

The Relationship Between Adolescent Worry, Intolerance of Uncertainty,  
and Fear of Anxiety

Nina Laugesen

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## Abstract

The Relationship Between Adolescent Worry, Intolerance of Uncertainty,  
and Fear of Anxiety

Nina Laugesen, Ph.D.

Concordia University, 2007

The primary goal of this research was to investigate the relationship between worry, intolerance of uncertainty, and fear of anxiety in a community sample of adolescents. Study 1 examined the association between adolescent worry, intolerance of uncertainty, and fear of anxiety ( $N = 258$ ). The results showed that intolerance of uncertainty and fear of anxiety were strongly, uniquely, and specifically related to adolescent worry above and beyond shared variance with gender, depression, and trait anxiety. The interaction between intolerance of uncertainty and fear of anxiety did not significantly predict worry above their separate and unique effects. Study 2 sought to delineate the normative adolescent trajectories of worry, intolerance of uncertainty, and fear of anxiety over time, and explored the longitudinal nature of the associations between worry and intolerance of uncertainty, and between worry and fear of anxiety ( $N = 338$ ). Data were collected from each participant twice a year for five years. The findings revealed modest, concave upward (i.e. U-shaped) trajectories for adolescent worry, intolerance of uncertainty, and fear of anxiety over the 10 assessment points. Gender differences in these trajectories were observed, with girls reporting more worry and fear of anxiety than boys across the study period. Unexpectedly, intolerance of uncertainty increased between the midpoint and endpoint of the study for girls, but not for boys. Support was found for a bidirectional and reciprocal relationship between

adolescent worry and intolerance of uncertainty, with change in one partially mediating change in the other, even when controlling for depression and trait anxiety. Conversely, adolescent worry and fear of anxiety showed a predominantly unidirectional relationship, with change in worry showing a stronger mediational effect on change in fear of anxiety than vice versa, a result which remained once the variance with depression and trait anxiety was partialled out. Overall, the findings highlight the important role of cognitive processes, such as intolerance of uncertainty and fear of anxiety, in our understanding of adolescent worry. These findings have important implications for our understanding of worry during this critical period of development.

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and Fear of Anxiety

General Introduction

During the past 30 years, there have been considerable advances in our understanding of worry. And yet, despite these many developments, research in the area of adolescent worry remains in its infancy. This lack of research is not surprising given that, within the psychological literature as a whole, the adolescent period itself has largely been understudied (e.g., U.S. Congress Office of Technology Assessment, 1991; Weisz & Hawley, 2002; Weisz, Weiss, Han, Granger, & Morton, 1995).

Researchers are now beginning to recognize that the adolescent period is a critical stage within human development that is in need of further attention (Cicchetti & Rogosch, 2002; Holmbeck, 2002; Kendall & Ollendick, 2004; Steinberg, 2005). Adolescence is a unique period during the life course, one that is characterized by both continuity and change (Montemayor & Flannery, 1990; Steinberg, 2005). Early experiences are important predictors of later psychological well-being, and the pathways established in childhood and adolescence are often carried into adulthood (Schulenberg, Sameroff, & Cicchetti, 2004). At the same time, adolescence brings forth a number of changes across physical, cognitive, emotional, and social domains (e.g., Cicchetti & Rogosch, 2002; Eyberg, Schuhmann, & Rey, 1998; Feldman & Elliott, 1990; Holmbeck, 2002; Spear, 2000a, 2000b; Steinberg, 2005). These changes, in turn, are linked to distinctive patterns of behaviour, both normative and maladaptive, which are manifested during this period. For example, adolescence commonly involves increased experimentation, heightened conflict with parents, and greater levels of depression and

anxiety (Holmbeck, 2002; Steinberg & Morris, 2001). While most difficulties encountered during this stage are believed to be relatively transitory in nature (e.g., Arnett, 1992), many youth experience significant problems during adolescence, creating distress and interference in the short term, and placing youth at risk for psychological difficulties over the long term.

At present, there is relatively little research on adolescent worry. Studies in this area have relied primarily on younger samples or have examined several anxiety disorders at once (Barrett, Dadds, & Rapee, 1996; Hudson & Rapee, 2004; Kendall & Ollendick, 2004). Nevertheless, initial research suggests that worry in youth is associated with a number of negative mental health outcomes, including high levels of distress, impaired social and academic functioning (King & Ollendick, 1989; Strauss, Lease, Kazdin, Dulcan, & Last, 1989), and increased depressive symptoms (Alpert, Maddocks, Rosenbaum, & Fava, 1994; Brady & Kendall, 1992; Last, Hersen, Kazdin, Finkelstein, & Strauss, 1987). Even more alarming are recent findings showing that Generalized Anxiety Disorder (GAD), which has excessive and uncontrollable worry as its main diagnostic feature, increases the risk of suicidal ideation for adolescents aged 15 years and up (Strauss et al., 2000). Additional data suggest that worry is chronic in nature, worsens over time, and frequently leads to problems in adulthood (e.g., Kendall & Ollendick, 2004; Last, Perrin, Hersen, & Kazdin, 1996; Muris, 2006).

Despite these findings, there remains a lack of published research on the etiology, course, and treatment of anxiety in youth. Similarly, there are significant gaps in our knowledge of worry during this crucial period within human development. First, there is a lack of normative developmental data on adolescent worry. Second, there is a paucity of

research on the correlates and developmental course of worry in youth. Third, little is known regarding the specific mechanisms through which adolescent worry emerges.

In recent years, cognitive factors such as intolerance of uncertainty (Dugas, Gagnon, Ladouceur, & Freeston, 1998) and fear of anxiety (Roemer & Orsillo, 2002) have emerged as important cognitive processes involved in the development and maintenance of adult worry. Yet little is known regarding their association with worry in adolescence. Accordingly, the main purpose of this investigation was to extend the current body of research by examining the associations between worry, intolerance of uncertainty, and fear of anxiety in a community sample of adolescents. Study 1 was a preliminary investigation of the unique and specific relationship between adolescent worry, intolerance of uncertainty, and fear of anxiety. Study 2 sought to extend this research by prospectively examining the developmental trajectories of worry, intolerance of uncertainty, and fear of anxiety throughout the adolescent period. In addition, Study 2 explored the longitudinal nature and sequence of change in worry, intolerance of uncertainty, and fear of anxiety.

This general introduction will provide an overview of the current empirical literature relevant to adolescent worry, including basic concepts and key research findings. When appropriate, reference will be made to research that has examined worry in adult and child populations. Subsequently, changes in classification and definitional criteria will be outlined, and a number of developmental issues which are believed to play a role in adolescent worry will be considered. Finally, a review of several key theories of worry will be provided. In considering these theories, an emphasis will be placed on the

central role of cognitive processes, including intolerance of uncertainty and fear of anxiety, in our understanding of worry.

### *Worry*

Worry, at low to moderate levels, is considered to be a common occurrence in the general population. For instance, Tallis, Davey, and Capuzzo (1994) found that as many as 38% of adults report worrying at least once a day. Not surprisingly, worry also appears to be a relatively normal phenomenon in youth. In a study examining worry in a community sample of children and young adolescents (Muris, Meesters, Merckelbach, Sermon, & Zwarkhalen, 1998), almost 70% of the respondents aged 8 to 13 years reported worrying “every now and then.” In a related investigation, Muris, Merckelbach, Meesters, and van der Brand (2002) found that 60.1% of nondisordered children between the ages of 3 and 14 years reported worrying “from time to time.”

Because of the lack of research on adolescent worry, there is little information on the prevalence of normative worry during this period. Nevertheless, the results from preliminary investigations suggest that adolescents do experience worry. Brown, O’Keefe, Sanders, and Baker (1986) found that children and adolescents aged 8 to 18 years report episodes of anxious anticipation during periods of high stress. Similarly, adolescents in grades 7 through 11 displayed average scores in the low to moderate range of severity on measures of the tendency to worry (Gosselin, Tremblay, Dugas, & Ladouceur, 2002; Laugesen, Dugas, & Bukowski, 2003).

Thus, in adolescence, worry appears to be a relatively common and normative experience of daily life. In most cases, worry is transient in nature, dissipating within a short period of time (see Craske, 1997; Muris, 2006). Some adolescents, however, suffer



from intense, distressing, and persistent levels of worry. In fact, research demonstrates that anxiety disorders are among the most common forms of psychopathology experienced in youth (Bernstein, Borchardt, & Perwien, 1996; Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Muris, 2006). With regards to problematic worry, Muris and colleagues (1998) reported that as many as 6.2% of children aged 8 to 13 years met criteria for GAD. Also, Bell-Dolan, Last, and Strauss (1990) demonstrated that as many as 30% of youth aged 5 to 18 years endorsed subclinical levels of excessive worry. These results were replicated by Fournier, Freeston, Ladouceur, Dugas, and Guevin (1996), where 25% of their nonclinical sample of adolescents reported worry in the pathological range.

Efforts to study worry in adolescence have been hindered by a number of key issues. These include changes in nomenclature, the delayed formulation of a clear definition of worry, debate regarding the distinctiveness of the worry construct, and the lack of cohesive framework for conceptualizing adolescent worry within its larger developmental context.

*Changes in nomenclature.* Over the last 25 years, there have been significant changes in the definitional criteria for generalized anxiety in the Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, 1980, 1987, 1994, 2000). When GAD was first introduced as a diagnostic category in the DSM-III (APA, 1980), it was conceptualized as a residual diagnosis (i.e., the diagnosis was assigned only if criteria were not met for another Axis I disorder) and was intended primarily for adults. Although youth under the age of 18 could be diagnosed with GAD if they met diagnostic criteria, a separate category was also included for childhood

generalized anxiety, namely Overanxious Disorder (OAD). The separation of generalized anxiety across two diagnostic categories, the considerable overlap between the two classifications and other DSM-III disorders (e.g., Kendall, Krain, & Treadweel, 1999), and poor definitional criteria for both GAD and OAD, resulted in unreliable and unstable diagnostic categories (Albano & Hack, 2004; Silverman & Eisen, 1992). Consequently, GAD remained an understudied and poorly understood diagnosis plagued by criticism regarding its authenticity as a separate and distinct syndrome (Mennin, Heimberg, & Turk, 2004).

As research in the area of generalized anxiety progressed, significant classification changes were made to the DSM manual. The status of GAD as a residual category was dropped in 1987, reflecting empirical advances which suggested an independent, stand-alone category. In addition, the primary criterion of 'generalized and persistent anxiety' was replaced by 'excessive and/or unrealistic worry in two or more areas' in 1987, and was again revised in 1994 to its current definition, 'excessive and uncontrollable worry about a number of daily activities.' Of particular relevance to the study of anxiety in youth, OAD and GAD were merged in 1994 into one unitary disorder, with OAD being completely eliminated as a diagnostic category and subsumed under the umbrella diagnosis of Generalized Anxiety Disorder (APA, 1994).

*The definition of worry.* A second obstacle to the investigation of adolescent worry has been the delayed emergence of a clear and explicit definition of worry for youth (Vasey & Daleiden, 1994). This gap in the literature has led many researchers to adopt adult characterizations of worry in their investigations with children and adolescents.

Even within the adult literature, there have been considerable shifts in the way worry has been defined. In fact, it wasn't until the early 1980s that one of the first research-based formulations of worry was proposed. Specifically, Borkovec and colleagues (Borkovec, Robinson, Pruzinsky, & DePree, 1983) defined worry as a series of negative and uncontrollable thoughts and images representing an effort to mentally problem-solve uncertain future situations involving the possibility of one or more negative outcomes. In 1990 (Borkovec & Inz, 1990) and 1993 (Borkovec & Lyonfields, 1993), research findings emerged indicating that worry was primarily composed of thoughts rather than images. Accordingly, Borkovec (1994) revised his definition, arguing that worry was a predominantly verbal-linguistic (rather than imaginal) strategy used in an attempt to anticipate and avoid possible future negative outcomes. In 1998, Borkovec, Ray, and Stöber further refined this definition, stating that worry is an internal dialogue about negative events which may occur in the future. In 2004, Borkovec, Alcaine, and Behar concluded that worry is a cognitive activity composed primarily of thought, centering on efforts to avoid future catastrophe, and functioning as a cognitive avoidance strategy in response to perceived and anticipated threat.

