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Excessive Commitment to Exercise and the Relationship Between
Dietary Restraint and Perfectionism: A Case of Moderation or Mediation?

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A Thesis

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of

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ABSTRACT

EXCESSIVE COMMITMENT TO EXERCISE AND THE RELATIONSHIP BETWEEN DIETARY RESTRAINT AND PERFECTIONISM: A CASE OF MODERATION OR MEDIATION?

Lindsay McLaren

Although excessive exercise and the personality characteristic perfectionism are both prevalent in eating disordered patients (especially in anorexia nervosa), the association between these two factors and the characteristic feature of dietary restraint has not been systematically investigated in a nonclinical population. The aim of the present study was to contribute to the understanding of this association by: a) investigating the relationship between perfectionism and dietary restraint; and b) exploring the moderating and/or mediating role of excessive commitment to exercise in this relationship. A university student sample of 269 women and 152 men completed paper and pencil questionnaires of dietary restraint, excessive commitment to exercise, and multidimensional perfectionism. Multiple regression analyses designed to test moderating and mediating models (Baron & Kenny, 1986) showed that higher perfectionism and more excessive commitment to exercise predicted more dietary restraint among both men and women ($p < .01$). No evidence was found to support the moderating role of excessive commitment to exercise on the relationship between perfectionism and dietary restraint. However, regression tests for mediation indicated that among women, excessive commitment to exercise mediated the relationship between self-oriented perfectionism and dietary restraint, and its inclusion significantly reduced

the strength of two other relationships: between socially-prescribed perfectionism and dietary restraint, and between self-presentational perfectionism and dietary restraint. In men, excessive commitment to exercise mediated the relationship between self-oriented perfectionism and dietary restraint, but only when Body Mass Index (BMI) was controlled. The conclusion is that excessive commitment to exercise may explain some aspects of deviant eating symptomatology.

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EXCESSIVE COMMITMENT TO EXERCISE AND THE
RELATIONSHIP BETWEEN DIETARY RESTRAINT AND PERFECTIONISM:
A CASE OF MODERATION OR MEDIATION?

Dieting and dietary restraint are widespread in the general population, occurring more frequently in women. Dietary restraint is a component of eating disorders including bulimia nervosa and, to a greater extent, anorexia nervosa. The prevalence of dietary restraint, coupled with its putative role in the etiology of eating disorders, has rendered it a focal point of investigation for researchers.

One approach to understanding the determinants of dietary restraint is to examine characteristics of personality that correlate with this behaviour. An intrapersonal characteristic that has consistently been shown to accompany disordered eating behaviour is *perfectionism*. Perfectionism refers to “the practice of demanding of oneself . . . a higher quality of performance than is required by the situation” (English & English, 1958, p. 379). Historically, anorexic individuals have been described as perfectionistic in nature (e.g., Bruch, 1978). Clinical reports (e.g., Roberts & Zendel, 1996) and empirical research (e.g., Davis, 1997c) have supported this contention in that anorexic and, possibly, bulimic individuals display higher levels of perfectionism than non-disordered control individuals. Moreover, unlike some correlates of disordered eating, perfectionism appears to endure in an individual following sustained weight recovery in the eating disorders (e.g., Bastiani, Rao, Weltzin, & Kaye, 1995), making this characteristic a

particularly important one to investigate. To date, however, most findings have been based on a simplistic, unidimensional conceptualization of perfectionism. In particular, questionnaire items assessing perfectionism have focussed exclusively on self-directed cognitions; for example, a tendency to set unrealistic standards and strive to attain these standards, to engage in stringent self-evaluation, and to overgeneralize failure (e.g., Burns, 1980). The tenability of this unidimensional approach, with its primary emphasis on the self, has been challenged recently.

Notably, a recent development in the perfectionism literature has been the acknowledgement that this construct has multiple dimensions, including personal, interpersonal, and self-presentational aspects. Several researchers (e.g., Hewitt & Flett, 1991b; Joiner, Heatherton, Rudd, & Schmidt, 1997; Pliner & Haddock, 1996) now consider that the construct includes several dimensions: a tendency to set very high standards for oneself, a tendency to hold very high standards for others, the perception that others hold high standards for you, and the desire to present oneself in a manner that appears perfect. Clearly, the previous use of a unidimensional conceptualization of perfectionism had precluded recognition of the heterogeneity of this belief system.

Although in its early stages, a body of research investigating multiple dimensions of perfectionism in the context of eating disorders is developing. Recently, it has been demonstrated that different dimensions of perfectionism may be differentially related to eating disorder attitudes and behaviours among college women (Hewitt, Flett, & Ediger, 1995). Specifically, self-imposed perfectionism (setting very high standards for oneself)

may be selectively related to anorexic symptoms such as dieting, whereas perfectionism of a social (perception that others hold high expectations for you) as well as self-presentational (desire to present oneself as perfect) nature may be related to a more global repertoire of eating disorder symptomology (i.e., body image disturbance, bulimic behaviours).

In this context, one of the purposes of the present study was to replicate existing findings relating different dimensions of perfectionism to patterns of eating disturbance, and to extend this investigation to include men as well as women in a university student sample. The present study focuses specifically on the relation between dietary restraint and the different dimensions of perfectionism.

The second purpose of this study concerns a behaviour pattern that is frequently associated with eating disorders: excessive exercise. Excessive exercise, that is, the tendency to engage in inordinately large volumes of physical activity, nearly always accompanies dietary restraint in anorexia nervosa (e.g., Davis, Kennedy, Ralevski, & Dionne, 1994), and may also be prevalent in bulimia nervosa as a means of purging or fulfilling a drive for thinness (Lacombe, Gauvin, Steiger, & Anderson, 1998). The prevailing view in the literature on eating disorders (e.g., Eisler & le Grange, 1990) is that exercise is adopted subsequent to dieting as an additional means of caloric expenditure. Some authors have argued, however, that it occupies a more central role in the pathogenesis of the disorder. This latter model is based, in part, on animal research; in particular, the activity-induced weight loss syndrome in which experimental rats with

access to running wheels begin to increase their running when food intake is restricted (Routtenberg & Kuznesof, 1967). Since the 1960s, this finding has been demonstrated consistently and has subsequently been proposed as a biobehavioral model for anorexia nervosa (Epling & Pierce, 1988). Furthermore, clinical reports have revealed patterns of activity and starvation in human anorexia patients that resemble those found in the animal research (e.g., Davis et al., 1994). Such findings from laboratory animals and human patients may provide insight into the etiology of the disorder, and could also have implications for prevention, inasmuch as they suggest that excessive exercise may best be viewed as a risk factor in the development and maintenance of an eating disorder, and not simply a behavioural correlate.

Due to the multifaceted nature of the eating disorders, research aimed at pinpointing the origins of eating pathology must address how predictors of this behaviour operate together as well as in isolation. Thus, the second purpose of this study is to investigate the moderating and/or mediating role of excessive exercise in the relationship between perfectionism and dietary restraint.

Background

Dietary Restraint

Eating Disorders are characterized by deviant eating behaviour. The particular pattern of deviant eating seen in both anorexia nervosa and bulimia nervosa (although arguably in different forms) is dietary restraint. Dietary restraint is defined in the literature in two different ways; first, as the act of decreasing one's food intake for the

purpose of weight loss or maintenance of weight loss; and second, in terms of the behaviour displayed by restrainers versus nonrestrainers in the laboratory using the experimental *preload paradigm*. Both of these conceptualizations will be discussed in turn.

“Normal” Dieting. The most familiar meaning of the term dieting is the restriction of one’s food intake for the purpose of losing weight, or for the purpose of maintaining a weight loss. It is widely acknowledged that dieting is extremely common, and has been cited as the most frequently used method to improve body shape (Brownell, 1991). This behaviour is more prevalent in women than men (e.g., Rodin, Silberstein, & Striegel-Moore, 1984), and it seems to be emerging in increasingly younger age groups (e.g., Sands, Tricker, Sherman, Armatas, & Maschette, 1997). The widespread adoption of this behaviour has led some authors to view dieting as normative behaviour, especially in female populations (Rodin et al., 1984).

What underlies the high prevalence of dieting? Clearly, today’s ideal body type for women is thin, and the quest for this ideal incites many women to resort to dietary restraint. The pursuit of a slender body seems to be motivated by aesthetic rather than health concerns (e.g., Davis & Cowles, 1989), and implicit in the aesthetic appeal of a thin body is the assumption that thinness is equated with such desirable characteristics as success, self-control, and discipline (e.g., Brownell, 1991). Thus, attainment of a thin body becomes a very powerful goal for some women.

Despite the prevalence of dietary restraint among individuals in pursuit of weight

loss, there are important consequences of this behaviour (for a review, see Garner & Wooley, 1991). First, many reports have documented the virtual ineffectiveness of dieting for permanent or long-term weight loss. This is because dieting or restricting food intake has the effect of reducing an individual's basal metabolic rate (e.g., Garner & Wooley, 1991; Keys et al., 1950 cited in Garner, 1997) which means that the body requires less energy in order to carry out normal physiological processes. The most successful studies in terms of weight loss have combined diet and exercise, which together optimize energy deficit (see American College of Sports Medicine, 1998). Second, even with an appropriate combination of diet and exercise, there are limits on the degree to which one's body can be modified. Elements of body composition such as fat distribution are dictated by a complex network of genetic, metabolic, nutritional, psychological, and social variables (e.g., Bouchard, 1991), and these variables place restrictions on the malleability of the body. This is an important consideration, because aspiring towards an 'ideal' body type may be a biologically unrealistic goal for many people. Finally, although the findings are somewhat inconsistent, sporadic or intermittent dieting may actually reduce the likelihood of long-term weight loss (e.g., Wing, 1992). Studies in both animals and humans have suggested that with successive diets, weight loss occurs more slowly and weight gain occurs more rapidly (e.g., Rodin et al., 1984) due to increased metabolic efficiency that accompanies repeated weight loss attempts. Since dieting behaviour in humans often assumes this sporadic pattern, these findings are relevant to many dieters. In light of the various negative consequences of dieting, it

seems puzzling that the prevalence rates of this behaviour are so high.

Experimental Investigation of Dietary Restraint. Aside from this familiar description of “dieting” is the experimental investigation of dietary restraint in the laboratory. Specifically, the eating behaviour of ‘dieters’ has been studied experimentally using the *preload paradigm* (Herman & Mack, 1975). In preload experiments, individuals are first classified as *restrainers* or *nonrestrainers* based on questionnaire scores. Restrained eaters are those who exert a conscious effort to restrict food intake, who tend to be preoccupied with thoughts about food and eating, and who tend to eat in response to emotions rather than internal hunger signals. Nonrestrainers, on the other hand, do not exhibit a preoccupation with food and eating, and are able to recognize and regulate food intake in accordance with internal feelings of hunger and satiety (Herman & Mack, 1975). In this experimental context, restrainers and nonrestrainers are given a *preload* that is either high-calorie (e.g., two milkshakes), or low-calorie / no preload at all. Following consumption of the preload, additional food is made available and individuals are observed to see how they respond to this additional food. Consistent differences are found between restrained and nonrestrained eaters; in particular, nonrestrained eaters consume less food following a high-calorie preload than they do following a low-calorie preload or no preload, whereas restrained eaters tend to eat more following a high-calorie preload than following a low-calorie or no preload (Herman & Mack, 1975). The pattern exhibited by restrainers is counterintuitive, in that these individuals eat more following a large snack than following a small snack. Also, it is

interesting that the individuals who are exerting a conscious effort to eat *less* (the restrainers) end up eating a great deal more than the individuals who are unconcerned about dietary restraint (the nonrestrainers) in the high-calorie preload condition. This counterintuitive pattern has been described as a disinhibition of cognitive control of eating behaviour; in other words, if restrained eaters 'violate' their diet by eating high-calorie foods, they are believed to lose cognitive control over the amount of food subsequently consumed (e.g., Polivy & Herman, 1985). Thus, restrainers do not end up restraining at all in this high-calorie preload condition. Because this behaviour pattern seen in these 'restrainers' is typical of individuals dieting to lose weight, it is not surprising to find that most dieters do not achieve significant weight loss in the long term (e.g., Garner et al., 1991).

It is important to mention that more recent research on dietary restraint has clouded the status of this research somewhat; for example, the restraint-disinhibition relationship may vary according to weight status (e.g., Ruderman, 1985 cited in Ogden, 1993), and it seems that 'restrained eating' and 'successful dieting' are two different but overlapping behaviour constructs whose measurement depends on the particular Restraint Scale being used (e.g., McFarlane, Polivy, & Herman, 1998; Ricciardelli & Williams, 1997). Nonetheless, while certain limitations of preload paradigm research need to be kept in mind, this conceptualization of restraint has been a prolific source of information about eating behaviour in some people throughout the past two decades.

Correlates of Dietary Restraint

Dietary restraint is a consistent feature in anorexia and bulimia; however, the existence of various other associated characteristics in these disorders must be recognized. That is, eating disorders are etiologically and behaviourally multifaceted. Although a large number of women diet in pursuit of a slender body type, only a small minority reach the extreme behavioural criteria of a clinical eating disorder (American Psychiatric Association, 1994). An important question, then, concerns the difference between those dieters who develop eating disorders and those who do not.

General Correlates. Despite growing media emphasis on the virtues of thinness and fitness (e.g., Rodin et al., 1984), it is generally acknowledged that such social pressures on females to conform to a slender ideal are *not*, in isolation, sufficient to incite the excessive concerns about weight and diet that characterize anorexia and bulimia (e.g., Davis, 1990a; Davis, 1997a). Rather, certain factors tend to amplify some individuals' responses to these pressures. A large body of literature indicates that personality characteristics such as neuroticism or emotional reactivity (Davis, 1990a; Davis & Cowles, 1989; Davis, Dionne, & Lazarus, 1996), obsessive-compulsive personality (e.g., Davis, Kennedy et al., 1995; Rothenberg, 1988 cited in Srinivasagam, Kaye, Plotnicov, Greeno, Weltzin, & Rao, 1995), and addictiveness (Davis, 1990b) tend to be reliable correlates of eating pathology. Other psychological factors that have been reported as being related to deviant eating patterns include the need to maintain extreme self-control (Garfinkel, 1992), and the presence of pervasive feelings of insecurity, inadequacy, and

worthlessness (Butow, Beumont, & Touyz, 1993). Finally, the self-esteem of anorexia and bulimia patients appears to be highly bound to external standards and is unduly influenced by attitudes of others, and these individuals are often extremely eager to please others and to conform to external standards (e.g., Wilkins, 1997).

Specific Correlate - Perfectionism. One psychological variable that has been consistently reported as characterizing anorexic (and possibly bulimic; e.g., Joiner et al., 1997) individuals is perfectionism. Many authors have, from a clinical perspective, described patients with anorexia nervosa as perfectionistic (e.g., Bruch, 1973, 1978; Strober, 1991), and empirical findings exist which support this description. For example, Terry-Short, Owens, Slade, and Dewey (1995) found that an eating disorder group scored higher than a control group on both 'positive perfectionism' and 'negative perfectionism'; and relative to groups of athletes, depressed individuals, and controls, eating disordered individuals scored the highest on 'negative perfectionism' (defined as perfectionism motivated by a fear of failure rather than by a striving for success). Mitzman, Slade, and Dewey (1994) were able to discriminate eating disorder patients from controls on a scale specifically designed to measure neurotic perfectionism in the eating disorders. Finally, Minarik and Ahrens (1996) documented differences in perfectionism that related to eating disturbance in college women.

Moreover, some recent studies have demonstrated that perfectionism may be an enduring characteristic in anorexia nervosa; in other words, perfectionism has been exhibited in anorexia patients even following sustained weight restoration (e.g.,

Srinivasagam et al., 1995; Bastiani et al., 1995; Szabo & Terre Blanche, 1997). Such data raise the speculation that perfectionistic behaviour may be independent of physiological recovery from the illness (i.e., weight gain), and reflect psychological factors that must be addressed in the course of a comprehensive treatment. That is, weight-restored anorexia patients who still exhibit perfectionism may be at risk for relapse. For these reasons, further investigation of the role of perfectionism in relation to deviant eating behaviour is worthwhile.

Perfectionism

Perfectionism is a personality characteristic that has received increased attention in the literature in recent years. A number of authors have examined the construct of perfectionism, as well as the association between perfectionism and a variety of physical and psychological outcomes. While occasionally described as a positive characteristic (e.g., Hamachek, 1978; Slaney & Ashby, 1996; Terry-Short et al., 1995), perfectionism is more often associated with negative outcomes such as self-criticism (Ferguson & Rodway, 1994), interpersonal difficulties (Slaney et al., 1996), and forms of psychopathology such as depression (e.g., Hewitt & Flett, 1991a). As further testament to the potential negativity of perfectionism, this personality characteristic is included in the diagnostic criteria for Obsessive-Compulsive Personality Disorder (APA, 1994).

