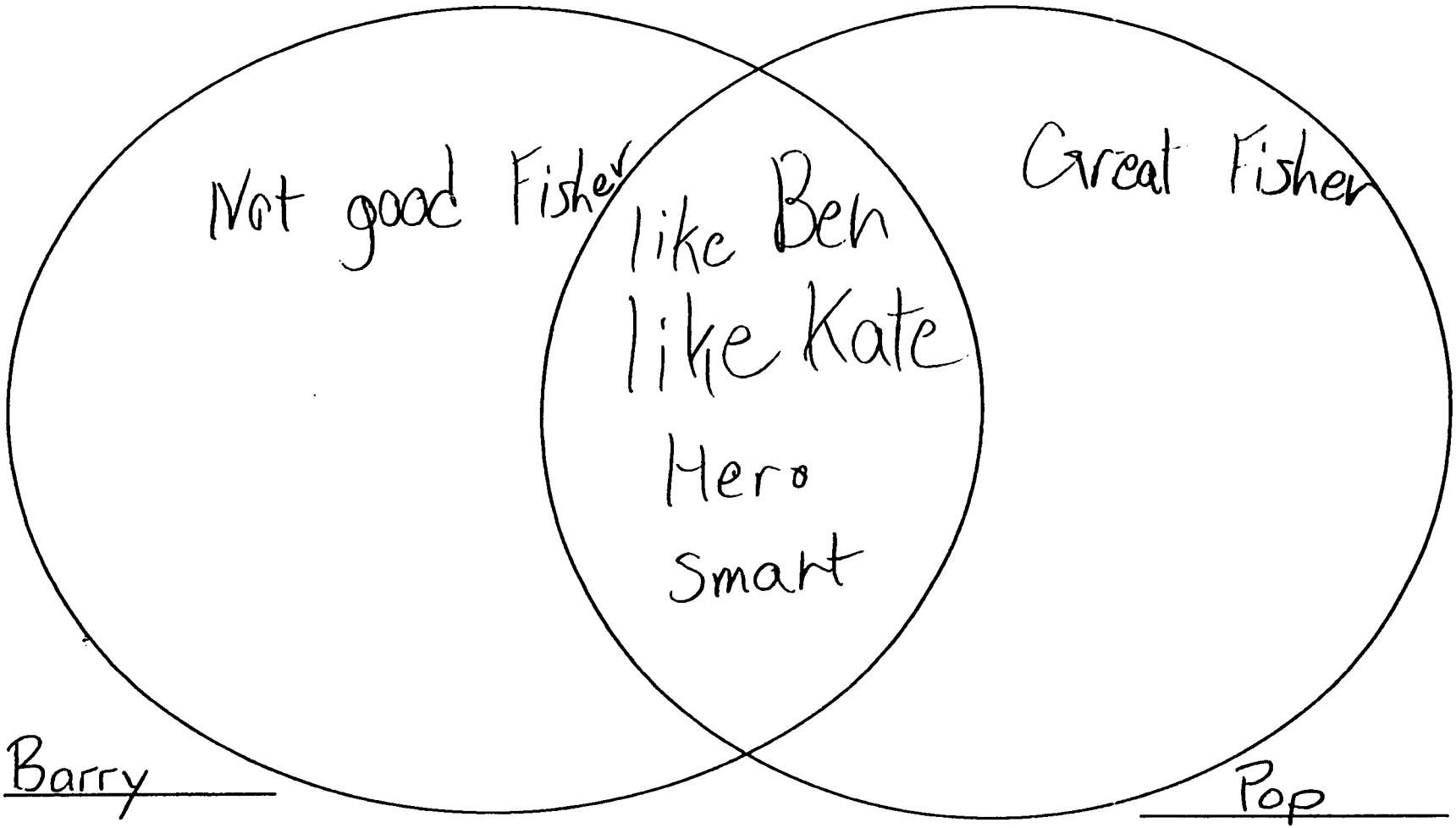
John Midas

Title Devil's Bridge

Author: Cynthia DeFelice

Name Peter

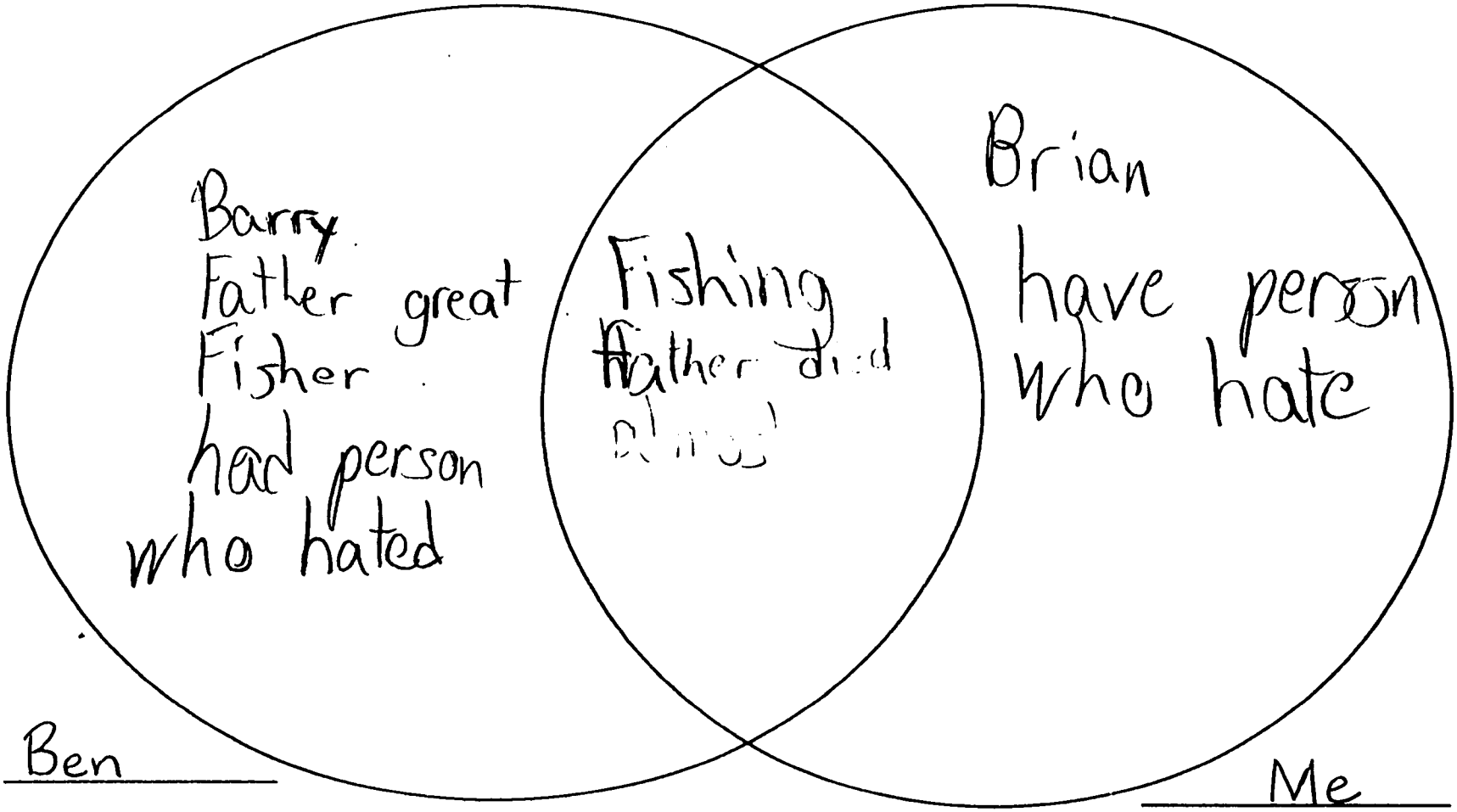
Date



Title Devil's Bridge

Author: Cynthia DeFelice