During the same general period, separate but related lines of inquiry provided similar descriptions. Mathews (1990) referred to adult worry as an awareness of potential future dangers, involving repeated rehearsals of situations without resolution. MacLeod, Williams, and Bekerian (1991) regarded worry in adulthood as a cognitive act accompanied by feelings of anxiety concerning future events in which there is uncertainty about the outcome and the future is appraised as negative.

To date, only one definition of childhood worry has been proposed. Building on existing adult definitions, Vasey and Daleiden (1994) conceptualized worry in childhood as a predominantly anticipatory cognitive process characterized by repetitive verbal thinking about a number of threatening events involving potentially threatening outcomes. Together, these accounts highlight three important features of worry. First, worry is primarily an anticipatory cognitive process; second, the focus is on potential future negative outcomes; and third, worry involves fear of uncertain events.

*Worry as a distinct construct.* The characterization of worry as a cognitive act has led some researchers to question the distinctiveness of worry as a separate and conceptually distinct construct from anxiety and depression. Consequently, a series of investigations have been carried out examining the commonalities and distinctions between these constructs.

Traditionally, worry and anxiety have been viewed as conceptually distinct, with anxiety described as a broad, all-inclusive construct involving of somatic, cognitive, and behavioural elements (Barlow, 1988; Lang, 1968), and worry being more narrowly defined as a cognitive process focusing on excessive concern about future events (e.g., Borkovec et al., 1998; MacLeod et al., 1991; Mathews, 1990). Worry and anxiety appear to be strongly related, with a number of studies reporting correlations between .60 and .70 (Borkovec et al., 1983; Davey, 1993; Russell & Davey, 1993; Zebb & Beck, 1998). Despite this strong relationship, research has shown that worry and anxiety each have specific and unique characteristics. For instance, the correlation between worry and anxiety is significantly lower when examined in individuals diagnosed with GAD (e.g.,  $r = .18$ ; Meyer, Miller, Metzger, & Borkovec, 1990). Worry and anxiety also show

differential relationships with other constructs. Worry, for example, appears to be more highly related to test performance than is anxiety (Deffenbacher, 1980). In community samples, worry and trait anxiety each account for separate variances in problem-solving and coping strategies (Davey, Hampton, Farrell, & Davidson, 1992). Relative to anxiety, worry is more highly associated with depression, negative affect, confusion, lack of emotional and personal control, inadequate problem solving skills (Zebb & Beck, 1998), intolerance of uncertainty, and negative problem orientation (Dugas, Freeston, & Ladouceur, 1997). In an experimental task comparing the effects of inducing either worrisome, somatically anxious, or neutral states, only worry induction (and not somatic anxiety induction) was found to produce a greater number of negative cognitive intrusions compared with the neutral induction (Borkovec et al., 1983; see also York, Borkovec, Vasey, & Stern, 1987). Finally, a preliminary investigation exploring the directionality of the relationship between worry and anxiety found that worry leads to increased anxiety, but not vice versa (Gana, Martin, & Canouet, 2001).

Similarities and distinctions have been also been found between worry and anxiety in childhood populations. Significant correlations between childhood worry and anxiety have been demonstrated in both community (Chorpita, Tracey, Brown, Collica, & Barlow, 1997; Muris et al., 1998; Silverman, La Greca, & Wasserstein, 1995) and clinical populations (Perrin & Last, 1997). Nevertheless, Weems, Silverman, and LaGreca (2000) found that worry in youth aged 6 to 16 years contributed to the prediction of fear scores above and beyond the contribution of anxiety. Together, these findings indicate that despite the overlap between the constructs of worry and anxiety, they each present with unique and distinguishing features.

In a similar vein, a number of investigations have indicated that worry and depression have both common and unique features. With regards to their commonalities, research has demonstrated a strong and unique association between excessive worry and depression (Axelson & Birhamer, 2001; Brown, Marten & Barlow, 1995; Starcevic, 1995). Mineka, Watson, and Clark (1998) reported lifetime comorbidity rates for anxiety and depression between 56 to 58%, with GAD showing the strongest rate of cooccurrence with depression (Brown, Chorpita, & Barlow, 1998). Joorman and Stöber (1999) similarly found a high degree of overlap between excessive worry in GAD analogues and depressed analogues, with only muscle tension reliably differentiating the two groups.

Despite this strong association, closer inspection has revealed that worry and depression have distinct characteristics, each with sources of variance not explained by the other. For instance, in a community sample of adults, Freeston, Dugas, and Ladouceur (1996) found a stronger relationship between excessive worry and GAD symptoms compared to depressive symptoms. Similarly, Chelminski and Zimmerman (2003) found that GAD patients reported significantly more worry than depressed patients. These authors also noted that depressed and anxiety-disordered patients (other than GAD patients) reported similar levels of worry. Dugas, Schwartz, and Francis (2004) demonstrated that the association between intolerance of uncertainty and worry was stronger than the association between intolerance of uncertainty and depression. Finally, evidence has emerged showing that worry and depression are each characterized by different thought content. Specifically, while worry appears to focus on themes of future threat, including harm and danger, depression is more focused on past experiences and excessive attention on loss and failure (Beck, Emery, & Greenberg, 2005).

Similar to their adult counterparts, worry and depression in youth are related but distinct constructs (Axelson & Birmaher, 2001; Chorpita et al., 1997; Cole, Peeke, Martin, Truglio, & Seroczynski, 1998; King, Ollendick, & Gullone, 1991; Muris et al., 1998). Last and colleagues (1987) found that 45.4% of youth with primary Major Depressive Disorder had OAD as a secondary diagnosis, whereas none of the children with primary OAD met criteria for secondary Major Depressive Disorder. In another study, Kovacs, Gatsonis, Paulauskas, and Richards (1989) found that while 41% of schoolchildren with Major Depressive Disorder received Social Phobia as a concurrent diagnosis, only 13% received a secondary diagnosis of OAD.

Research suggests that the relationship between excessive worry and depression is largely accounted for by the shared, underlying feature of general negative affect (i.e., general emotional distress) (Brown et al., 1998; Clark & Watson, 1991; Watson & Clark, 1984). In fact, findings show that general negative affect is particularly high in patients with GAD and depression compared with individuals with other anxiety disorders (Brown et al., 1998; Watson & Clark, 1984). Depression, however, can partly be differentiated from worry by the presence of low positive affect, including decreased arousal, energy, and activity (Beck et al., 2001; Clark, Watson, & Mineka, 1994; Watson & Clark, 1984).

Thus, the collective findings of these studies support the proposition that worry is a separate and unique construct from anxiety and depression, despite its shared features with these constructs.

*Normal versus problematic worry.* Research examining the difference between normal and problematic worry suggests several distinguishing features. Specifically, the

data indicate that worry is problematic when it becomes excessive and uncontrollable, as indicated by the length of time spent worrying (or percentage of day spent worrying), the frequency of worry events, and one's perceived difficulty controlling the worry (Brown, Antony & Barlow, 1992; Craske, Rapee, Jackel, & Barlow, 1989; Dupuy, Beaudoin, Rhéaume, Ladouceur, & Dugas, 2000). Interestingly, research examining content differences in worry themes between adult worriers and nonclinical controls shows few reliable differences in the types of worries experienced across these groups (Craske et al., 1989; Roemer, Molina, & Borkovec, 1997).

Comparisons of children with clinical and nonclinical levels of worry reveal a similar pattern of results. Muris et al. (1998) reported that OAD/GAD children reported a higher number of specific worries, a higher frequency of their main worry, a stronger interference with daily activities, more anxiety linked with their worry, and more difficulty controlling their worry than did control children. Consistent with these findings, Weems and colleagues (2000) found that the number, intensity, and frequency of worries were related to increased anxiety in children and adolescents. They also noted that the thematic content of worry reported by clinically-referred youth were highly similar to those of nonreferred youth. Szabo and Lovibond (2004) found that clinically anxious children aged 7 to 13 years displayed significantly higher scores on a self-report measure of the tendency to worry compared to control children. The clinically-anxious children also described their worry as more difficult to control compared to the control children.

Taken together, the evidence suggests that the worry process itself is similar in both nonclinical and clinical populations across the lifespan. Normal and clinical worry



are thus best differentiated by measuring the excessiveness and perceived controllability of worry experiences. Accordingly, increasing our understanding of normal worry can increase our knowledge of pathological worry and vice versa.

*The link between development and adolescent worry*

While it is commonly believed that developmental issues play an important role in the manifestation of worry in youth (Muris, 2006; Vasey & Daleiden, 1994), there have been surprisingly few studies specifically devoted to this issue (Ollendick & Vasey, 1999). Among those that have, a clear trend has emerged showing that worry undergoes a significant transformation sometime between childhood and adolescence. For instance, several studies have demonstrated that the characteristics of worry change with age, going from more concrete concerns in childhood (e.g., fear of strangers and physical injury) to increasingly abstract worries in adolescence (e.g., concerns regarding social evaluations) (Bernstein et al., 1996; Gullone, 2000; Spence, Rapee, McDonald, & Ingram, 2001). Similarly, research has shown that younger children tend to experience a number of comorbid and transient anxiety disorders (Masi, Mucci, Favilla, Romano, & Poli, 1999; Verduin & Kendall, 2003), whereas adolescents experience more distinct and persistent disorders (Bernstein et al., 1996). Empirical data also suggest age-related differences in the prevalence of excessive worry and GAD. For example, Last and colleagues (1987) found higher rates of OAD among postpubertal youth than prepubertal youth. Likewise, Anderson, Williams, McGee, and Silva (1987) reported that only 2.4% of their 11-year-old cohort met criteria for OAD compared with 5.9% in a 15-year-old cohort. In an epidemiological study by Kashani and Orvaschel (1988), OAD was the least reported anxiety disorder in preadolescence. Conversely, OAD was found to be the most

commonly occurring anxiety disorder in adolescents aged 14 to 18 years. In a follow-up investigation, Kashani and Orvaschel (1990) compared the rates of OAD across three groups of youth aged 9, 12, and 17 years. Findings revealed increased rates for OAD with each consecutive age group (age 9 = 8.6%, age 12 = 11.4%, age 17 = 17.1%).

In addition to these age-related differences, another well-established finding is that girls report significantly more worry than boys (e.g., Kaufman, Brown, Graves, Henderson, & Revolinski, 1993; McGuire, Mitic, & Neumann, 1987; Spruijt-Metz & Spruijt-Metz, 1997). For instance, one study found that girls aged 8 to 13 years scored significantly higher than boys on measures of worry, anxiety, and depression (Muris et al., 1998). Similarly, Laugesen et al. (2003) found that girls aged 14 to 18 years scored significantly higher on a measure of excessive worry than boys.

In short, the data presented above indicate that the manifestation of worry changes across time and according to gender, with older youth and females being at increased risk for developing difficulties with worry. Together, these results suggest that the individual's stage of development and unique environmental context may have a significant impact on the experience and expression of worry in youth.

The field of developmental psychopathology provides a comprehensive framework for conceptualizing these issues. Briefly, the stated goal of developmental psychopathology is to understand the origins and developmental course of human behaviour across the life course, increase our knowledge of how both normal and atypical behaviour emerges developmentally, and to understand how evolving functions, competencies, and challenges impact the experience and expression of a disorder (Cicchetti & Cohen, 1995; Schroeder & Gordon, 2002; Sroufe & Rutter, 1984).

According to this theoretical framework, human behaviour, both normal and atypical, is the result of dynamic interactions between the individual, the environment, and underlying mechanisms (Cicchetti, 1990; Cicchetti & Schneider-Rosen, 1984; Sroufe, 1997). Furthermore, this model incorporates knowledge of genetic, biological, and environmental factors (Cicchetti & Toth, 1995; Masten & Braswell, 1991). Thus, from this viewpoint, an underlying mechanism may lead to different behaviours at different times in the developmental process and across different contexts (Cicchetti, Nurcombe, & Garber, 1992).

Addressing the problem of worry in youth requires an approach that considers both individual and contextual influences involved in the adolescent's development. While few studies have specifically focused on these issues, evidence suggests that one's cognitive developmental level and changing environmental context may play important etiological roles (Muris, Merckelbach, & Lujten, 2002; Vasey, 1993).