Unidimensional Perfectionism. Despite the apparent pervasiveness of perfectionism, a problem in studying this construct has been the inconsistency of its definition. Initially, perfectionism was viewed in a unidimensional way, characterized

primarily by self-directed cognitions. That is, 'perfectionistic' has been a term used to describe individuals who hold unrealistically high standards for themselves, engage in self-criticism, evaluate experiences in an all-or-nothing manner, and overgeneralize failures (e.g., Burns, 1980; Hamachek, 1978; Pacht, 1984). Although these thought patterns are important components of the definition, more recent research suggests that such a conceptualization is too narrow. A significant development in the perfectionism literature has been the demonstration that perfectionism has interpersonal (social) as well as personal dimensions (Flett, Hewitt, & De Rosa, 1996; Frost, Marten, Lahart, & Rosenblate, 1990; Hewitt & Flett, 1991b; Hewitt, Flett, Turnbull-Donovan, & Mikail, 1991). This repertoire of more recent findings has led to a recognition that perfectionism is multidimensional in nature. Furthermore, the assertion that perfectionism may have both personal and social components is consistent with two other literatures: first, research on private versus public aspects of self (e.g., Fenigstein, Scheier, & Buss, 1975), and second, recognition that both intra- and inter-individual personality components play roles in the etiology and course of psychiatric disorders (APA, 1994).

Multidimensional Perfectionism. One model of the specific components of multidimensional perfectionism, and the one which is followed in the present study, has been outlined by Paul Hewitt and Gordon Flett. These authors initially asserted that perfectionism is made up of three important dimensions. The first, *self-oriented perfectionism*, is intrapersonal and refers to setting standards of perfectionism for oneself. The other two components are interpersonal: *other-oriented perfectionism* is the

expectation that others around you should be perfect, and *socially-prescribed perfectionism* is the perception that others expect perfection from you. The primary difference among these dimensions is not the behaviour pattern per se but the object to whom the perfectionistic behaviour is directed (Hewitt & Flett, 1991b), as well as the origin of the demands for perfection.

The relevance of viewing perfectionism in terms of these three dimensions is evident in studies on personality disorder symptoms. For example, research with heterogeneous samples has shown links between *other-oriented* perfectionism and narcissistic/histrionic symptoms (e.g., Hewitt, Flett, & Turnbull, 1992 cited in Flett et al., 1996) whereas *socially-prescribed* perfectionism has been found to be associated with paranoid and schizotypal features, and with avoidant, dependent, and passive-aggressive features (Hewitt et al., 1992 cited in Flett et al., 1996). Another study (Wyatt & Gilbert, 1998) found significant positive correlations between *socially-prescribed* perfectionism and measures of submissive behaviour and of depression. Finally, in a recent study using a nonclinical (student) sample, Flett et al. (1996) found that high levels of *socially-prescribed* perfectionism were associated with various psychosocial adjustment problems including greater loneliness, shyness, and fear of negative evaluation, and lower levels of social self-esteem.

Perfectionistic Self-Presentation. More recently, these authors (Hewitt et al., 1995) have gone a step further to introduce another component of perfectionism that is self-presentational in nature. This component involves behavioural styles adopted in

order to present an image of flawlessness to others. Three dimensions of *perfectionistic self-presentation* have been identified: need to appear perfect, need to avoid appearing imperfect, and the need to avoid disclosure of imperfections (Hewitt & Flett, 1993 cited in Hewitt et al., 1995). Because this self-presentational dimension of perfectionism is a relatively new development, little information is available about its viability despite its intuitive appeal.

Perfectionism and Dietary Restraint

Theoretical Background. Recognition of perfectionism as a multidimensional construct has contributed to greater understanding of the relationship between perfectionism and eating disorders. In fact, the early literature on eating disorders is characterized by frequent suggestions that perfectionistic tendencies in this population may be multifaceted. For example, a widely cited characteristic of eating disordered individuals is their tendency to set unrealistic self standards and to engage in all-or-none thinking with respect to these standards; that is, anything less than perfection is considered a failure (e.g., Wilson, Fairburn, & Agras, 1997). This pattern is the hallmark of self-oriented perfectionism. Also, many conceptualizations of eating disorder development emphasize various social or interpersonal factors (e.g., Rodin et al., 1984), including familial expectations or internalization of cultural standards of thinness. For example, anorexia patients often report family backgrounds that are very achievement-oriented, in which parents hold high expectations for their child(ren). The child then feels compelled to meet these expectations, often at any cost. Also, anorexia is often

associated with a disposition toward compliance with moral standards and established rules (e.g., Casper, 1990), which is essentially a tendency to adhere to external expectations. From these perspectives, socially-prescribed perfectionism may be relevant. Finally, Bruch (1973) and Garfinkel (1992) describe perfectionism in eating disorder individuals as reflecting a need to gain the approval of others by presenting themselves in a particular way, one which may be discrepant from their own inner experience. These anecdotes provide good examples of self-presentational perfectionism; thus, one may expect this type of perfectionism to be related to eating disordered attitudes and behaviours.

Empirical Findings. In fact, research using a multidimensional model of perfectionism has supported the contention that different dimensions of this construct are differentially related to deviant eating attitudes and behaviours. In an unpublished study, Davidson (1989 cited in Hewitt et al., 1995) was the first to investigate this topic. Specifically, she examined self-oriented, other-oriented, and socially-prescribed perfectionism in relation to a variety of eating disorder symptoms, in a high school sample using a child and adolescent perfectionism scale (Flett & Hewitt, 1992 cited in Hewitt et al., 1995). Findings suggested that both self-oriented and socially-prescribed perfectionism, but *not* other-oriented perfectionism, were positively correlated with eating disorder symptoms measured by the Eating Attitudes Test (EAT; Garner & Garfinkel, 1979 cited in Hewitt et al., 1995). In other words, adolescents who exhibited eating disturbances also tended to set very high standards for themselves (high self-oriented

perfectionism), and to feel as though others held high expectations for them (high socially-prescribed perfectionism). However, these individuals did *not* tend to expect others around them to be perfect (low other-oriented perfectionism).

These initial findings have been more or less supported in subsequent research; of which three studies are particularly relevant. First, Hewitt et al. (1995) replicated and extended the results of Davidson's (1989 cited in Hewitt et al., 1995) study by including a measure of self-presentational perfectionism along with self-oriented, other-oriented, and socially-prescribed perfectionism measures to investigate eating disturbance among female college students. These authors found significant positive zero-order correlations between self-oriented perfectionism and dieting measures; and between socially-prescribed perfectionism and dieting, bulimia, and body image disturbance measures. Once again, other-oriented perfectionism was not found to be related to any eating disorder symptomatology. These authors concluded that a tendency to set high standards for oneself (high self-oriented perfectionism) was related specifically to anorexic-type eating disturbance (i.e., dieting behaviour), whereas having the perception that others held high expectations of you (high socially-prescribed perfectionism) was related to a broader range of eating pathology including dieting, bulimic behaviours, and dissatisfaction with one's body. The measure of self-presentational perfectionism, used for the first time in this study, was found to be significantly related to the various measures of eating and body image disturbance, in that dieting, bulimic symptomatology, and body image disturbance were positively associated with a need to present oneself as perfect (high self-

presentational perfectionism). While analysis of unique contributions of the perfectionism measures did not yield such clear results, these authors contend that the findings underscore the importance of differentiating the personal, interpersonal, and self-presentational aspects of perfectionism in this eating disorder context.

Second, Bastiani et al. (1995) compared underweight anorexics, weight-restored anorexics, and healthy control women, and found that underweight and weight-restored anorexics scored similarly on all subscales of the Multidimensional Perfectionism Scale (MPS; Hewitt & Flett, 1991b); which assesses self-oriented perfectionism, other-oriented perfectionism, and socially-prescribed perfectionism. Specifically, both anorexic groups exhibited elevated scores on self-oriented perfectionism and socially-prescribed perfectionism, and lowered scores on other-oriented perfectionism. So in line with other research, women with eating disturbances (either presently or formerly) tended to set high standards for themselves and tended to believe that others held high standards for them, but they did not tend to hold high standards for others. Findings comparing the anorexic groups to control women indicated that underweight anorexics scored significantly higher than control women on self-oriented and socially-prescribed perfectionism, and weight-restored anorexics scored significantly higher than control women on self-oriented perfectionism. Because the weight-restored anorexics differed significantly from controls only on self-oriented perfectionism, Bastiani et al. (1995) asserted that anorexics experience perfectionism that is primarily *self-imposed*. Additionally, because of the similarities revealed in this study between underweight and weight-restored anorexics,

these findings suggest that perfectionism may be an enduring characteristic that persists in anorexics even after weight restoration.

Finally, Pliner and Haddock (1996) investigated perfectionism and its relationship to weight concern using a technique of experimental goal manipulation. In this study, extremely weight-concerned women and a control group of weight-unconcerned female college students (both groups defined by questionnaire scores) were required to perform a timed task with some performance goal in mind. In two conditions, participants' performance goals were imposed on them by the experimenter and were either unrealistically high (imposed-high condition), or low (imposed-low condition). In a third condition, participants chose a performance goal for themselves (self-defined condition). Participants in the two imposed goal conditions were also asked to indicate their own personal goal for each trial; the discrepancy between the imposed goal and the personal goal indicated the degree to which the participant adhered to the imposed goal. Finally, following task performance, false performance feedback was given to all participants; feedback was either positive (success) or negative (failure). Results of this study indicated that weight-concerned and unconcerned women did not differ in their acceptance of an imposed-low goal, as indicated by the similarity between the low-imposed goal and the corresponding personal goal indicated by all participants. However, weight-preoccupied participants showed a greater tendency to persevere in striving for imposed-high goals, compared to weight-unconcerned participants. Specifically, although all participants in the imposed-high condition initially reported personal goals

that were in accordance with the imposed goals, only weight-concerned women in this condition maintained these unrealistic personal goals over the course of several trials. The weight-unconcerned females, on the other hand, reduced their personal goals over the course of the trials, presumably realizing that the imposed-high goal was unrealistic. Regarding the false feedback, pre- and post- manipulation mood state questionnaires revealed that the effects of the different types of feedback were stronger among the weight-concerned women relative to the weight-unconcerned women. In particular, the former group was more adversely affected by failure feedback and more positively affected by success feedback compared to the control group. These findings present a picture of the weight-concerned female as one who accepts and internalizes the expectations of others even when these expectations are unrealistic, and who is strongly affected by the feedback of others following performance. Based on these results, the authors suggest that the perfectionism experienced in the eating disorders corresponds to Hewitt & Flett's (1991b) *socially-prescribed* perfectionism: the adherence to unrealistic standards believed to be held by others. Also, in the self-defined goal condition in this study, weight-concerned females tended to set lower goals for themselves than did weight-unconcerned females. This finding suggested to the authors that the perfectionism experienced in the eating disorders is *not* of Hewitt & Flett's (1991b) *self-oriented* nature.

Based on these findings, it is evident that a relationship between perfectionism and deviant eating attitudes and behaviours exists and may be further clarified through the use of multidimensional perfectionism. That is, perfectionism conceptualized in this way

may enable a more precise understanding of disordered eating patterns. It seems clear that eating disorder symptomology is *not* related to a tendency to hold high expectations for others, but dietary restraint and related symptoms may coexist in individuals who hold high expectations for themselves (high self-oriented perfectionism) and/or who perceive that others are holding high expectations for them (high socially-prescribed perfectionism). Finally, based on the one study that included a measure of self-presentational perfectionism (Hewitt et al., 1995), eating disturbance may also be related to a need to present an image of oneself that appears perfect (high perfectionistic self-presentation).

Because this collection of research is small, and because only one study exists that includes self-oriented, other-oriented, socially-prescribed, and self-presentational dimensions of perfectionism in relation to eating disorder symptomology, there is a need for additional research to clarify the nature of these relationships. The present study is designed to strengthen this developing body of research. Specifically, the first purpose of this study is to replicate existing research (e.g., Hewitt et al., 1995) investigating self-oriented, other-oriented, socially-prescribed, and self-presentational dimensions of perfectionism in relation to eating disturbance in a university student sample of individuals. Unlike the previous research, however, the present study focuses exclusively on the eating disturbance variable of dietary restraint, and includes in the sample men as well as women. Patterns of perfectionism in relation to dietary restraint among men represents an area not yet researched.

Excessive Exercise

The second purpose of this study concerns excessive exercise, a behaviour that is often seen in individuals with eating disorders. In anorexia, research has demonstrated that a large proportion of patients exercise excessively during the acute phase of the disorder (e.g., Davis, Katzman et al., 1997; Orphanidou, McCargar, Birmingham, & Belzberg, 1997), and although estimates among bulimics are varied, a recent study by Lacombe et al. (1998) suggests that excessive exercise in this population may also be the norm rather than the exception. Excessive exercise is included in the DSM-IV as a diagnostic criteria for the restricting subtype of anorexia nervosa, and it is also mentioned as a means of purging behaviour in bulimia nervosa (APA, 1994).

As early as the 1870's, hyperactivity was described as evident in anorexia (Lasague, 1873 cited in Beumont, Arthur, Russell, & Touyz, 1994; Gull, 1874 cited in Blumenthal, O'Toole, & Chang, 1984), and since this time, many clinicians and authors have advocated the same position (e.g., Janet, 1929 cited in Beumont et al., 1994; Bruch, 1973, 1978; Kron, Katz, Gorzynski, & Weiner, 1978; Katz, 1986; Davis, 1997b). Although the *presence* of physical activity in anorexia has long been acknowledged, the contention that this behaviour occupies a *central* role in the illness is a more recent development. Following a brief look at the literature on regular exercise, excessive exercise will be discussed; focussing on the nature of its relationship to dietary restraint and the basis of its role as a central feature in dieting disorders.

Regular Exercise. Regular exercise is an important part of a healthy lifestyle.

Recognition of the many physical and psychological benefits of exercise has led health and medical professionals to encourage exercise involvement in the general population. As a working definition of 'regular exercise', the American College of Sports Medicine (ACSM, 1998) recommends that 20-60 minutes of continuous or intermittent aerobic exercise, three to five times per week at an intensity at 60-90% of maximum aerobic heart rate is a sufficient minimum to improve cardiorespiratory fitness. Additionally, the ACSM (1998) advocates resistance training and flexibility training for the purpose of maintaining muscular strength, body composition, and flexibility. Participation in these components of physical fitness may yield benefits such as higher aerobic capacity (e.g., Palmer, 1995), increased muscle tone (e.g., ACSM, 1998), and decreased risk of hypertension (e.g., ACSM, 1993 cited in ACSM, 1998), coronary heart disease (e.g., ACSM, 1994 cited in ACSM, 1998) and non-insulin dependent diabetes mellitus (e.g., Depres et al., 1993 cited in ACSM, 1998). Correspondingly, exercise is often implemented as a therapeutic aid in physical illness such as heart conditions, diabetes, and arthritis (de la Torre, 1995).

In addition, exercise can help alleviate unpleasant psychological states including depression (e.g., Gauvin & Spence, 1996; Stephens & Craig, 1990) and anxiety (for a review see Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991) and can increase positive characteristics such as self-esteem (Palmer, 1995). Among Canadians, Stephens and Craig (1990) found a positive relationship between leisure time physical activity and self-reported emotional well-being. Emotional or psychological well-being is a familiar

phrase in the exercise literature, and is broadly conceptualized as a state characterized by a preponderance of positive over negative affect and a general feeling of life satisfaction (Gauvin & Spence, 1996). That physical activity involvement has been shown to be related to such a desirable outcome has provided a strong rationale for the recommendation and encouragement of exercise. And in fact, as a result of the widespread promotion and consistent medical and social approval of regular exercise, there has been some improvement in exercise participation among the general population in recent years (e.g., Stephens & Craig, 1990). Unfortunately, despite this improvement, it is still only a small percentage of the general Canadian population who engage in regular exercise. For example, defining 'active' in terms of overall energy expenditure, Stephens and Craig (1990) classified only one-third of Canadians as living an active lifestyle. Adopting a more stringent definition that requires activity to be *at least moderate* in intensity, only 11% of Canadians qualify as active (Stephens & Craig, 1990).

Excessive Exercise. While the bulk of the physical activity literature addresses physical and psychological correlates of regular exercise, a growing body of research is devoted to what has variously been termed *excessive*, *compulsive*, or *obligatory* exercise. These terms have been used to describe exercise behaviour that far exceeds the 'healthy' level of recommended guidelines, and that is typically accompanied by characteristic attitudes (i.e., cognitions that are similarly excessive in nature). An important implication of 'excessiveness', which adds to the compelling nature of the phenomenon, is that the aforementioned benefits of regular exercise may be compromised when the behaviour

becomes excessive. For example, whereas regular physical activity is associated with reduced use of physician services (Stephens & Craig, 1990), excessive exercise may increase one's risk of illness and injury because of an individual's inability to stop exercising when injured or sick (e.g., Slay, Hayaki, Napolitano, & Brownell, 1998). Also, whereas the positive effects of regular exercise on reduction of anxiety have been widely documented (e.g., Petruzzello et al., 1991), a different pattern seems to develop in excessive exercisers: reduction or cessation of activity in these individuals evokes responses of stress and anxiety. Thus, the very behaviour that is difficult for *most* people to adhere to (regular exercise) is, for a small subset of the population, extremely difficult to modify or reduce. For this reason, exercise in the latter population has been regarded by some authors as an addiction (e.g., Polivy, 1994).