Name Peter Date



Appendix C

Using Venn Diagrams as Reading Response to Build Understanding

Selected Samples of Caroline's Work

Mountain Rose: Looking At Character

Caroline

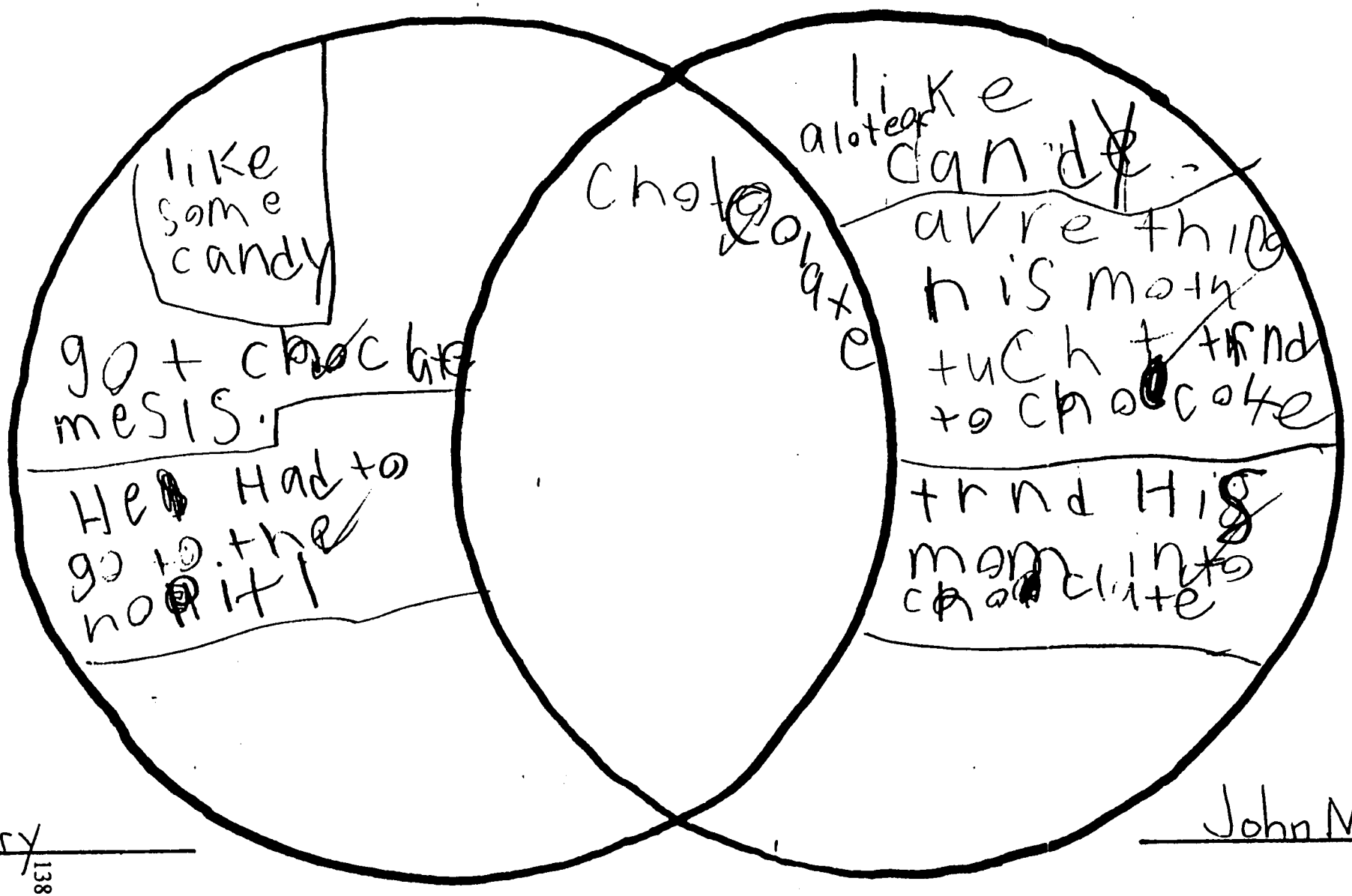
Date: Sept. 15/97

Mountain Rose

Gardenia Gus

Compare: Chocolate Touch + Chocolate Fever Name: 12

Caroline



Henry Green

John Midas

Appendix D

Topic and Task Questions in Mathematics

"Thinking Linking Logs"