*Worry and cognitive development.* In general, it is posited that children become increasingly capable of worry as their cognitive abilities develop. Research suggests that at least two cognitive abilities are necessary to fully engage in the worry process (Vasey, 1993; Vasey & Daleiden, 1994). First, because worry is primarily an anticipatory process, an individual must be able to anticipate and conceptualize future events in order to worry. Second, an individual who engages in worry must have the ability to consider multiple outcomes and to elaborate on potential negative and catastrophic consequences. According to Piaget's constructivist theory of cognitive development, children under the age of 7 are still in the preoperational stage of development, limiting their ability to conceptualize the future and elaborate on multiple potential negative outcomes (Piaget &

Inhelder, 1966; Vasey, 1993; Vasey, Crnic, & Carter, 1994; Vasey & Daleiden, 1994). Moreover, prior to this age, children rarely consider more than a single solution to a problem (Vasey, 1993). It is only at 7 to 8 years of age, when children transition from the preoperational stage to the concrete operational stage, that youth become capable of focusing on several features at once. Thus, children under the age of 7 or 8 years lack the cognitive capacities that would enable them to elaborate long chains of negative outcomes and their consequences. This is not to suggest that worry doesn't exist in younger children; rather, worries in early childhood appear to be more concrete and less elaborated in comparison to their older counterparts (Vasey & Daleiden, 1994).

Further cognitive developments which occur from later childhood to midadolescence may also have an impact on the worry process. While there is an increase in anticipatory capabilities between the ages of 8 and 13 years, it is only in adolescence that an individual is fully able to engage in formal reasoning. The acquisition of formal reasoning allows an individual to consider the future in an abstract way and to anticipate a number of potential outcomes across a variety of situations (Wallace & Rabin, 1960). As such, an individual's perception of a situation or event changes as he/she develops the ability to conceptualize the future in an abstract way (Vasey, 1993).

More recent conceptualizations of cognitive development in youth have indicated that adolescence is a period characterized by integrated, multilevel changes in ways of thinking (Graber & Petersen, 1991; Lerner & Galambos, 1998). Specifically, there appears to be an increase in cognitive abilities during adolescence, with individuals processing information more quickly and efficiently than their younger counterparts (Ceci & Bronfenbrenner, 1985; Kail, 1991). Accordingly, it may be that the emerging

cognitive capacities which occur during youth may lead to more salient and stable worries over time (Morris, Hirshfeld-Becker, Henin, & Storch, 2004).

Only a few studies have specifically examined the relationship between worry and cognitive development in youth. One study found a significant, positive association between cognitive development, worry elaboration, and the presence of a personal worry in nonclinical children aged 3 to 14 years (Muris, Merckelbach, Meesters et al., 2002). This study also revealed an increase in the number of specific worries and the degree of worry elaboration across age categories (i.e., 3 to 6 year-olds, 7 to 9 year-olds, and 10 to 14 year-olds). The authors also tested a preliminary model of worry in youth and found that worry elaboration mediated the relationship between age/cognitive development and the presence of a personal worry. Henker, Whalen, and O'Neil (1995) similarly found that seventh and eighth grade students provided more detail and elaboration when describing their worries than did fourth, fifth, and sixth graders. They also found that this increase in detail and worry elaboration for older children was not attributable to greater levels of verbal fluency, but was due instead to differences in the worry process itself.

Further evidence for a developmental shift in worry comes from a series of studies which suggest age differences in the perception of threat (Magnusson & Olah, 1981; Magnusson & Stattin, 1981). Specifically, the authors found that when confronted with an anxiety-provoking situation, 12-year-olds were more likely to be concerned with negative consequences that were temporally near, whereas 15- and 18-year-olds referred more frequently to temporally distant threats. In a related study, Stattin (1984) demonstrated that their 12-year-old sample classified anxiety-provoking situations primarily by focusing on the stimulus properties which were perceptually salient in nature

(i.e., situations sharing a common trigger object). By contrast, their 15- and 18-year old adolescent samples classified the same events on the basis of latent, anticipatory characteristics (i.e., situations sharing a common consequence). Therefore, it appears that a developmental shift towards increased worry among adolescents may be related to emerging cognitive abilities over time.

*Adolescent storm and stress.* Recent findings also suggest that the changing adolescent environment may play an important role in the development of worry in youth. In fact, adolescence has been described as a period of continual change between individuals and their contexts (Lerner & Galambos, 1998; Ollendick & Vasey, 1999).

Traditionally, adolescence has been viewed as a period of “storm and stress” (Hall, 1904, as cited in Arnett, 1999). The storm and stress theory posits that adolescence is a difficult stage in development characterized by turmoil and crisis. In recent years, however, it has become increasingly evident that despite the many challenges of adolescence, most individuals adapt quite well to the changes which occur during this period (e.g., Lerner & Galambos, 1998; Petersen, 1988). Nevertheless, the adolescent period does pose many unique challenges (Buchanan, Eccles, & Becker, 1992). Theorists propose that some adolescents experience an increase in difficulties in three major areas: (1) minor parent-adolescent conflicts, (2) frequent mood disruptions, and (3) increased risk taking (Arnett, 1999).

Research suggests that most adolescents experience happy and positive relationships with their parents (Smetana, Campione-Barr, & Metzger, 2006; Steinberg, 2001). Yet, several researchers have also noted age-related increases in adolescent-parent conflicts (Collins & Laursen, 2004; Holmbeck, 1996; Montemayor & Hanson, 1985;

Smetana, Campione-Barr, & Metzger, 2006), especially in families of teenagers with depression or conduct disorder (e.g., Steinberg, 2001). Although this higher rate of conflict does not appear to seriously disrupt parent-adolescent relationships (e.g., Hill & Holmbeck, 1987; Steinberg, 2001), adolescent mental health has been found to be better in families with close, nonconflicted adolescent-parent relationships (Steinberg, 2001). Similarly, some research suggests that while moderate levels of conflict are associated with positive adolescent adjustment, high levels of conflict appear to be deleterious for adolescent development and future adjustment (e.g., Laursen & Collins, 1994).

Adolescence is also characterized by frequent fluctuations in mood, with adolescents reporting more frequent and intense changes in mood compared with their younger and older counterparts (Arnett, 1999; Larson & Richards, 1994). Adolescents describe repeated episodes of feeling depressed, self-conscious, embarrassed, awkward, lonely, nervous, and ignored (Larson & Richards, 1994). Adolescents also tend to experience more negative and extreme reactions to life changes and personal transitions, including physical maturation, educational transitions, social interactions, and dating (Larson & Richards, 1994).

Finally, the adolescent period is associated with increased involvement in periodic experimentation (Jessor, 1998; Lerner & Galambos, 1998). In fact, research has shown the emergence of numerous risk-taking behaviours (i.e., behaviours with the potential for harm to self and/or others) during this developmental period, particularly in Western countries (Arnett, 1992; Gardner & Steinberg, 2005; Hurrelmann, 1990; Lerner & Galambos, 1998). Examples of risk behaviours include substance use (Johnston, O'Malley, & Bachman, 1995), delinquency, unsafe automobile driving (Smart, Adlaf, &

Walsh, 1994; Williams, 1998), and unprotected sex (Lerner & Galambos, 1998; Wills, DuHamel, & Vaccaro, 1995). Although some involvement in risky situations is considered normative (Arnett, 1992; Jessor, 1998; Lerner & Galambos, 1998), early and continued participation in risk-taking behaviours is linked with many negative health outcomes (Jessor, 1998; White, Bates, & Labouvie, 1998).

Taken together, these findings suggest that while most adolescents do not experience the extreme turmoil and crisis proposed by the storm and stress theory, this period certainly is characterized by an increase in difficulties across multiple domains (Arnett, 1999). In essence, then, adolescents are confronted with a number of challenges at a time when they are experiencing multiple personal transitions. According to Lerner and Galambos (1998), there is no single factor which universally impacts on adolescent development. Rather, it is the co-occurrence and interaction between multiple shifts across a number of contexts which can create difficulties for individuals during this period. Using this perspective as a base, it is possible that a simultaneous increase in difficulties may partly account for the increase in worry during adolescence (e.g., Laugesen et al., 2003). For instance, research has shown that worry is associated with daily hassles (e.g., Spruijt-Metz & Spruijt-Metz, 1997). Accordingly, adolescents who experience a high number of daily conflicts with authority figures may be at a heightened risk for worry. Similarly, research has shown a strong association between anxiety and depression in adolescence (e.g., Cole et al., 1998). Given that adolescents are more likely to experience frequent and intense mood disruptions, including negative mood, they may be more likely to experience an increase in worry. Finally, it appears that poor decision-making during the adolescent period entails more negative and serious consequences than



in childhood (Dryfoos, 1990, as cited by Lerner & Galambos, 1998). At the same time, adolescents are considered to be more responsible for their actions and associated consequences (Petersen, 1988). Accordingly, an increase in risky behaviours may lead to heightened levels of worry due to the possibility of potentially harmful and uncertain consequences of engaging in these activities.

*Conclusions regarding the link between development and adolescent worry.* In sum, the evidence presented thus far indicates that the process of worry during adolescence is closely linked to an individual's level of development and unique environmental context. The changes in the characteristics of worry over time may have important implications for the study of worry in youth. For instance, it is clear that understanding worry from a developmental perspective is critical for effectively assessing, diagnosing, and treating excessive worry and GAD in adolescence. Assessments and interventions would benefit from being developmentally sensitive; in other words, they should take into account the adolescent's level of cognitive development and his/her environmental context (Chronis, Hones, & Raggi, 2006; Holmbeck, Greenley, & Franks, 2003). Given that certain worries are normative at certain stages of development, an adolescent's worry behaviour must therefore be considered within the context of developmental norms.

As mentioned earlier, adult conceptualizations of worry are frequently used with youth and generally appear to be appropriate. The finding that worry in childhood is more concrete, temporally near, and less elaborated, whereas adolescent worry is more detailed and abstract, suggests the possibility that adolescent worry may be more similar to adult worry than childhood worry. Unfortunately, the research on worry and anxiety in youth

has frequently combined child and adolescent samples and/or examined several anxiety disorders simultaneously. Thus, the findings reviewed above suggest that: (1) a conceptualization of worry in youth which includes cognitive development may be appropriate; and (2) it may be more advantageous to study adolescent worry, particularly in older adolescents, independently of childhood worry.

### *The Nature and Function of Worry*

Although there have been significant advances in our understanding of the nature and function of worry in adults, theoretical models specifically focused on adolescent worry have not yet been proposed. Consequently, investigators must rely heavily upon adult models (Vasey, 1993).

*Avoidance theory of worry.* Researchers at Penn State University have proposed a comprehensive theoretical account of worry in adults. This influential theory is based on the extensive work of Borkovec and colleagues regarding the nature and function of worry. According to Borkovec and colleagues (2004), worry functions as a cognitive avoidance response to perceived threat. Specifically, Borkovec et al. (2004) propose that worry represents an effort to avoid or escape aversive somatic activation which is caused by threatening mental imagery. Borkovec further argues that because avoidance has the short-term effect of providing immediate relief from distress and aversive arousal, the worry process is negatively reinforced. Avoidance, however, has the adverse consequence of inhibiting the emotional processing of threat-related stimuli necessary for changing anxious meanings, and as a result, the cognitive avoidance function of worry is maintained over the longer-term.

Support for the avoidance function of worry comes from a number of studies showing that (1) worry is composed primarily of thought rather than imagery, and (2) thought activity, and therefore worry, inhibits aversive somatic activation which would otherwise be elicited by threatening imagery. In fact, a host of studies have supported the idea that worry is composed primarily of thought rather than imagery. In 1990, Borkovec and Inz compared individuals diagnosed with GAD with nonanxious controls during periods of relaxation and worry. During the periods of self-relaxation, the nonanxious group reported a predominance of imagery, while GAD subjects reported equal amounts of thoughts and images. When asked to worry, the nonanxious subjects reported an increase in thought predominance; the GAD subjects showed additional, though not significant, increases in thought and decreases in imagery. After treatment, the GAD subjects reported proportions of thoughts similar to nonclinical subjects. A follow-up study examined the proportion of thought and/or imagery experienced during worry episodes in a community sample of adults (Borkovec & Lyonfields, 1993). Fifty-one (51) percent of the participants reported a preponderance of thought, 3% reported a preponderance of imagery, and 46% reported a mixture of the two. Participants given a forced choice between a preponderance of thought content versus a predominance of imagery during worry episodes reported significantly more thought activity (70%) than imagery (30%). These results were replicated by Freeston et al. (1996) who found that worry was characterized largely by thought rather than imagery, and that excessive worriers endorsed a higher percentage of thoughts compared with their nonanxious counterparts. Similarly, Stöber and colleagues (Stöber, 1998; Stöber, Tepperwien, & Staak, 2000) found that worry topics had a weaker association with imagery than did

nonworry topics, and that heightened levels of worry were associated with decreased imagery.