Operational Definition of Excessive Exercise. While the physical activity level of some individuals is clearly *excessive* when compared to that of the general population, it is necessary to objectively define the construct for the purpose of experimental investigation. Studies have generally recognized that there are two important components to excessive exercise. First, the *frequency* of exercise behaviour should be substantially higher than in the general population or relative to the recommended guidelines in order to be considered excessive (Davis, Brewer, & Ratusny, 1993). Second, excessive exercisers are characterized by particular *attitudes and cognitions*; i.e., an inordinate psychological commitment to exercise. This component of the definition is typically assessed using a questionnaire such as the Obligatory Running Questionnaire

(Blumenthal et al., 1984) or the Commitment to Exercise Scale (Davis, Brewer et al., 1993). Items tap 'excessive' thoughts and attitudes such as degree of anxiety when unable to exercise, the degree to which one's self-confidence depends on exercise, an inclination to continue exercising despite injury or illness, and a tendency to prefer exercise over work commitments or family/social engagements.

Excessive Exercise and Dietary Restraint

To relate the discussion of excessive exercise back to the context of dietary restraint, there exists a wealth of literature addressing the relationship between these behaviours. In the general population, strong links exist between exercise and dieting, among various age groups (e.g., Davis, Shapiro, Elliott, & Dionne, 1993), and particularly among women (Davis, Shapiro et al., 1993; Davis, Fox, Cowles, Hastings, & Schwass, 1990). One suggestion for this co-occurrence is that dieting, and more recently exercise, are both highly socially accepted behaviours that are adopted as a means of achieving the coveted slim, fit body (e.g., Davis & Cowles, 1991). In terms of clinical populations, it is clear that the proportion of eating disorder patients who may be considered 'excessive exercisers' is much greater than that in a normal population (Kron et al., 1978). So it appears that the diet-exercise link exhibited in the general population is mirrored, to the extremes, in some eating disorders.

Another perspective on dieting and exercise comes from the Anorexia Analogue Hypothesis, which was put forth in 1983 by Yates, Leehey, & Shisslak to account for apparent similarities between anorexia nervosa and excessive running. The Anorexia

Analogue Hypothesis (AAH) was based on in-depth clinical observation of female anorexia patients and middle-aged male obligatory runners, and asserted that these two populations shared several personality characteristics. In particular, both populations seemed to exhibit perfectionistic tendencies, a diffuse sense of identity, and difficulty expressing anger; and Yates et al. (1983) argued on the basis of these shared characteristics that the underlying etiology of the two conditions might be similar. The compelling nature of this hypothesis, as well as its theoretical relevance, sparked debate and controversy, and incited various attempts at empirical investigation. For example, Blumenthal et al. (1984) compared MMPI profiles of anorexia patients and obligatory runners; these authors reported no basis for the claim that these groups share similar personality profiles. Specifically, whereas 79% of the anorexia group obtained at least one clinical scale in the abnormal range, only 16% of the runners obtained such a score. Similarly, Powers, Schocken, and Boyd (1998) compared 'habitual runners' (male and female) with anorexia nervosa patients on the MMPI and on obsessional and body image indices, and reported that the eating disorder sample had significantly more psychopathology than either group of runners based on significant group differences on all three measures. Finally, Coen and Ogles (1993) took a different perspective on the AAH and compared obligatory and nonobligatory male runners on dimensions specified in the hypothesis to characterize both male obligatory runners and female anorexia patients. These authors reasoned that if obligatory runners and anorexia nervosa patients are similar, then obligatory runners should differ from nonobligatory runners in the same

way that anorexia patients would differ from nonobligatory runners. Findings revealed that obligatory runners scored significantly higher than nonobligatory runners on measures of perfectionism and trait anxiety, but the two groups did not differ on measures of ego identity nor trait anger.

Evidently, most empirical research on the AAH suggested that these two groups have few if any similarities. Additionally, a theme among these studies was the acknowledgment of conceptual difficulties in testing the AAH; in particular, the difficulty comparing two populations who differ in important factors such as age, gender, and social milieu. On the basis of these difficulties and the mostly negative results, the AAH was largely discredited. Nonetheless, Yates et al.'s (1983) ideas encouraged a collection of research on an interesting question, and the lack of support for the hypothesis itself does not refute the current issue of dieting and exercise within the same individual.

As a final perspective on the exercise-diet link, there is a considerable literature devoted to the investigation of eating disorder symptomatology in the context of competitive sport involvement or elite athlete populations. Although there are many differences between competitive sport and recreational sport or exercise, this literature is still relevant and is worth mentioning. Briefly, some studies suggest that competitive sport involvement may place some individuals at increased risk for developing eating disorders. For example, Davis, Brewer et al. (1993) found that the percentage of female athletes classified as 'excessively weight preoccupied' was significantly greater than female non-athletes, and that the former group could be considered at an increased risk

for developing eating disorders. Also, Pasman and Thompson (1988) reported that high intensity female runners exhibited a significantly greater drive for thinness than controls, the implication being that these high-level runners may be more likely than non high-level runners to diet in order to pursue their goal of a slender body. On the other hand, some authors have argued that athletes are at *no* greater risk than non-athletes for developing disturbed eating patterns (e.g., Wilkins, Boland, & Albinson, 1991; Virnig & McLeod, 1996). It is likely that inconsistencies in the research reflect in part the type of sport investigated in these studies; that is, different sports demand different physiques and thus the 'ideal' body type will not be the same for all activities. For example, Davis and Cowles (1989) demonstrated that female athletes who participated in sports that encourage a thin body (e.g., ballet, figure skating, long distance running) showed greater weight concerns, more body dissatisfaction, and more dieting behaviour than female athletes involved in less weight-conscious sports (e.g., field hockey, soccer). Thus, the question of whether athletes are at increased risk for developing disordered eating habits likely cannot be answered in a global manner. The nature of the sport must be considered.

The Nature of the Relationship Between Dieting and Exercise

Despite a few inconsistencies in the literature, it is clear from the above discussion that dieting and exercise tend to co-occur in various populations, share some underlying similarities, and together are the topic of much research. Of relevance to the present study is the picture that has emerged about the nature of the relationship between these

two behaviours in the context of some eating disorders. This position is elaborated in the following paragraphs.

In both the scientific and popular literature, the prevailing view (e.g., Eisler et al., 1990) of eating disorders is that exercise is symptomatic of or secondary to the disorder. According to this view, the behavioural course of an eating disorder begins with dietary restraint, which, when it fails to lead to continued weight loss, is supplemented with exercise. However, more recent research has led some authors to argue against this popular model (e.g., Davis et al., 1994), in favour of an alternative suggestion: that the two behaviours may be *interrelated* (Davis et al., 1994; Epling & Pierce, 1984) in both a psychological and biological manner. There are two main lines of support for this speculation; one from clinical studies of human anorexia patients, and the other from a collection of animal experiments.

Human Research. Clinical investigation of anorexia patients has supported the idea that physical activity may occupy a central role in the disorder. Relevant to this position is evidence pertaining to the prevalence, time of onset, and intensity of excessive exercise behaviour in the anorexic population.

First, as mentioned earlier, excessive or compulsive exercise is exhibited in a majority of anorexia patients. Examples of recent prevalence estimates are 78% among hospitalized anorexia patients (Davis et al., 1994), and 81% among an adult anorexia sample (Davis, Katzman et al., 1997). Such high prevalence rates of this behaviour likely underscore its important role in the disorder.

Second, closer investigation of the physical activity history in anorexia patients has revealed that in many cases, engagement in exercise behaviour apparently *precedes* the initiation of dietary restraint. For example, Kron et al. (1978) reported retrospective data from 33 anorexia patients which revealed that 21 of these individuals (64%) were “extremely physically active” well before they dieted or lost weight. Similarly, Katz (1986) presented two case reports in which long-distance running clearly preceded the appearance of anorexia nervosa and appeared to play an important role in its onset. More recently, Davis, Katzman et al. (1997) found that a significantly greater number of anorexia patients were initially involved in regular exercise prior to dieting than the proportion who dieted first.

Finally, research has suggested that the amount and intensity of physical activity typically reach a peak during an acute phase of anorexia nervosa. In other words, the period of most restrictive dieting and greatest weight loss coincides with the period of greatest energy output through excessive exercise. To illustrate this finding, Davis et al. (1994) showed that 75% of a hospitalized eating disorder sample reported that physical activity levels steadily increased during the period when calorie intake and body weight decreased the most. In a later study, Davis, Katzman et al. (1997) reported that 81% of adult anorexia patients were excessive exercisers during the acute phase of the disorder.

These findings present a clinical picture of anorexia that clearly implicates a central role for physical activity behaviour in the course and possibly etiology of the disorder. This position is further clarified when one considers the counterintuitive nature

of the anorexic behaviour profile. That is, extreme dietary restriction and excessive energy output are biologically incompatible behaviours. Indeed, the typical human response to circumstances of starvation includes lethargy and *hypoactivity* (Keys, 1950 cited in Davis, Kaptein, Kaplan, Olmsted, & Woodside, 1998). The counterintuitive nature of the anorexia profile lends itself well to a body of animal research, as discussed next.

Animal Models. Insight into a possible biological connection between exercise and self-starvation has emerged from a collection of animal research that has consistently demonstrated the development of excessive exercising in response to food restriction. This experimental protocol, first exhibited in the 1960's, operates as follows. Laboratory rats on a food deprivation schedule are given voluntary access (experimental condition), or no access (control condition) to a running wheel. In the original experiment (Routtenberg & Kuznesof, 1967), experimental rats showed a strong increase in physical activity over the course of the experiment; this increase was almost directly proportional to a decrease in food intake and body weight. All control animals maintained their body weight and lived; while all experimental animals lost weight and died, literally running themselves to death.

The similarity between this self-starvation phenomena in laboratory animals and the behaviour in anorexia patients is striking. However, although the animal research has existed for 30 years, recognition of its relevance as an animal model for human anorexia is relatively recent. A comprehensive model of this disorder, based on the notion of

activity-based anorexia (Epling, Pierce, & Stefan, 1983) and elaborated by inclusion of psychological and social variables, is the topic of this final section.

The Biopsychosocial Nature of Anorexia

A comprehensive model of the etiology and course of anorexia draws from a number of sources. First, the biobehavioural model of activity-based anorexia (Epling & Pierce, 1988) represents a direct extrapolation from the animal literature to the human clinical population. This model, therefore, emphasizes the role of physiological mediators that perpetuate the diet-exercise cycle, once the cycle is adopted. Such mediation, originally ascribed to the beta-endorphins (Epling & Pierce, 1988), is now generally attributed to disruption in serotonin neurotransmitters (e.g., Aravich, Doerries, & Rieg, 1994 cited in Davis, 1997b). To account for the initiation of dieting and exercise in the first place, this biobehavioural model implicates cultural practices which familiarize and condone these behaviours (Epling & Pierce, 1988).

Psychosocial and personality variables can then fill in some gaps in the biobehavioural model. For example, dieting and exercise are highly socially approved behaviours. Both imply such desirable attributes as health, self-discipline, and caring for one's body; hence, adopting one or both of these behaviours is viewed as commendable. Moreover, the potential outcomes of dieting and exercising (e.g., healthier appearance, weight loss) are likely to elicit positive social reinforcement. So in a sociocultural context that rewards engagement in these activities as well as the outcomes they elicit, it is easy to see how and why an individual might initially begin and continue to diet and

exercise.

An individual who adopts one of these behaviours (either dieting or exercising) is at an increased likelihood of adopting the other (e.g., Davis, Shapiro et al., 1993). Regarding the mechanism of this increased likelihood, one suggestion concerns an individual's level of body focus. For example, Katz (1986) has proposed that initiation of an exercise regime may lead to an increase in body focus or critical interest in one's body, presumably because the physical demands of exercise commands greater attention to the condition of one's body. Davis et al. (1990) expanded on Katz's (1986) idea to suggest that such critical interest can lead to dissatisfaction with one's appearance and a desire to lose weight (Davis et al., 1990). In this way, narcissistic body focus is elemental in perpetuating involvement in both dieting and exercise. This perspective is consistent with suggestion that dieting and exercise share a 'central narcissistic dynamic' that is driven by an element of perfectionism (Sacks, 1987 cited in Davis, Brewer et al., 1993), and is supported by empirical findings that females who engaged in regular exercise exhibited greater body narcissism and reported that their physical appearance was more important to their self-esteem, relative to female non-exercisers (Davis, 1990a).

Finally, personality variables can play a role at any point mentioned above. First, it is clear that certain traits which are known to be related to eating pathology (e.g., obsessive-compulsiveness, Davis, Kennedy et al., 1995; perfectionism, Bruch, 1978; narcissism, Davis, Claridge, & Cerullo, 1997; and low self-esteem, Butow et al., 1993) can exacerbate an individual's response to social and cultural influences. Second, these

traits will likely affect the degree to which an individual will develop a critical interest in his or her body. Third, personality variables will probably play a role in dictating the degree to which an individual will diet and the intensity with which he or she will exercise in the first place.

In this context, the second purpose of this study is to isolate three variables in the above sequence of events (dietary restraint, excessive commitment to exercise, and the personality variable perfectionism) and examine whether the prediction of dietary restraint by perfectionism is moderated and/or mediated by excessive commitment to exercise. Moderation would suggest that the perfectionism-dietary restraint relationship differs at different levels of excessive commitment to exercise; whereas mediation would indicate that the perfectionism-dietary restraint relationship is actually attributable to excessive commitment to exercise.

Hypothesized Relationships

Because of the consistent and possibly enduring presence of perfectionism in the eating disorders, and because of the central role of excessive exercise in this population, these variables will be investigated for independent, interactive, and indirect prediction of dietary restraint among a university student sample of men and women.

Perfectionism and Dietary Restraint. It has been demonstrated repeatedly that perfectionism as a unidimensional variable exists among eating disorder patients and among nonclinical individuals who exhibit eating disorder-like characteristics. The few existing studies that have investigated multidimensional perfectionism and eating

disorder symptomology have suggested that eating pathology in females is positively associated with self-oriented perfectionism (Hewitt et al., 1995; Bastiani et al., 1995), socially-prescribed perfectionism (Hewitt et al., 1995; Pliner & Haddock, 1995), self-presentational perfectionism (Hewitt et al., 1995), but *not* with other-oriented perfectionism (Hewitt et al., 1995; Bastiani et al., 1995). Therefore, in the present study we expect to see significant independent prediction of dietary restraint by self-oriented perfectionism, self-presentational perfectionism, possibly socially-prescribed perfectionism, but not other-oriented perfectionism, among female participants. Because these variables have not been investigated among male participants, this part of the study is exploratory and we have no specific hypotheses.

Excessive Exercise and Dietary Restraint. A large body of literature supports the existence of a strong positive relationship between dietary restraint and exercise, both in the general population (e.g., Davis, 1990; Pasman & Thompson, 1988), and among clinical populations (e.g., Kron et al., 1978; Davis et al., 1994). Thus, we expect that excessive commitment to exercise will emerge as a significant independent predictor of dietary restraint among both men and women in the present sample, possibly with a larger effect among female participants. It is also expected that this pattern will emerge when perfectionism is controlled, arguably a more stringent test of the diet-exercise relationship.

Moderation/Mediation. Finally, taking into consideration the multifaceted etiology of eating disorders and deviant eating patterns, we expect that perfectionism and

excessive commitment to exercise will have a combined effect in the prediction of dietary restraint. This hypothesis is consistent with a recent study which found that the degree of perfectionism and of obsessive-compulsive personality characteristics among anorexia patients was moderated by excessive exercise (Davis et al., 1998). Specifically, it is predicted that those dimensions of perfectionism that emerge as significant, independent predictors of restraint will interact with excessive commitment to exercise variables such that at high levels of the exercise variable, the perfectionism dimensions will exhibit enhanced prediction of the dietary restraint variable. Moreover, this interactive relationship should hold for both men and women in the sample.

In addition to this moderation analysis, mediation analysis will be used to investigate the possibility of indirect prediction of dietary restraint by these two variables. In line with models implicating exercise as preceding and possible invoking dietary restraint, we hypothesize that our exercise commitment variable will mediate the relationship between perfectionism and dietary restraint. Such a finding lends support to the contention that exercise precedes dieting, although the cross-sectional nature of our data would preclude such conclusions.

Method

Participants

Questionnaire data was obtained from 455 (152 male, 269 female) university or college students, representing a range of cultural and ethnic backgrounds. Participants were enrolled in either Psychology or Exercise Science undergraduate courses at Concordia University or Vanier Cegep. The mean age for female participants was $M = 22.17$ years ($SD = 4.85$ years), and the mean age for male participants was $M = 21.63$ years ($SD = 4.78$ years). Other participant characteristics are summarized in Table 1.