Using the Rating Rubric to Score Selected Log Entries

ENTRY	1	2	3	4	5	6	7	8	9	10
Caroline	1	1	2	1	1	2	2	3	2	XXX
Fay	3	2	2	3	2	3	1	2	1	XXX
Neil	2	2	2	3	3	4	4	4	4	4
Ian	1	1-2	1	2	3	3	3	3	4	4

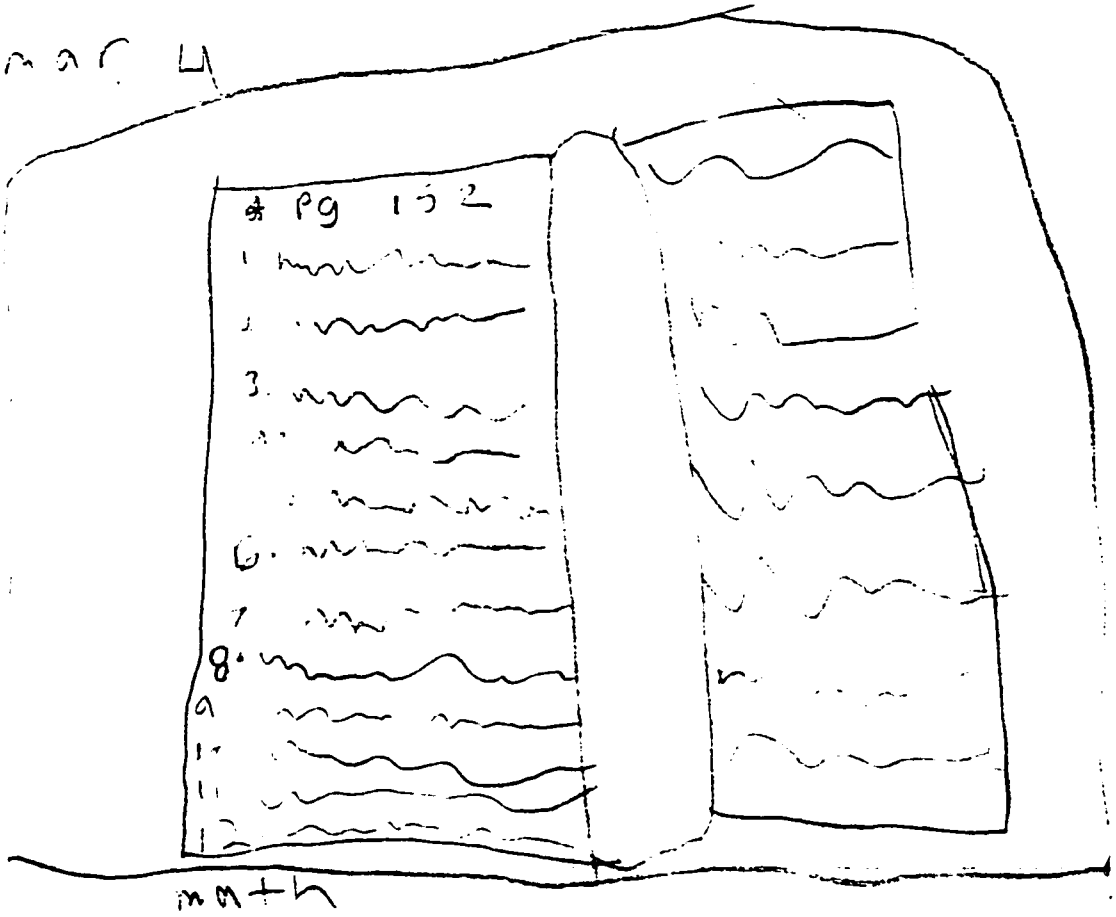
Appendix D

Topic and Task Questions in Mathematics

Selected Samples of Caroline's

"Thinking Linking Log"