The cognitive avoidant theory of worry is further supported by a sizeable literature showing that worry dampens aversive somatic experiences. Specifically, it appears that verbal thoughts about fear-provoking material produce less cardiovascular responding compared to imaginal activity (Vrana, Cuthbert, & Lang, 1986). Borkovec and Hu (1990), for example, found that participants who engaged in worrisome thinking before giving a speech showed very little cardiovascular responding (as measured by heart rate) compared with participants who engaged in either relaxed or neutral thinking prior to giving a speech. In a partial replication of this study, Borkovec, Lyonfields, Wisner, and Deihl (1993) found that the more participants worried, the less they experienced cardiovascular responding to threatening stimuli. Similarly, worrying after exposure to a gruesome film has been related to less anxiety compared with imaginal rehearsal (Wells & Papageorgiou, 1995). In line with this data, research has shown that individuals diagnosed with GAD display less heart rate variability compared with nonanxious controls (Lyonfields, Borkovec, & Thayer, 1995).

These findings led Borkovec and his colleagues (2004) to propose that the verbal-linguistic feature of worry functions primarily as a means to avoid somatic anxiety elicited by threatening mental imagery. In other words, the shifting of one's attention from imagery to worrisome thinking results in the short-term avoidance of the aversive, somatic component of the fear response. Borkovec further argues that worry suppresses a specific type of somatic responding, that is, the sympathetic or 'fight-or-flight' response. In fact, symptoms mediated by the autonomic nervous system are less common in

patients diagnosed with GAD than symptoms mediated by the central nervous system (Marten et al., 1993). Several mechanisms of how worry might lead to decreased cardiovascular responding have been hypothesized. Specifically, there is preliminary evidence suggesting that: (1) worry utilizes a substantial proportion of attentional resources needed for processing information (Mathews, 1990); (2) worry inhibits the shifting away of attention from excessive thought activity (Parkinson & Rachman, 1980); (3) worry isolates worry content from its associative network (Smith, 1984); and (4) worry lessens the probability of detecting a disparity between information expected and information received (Foa & Kozak, 1986).

Thus, the evidence suggests that worry may be 'beneficial' in the short term in that it reduces distressing cardiovascular responding, which in itself is negatively reinforcing (Borkovec, 1994). Over the longer term, however, worry is associated with significant detrimental effects, including interference of emotional processing and maintenance of anxiety-related thoughts. This is evidenced in the literature by data which show that worrying interferes with the habituation to phobic images (Borkovec & Hu, 1990). According to Foa and Kozak (1986), emotional processing occurs when all aspects of meaning, including physiological and affective components, are accessed and experienced. Therefore, in order to achieve anxiety reduction, a complete activation of the fear structures in memory must occur. If complete activation of the fear structures in memory considered necessary for emotional processing is not experienced, the processes of habituation and extinction are prevented, and the threatening meanings of stimuli are preserved.

In sum, according to the Penn State research group, worry is characterized by verbal-linguistic activity which functions primarily as a negatively reinforced avoidance strategy. It is postulated that worry represents an attempt to suppress aversive imagery which would otherwise evoke unpleasant somatic activity and consequently intense negative emotions in the short term. Unfortunately, worrying interferes with the emotional processing of fearful reactions, thus maintaining the perception of threat over the longer term. The negative reinforcement of worry represents one way in which worry may be maintained and strengthened (Borkovec et al., 1998).

The influential work of Borkovec and colleagues has led to increased attention to the phenomenon of worry and GAD. As a result, a number of investigators have advanced theoretical models of excessive worry which have incorporated many of the features highlighted in Borkovec's work.

*Fear and avoidance of internal experiences and worry.* Recently, Roemer and colleagues (Roemer & Orsillo, 2002; Roemer, Salters, Raffa, & Orsillo, 2005) have proposed an integrative conceptualization of excessive worry and GAD which emphasizes experiential avoidance and fear of emotional responding. Essentially, this model combines: (1) Borkovec's avoidance model of worry described above (1994; Borkovec et al., 2004); (2) Hayes and colleagues' theory of experiential avoidance (Hayes, Strosahl, & Wilson, 1999; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996); and (3) Mennin and colleagues' proposal of emotion dysregulation (Mennin, Heimberg, Turk, & Fresco, 2002, 2005).

In line with Borkovec's notion that worry functions as a cognitive avoidance response to perceived threat, the model of experiential avoidance proposed by Hayes

likewise emphasizes the avoidance aspect of worry. In essence, Hayes et al. (1996, 1999) define experiential avoidance as a process involving an unwillingness to be in contact with internal experiences, including physical sensations, emotions, thoughts, memories, and images. Hayes argues that many forms of psychopathology, including GAD, are due to repeated attempts to avoid, modify, or control the form and frequency of uncomfortable internal experiences as well as the situations that elicit them (Hayes et al., 1996). Hayes et al. (1999) further argue that understanding the basic principles of human learning theory is fundamental to our understanding the development of psychopathology. Specifically, Hayes asserts that humans have a unique associational style of learning which allows us to relate stimuli in a bidirectional manner (see Hayes et al., 1999, for a review). The implication of this style of learning is that a range of internal experiences (including thoughts, images, feelings, sensations, and memories) can become conditioned triggers of threat, evoking emotional, behavioural, and physiological responses (Roemer et al., 2005). To illustrate, an individual who experiences a negative emotional response to an external stimulus and later thinks about the stimulus may subsequently develop a negative emotional response not only to the external stimulus, but also to the thoughts themselves. Moreover, the individual is more likely to reexperience the thoughts if he or she is confronted with the stimulus and emotional response at a later date (Roemer & Orsillo, 2003). This account is comparable to other learning models of anxiety which emphasize associational learning between external, interoceptive, and verbal cues (Bouton, Mineka, & Barlow, 2001).

Accordingly, uncomfortable internal experiences have the potential to become threat cues, leading to attempts at avoidance of internal responses instead of specifically

addressing potentially problematic factors in the external environment (Hayes et al., 1999). However, attempts to avoid or suppress uncomfortable internal events are often ineffective and can have the paradoxical effect of increasing their functional importance (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). For instance, studies examining the effect of thought suppression suggest that attempting to control one's thoughts can result in an increase in their frequency (Purdon, 1999; Roemer & Borkovec, 1994; Wegner & Zanakos, 1994). This can occur in one of two ways. First, suppression of thoughts activates a cognitive monitoring process that increases accessibility of the unwanted thought, an effect which is termed the "enhancement effect." Put simply, the more an individual attempts to suppress a thought, the more likely this individual is to think about it because he/she must cue the very thought he/she is trying to avoid (Hayes et al., 1996). Another possibility is that even if a thought is initially suppressed, it is likely to be enhanced in the longer term, an effect referred to as the "rebound effect" (Wegner & Zanakos, 1994). Taken together, the evidence suggests that thought suppression is an ineffective cognitive strategy that may ultimately increase the very thoughts the individual is attempting to suppress. Unfortunately, many forms of pathological behaviour may be reinforced by the initial, short term reduction of uncomfortable internal events. In the longer term, however, attempts to modify emotional experience may result in increased distress (Hayes et al., 1999).

In line with Hayes' theory, initial findings suggest that experiential avoidance is related to both worry and GAD. A study conducted by Roemer and colleagues (2005) found that self-reports of experiential avoidance were significantly related to the tendency to worry and severity of GAD symptoms in an adult community sample. The



results from regression analyses also showed that experiential avoidance predicted GAD severity above and beyond the tendency to worry. Thus, experiential avoidance may be a significant component involved in adult worry.

The evidence of an association between experiential avoidance and worry fits nicely with Borkovec's proposal that worry functions as an avoidance response to threatening stimuli (Borkovec et al., 2004). In addition to findings that worry facilitates the avoidance of imagery and physiological arousal, evidence that high worriers have difficulty identifying and describing their emotions (Mennin et al., 2005; Schut, Castonguay, & Borkovec, 2001) has recently led Borkovec et al. (2004) to speculate that high worriers may be less in tune with their affective experiences more generally. This is consistent with Hayes' suggestion (Hayes et al., 1999) that emotion may be one of the main internal experiences that individuals try to avoid.

Using an emotion regulation framework, Mennin and colleagues (2002, 2005) have proposed a complementary theory to explain why emotional experiences may be particularly aversive for high worriers. As a field of study, emotion regulation explores the processes involved in how people experience, express, influence, and control their emotions. It is postulated that people differ in their ability to attend to, process, and act on their emotions (Mayer & Salovey, 1997). Difficulties with emotion regulation include problems regulating emotional experience and/or expression, and frequent or automatic attempts to constrain or suppress emotional experience and/or expression (Cicchetti, Ackerman, & Izard, 1995). From this perspective, an individual may use worry to avoid the distress associated with their emotions. Because emotions can be cues for action, the avoidance of distressing emotions may cause individuals to perseverate at the initial

stages of problem solving. Furthermore, this avoidance may cause the experience of emotion to become more intense and aversive, and can lead to even greater attempts to control emotion through worry (Mennin et al., 2002).

In fact, several studies by Mennin and colleagues (2002, 2005) have shown that high worriers do experience their emotions more easily, rapidly, and intensely than nonworriers. At the same time, they have difficulty describing and labeling their emotions, report more maladaptive attempts at modulating their emotional experiences, and view their emotions as more negative and threatening than do nonanxious controls. In addition, relative to their nonanxious counterparts, high worriers endorse a greater fear of emotional responding, including more negative beliefs concerning the consequences of their emotional experiences and a heightened fear of losing control over the expression of their emotions. This finding holds across four emotional domains, including anxiety, depression, anger, and positive emotions (Mennin et al., 2005). Several experimental studies have also shown that inducing negative moods leads to increase in worry and physiological responding (Mennin et al., 2005; Startup & Davey, 2001).

Only recently, however, has research begun to explore the nature of the emotional experience that may trigger the worry process. In fact, preliminary research suggests that the fear of emotions, and in particular the fear of anxiety, may play an important role in worry (Goldstein & Chambless, 1978). Fear of emotions is defined as the tendency to experience one's emotional responses as threatening and to fear losing control over the expression of one's emotions (Williams, Chambless, & Ahrens, 1997). Research has shown that anxious individuals fear a range of emotional experiences, including anxiety, depression, anger, and positive emotions (Williams et al., 1997). The specific association

between the fear of emotions and the tendency to worry was explored in the Roemer et al. (2005) study described above. The results indicated that fear of emotions was related to the tendency to worry and GAD symptom severity in both a clinical sample of GAD patients and in a nonclinical sample. Interestingly, results in the nonclinical sample showed that although fear of emotions across the four domains was related to the tendency to worry and GAD symptom severity, fear of anxiety demonstrated a unique and significant relationship with GAD symptom severity above and beyond the tendency to worry and fear of other emotions. Similarly, fear of depression was associated with the tendency to worry and showed a small but significant relationship with GAD severity when controlling for worry and fear of other emotions. In the clinical sample of GAD patients, fear of anxiety was significantly correlated with anxious and depressive symptomatology, fear of depression was significantly correlated with depressive symptoms, and the relationship between both subscales with the tendency to worry demonstrated medium effect sizes. Finally, GAD patients reported significantly greater levels of fear of anxiety and slightly elevated levels of fear of depression when compared to the nonclinical sample. The authors concluded that the fear of anxiety and depressive emotions may be particularly relevant to our understanding of the worry process.

In summary, research suggests that high worriers tend to view their emotional experiences, in particular anxiety and depression, as negative and threatening. At a broader level, the conceptualizations of worry proposed by Borkovec, Hayes, Mennin, and Roemer and Orsillo all indicate that worry is the result of repeated attempts to avoid, control, or modify one's internal experiences. In other words, individuals may engage in

worry as a means of controlling distressing emotional reactions to perceived threatening stimuli, including one's own anxious reactions (e.g., fear of anxiety).

*Intolerance of uncertainty and worry.* Dugas, Gagnon et al. (1998) have also proposed a cognitive model of excessive worry which highlights the key role of intolerance of uncertainty. In recent years, there has been an amassing body of evidence suggesting that intolerance of uncertainty may represent a fundamental cognitive process involved in the development and maintenance of adult worry and GAD (for a review, see Dugas & Robichaud, 2007). Intolerance of uncertainty is defined as a dispositional characteristic that results from a set of negative beliefs about uncertainty and its implications (Dugas & Robichaud, 2007; Koerner & Dugas, in press). According to Dugas' model, these fundamental beliefs about uncertainty influence the way individuals process information from their environment. More precisely, individuals who are intolerant of uncertainty believe that even a small amount of uncertainty is negative and unfair, that uncertainty is stressful and distressing, and that uncertainty interferes with one's ability to function and should be avoided at all costs (Buhr & Dugas, 2002).