Measures

Multidimensional Perfectionism. Three dimensions of perfectionism were assessed using the Multidimensional Perfectionism Scale (MPS; Hewitt & Flett, 1991b). The MPS is a 45-item measure of self-oriented perfectionism (e.g., “one of my goals is to be perfect in everything I do”), other-oriented perfectionism (e.g., “I have high expectations for the people who are important to me”), and socially-prescribed perfectionism (e.g., “my family expects me to be perfect”). Participants make responses on a seven-point scale anchored by ‘Disagree’ (1) and ‘Agree’ (7). Several items are reverse scored, and the subscales are scored such that higher scores reflect greater perfectionism. Additional sample items from the Multidimensional Perfectionism Scale are presented in Appendix B.

In scale development of the MPS, subscales were established on the basis of a principal-components factor analysis, which resulted in emergence of three factors which

Table 1

Participant Characteristics, Listed Separately for Males and Females

Characteristic	Males ($\underline{n} = 152$)		Females ($\underline{n} = 269$)	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
Age (years)*	21.63	4.78	22.17	4.85
Height (metres) ^a	1.78	0.08	1.65	0.07
Weight (kilograms) ^b	78.08	15.76	61.43	11.47
Body Mass Index (BMI; kg/m ²) ^c	24.44	4.00	22.54	4.12

^amale > female: $t_{(419)} = 18.48, p < .00$

^bmale > female: $t_{(419)} = 12.45, p < .00$

^cmale > female: $t_{(419)} = 4.61, p < .00$

*for age variable, values for females are based on $\underline{n} = 265$ and values for males are based on $\underline{n} = 150$

First Language	Males ($\underline{n} = 150$)		Females ($\underline{n} = 255$)	
	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>
English	86	57%	144	56%
French	30	20%	60	24%
Other	34	23%	51	20%

together accounted for 36% of the variance (Hewitt & Flett, 1991b). In this original study, the first factor (self-oriented items) had factor loadings ranging between .45 and .66; the second factor (socially-prescribed items) had a range of factor loadings from .39 to .63, and the third factor (other-oriented items) loadings ranged from .38 to .63.

Several studies have indicated that the MPS dimensions are reliable and valid in both clinical (e.g., Hewitt, Flett, Turnbull-Donovan, & Mikail, 1991) and nonclinical (Hewitt & Flett, 1991b) populations. In one preliminary study, Hewitt and Flett (1991b) report internal consistency values among a nonclinical sample as follows: Cronbach's $\alpha = .86$ for self-oriented perfectionism, $\alpha = .82$ for other-oriented perfectionism, and $\alpha = .87$ for socially-prescribed perfectionism. The temporal stability of the dimensions (over a three-month period) was demonstrated with test-retest coefficients of $r = .88$ for self-oriented perfectionism, $r = .85$ for other-oriented perfectionism, and $r = .75$ for socially-prescribed perfectionism (Hewitt & Flett, 1991b).

Construct validity of the MPS in a nonclinical population was evaluated using a sample of 104 students (Hewitt & Flett, 1991b) who completed the MPS along with various personality and psychopathology measures. These analyses revealed the following correlations (among others): self-oriented perfectionism was significantly and positively correlated with high standards, self-criticism, and self-blame; other-oriented perfectionism was positively correlated with authoritarianism, narcissism, and dominance; and socially-prescribed perfectionism was positively correlated with fear of negative evaluation. Finally, there is evidence that the MPS subscales are not influenced

significantly by response biases among either college students or clinical patients, as indicated by low correlations between the MPS and the Marlowe-Crown Social Desirability Scale (Hewitt & Flett, 1991b).

Perfectionistic Self-Presentation. Perfectionistic Self-Presentation was assessed using the Perfectionistic Self Presentation Scale (PSP; Hewitt, Flett, & Fairlie, 1994 cited in Hewitt et al., 1995). The PSP is a 27-item questionnaire assessing three dimensions of perfectionistic self-presentation: need to appear perfect, need to avoid appearing imperfect, and need to avoid disclosure of imperfections. Like the MPS, responses to the PSP are made on a seven-point scale anchored by 'Disagree' (1) and 'Agree' (7). Several items are reverse-worded, and the subscales are scored such that higher scores reflect greater self-presentational perfectionism. Examples of items from the PSP are provided in Appendix C.

Although psychometric data on the PSP has not been published, the authors of this scale make reference to at least one study that evaluates the tenability of the three subscales (Hewitt, Flett, & Fairlie, 1994 cited in Hewitt et al., 1995). Specifically, these authors report that “. . . [r]esearch in the development of the Perfectionistic Self-Presentation Scale . . . has confirmed that individual differences in perfectionistic self-presentation can be reliably assessed and that the construct encompasses three major components” (Hewitt et al., 1995, p. 318).

Dietary Restraint. Dietary restraint was assessed using the Restraint Subscale of the Dutch Restraint Scale (Van Strein, Frijters, Bergers, & Defares, 1986). This scale

consists of 10 items that refer specifically to dieting behaviour (e.g., “If you have put on weight, do you eat less than you usually do?”), for which responses are made on a five-point scale anchored by ‘Never’ (1) and ‘Very Often’ (5). The Restraint Subscale from the Dutch Restraint Scale is presented in Appendix D.

Psychometric evaluation of the Dutch Restraint Scale - Restraint Subscale has indicated that among a nonclinical student sample, the DRS yielded a high test-retest reliability coefficient ($r = .91$), and good internal consistency (Cronbach’s $\alpha = .95$; Allison, Kalinsky, & Gorman, 1992). Also, factor analysis indicated a single dominant factor that accounted for 68.2% of the variance of the scale (Allison et al., 1992), and this factor structure appears stable across genders, weight categories, and random samples (Allison et al., 1992). Earlier in the review of literature, it was mentioned that various restraint scales differ with respect to whether they tap typical dieting (i.e., diet-disinhibition pattern) versus successful dieting. The Dutch Restraint Scale used here is considered to tap *successful* dieting behaviour, based on the scale’s strong inverse relationship with caloric intake (Laessle, Tuschl, Kotthaus, and Pirke, 1989).

Excessive Commitment To Exercise. Excessive commitment to exercise was measured using the Commitment to Exercise Scale (CES; Davis, Brewer et al., 1993). The 8-item CES assesses an individual’s psychological commitment to the activity of exercising. It assesses the degree to which feelings of well-being are influenced by exercising (e.g., “Does it upset you if, for one reason or another, you are unable to exercise?”), the degree to which adherence to exercise is maintained in the face of various

adverse conditions (e.g., “Do you continue to exercise at times when you feel tired or unwell?”), and the extent to which one’s exercise regimen interferes with social commitments (e.g., “Are there times when you turn down an invitation to an interesting social event because it interferes with your exercise schedule?”). Extent of agreement with items is indicated by responding with a rating on a 5-point Likert scale anchored by “Never” (1) and “Always” (5). The Commitment to Exercise Scale is presented in Appendix E.

Scale development and psychometric evaluation of the Commitment to Exercise Scale is provided by Davis, Brewer et al. (1993). In this original study, factor analysis using oblique rotation revealed two moderately correlated ($r = .42$) factors to the scale: an *obligatory* aspect of exercising (i.e., psychological well-being is contingent upon strict adherence to a structured exercise schedule), and a *pathological* aspect of exercising (i.e., exercise is continued even throughout injury or illness and takes priority over social components of one’s life). A Cronbach’s alpha coefficient of .77 for the entire scale indicated reasonable internal consistency. Construct validity of the Commitment to Exercise Scale was supported by findings that weight preoccupation was related to both factors of the CES in both men and women, and that obsessive-compulsiveness was positively related to the “obligatory” factor of the CES and to the total scale among men (Davis, Brewer et al., 1993).

Exercise Intensity/Frequency. Because the Commitment to Exercise Scale assesses an individual’s psychological commitment to exercise, we were interested in

examining behavioural characteristics of excessive exercise: intensity/frequency.

Excessive exercise intensity/frequency was measured using the Stanford Usual Physical Activity Questionnaire (UPAQ); (Medicine and Science in Sports and Exercise [MSSE], 1997). The UPAQ items specify various strenuous exercise regimes (e.g., jog or run at least 10 miles a week; ride a bicycle at least 50 miles per week; play strenuous sports (basketball, soccer, etc.) at least 5 hours a week). In the current version, respondents were asked to indicate whether they “usually avoid”, “make no effort to avoid or to participate”, or “usually participate in” each of these regimes, rather than simply checking off activities engaged in as they did as in the original version of the UPAQ (MSSE, 1997). For the purposes of ongoing research, we wanted a finer distinction between not participating in an activity and deliberately avoiding an activity.

We created a variable whose value represents the sum of the “usually participate in” responses. The range of values on this new variable was 0 - 5, with higher values corresponding to participation in a greater number of strenuous exercise regimes each week. The maximum score on this variable, or the maximum amount of participation, equalled the number of items in the UPAQ questionnaire (five). Pearson correlations indicate that this intensity/frequency variable is positively correlated with excessive attitudes to exercise measured by the Commitment to Exercise Scale (males: $r = .396$, $p < .001$; females: $r = .359$, $p < .001$).

Body Mass Index. BMI (weight [kg] / height² [m]) was calculated for each participant to obtain a single measure of body size. The calculation was based on height

and weight values provided by participants on a general information sheet. While BMI is a popular measure of obesity because of its simplicity (Kraemer, Berkowitz, & Hammer, 1990 cited in Davis, Durnin, & Elliott, 1995), it has been shown to produce error in the assessment of fatness in any single individual (Garn & Hawthorne, 1986 cited in Davis, Durnin et al., 1995). As a general guideline, however, a BMI greater than 25 kg/m² may be considered overweight, a BMI less than 20 kg/m² can be considered underweight, and BMI values in between are in the normal weight range.

Procedure

All questionnaires were completed individually in lecture halls, during class time. After receiving procedural instructions, participants provided written informed consent and filled out the questionnaire packages. These data were collected as part of a larger-scale study on eating and exercise attitudes and behaviours, and a variety of other psychological variables. Participants were advised that participation in the study was voluntary and that they could withdraw at any time. Those individuals who expressed interest in receiving information about eating disorders were given a reference list of community services available, following completion of the questionnaires.

Analyses

Data Screening. Prior to analyses, dietary restraint, excessive commitment to exercise, self-oriented perfectionism, other-oriented perfectionism, socially-prescribed perfectionism, and self-presentational perfectionism were examined through various SPSS.PC programs for accuracy of data entry, missing values, and existence of univariate

and multivariate outliers.

Extreme z scores indicated the following potential univariate outliers: five males with very high scores on dietary restraint, and two males and one female with very low scores on other-oriented perfectionism. The criteria used to determine univariate outliers was a compromise of two considerations: first, a z score value of 3 and greater; and second, whether a score or scores were 'separate' or disjointed from the rest of the histogram (both recommended by Tabachnick and Fidell, 1996). For each univariate outlier, the score was changed to equal the next most extreme score so that the impact of these deviant scores was reduced. Multivariate outliers were identified using Mahalanobis distance statistic through SPSS Regression. Using Mahalanobis distance with $p < .001$ (Tabachnick & Fidell, 1996), three cases were identified as multivariate outliers across the entire sample: two were males (1.3% of male sample)¹; and one was female (0.4% of the female sample)². Analyses were run both with and without these univariate and multivariate outlying cases, and differences that emerged as a function of inclusion or exclusion are indicated in the results.

All analyses were conducted only on participants who had no missing data on

¹Case 484 (male) had very high scores on socially-prescribed perfectionism ($z = 2.86$), and perfectionistic self-presentation ($z = 2.93$). Case 214 (male) had a very high score on perfectionistic self-presentation ($z = 2.22$), along with very low scores on other-oriented perfectionism ($z = -3.21$), self-oriented perfectionism ($z = -2.03$), and excessive exercise ($z = -2.09$).

²Case 281 (female) had very high scores on self-oriented perfectionism ($z = 2.27$) and other-oriented perfectionism ($z = 2.30$), along with a relatively low score on excessive exercise ($z = -1.98$).

body mass index, dietary restraint, excessive commitment to exercise, self-oriented perfectionism, other-oriented perfectionism, socially-prescribed perfectionism, and perfectionistic self-presentation. Thus, listwise deletion was used to eliminate cases with missing values on one or more of these variables. This resulted in elimination of 34 participants; 14 males and 20 females. The reason for this seemingly high elimination had to do with time constraints in some lecture halls; that is, some sessions did not allow sufficient time for all participants to finish the package. The variable that most often contributed to incomplete data was the Perfectionistic Self-Presentation Scale, which was located at the end of the questionnaire package (11 males and 13 females were missing scores on this variable), but t-tests for missing versus non-missing values on the PSP for both males and females revealed no differences on the dietary restraint variable (the criterion) as a function of this missing data; males: $t_{(164)} = .678$, $p = .499$ and females: $t_{(287)} = 1.268$; $p = .206$. It should be mentioned that although the order of the questionnaires used in this study was not counterbalanced, the entire questionnaire package (from the larger-scale study, of which the present study was a part) was compiled randomly. That is, the entire package included several measures each of eating behaviour, exercise behaviour, and psychosocial variables, and these three categories of measures were intermixed within the package. So even though the order of the questionnaires used in this study was dietary restraint, followed by excessive commitment to exercise, followed by perfectionism for all participants, there were other eating, exercise, and psychosocial variable questionnaires randomly placed among these. So this

lack of counterbalancing was not considered to be a problem.

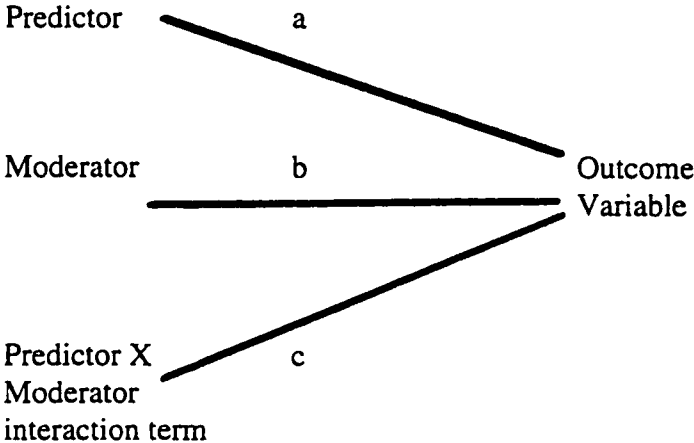
Due to extreme non-normality (positive skewness) of the dietary restraint data among the male participants, this variable was subjected to an inverse transformation (Tabachnick & Fidell, 1996). This procedure improved the distributional characteristics of dietary restraint, and resulted in better adherence to assumptions of multiple regression. Analyses were run with both transformed and untransformed data; again, differences arising as a function of transforming or not transforming are noted in the results.

Finally, to eliminate potential multicollinearity between main effect terms and interaction terms, all predictor variables were centered prior to analyses. This procedure also facilitates interpretation of the regression coefficients (Aiken & West, 1991) in the case of an interaction or moderation effect.

Multiple Regression Analyses - Moderation. The multiple regression approach to testing for moderation (Baron & Kenny, 1986) was used to examine the independent and interactive prediction of dietary restraint by perfectionism and excessive attitudes toward exercise. The properties of this moderational model are diagrammed in Figure 1. In this model, there are three direct paths that lead to the outcome or criterion variable: *path a* concerns the independent prediction by the independent variable of the outcome measure, *path b* involves the independent prediction by the moderating variable of the criterion, and *path c* represents the impact of the interaction of these two variables on the criterion. *Paths a* and *b* represent main effects, whereas *path c* is the interaction that, if

Figure 1

Diagrammatic Representation of Moderational Model



significant, supports a moderator hypothesis.

According to Baron and Kenny (1986), testing a moderator hypothesis involves assessing the differential effect of the independent variable on the criterion variable as a function of the moderator, which is expressed through statistical significance of the interaction term. When a linear effect of the moderator is assumed, the model in Figure 1 is expressed mathematically as a regression equation that includes as predictors the independent variable, the moderator, and the product of the moderator and the continuous independent variable; each of which is entered separately into the equation. That is, if the independent variable is denoted X , the moderator as Z , and the criterion variable as Y , then the analysis involves regressing Y on X , Z , and XZ . The significance of XZ indicates the presence of a moderating effect.