#1



remain point to today's lesson

will to make us smart

#2

To Pa ins Lesson reminds me of The marker page becos. they Both have the same cind of problems

man mar 9 #3

The main ponit of todays lesson

was yousing the number line

mar 30

#4

Dividing is ware you have 2 numbers and you put them together

April 21

#5

I made a Function how to Better at washing. I Did this so I Could learn to mashup.

April 22

#6

we Did Fact Sheets and Try to Find out how to put numbers together!

May 19

#7

I learned that you can make a lot of shapes from a elastic and learning more names of shapes

Perimeter

#3

Perimeter is How much is
All the way arownD

Wed 3:17

#9

Area and perimeter are the same Because thay Both meen lacth

2 - thar Diffrent Because perimeter meahs sqarer area mean: Room

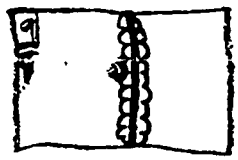
Appendix D

Topic and Task Questions in Mathematics

Selected Samples of Fay's

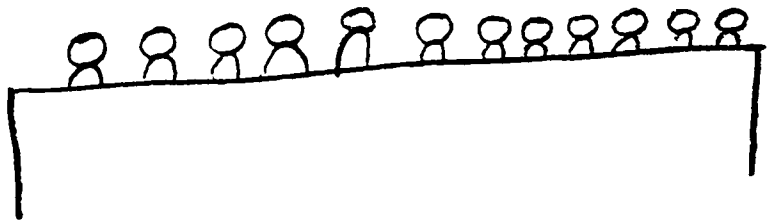
"Thinking Linking Log"

#1



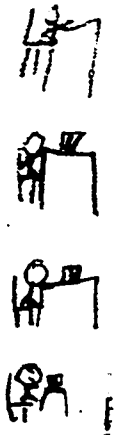
What was the main point of todays lesson
the main point of todays lesson was about toni sorting her photos by the year the point of today was to divide using the 8 mes tables.

#2



Thurs March 5 / 18
I did this so i could learn to estimate
with Valentines Stuff.

#3



Friday March 6 (98

Today's lesson is the Same because we Dividing threw Chapter 9.

#4

March 10/98
I learned how to divide with
larger numbers

#5

April 16

The main thing I had to do today was fractions with blocks.

I did this so that I could learn how to work with fractions and fatter blocks.