Research in community and clinical samples of adults has demonstrated that intolerance of uncertainty is highly correlated with adult worry ( $r = 0.70$ , Dugas et al., 1997;  $r = 0.63$ , Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 1994). In addition, intolerance of uncertainty has been found to reliably distinguish individuals with GAD and nonclinical worriers from nonanxious controls (Buhr & Dugas, 2002). Recent empirical data have emerged suggesting a specific relationship between intolerance of uncertainty and the tendency to worry. For instance, Dugas, Gosselin, and Ladouceur (2001) investigated the specificity of intolerance of uncertainty and nonclinical worry

compared with other anxiety symptoms. Results revealed that intolerance of uncertainty was highly correlated with worry, moderately correlated with obsessions/compulsions, and weakly related to panic sensations. Moreover, the relationship between intolerance of uncertainty and worry remained significant after removing the shared variance accounted for by the other symptom and process variables (i.e., excessive responsibility and anxiety sensitivity). Findings from a series of studies revealed that intolerance of uncertainty predicted pathological worry, but did not predict OCD, panic, or health anxiety symptoms in both clinical and nonclinical samples (Norton, Sexton, Walker, & Norton, 2005; Sexton, Norton, Walker, & Norton, 2003). Ladouceur and colleagues (1999) also found intolerance of uncertainty to be greater among patients with GAD than among patients in a mixed anxiety disorder group (where 73.7% of the patients had primary diagnoses of OCD), though both groups reported higher levels of intolerance of uncertainty than a nonclinical control group. More recently, Dugas, Marchand, and Ladouceur (2005) compared levels of intolerance of uncertainty in patients with GAD with patients diagnosed with panic disorder with agoraphobia (PDA) and found that the GAD group reported higher levels of intolerance of uncertainty relative to the PDA group. The results also showed that intolerance of uncertainty was significantly related to a measure of worry (i.e., the central feature of GAD) but not to the main features of PDA (i.e., bodily sensations, agoraphobic cognitions, and behavioural avoidance).

Intolerance of uncertainty has also been found to be related to the tendency to worry independent of depressive symptomatology (Dugas et al., 1997; Freeston et al., 1994). However, the specificity of the association between intolerance of uncertainty and worry in contrast to depressive symptoms remains unclear. In the Norton et al. (2005)

study reported above, results showed that intolerance of uncertainty was a specific risk factor for both worry and depression. In another study conducted by Dugas, Schwartz et al. (2004), intolerance of uncertainty was more highly, but not significantly, related to worry than to depression. The authors reported, however, a moderate effect size for differences between correlations, suggesting that the higher correlation between intolerance of uncertainty and worry compared with intolerance of uncertainty and depression was indeed meaningful. The strong relationship between intolerance of uncertainty and depression is not surprising given the strong association between worry and depressive symptoms reported in the literature (Brown et al., 1992). Thus, further research is needed to more clearly elucidate the relationship between intolerance of uncertainty and depression.

Research has contrasted the relationship between nonclinical worry and intolerance of uncertainty with other underlying processes believed to be related to worry. In a study which compared the relationships between worry and intolerance of uncertainty relative to problem orientation, beliefs about worry, and cognitive avoidance, intolerance of uncertainty emerged as the best predictor of worry (Lachance, Ladouceur, & Dugas, 1999). In 2006, Buhr and Dugas found that nonclinical worry was more highly related to intolerance of uncertainty than to self-oriented and socially-prescribed perfectionism, intolerance of ambiguity, and perceived need for control. The results also showed that the relationship between worry and intolerance of uncertainty maintained its significance after the effects of perfectionism, intolerance of ambiguity, and perceived control were statistically partialled out. In the Dugas, Schwartz et al. (2004) study described above, results showed that worry was more highly and specifically related to

intolerance of uncertainty than to dysfunctional attitudes, a cognitive factor related to depression.

While accumulating data support the existence of a specific and unique relationship between intolerance of uncertainty and worry/GAD, some studies have reported contradictory results. For instance, a recent study found that intolerance of uncertainty displayed equally strong associations with measures of pathological worry, GAD symptoms, and OCD symptoms (Holaway, Heimberg, & Coles, 2006). In a replication of this study, Roberts, Gervais, and Dugas (2006) confirmed the finding that intolerance of uncertainty was correlated with worry, GAD and OCD symptoms. Notably, however, the results indicated a significantly greater relationship between intolerance of uncertainty and both worry and GAD symptoms, than with symptoms of OCD. Moreover, OCD symptoms did not predict intolerance of uncertainty after controlling for GAD symptoms. Taken together, the results suggest that although intolerance of uncertainty is not exclusive to worry and GAD, it is more present in worry and GAD than in other disorders.

Although there is a very strong association between intolerance of uncertainty and worry, data suggest that they are each distinct constructs (see Dugas, Buhr, & Ladouceur, 2004). For instance, several studies have highlighted differential relationships for worry and intolerance of uncertainty with other constructs. Ladouceur, Talbot, and Dugas (1997) found that intolerance of uncertainty in adults was strongly related to the perception of performance on ambiguous tasks, whereas worry was not. Similarly, research has clearly demonstrated gender differences in rates of worry (with women reporting greater levels than men), whereas women and men show a tendency to endorse

similar levels of intolerance of uncertainty (e.g., Robichaud, Dugas, & Conway, 2003). These results have been replicated in at least one adolescent sample (Laugesen et al., 2003).

Preliminary evidence suggests that intolerance of uncertainty may play a causal role in the development of worry (Dugas & Robichaud, 2007). Findings from several treatment studies specifically targeting features of intolerance of uncertainty have demonstrated success in decreasing both worry and related somatic symptoms in individuals diagnosed with GAD (Dugas et al., 2003; Ladouceur, Dugas et al., 2000). Results also indicate that change in intolerance of uncertainty tends to precede change in worry over the course of cognitive-behavioural therapy (Dugas & Ladouceur, 2000; Dugas, Langlois, Rhéaume, & Ladouceur, 1998).

Dugas and Robichaud (2007) propose that intolerance of uncertainty may lead to worry through biases in information processing. Consistent with this view, experimental data suggest that adult worriers show automatic and controlled attentional biases towards threat-related cues, and demonstrate a tendency to interpret ambiguous information as threatening (e.g., Mathews, 1990; Mathews & Mackintosh, 1998; MacLeod & Rutherford, 2004). According to Dugas and Robichaud (2007), intolerance of uncertainty may lead to worry through several possible pathways. Specifically, research has shown that adults high on intolerance of uncertainty tend to interpret ambiguous information as negative and threatening (e.g., Dugas, Hedayati et al., 2005). In addition, adults high on intolerance of uncertainty perform poorly on tasks involving increased ambiguity (Tallis, Eysenck, & Mathews, 1991). Finally, adults high on intolerance of uncertainty feel less confident in their decisions about ambiguous situations while anxious (Talbot, Dugas, &



Ladouceur, 1999). Accordingly, negative beliefs about uncertainty may play a key role in the aforementioned biases in information processing, resulting in increased levels of worry.

Research suggests that similar biases may affect information processing among adolescents. For example, anxious youth demonstrate a tendency to make threatening interpretations of ambiguous information (Barrett et al., 1996; Bogels & Zigterman, 2000; Chorpita et al., 1997; Hadwin, Frost, French, & Richards, 1997) and often predict negative over neutral outcomes (Barrett et al., 1996). In addition, anxious youth tend to make threat-related interpretations when faced with relatively mild threat cues, show increased attention towards threatening stimuli (Daggleish et al., 2003), display greater threat detection during the early stages of processing (Muris, Meesters, Smulders, & Mayer, 2005), and feel less confident in their ability to cope with perceived threat (Daggleish et al., 2003).

In sum, there is a substantial literature suggesting that intolerance of uncertainty is a key variable involved in the development and maintenance of adult worry. There are also initial indications that a similar mechanism operates among adolescents.

*Fear of Anxiety, Intolerance of Uncertainty, and Adolescent Worry.* Despite the widely accepted role of cognition in the presentation of adult worry (e.g., Borkovec & Inz, 1990; Davey & Levy, 1999; Dugas, Gagnon et al., 1998; Wells & Carter, 1999), only a handful of studies have specifically explored the association between cognitive factors and worry in youth. Among those that have, preliminary results suggest that some of the processes underlying adolescent worry are similar to those involved in adult worry.

Preliminary evidence of an association between intolerance of uncertainty and adolescent worry comes from a study conducted by Laugesen and colleagues (2003). This investigation examined the relationship between worry and intolerance of uncertainty, positive beliefs about worry, negative problem orientation, and cognitive avoidance in an adolescent community sample of boys and girls aged 14 to 18 years (i.e., in Grades 9 and 10; Mean age: 15.5 years). Findings revealed that each of the aforementioned variables was significantly correlated with worry, even after controlling for gender and somatic anxiety symptoms. Furthermore, the results demonstrated that intolerance of uncertainty, positive beliefs about worry, and negative problem orientation each accounted for a significant amount of variance in the prediction of adolescent worry scores, and that the four variables together were effective in classifying moderate and high worriers into their respective groups. Additional analyses revealed that intolerance of uncertainty had the strongest association with worry scores and was the most important variable in discriminating between moderate and high adolescent worriers. Thus, these results provide initial evidence that intolerance of uncertainty plays an important role in adolescent worry.

To our knowledge, these findings have not yet been replicated, and we are not aware of any studies which have examined the specificity of the relationship between adolescent worry and intolerance of uncertainty with regards to depression or trait anxiety. Likewise, even though the relationship between worry and fear of anxiety has been empirically confirmed in adults, research has not examined the extent to which these findings generalize to adolescent worry. Finally, only one study has specifically examined the interaction between intolerance of uncertainty and fear of anxiety to the

prediction of worry. In 2003, Bakerman, Buhr, and Dugas explored the relationship between adult worry with intolerance of uncertainty and fear of anxiety by examining their unique effects and interaction. Results demonstrated that while intolerance of uncertainty and fear of anxiety each made unique and additive contributions to adult worry, their interaction was not significant. These results have not been replicated in an adolescent sample. Clearly, more research is needed to clarify the relationship between adolescent worry, intolerance of uncertainty, and fear of anxiety.

## Study 1

The objective of this initial study was to gain a better understanding of the relationship between intolerance of uncertainty, fear of anxiety, and worry in an adolescent population. As mentioned in the general introduction, a preliminary study examining adolescent worry in a French high school sample found that intolerance of uncertainty was highly related to adolescent worry scores above and beyond demographic variables and somatic anxiety symptoms (Laugesen et al., 2003). Likewise, initial findings with adults suggest that intolerance of uncertainty is more highly related to worry than to depression and trait anxiety (Dugas, Schwartz et al., 2004). Research, however, has yet to examine the specificity of the relationship between intolerance of uncertainty and adolescent worry with regards to depressive symptomatology or trait anxiety. In addition, while a strong association has been found between adult worry and fear of anxiety (Roemer et al., 2005), research has not yet examined their relationship in an adolescent sample. In a recent study examining the prediction of intolerance of uncertainty and fear of anxiety to adult worry, the results demonstrated that intolerance of uncertainty and fear of anxiety each made unique contributions to adult worry, but that their interaction was not significant (Bakerman et al., 2003).

The main purpose of the present study was to examine the association between nonclinical adolescent worry and two cognitive processes, fear of anxiety and intolerance of uncertainty. Accordingly, one of the objectives of this study was to replicate previous findings of a strong association between intolerance of uncertainty and adolescent worry. In addition, we sought to extend these results by examining their association in an English adolescent sample and examining the specificity of their relationship with

regards to depressive symptoms and trait anxiety. We also wanted to examine the relationship between fear of anxiety and adolescent worry, and to ascertain the strength of their relationship above and beyond depressive symptoms and trait anxiety. Finally, we explored the interaction between intolerance of uncertainty and fear of anxiety towards the prediction adolescent worry.