In the present study, the perfectionism dimensions are the predictors, excessive commitment to exercise is the hypothesized moderator, and dietary restraint is the criterion or outcome variable. Each of the four perfectionism dimensions (self-oriented perfectionism, other-oriented perfectionism, socially-prescribed perfectionism, and perfectionistic self-presentation) were tested for independent prediction of dietary restraint as well as for interaction with excessive commitment to exercise in the prediction of dietary restraint. As described above, this involved regressing the dietary restraint mean score on the mean score for the particular perfectionism dimension, followed by regression of dietary restraint on the excessive commitment to exercise mean score, followed by regression of dietary restraint on the product of the perfectionism

dimension and excessive commitment to exercise. This procedure enabled estimation of perfectionism main effects, excessive commitment to exercise main effects, and perfectionism - excessive commitment to exercise interactive effects, respectively. A statistically significant interaction would indicate that the relationship between perfectionism and dietary restraint is not uniform across all levels of excessive commitment to exercise; alternatively, that the relationship between excessive commitment to exercise and dietary restraint is not constant at different levels of perfectionism.

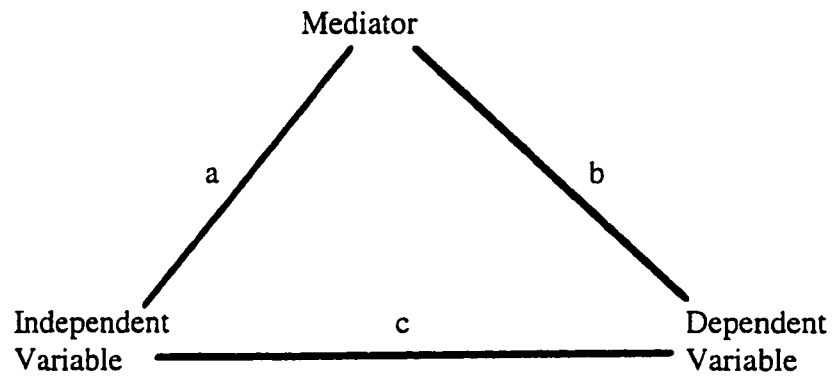
Multiple Regression Analyses - Mediation. Also of interest was the possible presence of a mediational relationship among the variables; a mediation analysis was thus conducted using multiple regression (Baron & Kenny, 1986). So, for each dimension of perfectionism, regression equations were used to assess whether excessive commitment to exercise mediated the relationship between that particular dimension of perfectionism and dietary restraint. In general terms, the presence of a statistically significant mediating variable implies that the relationship between the independent variable and dependent variable is indirect; that is, the mediating variable accounts for the relation between the predictor (IV) and criterion (DV).

To clarify the nature of mediation, a diagram is provided in Figure 2a. The diagram includes three variables, and indicates that there are two causal paths leading to the dependent variable: the direct effect of the independent variable (*path c*) and the direct path from the mediator (*path b*); in addition to a path from the independent variable

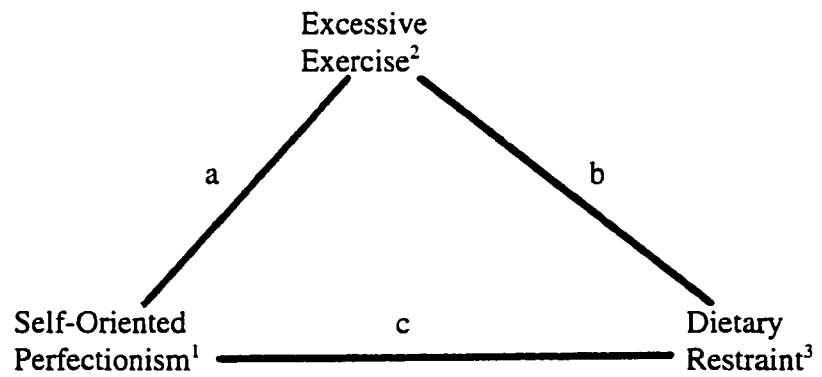
Figure 2

Diagrammatic Representation of Mediational Model (a), and Example of Mediational Model using Self-Oriented Perfectionism (b)

a)



b)



¹ Independent Variable

² Mediator

³ Outcome Variable

to the mediator (*path a*).

Baron and Kenny (1986) state that in order to establish mediation, the following conditions (which correspond to four regression equations) must hold: First, the independent variable must account for significant variance in the dependent variable (i.e., significance of *path c*). Second, the mediator must account for significant variance in the dependent variable (i.e., significance of *path b*). Third, the independent variable must account for significant variance in the mediator (i.e., significance of *path a*). Finally, when the dependent variable is regressed on the independent variable and mediator simultaneously, the IV-DV relationship should no longer emerge as significant; alternatively, this path should show a significant reduction from its value in the first equation (i.e., significant reduction in *path c* when both independent variable and mediating variable are included in the equation).

Regarding the gender variable, males and females were analysed separately throughout all procedures. This decision for separate analyses was based on theoretical and statistical criteria. First, the variables involved in the analyses are ones for which males and females have consistently shown differences. For example, females are much more likely to diet than males (e.g., Rodin et al., 1984); and some studies have indicated that males tend to be more physically active than females (e.g., Lee & White, 1997). Second, the inclusion of gender as a dummy-coded moderating variable leads to the unwieldy statistical situation of dealing with three-way interactions, detection of which demands a very large sample size in order to have sufficient power.

Results

Psychometric Qualities of Scales

Internal Consistency. Table 2 presents the internal consistency values, expressed as Cronbach's alpha coefficients, for all variables listed separately for males, females, and the total sample.

The internal consistency value for the Commitment to Exercise Scale in the present study was $\alpha = .88$ for females ($n = 268$), males ($n = 152$), and the total sample ($n = 420$). This value indicates greater internal consistency than the value of $\alpha = .77$ reported by the authors of the scale (Davis, Brewer et al., 1993), which was obtained using a sample of $n = 88$ males and $n = 97$ females.

The internal consistency values for the Restraint subscale of the Dutch Restraint Scale in the present study were as follows: $\alpha = .93$ (females; $n = 260$), $\alpha = .90$ (males; $n = 142$), and $\alpha = .94$ (total sample; $n = 402$). These values are just slightly lower than those reported in a psychometric evaluation of the Dutch Restraint Scale (Allison et al., 1992).

The self-oriented perfectionism subscale in the present study yielded the following internal consistency values expressed as Cronbach's alpha statistics: $\alpha = .90$ (females; $n = 258$), $\alpha = .84$ (males; $n = 145$), and $\alpha = .88$ (total sample; $n = 403$). These values are reasonable when one considers the internal consistency values obtained by the authors of this scale; for example, Hewitt & Flett (1991b) reported $\alpha = .86$ among a sample of 156 students; and $\alpha = .89$ among a different sample of 1106 students.

The Cronbach's alpha values obtained for the socially-prescribed perfectionism

Table 2

Internal Consistency Values; Listed Separately for Males, Females, and Total Sample

Scale/Subscale	Male		Female		Total	
	α	n	α	n	α	n
Dutch Restraint Subscale	.90	155	.93	280	.93	435
Commitment to Exercise Scale	.88	163	.88	283	.88	446
MPS (Self-Oriented Perfectionism)	.86	150	.90	268	.89	418
MPS (Other-Oriented Perfectionism)	.76	149	.67	267	.71	416
MPS (Socially-Prescribed Perfectionism)	.80	148	.84	268	.83	416
Perfectionistic Self-Presentation (PSP)	.93	144	.93	254	.93	398
PSP (Need to Appear Perfect)	.86	149	.89	266	.88	415
PSP (Avoid Appearing Imperfect)	.87	152	.87	268	.87	420
PSP (Avoid Disclosure of Imperfections)	.80	152	.79	269	.79	421

subscale were as follows: $\alpha = .84$ (females; $n = 260$), $\alpha = .80$ (males, $n = 144$), $\alpha = .83$ (total sample, $n = 404$). For this subscale, Hewitt & Flett (1991b) reported the following internal consistency values: $\alpha = .87$ among a sample of $n = 156$ students, and $\alpha = .86$ among $n = 1106$ students.

Finally, the other-oriented perfectionism subscale in the present study showed the least internal consistency of the three subscales, as apparent from the following Cronbach's alpha statistics: $\alpha = .67$ (females; $n = 257$), $\alpha = .75$ (males; $n = 145$), and $\alpha = .71$ (total sample, $n = 402$). To compare, Hewitt & Flett (1991b) presented the following values: $\alpha = .82$ among a sample of $n = 156$ students, and $\alpha = .79$ among a sample of $n = 1106$ students. Although the values obtained in this study are lower than those obtained by Hewitt & Flett (1991b), it is important to note that in both cases it was the other-oriented perfectionism subscale that emerged as the least internally consistent of the three subscales. In any case, the values obtained in the present study are not unreasonably low as to cause concern.

The perfectionistic self-presentation scale (PSP) was shown to have good internal consistency in the present study: Cronbach's $\alpha = .94$ for females ($n = 248$), $\alpha = .93$ for males ($n = 141$), and $\alpha = .93$ for the total sample ($n = 389$). Because at present there are no published reports of psychometric data on the PSP, these obtained alpha values cannot be compared to any existing data. The authors of the PSP report that the scale has three subscales, including the need to appear perfect, need to avoid appearing imperfect, and the avoidance of disclosure of imperfections. The Cronbach's alpha statistics for these

three subscales are reported in Table 2. The decision was made in the present study to disregard the three subscales and to treat perfectionistic self-presentation as a unidimensional construct because the subscale dimensions (need to appear perfect, need to avoid appearing imperfect, and avoidance of disclosure of imperfections) are intuitively very similar; additionally, correlations among these subscales were extremely high (pearson r range: .58 to .72).

Factor Analysis. Factor analyses were conducted for the Multidimensional Perfectionism Scale, the Perfectionistic Self-Presentation Scale, and the Commitment to Exercise Scale; the three measures that claim to assess more than one dimension of the particular construct. Missing values were dealt with using listwise deletion; thus, the data used in each factor analysis consisted of all males and females with complete data on the measure in question.

We conducted a principal components factor analysis with orthogonal (varimax) rotation for the Multidimensional Perfectionism Scale. In the initial analysis, 10 factors emerged with eigenvalues greater than 1. Rotation and specification of a three-factor solution produced factors that accounted for 15%, 13%, and 7% of the variance, respectively. Factor 1 loaded on 14 of the 15 self-oriented perfectionism items, with loadings for these items ranging from .33 to .77. Factor 2 loaded on 13 of the 15 socially-prescribed perfectionism items, with loadings for these items ranging from .32 to .70. Factor 3 loaded on 11 of the 15 other-oriented perfectionism items, with loadings for these items ranging from .25 to .58. Factor 1 also consisted of two items from the

socially-prescribed perfectionism scale (loadings = .17 and .40); factor 2 also included four items from the other-oriented perfectionism scale (loadings = .27 to .48), and factor 3 included one item from the self-oriented perfectionism scale (loading = .36). Use of an oblique rotation strategy did not reduce the number of cross-loadings; thus, the decision was made to report results from the orthogonal analysis. Also, the oblique solution revealed that correlations among factors were low (less than .2 in all cases), and therefore orthogonal rotation is appropriate for this data (Tabachnick & Fidell, 1996). Because the factor structure of the MPS bore reasonable resemblance to that obtained by the authors of the scale (Hewitt & Flett, 1991b), and because the three subscales intuitively measure different aspects of perfectionism that are interesting and relevant in the present context, the structure of the MPS subscales as designed by the authors was retained.

Principal components factor analysis was also conducted with data from the Perfectionistic Self-Presentation Scale. An oblique (oblimin) rotation strategy indicated that when three factors were specified, correlations among these factors exceeded $r = .34$ in all cases. According to Tabachnick and Fidell (1996), a situation in which factor correlations exceed $r = .32$ indicates sufficient overlapping variance to choose an oblique rotation strategy. Using this strategy, we found that the three subscales proposed by the authors of the scale emerged with reasonable clarity in the present sample (i.e., only two items cross-loaded). However, closer inspection of the analyses indicated that among the male sample, the emergence of the three factors was much less clear (i.e., two subscales were indistinguishable). So, as mentioned above, the decision was made to view

perfectionistic self-presentation as a unidimensional construct for our purposes. In addition, the proposed subscales (need to appear perfect, avoid appearing imperfect, and avoid disclosure of imperfections) show much overlap when evaluated statistically, and do not intuitively seem very distinct; that is, it is difficult to imagine an individual who expresses a needs to appear perfect yet does not also express a need to avoid appearing imperfect. Given the hypotheses and analytical techniques of our study, it seemed that such a fine distinction between ‘aspects’ of perfectionistic self-presentation was inappropriate.

Finally, an oblique (oblimin) principal components analysis of the Commitment to Exercise data indicated that the two specified factors correlated highly ($r = .54$) enough to select this rotation strategy over an orthogonal one (Tabachnick & Fidell, 1996). Pattern coefficients indicated that the eight items on this scale loaded reasonably well on the two factors specified by the authors (Davis, Brewer et al., 1993). Specifically, factor 1 consisted of four items from the obligatory subscale and one item from the pathological subscale (loading values = .53 to .90), and factor 2 consisted of three items from the pathological subscale (loading values = .50 to .96). However, the pearson correlation of $r = .74$ between the two factors (compared to inter-factor correlation of $r = .42$ obtained by the authors of the scale; Davis, Brewer et al., 1993), led to the decision to treat Commitment to Exercise as a unidimensional construct for the following analyses in this study.

Descriptive Statistics

Table 3 presents the means and standard deviations for all variables used in the analyses, listed separately for males and females. Notably, the mean values for the MPS subscales (self-oriented, other-oriented, and socially-prescribed perfectionism) were similar to other reports from other nonclinical samples (e.g., Hewitt & Flett, 1991b). As evident from Table 3, males scored significantly higher than females on other-oriented perfectionism ($t_{(419)} = 2.92, p < .005; E.S. = .29$); in other words, males in the sample were more likely to hold very high expectations for others relative to females. This finding is consistent with other studies using student samples (e.g., Hewitt & Flett, 1991b). Males also scored significantly higher than females on socially-prescribed perfectionism ($t_{(419)} = 2.72, p < .01; E.S. = .28$). On the other hand, females scored significantly higher than males on dietary restraint ($t_{(419)} = 8.67, p < .001; E.S. = .88$). Such a large and statistically significant finding is consistent with other studies indicating that women are more likely to diet than men (e.g., Rodin et al., 1984). As a point of interest, males also scored significantly higher than females on exercise intensity/frequency ($t_{(419)} = 4.62, p < .00; E.S. = .48$), indicating that males in this sample are more frequently involved in various high intensity physical activities than females. Males and females did not differ on the remaining variables.

A matrix of all pairwise correlation coefficients is presented in Table 4. As can be seen, dietary restraint is positively correlated with all variables except other-oriented perfectionism among women, whereas in males, dietary restraint is positively correlated

Table 3

Means and Standard Deviations for All Variables, Listed Separately for Males (n =152) and Females (n = 269)

Variable	Males		Females	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
MPS - self-oriented	4.51	0.92	4.48	1.12
MPS - other-oriented ^a	3.89	0.76	3.68	0.71
MPS - socially-prescribed ^b	3.59	0.84	3.34	0.91
PSP - mean score	3.88	0.98	3.81	1.03
Dietary Restraint ^c	1.82	0.78	2.64	1.00
Excessive Commitment to Exercise	2.87	0.89	2.69	0.85
Exercise Intensity/Frequency ^d	1.20	1.10	0.72	0.96

^a male > female; $t_{(419)} = 2.92, p < .01^*$; E.S. = .29

^b male > female; $t_{(419)} = 2.72, p < .01^*$; E.S. = .28

^c female > male; $t_{(419)} = 8.67, p < .00^*$; E.S. = .88

^d male > female; $t_{(419)} = 4.62, p < .00^*$; E.S. = .48

* Bonferroni corrected at $p < .008$

Table 4

Matrix of All Pairwise Correlation Coefficients Among Variables Using Listwise

Deletion: Values for Female Participants (n = 269) Above the Diagonal; Values for Male Participants (n = 152) Below the Diagonal

	DRS	Self	Other	Soc	PSP	Excom	BMI	ExI/F
DRS ^a		.22*	.07	.22*	.29*	.32*	.22*	.13
Self ^b	.16		.39*	.39*	.50*	.37*	-.05	.20*
Other ^c	.24	.47*		.24*	.19*	.07	.00	.07
Social ^d	.22	.32*	.29*		.60*	.18	.07	.07
PSP ^e	.23	.34*	.24	.67*		.20*	.02	.07
Excom ^f	.30*	.28*	.22	.02	.04		.04	.36*
BMI ^g	.39*	.03	.05	.02	.00	.21		.01
ExI/F	-.03	.15	.03	.04	-.12	.40*	-.10	

* $p < .002$ (Bonferroni corrected)

^aDRS = Dutch Restraint Scale - restraint subscale

^bSelf = MPS - self-oriented perfectionism

^cOther = MPS - other-oriented perfectionism

^dSocial = MPS - socially-prescribed perfectionism

^ePSP = Perfectionistic Self-Presentational Scale

^fExcom = Commitment to Exercise Scale

^gBMI = Body Mass Index

^hExI/F = Exercise Intensity/Frequency

only with excessive commitment to exercise and with Body Mass Index. In both men and women, Body Mass Index is positively correlated only with dietary restraint, suggesting that it is the larger men and women in the sample who tend to diet.