#6

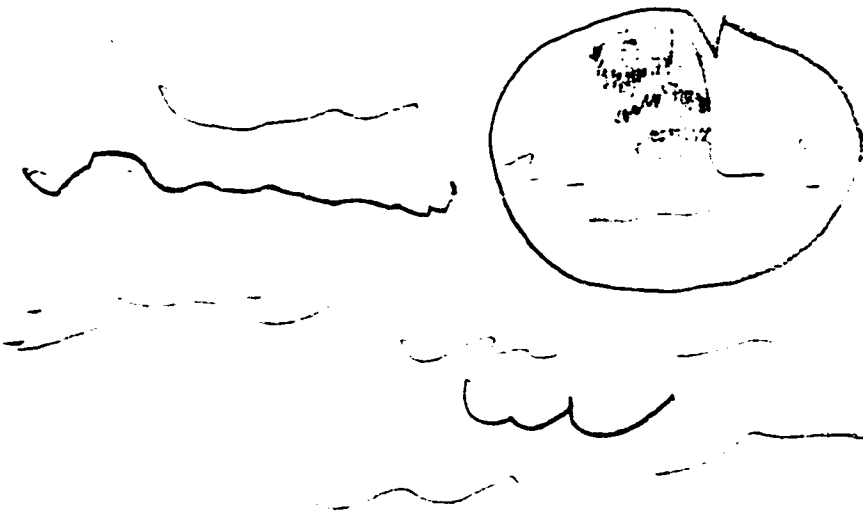
Wednesday April 22/98

-today we are learning about fractions with shapes like

$\frac{12}{6}$ $2\frac{1}{2}$ $3\frac{1}{3}$

MAKING A FROG

#7



thursday may 23 12

origami

1
Because most of the lines are the same

2
Because if you start with a square it makes it easier

3
Because it is sort of easy

Perimeter #8

Tuesday June 2/98

a Perimetre is an outside of a box

#9

Perimeter

Area

Area and perimeter are almost the same because they are almost the same

Appendix D

Topic and Task Questions in Mathematics

Selected Samples of Neil's

"Thinking Linking Log"

March

#1

Math

My script at today's lesson was to get us thinking about photos and planes.

Thinking, Linking, and Learning

The math thing we did today was estamating. I did this so that I know how to estimate and divid at the same time.

March

#2

Todays lesson is simiar to Yester work because its all divisony

March 9/98

#3

The main point of today's lesson was to get six dividing with bigger numbers.

April 20/98 #4

The point of todays lesson was to split up a number line into decamals

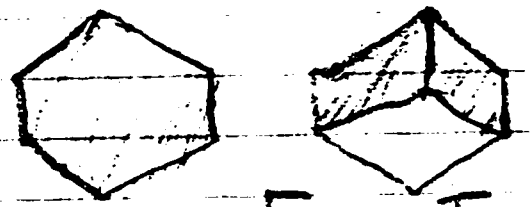
April 21/98 #5

I was comparing numbers.
I did this so I can learn to
Compare decimals.

April 22 '08

#6

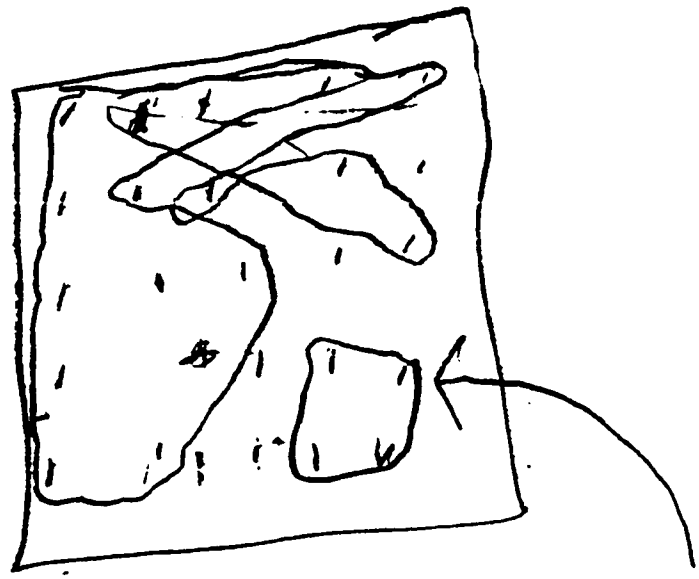
We learned about Improper fractions:



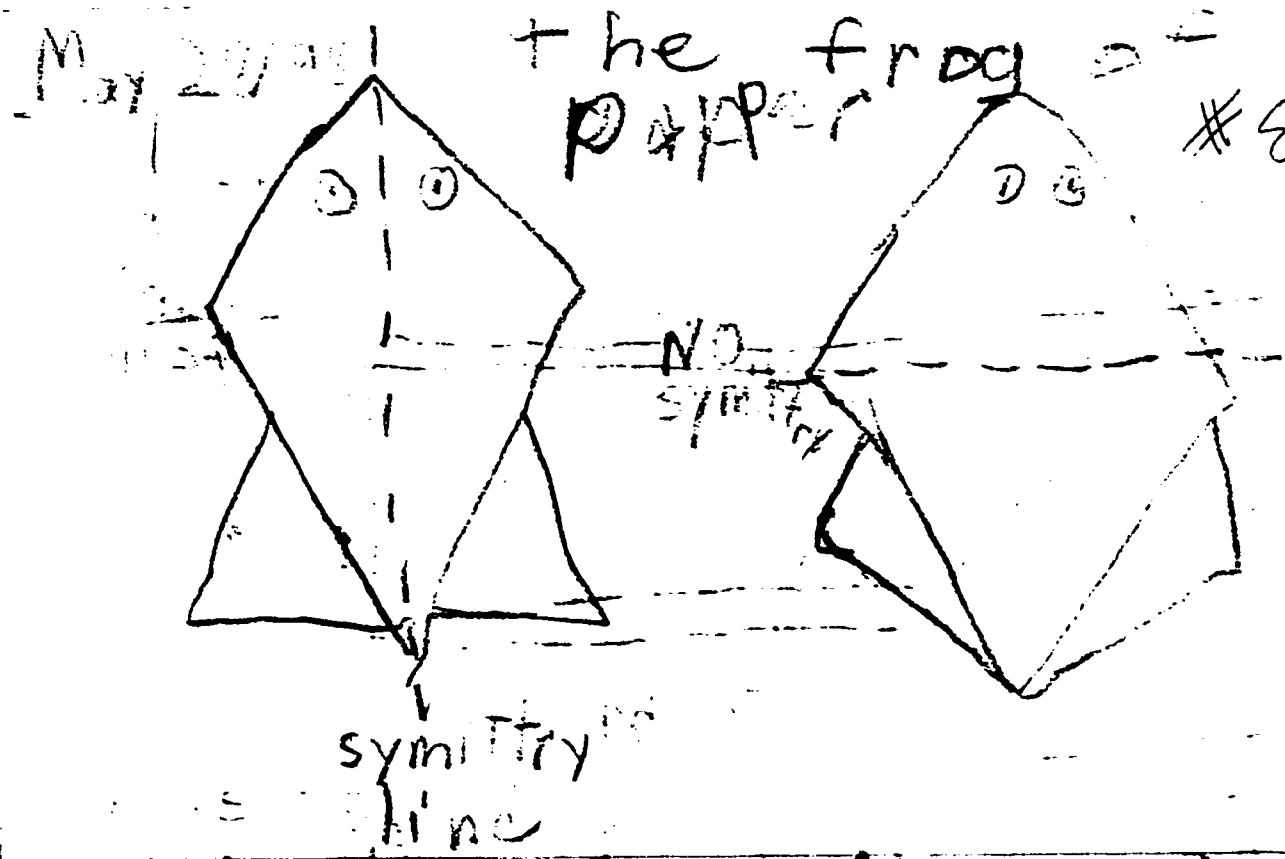
$\frac{5}{3}$ = Improper Fractions

May 19/98

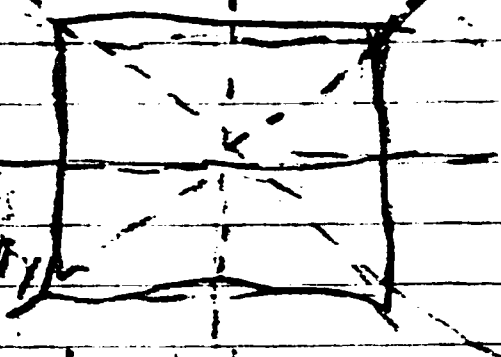
#7



We worked with quadrilaterals using geo boards.