The study had several main hypotheses. The first hypothesis was that intolerance of uncertainty and fear of anxiety would be related to adolescent worry, and that they would each make a unique and specific prediction to adolescent worry above and beyond shared variance with depression and trait anxiety. The second hypothesis was that the interaction between intolerance of uncertainty and fear of anxiety to the prediction of adolescent worry would not be significant. The third hypothesis was that intolerance of uncertainty would be more highly and specifically related to worry than to depression and trait anxiety. To our knowledge, the specificity of the relationship between fear of anxiety and worry with regards to depression and trait anxiety has not yet been explored. Accordingly, no hypotheses were set forth regarding the specificity of the association between worry and fear of anxiety. We did speculate, however, that fear of anxiety might be more highly associated with worry than with depression and trait anxiety.

## Method

### *Participants*

The participants in this study were part of a larger longitudinal project. Participants included 258 adolescents in grade 9 from four English high schools located in the region of Montreal (School 1: 52; School 2: 66, School 3: 18; School 4: 122). The sample included 107 boys (41.5%;  $M$  age = 14.42 years) and 151 girls (58.5%,  $M$  age =

14.25 years). Informed consent was obtained from the Ethics Committee at Concordia University, from the Sir Wilfrid Laurier School Board, from the individual schools (verbal consent), as well as from parents (see Appendices A and B) and students (see Appendix C).

### *Measures*

A *demographic information* questionnaire was completed by each participant indicating their age, date of birth, gender, grade, type of family (nuclear, single parent household, or one or more parents remarried), and racial origin (e.g., Asian, Black, Caucasian, Hispanic, Other) (see Appendix D).

The *Penn State Worry Questionnaire for Children* (PSWQ-C; Chorpita et al., 1997) is a 14-item questionnaire measuring the tendency to worry in children aged 6 to 18 years (see appendix E). Responses on the original questionnaire are rated on a 4-point Likert-type scale, ranging from 0 ("*not at all typical of me*") to 3 ("*very typical of me*"). Internal consistency estimates are excellent ( $\alpha = .90$ ), and convergent and discriminant validity are sufficient. Test-retest reliability at one week is very good ( $r = .92$ ). The Penn State Worry Questionnaire for Children was derived from the adult version (PSWQ; Meyer et al., 1990). In order to make subscales appropriate for children and adolescents, Chorpita and colleagues (1997) omitted and reworded several items on the adult questionnaire to be readable at approximately the second grade level. For the current study, anchors were reworded to maintain consistency between measures within the questionnaire package. Thus, the 4-point Likert-type scale ranged from 0 ("*not at all true*") to 3 ("*always true*"). For the present sample, the reliability estimate for the PSWQ-C was  $\alpha = .93$ .

The *Center for Epidemiological Studies Depression Scale* (CES-D; Radloff, 1977, 1991) is a 20-item questionnaire designed to measure depressive symptomatology in the general population (see appendix F). Specifically, the CES-D measures cognitive, affective, motivational, and somatic symptoms associated with depression. Symptoms assessed include sad mood, low energy and fatigue, difficulties with concentration, and changes in sleep and eating patterns. Sample items include “I felt sad,” “I did not feel like eating; my appetite was poor,” and “I had trouble keeping my mind on what I was doing.” Using a 4-point Likert-type scale ranging from “*not at all true*” to “*always true*,” participants rated the frequency of occurrence of these symptoms during the past week. Four of the 20 items were positively worded (e.g., “I was happy”). Total scores were calculated by first reversing all positively worded items, and then adding the numerical value associated with each item to obtain the total score. The possible range of total scores is from 0 to 60, with higher scores reflecting greater severity of depressive symptomatology. A CES-D total score of 16 or more is considered the clinical cutoff associated with the presence of depression.

The CES-D demonstrates good construct and discriminant validity and shows high internal consistency in both the general population,  $\alpha = .85$ , and in clinical samples,  $\alpha = .90$  (Radloff, 1977, 1991; Zimmerman & Coryell, 1994). Test-retest correlations at 2, 4, 6, and 8 week intervals are in the moderate range (.45 to .70) and correlations are typically larger for shorter time intervals. These results are not surprising given that the CES-D scale was specifically designed to measure *current* level of symptomatology, which tends to be cyclical and thus more likely to vary over time (Radloff, 1977). The CES-D shows adequate psychometric properties in adolescent populations (Mojarrad &

Lennings, 2002; Radloff, 1991) and has been utilized in numerous studies, including the National Longitudinal Study of Adolescent Health (Rushton, Forcier, & Schechtman, 2002). In this sample, the reliability estimate for the CES-D was  $\alpha = .88$ .

The *State-Trait Anxiety Inventory* (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1977) is a 20-item measure of chronic and current levels of anxiety (see appendix G). The Trait version of the scale, which assesses characteristic tendencies to be anxious, was used in this study. Items are rated on a 4-point Likert-type scale, ranging from 1 to 4. The STAI-Trait subscale has good internal consistency (coefficient alphas range from .86 to .92) and good test-retest reliability across 1 to 4 months (correlations range from .73 to .86) for high school and college students. The STAI has also demonstrated both convergent and discriminant validity (Spielberger, Vagg, Barker, Donham, & Westberry, 1980). With the goal of consistency between questionnaires, the 4-point Likert-type scale was preserved, but the anchors were modified, using a range from 0 (“*not at all true*”) to 3 (“*always true*”). The reliability estimate for the STAI-Trait subscale was  $\alpha = .90$  in the present study.

The *Intolerance of Uncertainty Scale* (IUS; Original French version: Freeston et al., 1994; English translation: Buhr & Dugas, 2002) is a 27-item measure relating to the idea that uncertainty is unacceptable, reflects badly on a person, and leads to frustration, stress, and the inability to take action (see appendix H). Items include “I can’t stand life when I feel uncertain” and “It’s not fair that there are no guarantees in life.” All items are rated on a 5-point Likert-type scale, ranging from 1 (“*not at all characteristic of me*”) to 5 (“*entirely characteristic of me*”). The IUS shows excellent internal consistency,  $\alpha = .94$ , and demonstrates convergent and discriminant validity. Test-retest reliability is adequate



over 5 weeks,  $r = .74$  (Buhr & Dugas, 2002). Because the IUS has not been validated for use with adolescents, several adaptations were made regarding the scale and anchors. Specifically, the scale used in this study was changed to a 4-point Likert-type scale, ranging from 0 (“*not at all true*”) to 3 (“*always true*”). In the current sample, the IUS yielded a reliability coefficient of  $\alpha = .95$ .

The *Affective Control Scale* (ACS; Williams et al., 1997) consists of 42 items measuring fear of one’s emotions and attempts to control one’s emotions (see appendix I). Specifically, it examines the degree to which individuals fear the loss of control over either the experience or the behavioural expression of their emotions across four emotional domains, including anger, anxiety, positive emotions, and depression. Items are rated on a 7-point Likert-type scale, ranging from 1 (“*very strongly disagree*”) to 7 (“*very strongly agree*”), with higher scores representing higher levels of fear of emotions. The full scale of the ACS demonstrates high internal consistency,  $\alpha = .94$ , and good test-retest reliability at 2 weeks,  $r = .78$  (Williams et al., 1997). For this study, only the anxiety subscale was used. Internal consistency estimates reported by Williams and colleagues (1997) for the anxiety subscale is .84. Sample items include “It scares me when I am nervous,” and “Once I get nervous, I think that my anxiety might get out of hand.” Because the Affective Control Scale has not, to date, been validated for use with adolescents, reversed-scored items were deleted from the subscale, resulting in a total of 9 items. In addition, the scale and anchors were modified to a 4-point Likert-type scale, ranging from 0 (“*not at all true*”) to 3 (“*always true*”). In the present sample, the ACS anxiety subscale showed good reliability,  $\alpha = .90$ .

### *Procedure*

Participants were tested at school during regular school hours. Because the data collected were part of a larger, longitudinal project, students were asked to indicate their name on the first sheet of the questionnaire package (in order to match participant responses over time). They were reminded that although their answers would not be anonymous, their responses would remain confidential in that, upon the investigator's return to Concordia University, the first page of the questionnaire package would be removed, and a random code number, which was assigned to them before beginning the study, would be used to identify all questionnaires. They were also reminded that only the principal investigators of this study would have access to this information. Students participating in the study were also informed of the voluntary nature of the study, and were told that they could discontinue at any time. Prior to the administration of the test batteries, participants were provided with instructions for questionnaire completion, using the example provided on the cover page of the questionnaire package. Students had approximately 45 minutes in which to complete the questionnaires, and were encouraged to ask questions about meaning or vocabulary.

### Results

#### *Data Preparation and Screening*

In order to ensure the accuracy of the data files, the raw data from the questionnaires were entered twice, with each entry done by a different person. The files were compared and discrepancies were corrected when needed. Next, cases with missing data were deleted from the analyses using a listwise deletion procedure. The data were then examined for univariate and multivariate outliers, normality, linearity, singularity,

multicollinearity, homoscedacity, and fit between their distributions and the assumptions of multivariate analysis.

Standardized scores were calculated using SPSS in order to detect the presence of univariate outliers. Cases with standardized scores above 3.29 or below -3.29 were considered outliers (Tabachnick & Fidell, 1996). In total, two cases were identified as univariate outliers because of their high scores on the STAI-Trait. Both cases were deleted from subsequent analyses. The Mahalanobis distance with  $p < .001$  was also computed in order to identify possible multivariate outliers. One case was found and removed from further analyses. No departures from normality were detected, and scatterplots showed a linear relationship between all variables. Perusal of tolerance levels revealed that none of the variables were singular or multicollinear.

### *Analyses*

For all measures, items were summed to create composite scores. The mean and standard deviation for each of the study's measures were calculated and are presented in Table 1. Previous investigations with adults have shown gender differences on measures of worry, with women reporting greater levels of worry than men (e.g., Robichaud et al., 2003). Consequently, a series of independent t-tests were conducted to evaluate gender differences for all study measures. The results revealed significant gender differences for all study measures except for the IUS ( $t(254) = 4.68, ns$ ). Adolescent girls reported higher scores on the PSWQ-C ( $t(255) = 3.46, p < .01$ ), the CES-D ( $t(255) = 3.01, p < .01$ ), the STAI-Trait ( $t(256) = 3.02, p < .01$ ), and the ACS-Anx ( $t(254) = 2.74, p < .01$ ) compared with adolescent boys. Thus, gender was controlled for in subsequent analyses.

Table 1

*Mean Scores and Standard Deviations for all Measures*

Measure	<i>n</i>	<i>M</i>	<i>SD</i>
PSWQ-C	257	15.08	8.72
CES-D	257	16.75	9.52
STAI-Trait	258	20.81	9.90
IUS	256	20.87	13.91
ACS-Anx	256	7.59	6.11

*Note:* PSWQ-C = Penn State Worry Questionnaire for Children; CES-D = Center for Epidemiological Studies Depression Scale; STAI-Trait = State-Trait Anxiety Inventory, Trait subscale; IUS = Intolerance of Uncertainty Scale; ACS-Anx: Affective Control Scale-Anxiety subscale.

Zero-order correlations were then computed for each of the study measures and are presented in Table 2. As expected, all measures were significantly and positively correlated. In addition, all correlation coefficients met criteria for large effect sizes (Cohen & Cohen, 1983). Both the IUS and ACS-Anx were significantly associated with scores on the PSWQ-C and with each other. Tests for differences between nonindependent correlations revealed that the correlation between the IUS and PSWQ-C was not statistically different from either the correlation between the IUS and CES-D ( $z = 0.26$ ; *ns*), or between the IUS and STAI-Trait ( $z = 0.27$ , *ns*). Similarly, the correlation between the ACS-Anx and the PSWQ-C was not significantly different from the correlation between the ACS-Anx and CES-D ( $z = 0.70$ , *ns*). Interestingly, the ACS-Anx showed a nonsignificant trend for a stronger correlation with the PSWQ-C than with the STAI-Trait ( $z = 1.93$ ,  $p = .054$ ). Finally, we compared the correlations between the IUS and PSWQ-C with the ACS-Anx and PSWQ-C. While the numerical values in Table 2 suggested a stronger correlation between the IUS and PSWQ-C than between the ACS-Anx and PSWQ-C, the test of differences between nonindependent correlations revealed that this was a nonsignificant difference ( $z = 1.46$ , *ns*).