The four dimensions of perfectionism are at least moderately intercorrelated. In fact, the *lowest* bivariate correlation among the dimensions, that between perfectionistic self-presentation and other-oriented perfectionism among the female sample, is still relatively high at $r = .19$, $p < .001$. A particularly high bivariate correlation is seen between the perfectionistic self-presentation and socially-prescribed perfectionism: $r = .67$, $p < .001$ in males, and $r = .60$, $p < .001$ in females. These values are indicative of overlap in the constructs measured by the different perfectionism scales and subscales. The authors of these scales (Hewitt & Flett; e.g., 1991b) acknowledge this overlap, and report that this is to be expected given that all items measure perfectionism and have some focus on the attainment of standards. Also relevant to this overlap is Hamachek's (1978) notion of 'neurotic perfectionism' in which an individual is high on all dimensions of perfectionism. Thus, neurotic perfectionism may be another reason for scale overlap and intercorrelation (Hewitt & Flett, 1991b).

Multiple Regression Tests for Moderation

Tests for moderation using multiple regression (Baron & Kenny, 1986) were conducted using each perfectionism dimension. In the first step of moderation analysis, perfectionism dimensions were entered individually into the regression equation using dietary restraint as the outcome variable. As predicted in this step, several dimensions of

perfectionism emerged as significant independent predictors of dietary restraint among men and among women.

Among females, self-oriented perfectionism, socially-prescribed perfectionism, and perfectionistic self-presentation each predicted significant independent variance in dietary restraint. Specifically, self-oriented perfectionism predicted 5% of the variance in dietary restraint ($p < .001$), socially-prescribed perfectionism predicted 5% of the variance in dietary restraint ($p < .001$), and perfectionistic self-presentation accounted for the largest amount of variance, 8% ($p < .001$), in dietary restraint. There was no independent prediction of dietary restraint by other-oriented perfectionism in females ($R^2 = .01$, ns). Regression coefficients and associated significance values from these analyses are presented in Tables 5.

Among males, findings indicated that other-oriented perfectionism, socially-prescribed perfectionism and perfectionistic self-presentation each significantly and independently predicted variance in dietary restraint among males. Specifically, other-oriented perfectionism predicted 6% of the variance in dietary restraint ($p < .005$), socially-prescribed perfectionism predicted 5% of the variance in dietary restraint ($p < .01$), and perfectionistic self-presentation predicted 5% of the variance in dietary restraint ($p < .01$). There was no main effect of self-oriented perfectionism in predicting dietary restraint ($R^2 = .03$, $p = .51$) among males. Regression coefficients and associated significance values for these findings are presented in Table 6.

So it appears that perfectionistic self-presentation and socially-prescribed

Table 5

Results of Multiple Regression Analyses Testing for Moderation in Women (n = 269)
using Dietary Restraint as the Criterion Variable

Self-Oriented Perfectionism				Other-Oriented Perfectionism			
Variable	<u>B</u>	<u>SE B</u>	β	Variable	<u>B</u>	<u>SE B</u>	β
Self	.20	.05	.22**	Other	.10	.09	.07
Exci	.33	.07	.28**	Exci	.37	.07	.32**
Product term	-.03	.06	-.03	Product term	-.15	.10	-.09
** p < .01				** p < .01			

Socially-Prescribed Perfectionism				Perfectionistic Self-Presentation			
Variable	<u>B</u>	<u>SE B</u>	β	Variable	<u>B</u>	<u>SE B</u>	β
Social	.24	.07	.22**	PSP	.28	.06	.29**
Exci	.34	.07	.29**	Exci	.32	.07	.28**
Product term	.06	.07	.05	Product term	.07	.06	.07
** p < .01				** p < .01			

Table 6

Results of Multiple Regression Analyses Testing for Moderation in Men (n = 152) using Dietary Restraint as Criterion Variable

Self-Oriented Perfectionism				Other-Oriented Perfectionism			
Variable	<u>B</u>	<u>SE B</u>	β	Variable	<u>B</u>	<u>SE B</u>	β
Self	.14	.07	.16	Other	.24	.08	.24**
Exci	.24	.07	.27**	Exci	.22	.07	.26**
Product term	-.03	.07	-.03	Product term	.04	.08	.04
** p < .01				** p < .01			
Socially-Prescribed Perfectionism				Perfectionistic Self-Presentation			
Variable	<u>B</u>	<u>SE B</u>	β	Variable	<u>B</u>	<u>SE B</u>	β
Social	.20	.07	.22**	PSP	.18	.06	.23**
Exci	.26	.07	.29**	Exci	.25	.07	.29**
Product term	-.01	.07	-.01	Product term	.05	.06	.07
**p < .01				** p < .01			

perfectionism are related to dietary restraint among males and females, whereas self-oriented perfectionism is related to dietary restraint among females but not males, and other-oriented perfectionism is related to dietary restraint among males but not females. To evaluate whether these latter two dimensions differentially predict dietary restraint in men and women, we ran regression analyses using each of the four dimensions of perfectionism as independent variables, dietary restraint as the dependent variable, and gender as a moderator. Results of these regressions indicated that gender did not moderate the relationship between perfectionism and restraint for any of the perfectionism dimensions. Regression coefficients and associated significance values are presented in Table 7 for the regressions involving self-oriented perfectionism and other-oriented perfectionism; the two dimensions for which the prediction of dietary restraint appeared different for males and females.

Because it is possible that this inability to find a moderating role of gender is due to the non-normality of the male dietary restraint distribution, these regressions were re-run using an outcome variable that was inversely transformed (Tabachnick & Fidell, 1996) for the entire sample (males and females). The results of these regressions, because they differed slightly from those using untransformed data, are also presented in Table 7. Interestingly, use of the inversely transformed dietary restraint variable worsened the interaction effect in the case of self-oriented perfectionism, but improved it in the case of other-oriented perfectionism such that gender approached significance as a moderator of the relationship between other-oriented perfectionism and dietary restraint

(subject to inverse transformation); $R^2 = .01$, $p = .08$.

In the second step of the multiple regression approach to testing moderation, excessive commitment to exercise was entered into the equation with dietary restraint as the criterion variable. As hypothesized, excessive commitment to exercise showed significant independent prediction of dietary restraint among both males and females. Specifically, for both males and females, excessive commitment to exercise predicted a significant amount of the variance in dietary restraint (R^2 range: 6% to 10%, $p < .01$ in all instances) above and beyond that predicted by the particular dimension of perfectionism. Regression coefficients and associated significance values for the independent prediction of excessive commitment to exercise are presented in Table 5 and Table 6 for women and men, respectively.

The final step of the multiple regression analysis to testing moderation involved entering the product of perfectionism and excessive commitment to exercise into the equation, for each dimension of perfectionism, and examining the degree to which this interaction term contributed to the prediction of dietary restraint above and beyond the contribution of perfectionism and excessive commitment to exercise independently. Contrary to hypotheses, there was no evidence of an interaction between any of the perfectionism dimensions and excessive commitment to exercise in the prediction of dietary restraint. This absence of moderation was observed among both males and females. In fact, the amount of independent variance in dietary restraint predicted by interaction terms did not even reach 1% in any instance. Regression coefficients and

associated significance values for the interaction terms are presented in Tables 5 and 6 for females and males respectively.

Multiple Regression Tests for Mediation

Females. Using dietary restraint as the dependent variable, excessive commitment to exercise was evaluated for its mediational effect in the relationship between perfectionism and dietary restraint. This analysis was conducted separately for each of the four perfectionism dimensions: self-oriented perfectionism, other-oriented perfectionism, socially-prescribed perfectionism, and perfectionistic self-presentation. Because other-oriented perfectionism does not predict dietary restraint among the females ($R^2 = .01$, $p = .24$), a critical path that is necessary for mediation is not present; thus, mediation is not possible in this case. Nevertheless, the results are presented for analyses of all four dimensions of perfectionism.

Regression analyses indicated that excessive commitment to exercise emerged as a complete mediator in the relationship between self-oriented perfectionism and dietary restraint among females. A description of this mediational effect may be understood by referring to Figure 2b and to Table 8. First, the direct *path a* which predicts excessive commitment to exercise (mediator) from self-oriented perfectionism (IV), is statistically significant ($B = .28$, $p = .00$). Second, the direct *path b* which predicts dietary restraint (DV) from excessive commitment to exercise (mediator), is statistically significant ($B = .377$, $p = .000$). Third, the direct *path c* that predicts dietary restraint (DV) from self-oriented perfectionism (IV), is statistically significant ($B = .20$, $p = .00$). In addition to

Table 8

Results of Multiple Regression Analysis for Testing Mediating Role of Excessive Commitment to Exercise in Prediction of Dietary Restraint by Various Perfectionism Dimensions (including correlation matrix), for Females (n = 269)

Self-Oriented Perfectionism					<u>B</u>	<u>SE B</u>	<u>β</u>	
	Self	Exci	DRS	BMI	path a	.28	.04	.37**
Self		.37*	.22*	-.05	path b	.38	.07	.32**
Exci			.32*	.04	path c (dir)	.20	.05	.22**
DRS				.22*	*** path c (indir)	.11	.06	.12
BMI					**p < .01			
*p < .0083 (Bonferroni corrected)					*** Complete mediational effect present			
Socially-Prescribed Perfectionism					<u>B</u>	<u>SE B</u>	<u>β</u>	
	Social	Exci	DRS	BMI	path a	.17	.06	.18**
Social		.18*	.22*	.07	path b	.38	.07	.32**
Exci			.32*	.04	path c (dir)	.24	.07	.22**
DRS				.22*	*** path c (indir)	.19	.06	.17**
BMI					**p < .01			
*p < .0083 (Bonferroni corrected)					*** Significant reduction from path c (dir), suggesting some mediational effect			

Table 8 (cont'd)

Results of Multiple Regression Analysis for Testing Mediating Role of Excessive Commitment to Exercise in Prediction of Dietary Restraint by Various Perfectionism Dimensions (including correlation matrix), for Females (n = 269)

Other-Oriented Perfectionism					<u>B</u>	<u>SE B</u>	<u>β</u>	
	Other	Exci	DRS	BMI	path a	.09	.07	.07
Other		.07	.07	.00	path b	.38	.07	.32**
Exci			.32*	.04	path c (dir)	.10	.09	.07
DRS				.22*	path c (indir)	.07	.08	.05
BMI					**p < .01			
*p < .0083 (Bonferroni corrected)					No mediational effect present			
Perfectionistic Self Presentation					<u>B</u>	<u>SE B</u>	<u>β</u>	
	PSP	Exci	DRS	BMI	path a	.16	.05	.20**
PSP		.20*	.29*	.02	path b	.38	.07	.32**
Exci			.32*	.04	path c (dir)	.28	.06	.29**
DRS				.22*	*** path c (indir)	.23	.06	.23**
BMI					**p < .01			
*p < .0083 (Bonferroni corrected)					*** Significant reduction from path c (dir), suggesting some mediational effect			

the statistical significance of these three direct paths, the final condition that is necessary to claim a mediational or indirect effect is that this prediction of dietary restraint (DV) from self-oriented perfectionism (IV), or *path c*, becomes nonsignificant when excessive commitment to exercise is also included in the equation. In other words, we can see that by including excessive commitment to exercise as a mediating variable in this equation, the unstandardized path coefficient in the prediction of dietary restraint from self-oriented perfectionism is reduced from a significant value of $B = .20$ ($p = .00$) to a nonsignificant value of $B = .11$ ($p = .06$). This particular situation is considered *complete mediation* (Baron & Kenny, 1986), because the relationship between predictor and criterion is completely eliminated by inclusion of the mediating variable.

It was also found that, among females, excessive commitment to exercise mediated the relationship between socially-prescribed perfectionism and dietary restraint, and between perfectionistic self-presentation and dietary restraint. The values for these series of regression equations are presented in Table 8. In these instances, the mediation was not a complete one as in the case of self-oriented perfectionism, but using subsequent hand calculations developed by Sobel (1988), it was determined that the prediction of dietary restraint from each of these two perfectionism dimensions was significantly reduced when excessive commitment to exercise was included in the regression equations. According to Baron & Kenny (1986), it is reasonable in the social sciences to consider such a significant reduction as evidence of mediation, though not complete mediation. The difference is that complete mediation is strong evidence of a single,

dominant mediator, whereas a significant reduction indicates that we have isolated one of perhaps several mediating factors.

Because the above results were based on exercise attitudes rather than behaviour (i.e., a psychological commitment to exercise), we were curious to see if similar results emerged when excessive exercise was conceptualized in terms of frequency/intensity. Thus, the same mediational model was tested using excessive frequency/intensity of exercise as the proposed mediator. Interestingly, no mediational effects emerged in any case with this series of regressions. This suggests that an individual's attitude (psychological commitment) toward exercise, and not the exercise behaviour per se, is the critical component that incites dietary restraint behaviour.

All above results were obtained whether we used data adjusted for univariate and multivariate outliers or unadjusted data; therefore, the decision was made to present the values based on unadjusted data in Table 8 because this allowed for a slightly larger sample size of women.

Males. Mediational effects of excessive commitment to exercise attitudes in the relationship between perfectionism and dietary restraint were tested using the four dimensions of perfectionism as predictor variables (self-oriented perfectionism, other-oriented perfectionism, socially-prescribed perfectionism, and perfectionistic self-presentation). Because self-oriented perfectionism, socially-prescribed perfectionism, and perfectionistic self-presentation do not predict dietary restraint among men, the presence of a mediational effect with these variables was not possible due to the absence

of a critical path in mediation analysis (Baron & Kenny, 1986). This absence of a critical path remained whether we used the untransformed dietary restraint variable or the inversely-transformed dietary restraint variable, and whether we used data that had been adjusted for univariate and multivariate outliers or the unadjusted data. Although the critical paths are satisfied in the case of other-oriented perfectionism, there was no indication of mediation using this perfectionism dimension. The results of these series of regression equations are presented in Table 9. Because the findings concerning absence of mediational effects were the same whether we used the transformed dietary restraint variable or the untransformed data that had been adjusted for univariate and multivariate outliers, the decision was made to present values based on the untransformed, adjusted-for-outliers data to be consistent with the female data.

Consideration of BMI. Since Body Mass Index shows a significant positive zero-order correlation with dietary restraint among females ($r = .214, p < .001$) and males ($r = .39, p < .00$), and because regression outputs indicate that BMI predicts a significant amount of the variance in dietary restraint among females ($R^2 = 5\%, p < .00$) and males ($R^2 = 15\%, p < .00$), mediational analyses were re-run controlling for this BMI variable.

Among females, it was found that excessive commitment to exercise retains its role as a mediating variable between self-oriented perfectionism and restraint, between perfectionistic self-presentation and restraint, and between socially-prescribed perfectionism and restraint. The results of these regressions are presented in Table 10.

Among males, an interesting finding emerged once we controlled for BMI.