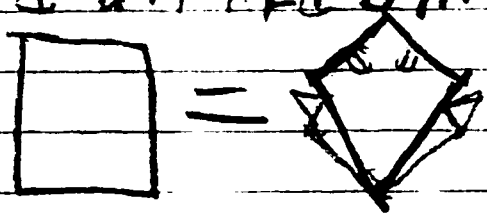


Horizontal does not work



a square has
4 lines of symmetry

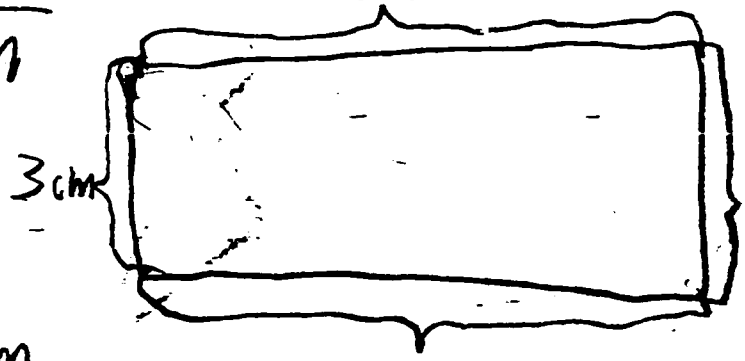
Our work took a
quad and turned it into
a different quad.



June 2 '98 #9

3 cm
+3 cm
6 cm

7cm
+7cm
14cm



14 cm
+6 cm
20cm

the perimeter is 20cm

A perimeter is the length around a certain object.

June 5th 98

#10

1. Area and Perimeter are simalar because area is the space inside the Perimeter.

2. Area and Perimeter are different because Perimeter is the space around an object while Area is the space an object takes up.

Appendix D

Topic and Task Questions in Mathematics

Selected Samples of Ian's

"Thinking Linking Log"

Mar. 4/93

#1

Math.

Organizing photos.
Help us with division.

18

#2

March 5 / 98

sent out valentines

Estimate.

So need get letter at estim.

ing & would not have

lower rate

#3

March 9/98

Mall

The main point of today's work was student putting labels on, and estimating it.

#4

March 10 198

We were doing
division and long
division.

#5

April 2092

fractions & decimals

The main point of

today's lesson

was to see how

fractions and the

same as decimals

#6

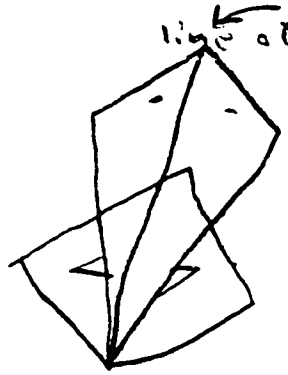
April 21/98
The main thing
today was Ulla
got more pieces
of pizza.
I did this so that
I can explain
decimals to fractions

#7

Lab Prog 1908.

The main point of
lab prog is less-
ons to make
quadrilateral shapes
square sided not
square side

#8



May 28/98

The frog shows
line of symmetry
from the front

Because if you
use a square
at the end it
will be a symmetry
line

it maybe "more lasting
quadrilaterals" it take
time it got lines of
symmetry

#9

Perimeter

June 21 '88

perimeter is the sum of the sides and measuring the sides

#10

June 7 AG

Area and perimeter similar
Because, perimeter
is outside area is
inside if there is
perimeter there is area

perimeter is outside
area inside

Vita

Name	David Robert Turner
Place and Year of Birth	Toronto, Ontario, 1957

EDUCATION

1971-1976	Stephen Leacock Collegiate Institute, Agincourt, Ontario
1976-1980	University of Waterloo, Bachelor of Environmental Studies Honours Geography
1982-1983	Queen's University, Bachelor of Education
1992-1999	Queen's University, Master of Education

PROFESSIONAL EXPERIENCE

1983-1985	Field Studies Leader, Toronto Urban Studies Centre Toronto Board of Education
1985-1986	Teacher-Demonstrator, Mobile Education Program Ontario Natural Gas Association, Toronto
1986-1987	Historical Interpreter, Toronto Urban Studies Centre Toronto Board of Education
1987-1990	Teacher, Grade 1, Smithfield Public School, Smithfield, Ontario Northumberland Newcastle Board of Education
1990-	Teacher, Grades 4-6, Percy Centennial Public School, Warkworth, Ontario, Kawartha Pine Ridge District School Board

PROFESSIONAL DEVELOPMENT

1984	York University, Ontario Ministry of Education Computers in the Classroom, Part 1
1987	York University, Ontario Ministry of Education Junior Basic Qualification
1988	York University, Ontario Ministry of Education Primary Basic Qualification