With the goal of exploring the unique association between the PSWQ-C and the IUS and ACS-Anx, partial correlations were calculated while statistically controlling for the effects of gender, depression (CES-D), and trait anxiety (STAI-Trait). The results are presented in Table 3. The findings showed that both the IUS and the ACS-Anx remained significantly correlated with the PSWQ-C above and beyond the effects of gender, the CES-D, and the STAI-Trait. The findings also showed that the IUS and ACS-Anx remained significantly correlated with each other. Although the correlation between the

Table 2

*Correlation Matrix for Study Measures (N = 256)*

Variables	PSWQ-C	CES-D	STAI-Trait	IUS	ACS-Anx
PSWQ-C	—	.57***	.63***	.68***	.63***
CES-D		—	.78***	.69***	.60***
STAI-Trait			—	.67***	.55***
IUS				—	.71***
ACS-Anx					—

*Note:* PSWQ-C = Penn State Worry Questionnaire for Children; CES-D = Center for Epidemiological Studies Depression Scale; STAI-Trait = State-Trait Anxiety Inventory, Trait subscale; IUS = Intolerance of Uncertainty Scale; ACS-Anx = Affective Control Scale-Anxiety subscale.

\* $p < .05$ .      \*\* $p < .01$ .      \*\*\* $p < .001$ .

Table 3

*Partial Correlation Matrix Controlling for Gender, the CES-D, and STAI-Trait (N = 253)*

Variables	PSWQ-C	IUS	ACS-Anx
PSWQ-C	—	.46***	.40***
IUS		—	.50***
ACS-Anx			—

*Note:* CES-D = Center for Epidemiological Studies Depression Scale; STAI-Trait = State-Trait Anxiety Inventory, Trait subscale; PSWQ-C = Penn State Worry Questionnaire for Children; IUS = Intolerance of Uncertainty Scale; ACS-Anx = Affective Control Scale-Anxiety subscale.

\* $p < .05$ .    \*\* $p < .01$ .    \*\*\* $p < .001$ .

IUS and the PSWQ-C was again numerically higher than the correlation between the ACS-Anx and the PSWQ-C, the test for differences between nonindependent correlations showed that the difference was not statistically significant ( $z = 1.07, ns$ ).

The unique and additive contributions of intolerance of uncertainty and fear of anxiety to the prediction of adolescent worry were then assessed. A hierarchical regression was thus conducted predicting scores on the PSWQ-C. Gender was entered in the first step of the analysis. The IUS, the ACS-Anx, and their interaction were entered on the second step. The results are presented in Table 4. As expected, both the IUS and ACS-Anx emerged as significant predictors, explaining an additional 48% of the variance in PSWQ-C scores. Perusal of beta weights suggested that the IUS was the strongest predictor of PSWQ-C scores. Consistent with adult research (Bakerman et al., 2003), the interaction between the scores on the IUS and ACS-Anx was not significant.

To further clarify the relationship between worry, intolerance of uncertainty, and fear of anxiety above and beyond their respective associations with depression and trait anxiety, a multivariate regression was performed predicting the tendency to worry (PSWQ-C). In this analysis, gender was entered in the first step, the STAI-Trait and CES-D were entered in the second step, and the IUS and ACS-Anx were entered in the final step. The results, which are presented in Table 5, indicated that gender accounted for 5% of the variance in PSWQ-C scores. The STAI-Trait and CES-D also made a significant contribution, explaining 37% of the variance in the PSWQ-C above and beyond gender. In the last step, the IUS and ACS-Anx together made a significant contribution to the prediction of the PSWQ-C, explaining an additional 15% of the variance in the PSWQ-C. Examination of the beta weights indicated that both the IUS and ACS-Anx made



Table 4

*Summary of Hierarchical Regression Analysis Predicting the PSWQ-C (N = 253)*

Variable	Model 1			Model 2		
	B (SE)	$\beta$	r partial	B (SE)	$\beta$	r partial
Gender	3.89 (1.10)	.21***	.22	2.73 (0.80)	.15**	.21
IUS				0.34 (0.05)	.54***	.37
ACS-Anx				0.40 (0.15)	.28**	.17
IUS x ACS-Anx				-0.002 (0.01)	-.06	-.03
R <sup>2</sup> change					.48	
F for Change in R <sup>2</sup>					12.58***	85.02***

Note: PSWQ-C = Penn State Worry Questionnaire for Children; IUS = Intolerance of Uncertainty Scale; ACS-Anx = Affective Control Scale-Anxiety subscale.

<sup>a</sup> gender: 0 = male, 1 = female.

\* $p < .05$ .    \*\* $p < .01$ .    \*\*\* $p < .001$ .

Table 5

*Summary of Hierarchical Regression Analysis Predicting the STAI-Trait and CES-D (N = 253)*

Variable	Model 1			Model 2			Model 3		
	B (SE)	$\beta$	r partial	B (SE)	$\beta$	r partial	B (SE)	$\beta$	r partial
Gender	3.89 (1.10)	.22***	.22	1.55 (0.88)	.09	.11	-2.10 (0.78)	.12**	.17
STAI-Trait				0.42 (0.07)	.47***	.35	0.26 (0.06)	.30***	.25
CES-D				0.17 (0.07)	.18*	.15	-0.07 (0.07)	-.08	-.07
IUS							0.24 (0.04)	.38***	.32
ACS-Anx							0.32 (0.09)	.22***	.23
R <sup>2</sup> change		.05			.37			.15	
F for Change in R <sup>2</sup>		12.58***			80.00***			41.04***	

Note: PSWQ-C = Penn State Worry Questionnaire for Children; STAI -Trait = State-Trait Anxiety Inventory, Trait subscale; CES-D = Center for Epidemiological Studies Depression Scale; IUS = Intolerance of Uncertainty Scale; ACS-Anx = Affective Control Scale-Anxiety subscale.

<sup>a</sup> gender: 0 = male, 1 = female.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

significant and unique contributions to the prediction of the PSWQ-C above and beyond gender, the STAI-Trait, and the CES-D. The IUS was the strongest predictor of worry at this last stage. Interestingly, the results showed that the CES-D no longer made a unique contribution to the prediction of the PSWQ-C once the IUS and ACS-Anx were included as predictors in the analyses.

A second multivariate regression predicting scores on the IUS was then performed in order to further explore the specificity of the association between intolerance of uncertainty and adolescent worry. In this regression, gender was entered in the first step, the STAI-Trait was entered in the second step, the CES-D in the third, followed by the PSWQ-C in the fourth. Table 6 summarizes the results of this analysis. As expected, gender did not contribute to the prediction of IUS scores in the first model, accounting for less than 1% of the variance. The STAI-Trait made a significant contribution to the prediction of IUS scores, accounting for 45% of the variance. In the third step, the CES-D accounted for 7% of the variance above and beyond gender and the STAI-Trait. In the last step, the PSWQ-C explained an additional 10% of variance in IUS scores. Perusal of the individual beta weights in Model 4 revealed that the PSWQ-C was the strongest predictor of the IUS, followed by the CES-D. Interestingly, while the beta weight for the STAI-Trait was quite high in Model 2 ( $\beta = .68$ ), it decreased to  $\beta = .14$  in Model 4 once the CES-D and PSWQ-C were included in the prediction of the IUS.

The specificity of the relationship between fear of anxiety and worry was also examined by performing a similar analysis. As such, a hierarchical regression predicting scores on the ACS-Anx was performed. In this regression, gender was entered in the first step and the STAI-Trait in the second step. The CES-D was included in the third step,

Table 6

Summary of Hierarchical Regression Analysis Predicting the IUS ( $N = 254$ )

Variable	Model 1			Model 2			Model 3			Model 4		
	$B$ (SE)	$\beta$	$r$ partial	$B$ (SE)	$\beta$	$r$ partial	$B$ (SE)	$\beta$	$r$ partial	$B$ (SE)	$\beta$	$r$ partial
Gender	1.17 (1.77)	.04	.04	2.63 (1.35)	.09	.12	2.99 (1.26)	.11*	.15	4.01 (1.13)	.14***	.22
STAI-Trait				0.96 (0.07)	.68***	.67	0.48 (0.10)	.34***	.29	0.20 (0.10)	.14*	.13
CES-D							0.64 (0.10)	.44***	.36	0.53 (0.09)	.36***	.36
PSWQ-C										0.66 (0.08)	.42***	.46
$R^2$ change		.002			.45			.07			.10	
F for Change		0.44			203.19***			37.53***			65.31***	

Note: IUS = Intolerance of Uncertainty Scale; STAI -Trait = State-Trait Anxiety Inventory, Trait subscale; CES-D = Center for Epidemiological Studies Depression Scale; PSWQ-C = Penn State Worry Questionnaire for Children.

<sup>a</sup> gender: 0 = male, 1 = female.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

followed by the PSWQ-C in the fourth. The results are presented in Table 7. The findings revealed that both gender (3%) and the STAI-Trait (28%) made significant contributions to the prediction of the ACS-Anx. In the third step, the CES-D accounted for 8% of the variance in ACS-Anx scores after controlling for both gender and the STAI-Trait. In the last step, the PSWQ-C explained an additional 10% of variance in ACS-Anx scores. Examination of the individual beta weights for Model 4 demonstrated that the PSWQ-C was the strongest predictor of the ACS-Anx, followed by the CES-D. The results also showed that the beta weight for the STAI-Trait in Model 2 ( $\beta = .54$ ) decreased to a nonsignificant level in Model 4 ( $\beta = -.01$ ) once the CES-D and PSWQ-C were included as predictors in the final model.

Table 7

*Summary of Hierarchical Regression Analysis Predicting the ACS-Anx (N = 255)*

Variable	Model 1		Model 2		Model 3		Model 4					
	B (SE)	$\beta$	r partial	B (SE)	$\beta$	r partial	B (SE)	$\beta$	r partial			
Gender	2.17 (0.77)	.18***	.18	0.80 (0.66)	.07	.08	0.62 (0.63)	.05	.06	0.16 (0.58)	.01	.02
STAI-Trait				0.33 (0.03)	.54***	.53	0.12 (0.05)	.19*	.15	-0.01 (0.05)	-.01	-.01
CES-D							0.29 (0.05)	.45***	.33	0.24 (0.05)	.37***	.30
PSWQ-C										0.29 (0.04)	.42***	.40
R <sup>2</sup> change		.03			.28			.08			.10	
F for Change		8.01**			99.78***			30.40***			47.88***	

Note: ACS-Anx = Affective Control Scale-Anxiety subscale; STAI -Trait = State-Trait Anxiety Inventory, Trait subscale; CES-D = Center for Epidemiological Studies Depression Scale; PSWQ-C = Penn State Worry Questionnaire for Children.

<sup>a</sup> gender: 0 = male, 1 = female.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

## Discussion

Study 1 was a preliminary investigation exploring the relationship between worry, intolerance of uncertainty, and fear of anxiety in a community sample of adolescents. Several major findings emerged from the present study. First, intolerance of uncertainty and fear of anxiety were highly related to adolescent worry, and each made a unique prediction to adolescent worry, above and beyond shared variance with gender, depression, and trait anxiety. Second, the interaction between intolerance of uncertainty and fear of anxiety to the prediction of adolescent worry was not significant. Finally, both intolerance of uncertainty and fear of anxiety demonstrated specificity in their relationship with adolescent worry. Each of these results is elaborated on below.

### *The Association Between Intolerance of Uncertainty, Fear of Anxiety, and Worry*

The findings supported the first hypothesis that both processes, namely intolerance of uncertainty and fear of anxiety, would be strongly and uniquely associated with adolescent worry. The zero-order correlations between intolerance of uncertainty and worry and between fear of anxiety and worry were significant, and each association represented a large effect size. The partial correlations between each process and worry remained significant after statistically controlling for the effects of gender, trait anxiety, and depression, revealing associations with moderate effect sizes. The results from the multivariate regression indicated that the processes together were strong predictors of adolescent worry, above and beyond gender, trait anxiety, and depression. In addition, intolerance of uncertainty and fear of anxiety each made unique contributions to the prediction of adolescent worry. Finally, intolerance of uncertainty emerged as a stronger predictor of adolescent worry.

The findings also supported the second hypothesis that the interaction between intolerance of uncertainty and fear of anxiety to the prediction of adolescent worry would not be significant. The multivariate regression clearly demonstrated that the interaction between intolerance of uncertainty and fear of anxiety did not contribute significantly to the prediction of worry above each variable's separate effects. These results corroborate previous findings with adults (Bakerman et al., 2003) which suggest that there is no interaction between the process variables, above and beyond their separate and individual contributions.