Table 9

Results of Multiple Regression Analysis for Testing Mediating Role of Excessive Commitment to Exercise in Prediction of Dietary Restraint by Various Perfectionism Dimensions (including correlation matrix), for Males (n = 152)

Self-Oriented Perfectionism					<u>B</u>	<u>SE B</u>	<u>β</u>	
	Self	Exci	DRS	BMI	path a	.27	.08	.28**
Self		.28*	.16	.03	path b	.26	.07	.30**
Exci			.30*	.21	path c (dir)	.14	.07	.16
DRS				.39*	path c (indir)	.07	.07	.08
BMI					**p < .01			
*p < .0083 (Bonferroni corrected)					No mediational effect present			
Socially-Prescribed Perfectionism					<u>B</u>	<u>SE B</u>	<u>β</u>	
	Social	Exci	DRS	BMI	path a	.02	.09	.02
Social		.02	.22*	.02	path b	.26	.07	.30**
Exci			.30*	.21	path c (dir)	.20	.07	.22**
DRS				.39*	path c (indir)	.20	.07	.21**
BMI					**p < .01			
*p < .0083 (Bonferroni corrected)					No mediational effect present			

Table 9 (cont'd)

Results of Multiple Regression Analysis for Testing Mediating Role of Excessive Commitment to Exercise in Prediction of Dietary Restraint by Various Perfectionism Dimensions (including correlation matrix), for Males (n = 152)

Other-Oriented Perfectionism					<u>B</u>	<u>SE B</u>	β	
	Other	Exci	DRS	BMI	path a	.25	.09	.22*
Other		.22*	.24*	.05	path b	.26	.07	.30**
Exci			.30*	.21	path c (dir)	.24	.08	.24**
DRS				.39*	path c (indir)	.19	.08	.18*
BMI					** $p < .01$	* $p < .05$		
* $p < .0083$ (Bonferroni corrected)					No mediational effect present			
Perfectionistic Self-Presentation					<u>B</u>	<u>SE B</u>	β	
	PSP	Exci	DRS	BMI	path a	.04	.08	.04
PSP		.04	.23*	.00	path b	.26	.07	.30**
Exci			.30*	.21	path c (dir)	.18	.06	.23**
DRS				.39*	path c (indir)	.17	.06	.22**
BMI					** $p < .01$			
* $p < .0083$ (Bonferroni corrected)					No mediational effect present			

Table 10

Results of Multiple Regression Analysis for Testing Mediating Role of Excessive Commitment to Exercise in Prediction of Dietary Restraint by Various Perfectionism Dimensions (including correlation matrix), Controlling for BMI, for Females (n = 269)

Self-Oriented Perfectionism					B	SE B	β	
	Self	Exci	DRS	BMI	BMI	.05	.02	.22**
Self		.37*	.22*	-.05	path a	.28	.04	.37**
Exci			.32*	.04	path b	.37	.07	.31**
DRS				.22*	path c (dir)	.21	.05	.23**
BMI					*** path c (indir)	.12	.05	.13*
*p < .0083 (Bonferroni corrected)					**p < .01		*p < .05	
					*** Significant reduction from path c (dir), suggesting some mediational effect			
Socially-Prescribed Perfectionism					B	SE B	β	
	Soci	Exci	DRS	BMI	BMI	.05	.02	.22**
Soc		.18*	.22*	.07	path a	.17	.06	.18**
Exci			.32*	.04	path b	.37	.07	.31**
DRS				.22*	path c (dir)	.23	.07	.21**
BMI					*** path c (indir)	.17	.06	.16**
*p < .0083 (Bonferroni corrected)					**p < .01		*** Significant reduction from path c (dir), suggesting some mediational effect	

Table 10 (cont'd)

Results of Multiple Regression Analysis for Testing Mediating Role of Excessive Commitment to Exercise in Prediction of Dietary Restraint by Various Perfectionism Dimensions (including correlation matrix), Controlling for BMI, for Females (n = 269)

Other-Oriented Perfectionism						<u>B</u>	<u>SE B</u>	β
	Oth	Exci	DRS	BMI	BMI	.05	.02	.22**
Oth		.07	.07	.00	path a	.09	.07	.07
Exci			.32*	.04	path b	.37	.07	.31**
DRS				.22*	path c (dir)	.10	.08	.07
BMI					path c (indir)	.07	.08	.05
* $p < .0083$ (Bonferroni corrected)					** $p < .01$ No mediational effect present			
Perfectionistic Self-Presentation						<u>B</u>	<u>SE B</u>	β
	PSP	Exci	DRS	BMI	BMI	.05	.02	.22**
PSP		.20*	.29*	.02*	path a	.16	.05	.20**
Exci			.32*	.04	path b	.37	.07	.31**
DRS				.22*	path c (dir)	.27	.06	.28**
BMI					*** path c (indir)	.22	.06	.23**
* $p < .0083$ (Bonferroni corrected)					** $p < .01$ *** Significant reduction from path c (dir), suggesting some mediational effect			

Specifically, excessive commitment to exercise attitudes emerged as a complete mediator of the relationship between self-oriented perfectionism and dietary restraint. This is because BMI accounts for a large amount (15%) of the variance in dietary restraint among men, and this value enabled a significant direct path from self-oriented perfectionism and dietary restraint ($p < .05$) that was absent in the earlier analyses that did not include BMI. The values for these regression tests for mediation including BMI among men are presented in Table 11. Because this interesting finding only emerged when we used untransformed, unadjusted data, the values in Table 11 are based on this untransformed, unadjusted data. No other evidence of mediation was revealed through controlling BMI in the male sample.

Table 11

Results of Multiple Regression Analysis for Testing Mediating Role of Excessive Commitment to Exercise in Prediction of Dietary Restraint by Various Perfectionism Dimensions (including correlation matrix), Controlling for BMI, for Males (n = 152)

Self-Oriented Perfectionism						<u>B</u>	<u>SE B</u>	β
	Self	Exci	DRS	BMI	BMI	.08	.02	.39**
Self		.28*	.16	.03	path a	.27	.08	.28**
Exci			.30*	.21	path b	.20	.07	.22**
DRS				.39*	path c (dir)	.13	.06	.15*
BMI					*** path c (indir)	.08	.07	.10
* $p < .0083$ (Bonferroni corrected)					** $p < .01$		* $p < .05$	
					*** Complete mediational effect present			
Socially-Prescribed Perfectionism						<u>B</u>	<u>SE B</u>	β
	Soc	Exci	DRS	BMI	BMI	.08	.02	.39**
Soc		.02	.22*	.02	path a	.02	.09	.02
Exci			.30*	.21	path b	.20	.07	.22**
DRS				.39*	path c (dir)	.20	.07	.21**
BMI					path c (indir)	.19	.07	.21**
* $p < .0083$ (Bonferroni corrected)					** $p < .01$		No mediational effect present	

Table 11 (cont'd)

Results of Multiple Regression Analysis for Testing Mediating Role of Excessive Commitment to Exercise in Prediction of Dietary Restraint by Various Perfectionism Dimensions (including correlation matrix), Controlling for BMI, for Males (n = 152)

Other-Oriented Perfectionism						<u>B</u>	<u>SE B</u>	β
	Oth	Exci	DRS	BMI	BMI	.08	.02	.39**
Oth		.22*	.24*	.05	path a	.24	.09	.21*
Exci			.30*	.21	path b	.20	.07	.22**
DRS				.39*	path c (dir)	.23	.08	.22**
BMI					path c (indir)	.19	.08	.18*
* $p < .0083$ (Bonferroni corrected)					** $p < .01$		* $p < .05$	
					No mediational effect present			
Perfectionistic Self-Presentation						<u>B</u>	<u>SE B</u>	β
	PSP	Exci	DRS	BMI	BMI	.08	.02	.39**
PSP		.04	.23*	.00	path a	.04	.07	.04
Exci			.30*	.21	path b	.20	.07	.22**
DRS				.39*	path c (dir)	.18	.06	.23**
BMI					path c (indir)	.19	.06	.22**
* $p < .0083$ (Bonferroni corrected)					** $p < .01$			
					No mediational effect present			

Discussion

The purpose of this investigation was twofold. The first purpose was to replicate findings concerning the prediction of dietary restraint by multidimensional perfectionism in a university student sample of women. Second, it was of interest to examine the moderating and/or mediating role of excessive commitment to exercise in this perfectionism-dietary restraint relationship. As an extension of these findings, we were interested in explaining the relationship between perfectionism, dietary restraint, and excessive commitment to exercise in men. In order to achieve these goals, we used multiple regression to detect the independent, interactive, and indirect prediction of dietary restraint by multidimensional perfectionism and excessive commitment to exercise. Among females, consistent with previous research, it was found that certain dimensions of perfectionism related to dietary restraint. Some similar and some dissimilar dimensions of perfectionism were also related to dietary restraint in males. While we found no evidence for the effect of moderation, some findings concerning the mediating role of excessive commitment to exercise were significant. These findings are discussed in turn.

Perfectionism and Dietary Restraint: Replication and Extension

Females. Among females, it was found that three dimensions of perfectionism contributed significantly to the prediction of dietary restraint; specifically, self-oriented perfectionism, socially-prescribed perfectionism, and perfectionistic self-presentation. These findings are consistent with existing reports that eating pathology in females is

positively associated with self-oriented perfectionism (Hewitt et al., 1995; Bastiani et al., 1995), socially-prescribed perfectionism (Hewitt et al., 1995; Pliner & Haddock, 1995), self-presentational perfectionism (Hewitt et al., 1995), but *not* with other-oriented perfectionism (Hewitt et al., 1995; Bastiani et al., 1995). With the present study included, this collection of findings suggests that females who engage in dietary restraint also tend to hold very high standards for themselves (high self-oriented perfectionism), to always endeavour to present themselves as perfect (high perfectionistic self-presentation), and to hold the belief that others have very high expectations for them (high socially-prescribed perfectionism). The use of a multidimensional measure of perfectionism in this and other similar studies thus suggests that perfectionism in the context of dietary restraint among women is not limited to self or personal expectations; rather, personal, interpersonal, and self-presentational aspects of perfectionism all appear to play a role.

The magnitude of results provides further insight into the importance of different dimensions of perfectionism in the context of dietary restraint. Specifically, the effect size for the variance explained in dietary restraint by self-oriented and socially-prescribed perfectionism among women in this study is 'small-medium' based on values of 5% explained variance in both cases, and 'medium' for self-presentational perfectionism based on 8% explained variance (Keppel, 1991). These values are similar to those obtained in one other study (Hewitt et al., 1995), in which the magnitude of effect was 'medium' for self-presentational perfectionism, 'small-medium' for self-oriented and socially-prescribed perfectionism, and 'small' for other-oriented perfectionism (Keppel,

1991). Presently, these are the only two studies which have included the self-presentational dimension of perfectionism in an investigation of eating pathology, and it is interesting that in both of these studies self-presentational perfectionism emerged in women as the strongest predictor of dietary restraint among all perfectionism dimensions. Thus, dieting behaviour in a woman who is inordinately concerned about presenting herself as flawless may be seen as a warning signal, and perhaps monitored so that the dieting does not reach excessive levels.

Although self-presentational perfectionism accounts for the most variance in dietary restraint among the perfectionism dimensions in females, two other dimensions also predicted significant variance in this outcome variable. The disheartening implication of these findings is that unrealistic expectations for appearance and body weight within female dieters come from a variety of sources (intrapersonal, interpersonal, and self-presentational), and that all may contribute to a sensation of failure and inadequacy when the unrealistic standards go unmet. This knowledge of the importance of the *source* of these expectations is informative and may represent a focus for intervention. For example, reduction of self-oriented expectations might be dealt with by challenging the rationality of one's thought patterns, whereas interventions aimed at reducing perceived expectations from others may focus on increasing the accurateness of one's interpretation of others' comments and behaviours. Along with such cognitive interventions, behavioural interventions would be necessary such that the individual can experience the consequences of being 'imperfect' in terms of standards set by herself as

well as by others (real or perceived).

Males. Among males, the three perfectionism dimensions that predicted dietary restraint were socially-prescribed perfectionism, perfectionistic self-presentation, and other-oriented perfectionism; the latter being the strongest predictor. That is, those males who engage in dietary restraint also tend to hold very high expectations for others (high other-oriented perfectionism), to try to present themselves as outwardly perfect (high perfectionistic self-presentation), and to believe that others hold very high expectations for them (high socially-prescribed perfectionism).

Although gender moderation analyses were nonsignificant, the pattern of findings suggests that different dimensions of perfectionism are relevant in the context of dietary restraint in men and women. This knowledge is interesting and relevant, given that such outcomes may not have been detected had we used a unidimensional measure of perfectionism as is typical of earlier studies (e.g., Mitzman et al., 1994; Terry-Short et al., 1995). Use of a multidimensional measure of perfectionism in this study suggested that dietary restraint in women is linked to a combination of *intrapersonal* (self-oriented), *interpersonal* (socially-prescribed), and self-presentational perfectionistic tendencies, whereas in men it is essentially the *interpersonal* (other-oriented and socially-prescribed) and self-presentational dimensions that predominate in this relationship. One can draw several implications from these findings. First, culturally-based standards for what is considered physically attractive exist for both men and women. While an ultra-slender body shape characterizes the female ideal, the masculine ideal toward which many men

aspire is lean and muscular (e.g., Mishkind, Rodin, Silberstein, & Striegel-Moore, 1986). Because both men and women are influenced by and possibly aspire toward some external standard (i.e., these societal impressions of physical attractiveness), this might explain the link between dietary restraint and both socially-prescribed and self-presentational perfectionism, in both men and women. In other words, those men and women who are most concerned about presenting themselves as perfect and who feel that others expect perfectionism of them may be most attuned to and influenced by societal expectations of physical attractiveness, and therefore be more likely to diet in pursuit of these standards (since dieting is relevant to both female and male ideals, because neither ideal is overweight). Second, because these external standards of beauty for females have existed for several decades whereas cultural expectations for the male body shape are a more recent development (e.g., Mishkind et al., 1986), it is possible that women have internalized such standards to a greater degree than men. This could account for the link between self-oriented perfectionism and dietary restraint found in women but not in men. In other words, impressions of the 'ideal' female somatotype have become so familiarized by the media that many women perhaps no longer conceive this ideal as an external standard; it has become a goal that is attributed internally. Finally, the link between other-oriented perfectionism and dietary restraint in men but not in women may be related to reports that men more than women are visually interested in the bodies of the other sex (Mazur, 1986). If men are more highly invested than women in the physical appearance of others, it makes sense that men are more likely to have higher expectations than

women in terms of the physical appearance of others. Concerning the greater likelihood of dieting among these men, we can propose that men who are more highly invested in the physical attractiveness of others will consequently have more interest in their own physique and take measures to change it, through behaviour such as dieting.

Concerning the magnitude of effects obtained in the male sample, it is interesting that other-oriented, socially-prescribed, and self-presentational perfectionism all predicted a 'small-medium' (Keppel, 1991) amount of variance in dietary restraint (i.e., 5-6%); an effect size that is similar to that obtained for the relevant dimensions in the female sample. Viewed globally, the magnitude of these values suggests that perfectionism is not a trivial nor peripheral concern in the context of female or male dieters. It is clear that dieting behaviour undertaken by someone with perfectionistic tendencies should be taken perhaps more seriously than dieting by a non-perfectionist. Moreover, based on the magnitude of results, one might want to pay greatest attention to the following dieter prototypes: males who hold very high expectations for others, and females who are inordinately concerned about presenting an image of flawlessness; as these combinations of characteristics are associated with the strongest dieting attitudes and behaviours in this sample. In terms of preventing the development of eating disorder symptomatology, men and women with these respective perfectionistic tendencies might comprise the target population.

For the perfectionist, mistakes and flaws represent failure to live up to one's own or perceived expectations of perfection (Hewitt & Flett, 1991a). Because expectations of

perfection are unrealistic, perceived failure happens frequently. For the dieter, these expectations pertain to physical appearance and body weight. The inevitable failure to achieve unrealistic appearance and body weight goals evokes the perception of continued failure and feelings of inadequacy. A sense of failure and inadequacy characterizes eating disorder individuals (e.g., Butow et al., 1993) and high expectations likely contribute to these feelings of inadequacy in this population. In this context, future research might specifically address this link between expectations, feelings of inadequacy or failure, and eating disorder symptomatology. For example, is the link between different perfectionism dimensions and eating disorder symptomatology moderated by an experience of failure or inadequacy, such that perfectionistic individuals who are somehow resilient to failure experience (so-called 'healthy' perfectionists) are less likely to diet than those who are prone to feel inadequate? Alternatively, it would be interesting to experimentally manipulate conditions of realistic versus unrealistic expectations of body weight or appearance, among individuals of varying degrees of body dissatisfaction. Pre- and post-manipulation measures of self-esteem or self adequacy might then provide insight into the specific nature of the expectation-inadequacy link, and perhaps pinpoint individuals for whom this link is strongest and who might thus be at greatest risk.

Direct Prediction of Dietary Restraint by Excessive Exercise Commitment, Controlling for Perfectionism

As an ancillary hypothesis, we were interested in the prediction of dietary restraint by excessive commitment to exercise, controlling for the perfectionism variable. We

found that excessive commitment to exercise is a good predictor of dietary restraint among both males and females, once perfectionism is controlled. Specifically, the magnitude of this effect ranges from 6-8% in men (medium effect size; Keppel, 1991), and from 7-10% in women (medium effect size; Keppel, 1991). Thus, the prediction of dieting from exercise commitment, *above and beyond perfectionism*, is still sizeable, in both men and women.

The existence of a dieting-exercise relationship in this study is consistent with other research that has documented such an association (e.g., Davis, Shapiro et al., 1993; Davis et al., 1990), and by eliminating the effect of perfectionism we have arguably provided a more stringent examination of this relationship. In other words, the emergence of a sizeable dieting-exercise relationship both with and without the perfectionism variable is a testament to the strength of association between dieting and exercise variables, and underscores the importance of considering exercise variables in the context of dieting behaviour. The strength of this relationship makes sense when one considers the combined potential of these behaviours to yield weight loss, as well as the positive social reputation of diet and exercise that has emerged. First, the most successful incidences of weight loss are known to include both dieting and exercise (e.g., American College of Sports Medicine, 1998). Therefore, it makes sense that an individual whose goal is weight loss would adopt both behaviours. Second, dietary regulation and regular physical activity are highly socially approved behaviours that are widely acknowledged as the means to a healthy lifestyle and youthful appearance. The positive connotations of

diet and exercise regulation, in addition to the potential benefits they accrue, means that involvement in these behaviours will likely evoke social reinforcement of this involvement. For example, an individual who diets and exercises regularly may be admired by others for his or her self-discipline, desire to take care of his/her body, health status, appearance, and so on. Such complements can then increase one's likelihood of continuing these behaviours. This latter notion represents another area for future research; namely, an investigation of the specific effects of positive (versus negative) social feedback on different aspects and degrees of dieting and/or exercise behaviour.

In terms of gender differences, it was found that the effect size for the prediction of dietary restraint by exercise commitment showed a trend of being greater in females than in males. Although not statistically significant, this pattern of gender differences supported our hypotheses, and is consistent with existing data; for example, Davis, Shapiro et al. (1993) found that greater exercise participation was a significant positive correlate of dietary restraint in both young men and women, but to a greater degree in women. These patterns are likely related to gender differences in motivation for exercising. Specifically, it is quite clear that young women more than young men tend to exercise for the purpose of weight loss (Silberstein, Striegel-Moore, Timko, & Rodin, 1988; Davis, Fox, Brewer, & Ratusny, 1995) and therefore it makes sense that in women, for whom both behaviours are geared at weight loss, the association would be stronger.

Is the Link Between Perfectionism and Dietary Restraint Different in Exercisers Versus Non-Exercisers?

It was hypothesized that an excessive commitment to exercise might moderate the relationship between perfectionism and dietary restraint, such that for individuals who are highly committed to exercising, the perfectionism-restraint relationship would be stronger than for individuals who are not committed to exercise. The data showed that no such interaction effect exists. On the surface, these findings appear contrary to a recent study (Davis et al., 1998) which examined a similar hypothesis concerning an interaction between exercise commitment and perfectionism among anorexia patients. Dividing the anorexia patients into high and low levels of exercise commitment, these authors found that the two groups differed significantly on self-oriented perfectionism and claimed that exercise was thus a moderator of perfectionism in anorexia. Several differences between the study by Davis et al. (1998) and the present one can account for the discrepant findings; in particular, different outcome variables (body esteem versus dietary restraint), different participant samples (anorexia patients versus university students), and a different measurement scale for the exercise variable (dichotomous versus continuous) were used in these two studies.

So, while an interaction of perfectionism and excessive commitment to exercise in the prediction of dietary restraint within a university student sample was an interesting and reasonable topic to investigate, we did not find any evidence of this occurrence in the present study. Nonetheless, the significant and substantial independent prediction of

dietary restraint by both perfectionism and exercise variables suggests that these two variables are each important and their effect on dietary restraint may be best regarded as additive.

Is the Relationship Between Perfectionism and Dietary Restraint a Byproduct of an Excessive Commitment to Exercise?

Finally, in the absence of an interaction effect, we were interested in whether excessive commitment to exercise *mediated* the relationship between perfectionism and dietary restraint. Results of mediation analyses suggested that the relationship between perfectionism and dietary restraint may be due in fact to the intervening role of commitment to exercise. Specifically, with regard to self-oriented perfectionism, we found that the relationship between self-oriented perfectionism and dietary restraint in women was completely eliminated once commitment to exercise was introduced into the regression equation. This suggests that the relationship between perfectionism and dietary restraint may only be a byproduct of an individual's psychological commitment to exercise behaviour. However, having said that, not all dimensions of perfectionism may be explained in this way. For socially-prescribed and self-presentational perfectionism in women, this relationship was significantly reduced by the inclusion of the exercise variable, but not completely eliminated as was the case with self-oriented perfectionism. Among males, the relationship between self-oriented perfectionism and dietary restraint was also completely eliminated once commitment to exercise was considered; however, this result only emerged when we controlled for body mass index. For males, no other

dimensions of perfectionism behaved this way in the context of the exercise variable.

High self-expectations are the hallmark of unidimensional definitions of perfectionism (Burns, 1980; Hamachek, 1978; Pacht, 1984), and therefore it is interesting that it is this dimension for which findings of complete mediation emerged in both men and women. Moreover, regarding the historical acknowledgment of perfectionism as a consistent characteristic of anorexia patients, it should be pointed out that prior to the acknowledgement of multiple dimensions of perfectionism, the collection of clinical reports and empirical findings typically implied perfectionism of this self directed type. The present study has demonstrated that this well replicated association may in fact reflect an intervening variable: excessive commitment to exercise. Moreover, because complete mediation was obtained, this exercise variable may be considered the single, dominant factor accounting for this relationship.

Although causal conclusions cannot be drawn because of the cross-sectional design of the study, a mediating model can offer support for hypothesized causal or temporal relationships. Earlier in this paper, evidence was presented suggesting that exercise may precede and/or precipitate deviant eating behaviour. This position is largely based on retrospective behavioural history reports of anorexia patients (Kron et al., 1978; Katz, 1986; Davis, Katzman et al., 1997) for whom onset of excessive exercise often preceded onset of dieting. The findings from the present study, which are based on a measure of exercise attitudes rather than behaviour, suggest that this claim may only be relevant among males. This position is elaborated in the following paragraph.

The situation in which a variable mediates the relationship between a predictor and an outcome variable can be used to support a hypothesis that the mediating variable precedes the outcome variable. Thus, in the present study, the finding that excessive commitment to exercise mediates the relationship between self-oriented perfectionism and dietary restraint among both men and women can be used to support the contention that excessive exercise commitment precedes dietary restraint, the outcome variable, in both men and women. However, to strengthen the viability of this temporal claim, one needs to reverse the positions of the outcome variable and the proposed mediator, and demonstrate that mediation does not occur in this reverse situation. When we reversed the outcome variable and the mediating variable so that excessive commitment to exercise was the outcome variable and dietary restraint was in the mediator position, we found that dietary restraint *did* mediate the relationship between two dimensions of perfectionism (perfectionistic self-presentation and socially-prescribed perfectionism) and excessive exercise commitment among women. This finding is contrary to a hypothesis of a exercise-then-diet sequence, and supports the opposite, a diet-then-exercise sequence. In other words, the results of these various mediation analyses suggest that sequence of onset of dieting and exercise behaviour among women is likely bidirectional; one does not uniformly precede the other on the basis on these findings.

Among men, on the other hand, reversing the position of the dietary restraint and excessive exercise commitment variables did *not* provide evidence of mediation in the opposite direction. That is, dietary restraint did *not* mediate relationships between any

dimension of perfectionism and excessive exercise commitment, and this result emerged regardless of whether body mass index was controlled or not. Thus, among men, there is no support for a diet-then-exercise pattern (because dietary restraint does not mediate any regressions in which exercise commitment is the outcome variable) but there is some support for the exercise-then-diet pattern, based on the original result in which exercise commitment mediates the relationship between self-oriented perfectionism and dietary restraint, once body mass index was taken into account.

Once again it must be reinforced that causality and temporal sequencing cannot be concluded from cross-sectional data, so the above speculations regarding sequence of onset are only tentative. Regarding the mechanism by which an exercise variable may cause dieting behaviour or vice versa (i.e., through increased body narcissism or some physiological mediator), we would need to investigate the link between these two variables in greater depth. For example, a longitudinal or perhaps retrospective / prospective study that investigates the onset and course of exercise behaviour, dieting behaviour, and degree of body focus or other hypothesized linking variables among people who diet initially and people who exercise initially may clarify the nature of such causal hypotheses.

That evidence of mediation only emerges in men when body mass index is held constant can be explained simply. Larger men tend to diet; normal- and under-weight men don't. Numerically, this statement is represented by a strong relationship between BMI and dietary restraint in men. Thus, holding body mass index constant in men

enabled us to see the analysis in question more clearly, by removing the influence of a variable which is strongly related with both the predictor variable (self-oriented perfectionism) and the criterion variable (dietary restraint). Nonetheless, these findings do apply to a large number of individuals who combine dieting and exercise in an attempt to lose weight; in men the focus may simply be on those with a larger body mass index.

Final Statement and Future Research Directions

In summary, the contributions of this study have been to replicate and clarify the nature of a perfectionism-dieting relationship in nonclinical women, to extend this knowledge to a university student male sample, and to identify a mediating role of excessive commitment to exercise in the well-documented relationship between perfectionism and dietary restraint. More specifically, it appears that the relationship between the personal element of perfectionism - high self-expectations - and dietary restraint is only a byproduct of an excessive commitment to exercise.

Conceptually and methodologically, these findings suggest several avenues for future research. In order to elucidate the precise interrelationships and temporal ordering of events in the development of eating disorders, it is necessary to draw from population data as much information as is available about the variables known to be implicated in the etiology of eating disorders and to track the patterns of these variables across time. For example, it would be useful to pinpoint the age interval or 'window' of time during which dieting behaviour fluctuations are known to occur, above and below which the presence or risk of developing an eating disorder is substantially reduced. Similarly, population

data concerning the prevalence of excessive exercise behaviour and attitudes would be helpful in identifying populations at risk. Perhaps a clear cross-sectional examination of the prevalence and severity of dietary restraint and of excessive exercise across several age groups would be a reasonable place to start. Once the 'at risk' window of age is established, one might examine individual difference variables that are present prior to the at risk age, and follow these variables longitudinally in order to investigate the unfolding of deviant eating and exercise behaviour patterns.

From here, an interesting step might take the form of an experimental manipulation; for example, it might be useful to examine interventions designed to reduce the pathological aspects of an individual's attitudes toward exercise, or to somehow manipulate individual difference variables that seem to dictate an individual's path toward developing pathological eating or exercise behaviour. For example, if perfectionism of a self-oriented nature emerges as an individual difference variable that reliably separates children who go on to diet versus those who don't, it would be useful to investigate the viability of interventions designed to reduce or normalize an individual's perfectionistic tendencies at a young age. Such interventions might begin in a school environment in which pros and cons of being perfectionistic are discussed in the context of a classroom. Following this, individual children who are observed to express an inordinate amount of concern about how they appear or perform or present to others might be directly spoken to with the aim of exploring the reasons for and intensity of these concerns and perhaps challenging them. Ideally, the children's parents would be

involved in such consultations, and advised on such matters as how to encourage their children to achieve their potential yet not hold unrealistic expectations for them. Since the results of this study identify exercise and particularly dieting as behaviours to monitor in the context of perfectionistic tendencies, this classroom discussion about perfectionism might be most effective if presented in close temporal proximity to a unit on these health behaviours. And, as an additional step for individuals who appear most at risk, some behavioural intervention is necessary to truly convince an individual that imperfections and a normal (non-excessive) attitude toward exercise are possible and do not represent disasters. That is, for some individuals, recognition of dysfunctional cognitions is insufficient; and the actual behavioural experience of situations that are contrary to their belief system is crucial.

In the absence of longitudinal data, it should be recognized that retrospective data has been a useful means of tracking behaviour over time (e.g., Kron et al., 1978). Because of the expense and logistical burden of longitudinal data, and the difficulties with the experimental manipulation of some variables, retrospective data may be a reasonable alternative to examining the effect of individual difference variables on behaviour over time, and address some behaviours that are difficult to manipulate experimentally.

In conclusion, exercise variables need to be acknowledged in the context of dietary restraint. The co-occurrence of these behaviours is a strong, consistent phenomenon among both men and women. Among women, it is not clear whether

diETING precedes exercise or vice versa, and therefore both behaviours in excess and in isolation should be taken seriously. Future research might best be directed at establishing population-based data on excessive dieting and exercise patterns, in order to pinpoint an age interval for whom risk of eating disorder development is highest. Personality and psychosocial variables known to be important in the premorbid eating disorder profile, both transient and enduring, need to be investigated prior to and throughout the at-risk age interval. Cross-sectional studies involving experimental manipulation may help elucidate the role of some personality / psychosocial factors and the degree to which they can be modified or enhanced if such manipulation would decrease risk.

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Appendix A
Consent Form

PARTICIPANT CONSENT FORM

Project Title: Lifestyle and Ways of Being: The “Who I Am” Project

Investigators: Lise Gauvin, Ph.D. (Concordia University)
Donna R. White, Ph.D. (Concordia University)
Howard Steiger, Ph.D. (Douglas Hospital)
Beverley Mendelson, Ph.D. (Vanier Cegep)

This project is designed to understand more about how lifestyle is related to different ways of being in young adults. The results will help researchers and practitioners in the area of health to better understand the psychological factors related to lifestyle.

Your involvement in the project will consist of completing a series of questionnaires about your thoughts, feelings, opinions, and health behaviours. Completing the questionnaires requires about 60 minutes and substantial mental effort. There are no other risks associated with participating in this study and there are no hidden purposes to the study.

All individual scores will be kept confidential although group findings will be reported in the scientific literature. The results of the study will not be released in any form in which individuals may be identified. You are free to discontinue participation at any time.

I _____ have read the paragraphs explaining the nature and the procedures of the study conducted by Drs. Gauvin, White, Steiger, and Mendelson. I hereby consent to participate in the above-mentioned study recognizing that I am free to discontinue participation at any time.

Signature: _____

Date: _____

Appendix B

Multidimensional Perfectional Scale

Sample Items

© Paul L. Hewitt, Ph.D., & Gordon L. Flett, Ph.D., 1988

Multidimensional Perfectionism Scale (Sample Items)

© Paul L. Hewitt, Ph.D., & Gordon L. Flett, Ph.D., 1988

Self-Oriented Perfectionism Subscale

- 23. It makes me uneasy to see an error in my work.
- 6. One of my goals is to be perfect in everything I do.
- 1. When I am working on something, I cannot relax until it is perfect.
- 32. I must work to my full potential at all times.
- 42. I must always be successful at school or work.

Other-Oriented Perfectionism Subscale

- 16. I have high expectations for the people who are important to me.
- 26. If I ask someone to do something, I expect it to be done flawlessly.
- 7. Everything that others do must be of top-notch quality.
- 22. I can't be bothered with people who won't strive to better themselves.
- 29. The people who matter to me should never let me down.

Socially-Prescribed Perfectionism Subscale

- 11. The better I do, the better I am expected to do.
- 35. My family expects me to be perfect.
- 18. The people around me expect me to succeed at everything I do.
- 33. Although they may not show it, other people get very upset with me when I slip up.
- 13. Anything that I do that is less than excellent will be seen as poor work by those around me.

Appendix C

Perfectionistic Self-Presentation Scale

Sample Items

© Hewitt, Flett, & Fairlie, 1994

Perfectionistic Self-Presentation Scale (Sample Items)

© Hewitt, Flett, & Fairlie, 1994

2. I judge myself based on the mistakes I make in front of other people.
5. I try always to present a picture of perfection.
6. It would be awful if I made a fool of myself in front of others.
7. If I seem perfect, others will see me more positively.
14. I should solve my own problems rather than admit them to others.

Appendix D

Dutch Restraint Scale

Van Strien, Frijters, Bergers, & Defares, 1986.

Please respond to the following questions by circling the number that best corresponds to how often you engage in each of the behaviours as described.

1	2	3	4	5
never	seldom	sometimes	often	very often

- | | | | | | |
|---|---|---|---|---|---|
| 1. If you have put on weight, do you eat less than you usually do? | 1 | 2 | 3 | 4 | 5 |
| 2. How often do you refuse food or drink offered because you are concerned about your weight? | 1 | 2 | 3 | 4 | 5 |
| 3. Do you watch exactly what you eat? | 1 | 2 | 3 | 4 | 5 |
| 4. How often do you try not to eat between meals because you are watching your weight? | 1 | 2 | 3 | 4 | 5 |
| 5. How often in the evening do you try not to eat because you are watching your weight? | 1 | 2 | 3 | 4 | 5 |
| 6. Do you take into account your weight in deciding what to eat? | 1 | 2 | 3 | 4 | 5 |
| 7. Do you try to eat less at mealtimes than you would like to eat? | 1 | 2 | 3 | 4 | 5 |
| 8. Do you deliberately eat less in order not to become heavier? | 1 | 2 | 3 | 4 | 5 |
| 9. Do you deliberately eat foods that are low calorie? | 1 | 2 | 3 | 4 | 5 |
| 10. When you have eaten too much, do you eat less than usual the following days? | 1 | 2 | 3 | 4 | 5 |

Appendix E

Commitment to Exercise Scale

Davis, Brewer, & Ratusny, 1993

Instructions: The following are statements describing attitudes to exercise. Please respond by circling the number that best describes your opinion about each statement.

1. How important do you think it is to your general well-being *not* to miss your exercise sessions?

1	2	3	4	5
not at all important	of little importance	neither important nor unimportant	important	very important

2. Does it upset you if, for one reason or another, you are unable to exercise?

1	2	3	4	5
never	rarely	sometimes	often	always

3. If you miss an exercise session, or several sessions, do you try to make them up by putting in more time when you resume exercise?

1	2	3	4	5
never	rarely	sometimes	often	always

4. Do you have a set routine for your exercise sessions; e.g., the same time of day, the same location, the same number of laps, particular exercises, and so on?

1	2	3	4	5
never	rarely	sometimes	often	always

5. Do you continue to exercise at times when you feel tired or unwell?

1	2	3	4	5
never	rarely	sometimes	often	always

6. Do you continue to exercise even when you have sustained an exercise-related injury?

1	2	3	4	5
never	rarely	sometimes	often	always

7. Do you feel guilty that you have somehow let yourself down when you miss an exercise session?

1	2	3	4	5
not at all	a little	somewhat	guilty	very
guilty	guilty	guilty		guilty

8. Are there times when you turn down an invitation to an interesting social event because it interferes with your exercise schedule?

1	2	3	4	5
never	rarely	sometimes	often	always