#### *The Specificity of the Association Between Intolerance of Uncertainty and Worry*

The third hypothesis, stating that intolerance of uncertainty would be more highly and specifically related to adolescent worry than to depression and trait anxiety, was only partially supported. That is, the zero-order correlations did not reveal a significant difference in the strength of the associations between intolerance of uncertainty and the symptoms of worry, depression, and trait anxiety. These results are not surprising, however, when one considers that the zero-order correlations did not control for the shared variance between worry, depression, and trait anxiety (Borkovec et al., 1983). In contrast, the partial correlations revealed a unique association between intolerance of uncertainty and worry above and beyond the effects of gender, depression, and trait anxiety. In addition, the results showed that worry made the greatest unique contribution to the prediction of intolerance of uncertainty once the shared variance with gender, depression, and trait anxiety was statistically removed. Finally, the results showed that the unique contribution of trait anxiety to the prediction of intolerance of uncertainty was greatly reduced once the other symptom measures were taken into account, suggesting



that the variance accounted for by trait anxiety was largely subsumed by worry. Taken together, the results suggest that intolerance of uncertainty meets criteria for specificity with worry (see Garber & Hollon, 1991) with regards to depression and trait anxiety.

*The Specificity of the Association Between Fear of Anxiety and Worry*

Although no explicit hypotheses were set forth regarding the specificity of the association between fear of anxiety and worry, we did speculate that fear of anxiety might be more highly and specifically related to worry than to depression or trait anxiety. The results showed that the correlation between fear of anxiety and worry was not significantly greater than the correlation between fear of anxiety and depression. A nonsignificant trend was observed, however, in that the correlation between fear of anxiety and worry was greater than the correlation between fear of anxiety and trait anxiety. Again, these results fit with research which has shown a strong association between worry, depression, and trait anxiety (e.g., Borkovec et al., 1983). In fact, when controlling for gender, depressive symptoms, and trait anxiety, fear of anxiety remained significantly associated with adolescent worry. In addition, adolescent worry made the greatest unique contribution to the prediction of fear of anxiety once the shared variance with gender, trait anxiety, and depression was accounted for. Finally, although trait anxiety was positively correlated with fear of anxiety, it did not add to the prediction of fear of anxiety once worry was taken into account. This latter finding suggests that trait anxiety does not make a unique contribution to the prediction of fear of anxiety above worry. Together, the results suggest that fear of anxiety is specific to adolescent worry compared to depression and trait anxiety.

In sum, the results from Study 1 replicate previous findings (Laugesen et al., 2003) demonstrating a strong association between intolerance of uncertainty and adolescent worry. In addition, the current study extends prior research by showing that this association is similarly present in a community sample of English-speaking Canadian adolescents (current study:  $r = .68$  vs. French-speaking Canadian sample:  $r = .66$ ; Laugesen et al., 2003). The results also provide promising initial evidence for a unique and specific association between intolerance of uncertainty and adolescent worry which is not explained by other symptoms, including trait anxiety or depressive symptomatology. Furthermore, to our knowledge, this is the first attempt to specifically explore the relationship between fear of anxiety and adolescent worry. The results provide preliminary support for a unique, and specific relationship between fear of anxiety and adolescent worry. Finally, by examining both intolerance of uncertainty and fear of anxiety simultaneously, the present study allowed us to explore the relative importance of each process variable as well as their interaction. The findings revealed that although both processes were highly and uniquely related to adolescent worry, their contributions were purely additive. Across all analyses, intolerance of uncertainty emerged as a slightly stronger predictor of adolescent worry in this adolescent sample.

Taken together, the current findings suggest that adolescents who hold negative beliefs about uncertainty, and who fear and attempt to control the expression of their anxiety, report higher levels of worry. These findings are in line with research with adults which suggests that assessing intolerance of uncertainty and fear of anxiety can help predict level of worry (Dugas, Gagnon et al., 1998; Roemer et al., 2005). Little is known, however, about the nature or direction of these associations. In other words, do the

processes lead to the symptoms, do the symptoms lead to the processes, or is there a bidirectional causal relationship between the processes and symptoms?

### *Limitations and Future Directions*

The current study has several limitations which suggest a number of potential directions for future research. First, the data collected for this study relied solely on self-report measures which required the participants to provide information about their thoughts, beliefs, and/or perceptions of the study constructs. As such, the results did not assess elements outside the participants' awareness. On the one hand, it is well documented that self-report methodologies are an important way of gathering information about an individual's internal state. In fact, numerous researchers have recommended using self-report measures with youth, particularly when assessing internalizing symptoms (e.g., Edelbrock, Costello, Dulcan, Kalan, & Conover, 1985; Elliott & Busse, 2004; Kazdin, 1986). On the other hand, it is important to take into account that these perceptions are subjective (McConaughty & Ritter, 1995), retrospective (Kratochwill & Shapiro, 2000), and context specific (Kazdin, 1979). Self-report methodologies are also vulnerable to problems with response bias, such as faking and social desirability (Merrell, 2003). Accordingly, an important contribution to future studies would be the inclusion of ratings by a third party, including peers, parents, teachers, or trained professionals.

Second, although the measures used in the present investigation have been well-validated in adult populations, only the Penn State Worry Questionnaire for Children and the Center for Epidemiological Studies Depression Scale have been specifically validated for use in adolescent populations. In fact, researchers have consistently documented a dearth of well-validated self-report measures for use with children and adolescents (e.g.,

Chorpita et al., 1997; Vasey & Daleiden, 1994). At issue are a number of measurement concerns relating to the participants' cognitive, language, and reading abilities, as well as the appropriateness of the items themselves. For instance, self-report questionnaires assume that the individual completing the questionnaire has already developed the necessary skills to identify, understand, and describe their thoughts and feelings. Younger participants are also less likely to be familiar with complex terminology or may misunderstand the context in which the words are used. In addition, many questionnaires validated for use with adult populations contain reverse-worded items. This can be problematic as research has shown that youth often interpret reverse-worded items differently than positively worded items (Benson & Hocevar, 1985, Marsh, 1986). Consequently, the level of development of the participants' communication and language skills can significantly impact the validity of their responses. With the goal of addressing these issues, a training period in the use of Likert-type scales was included before beginning the testing period. Research investigators were also available at all times to answer questions about meaning and/or vocabulary. Finally, the anchors and Likert scales used in the current study were modified to maintain consistency across the study questionnaires, and reverse-worded items were removed from questionnaires which had not been previously validated for use with adolescents. An unfortunate consequence of these modifications, however, is that altering the anchors and scales and the removal of certain items may have had an influence on the scaling properties of the measures (Clarke, Lawford, Sheppard, & Eiser, 2005). Together, these limitations highlight the need for further development and validation of measures specifically designed for use

with adolescent populations in order to increase the validity of adolescent clinical research.

With regards to research methodology, Study 1 was a preliminary investigation which utilized a correlational approach. Consequently, no conclusions can be drawn regarding etiology or direction of the associations. To address this, follow-up investigations should include laboratory examinations, such as, for example, experimentally manipulating intolerance of uncertainty and fear of anxiety in order to determine their impact on worry and vice versa. Longitudinal investigations are also needed to more fully understand the nature of the associations between adolescent worry, intolerance of uncertainty, and fear of anxiety across time. In addition, although the current findings suggest important relationships between the aforementioned constructs, clinical studies can further our understanding of the utility of these constructs for clinically-referred youth.

Although the specificity of the relationship between intolerance of uncertainty and fear of anxiety with adolescent worry was examined with regards to depression and trait anxiety, worry has been found to be an important variable in other anxiety disorders (Brown et al., 1992). Follow-up studies examining the specificity of the associations between these processes and adolescent worry with regards to other anxiety disorders are thus required. Furthermore, although this study assessed self-reported levels of worry, we did not assess the somatic symptoms of Generalized Anxiety Disorder (GAD). Although recent findings have provided strong support for the Penn State Worry Questionnaire as a screening tool for identifying both adult (Fresco, Mennin, Heimberg, & Turk, 2003) and

children (Chorpita et al., 1997) with GAD, specifically evaluating the somatic symptoms would provide support for the generalizability of the current findings to clinical worriers.

Other limitations involve the racial composition and age range of the current adolescent sample. Specifically, the sample was composed primarily of Caucasian adolescents. In addition, this study assessed worry and its associated constructs in an adolescent sample with a mean age of 14.32 years. Thus, the generalizability of the current findings to other age and racial groups is limited. Accordingly, future studies should examine the association between worry, intolerance of uncertainty, and fear of anxiety across age and racial groups.

### *Implications*

This study has important implications for the prevention and treatment of adolescent excessive worry. Despite the aforementioned limitations, the results suggest that prevention and treatment plans aimed at decreasing the experience of worry in youth would benefit from directly assessing and targeting intolerance of uncertainty and fear of anxiety. Strategies that may be appropriate for use in adolescent populations include interventions which would increase an adolescent's tolerance of uncertainty, reduce their fearful interpretations of their anxiety, and reduce their attempts to control the expression of their anxiety. For instance, psychoeducation and cognitive restructuring could enable adolescent high worriers to reassess their negative beliefs about uncertainty (e.g, whether or not uncertainty is always negative) as well as increase their understanding of the negative consequences of avoiding uncertainty. Likewise, cognitive exposure techniques would provide adolescent high worriers with the opportunity to: (1) increase their tolerance of uncertainty by exposing themselves to potential negative events which may

occur in the future, no matter how improbable; and (2) increase their tolerance of anxious arousal by staying focused on threatening worry scenarios until they experience a decrease in arousal (see Dugas et al., 1997).

## Study 2

The adolescent period is a critical stage of human development characterized by important biological, psychological, and social role changes. Yet surprisingly, this period has been largely ignored in the anxiety literature. In fact, little is known about the cognitive, social, and emotion-regulating factors associated with the development of anxiety and its disorders in adolescence (Kendall & Ollendick, 2004).

As a first step towards increasing our knowledge of adolescent anxiety, it is crucial that we extend our understanding of “normal” adolescent development. In fact, clearly elucidating the normative developmental trajectory of anxiety from childhood through adolescence and into adulthood provides an important backdrop to our understanding of the development of anxiety-related disorders across the lifespan (Kendall & Ollendick, 2004). Correspondingly, for a more complete understanding of excessive worry and GAD, a broader perspective which includes normative data on worry is essential. Unfortunately, there are little available data on the specific progression of worry across the adolescent period and prospective data on adolescent worry are nearly nonexistent in the literature.

Researchers investigating adult worry have emphasized the importance of identifying the specific cognitive processes involved in the development and maintenance of excessive worry and GAD (Borkovec & Inz, 1990; Dugas, Gagnon et al., 1998). As reviewed in the general introduction, there is a sizeable literature documenting a sensitive and specific association between intolerance of uncertainty and adult worry (e.g., Buhr & Dugas, 2006; Dugas et al., 1997). The most extensive work on the relationship between these two constructs has been conducted by Dugas and colleagues. To date, Dugas has



provided convincing evidence supporting the theory that intolerance of uncertainty is a key cognitive vulnerability involved in the development of excessive worry and GAD. However, research has yet to examine the predictive and/or reciprocal association between intolerance of uncertainty and worry within the context of a longitudinal investigation. Likewise, while recent research points to a significant and positive association between fear of anxiety and adult worry and GAD, the nature of their relationship in adolescence remains unclear (Roemer et al., 2005). The results from study 1 suggest that adolescent worry is strongly associated with fear of anxiety, above and beyond their shared variance with trait anxiety and depression. However, little is currently known regarding the mechanism through which these variables are related.

The current study used a prospective, longitudinal approach with several objectives in mind. First, we sought to explore the normative developmental trajectories of worry, intolerance of uncertainty, and fear of anxiety throughout the adolescent period. Second, we extended these analyses by examining gender differences in the mean levels of, and trajectories of change in, these variables. Third, we examined the reciprocal, predictive relationships between intolerance of uncertainty and worry, and between fear of anxiety and worry. A final objective was to investigate the presence of mediational associations between change in intolerance of uncertainty and change in worry, and between change in fear of anxiety and change in worry, above and beyond their respective relationships with anxiety and depression. In accordance with these objectives, a number of hypotheses were set forth.

## Hypotheses

### *Hypotheses 1: Trends Over Time*

*Hypothesis 1a.* Given findings which suggest increasing rates of worry and OAD/GAD as youth age (e.g., King, Ollendick, & Mattis, 1994; Strauss, Last, Hersen, & Kazdin, 1988), we expected mean levels of worry, as measured by the PSWQ-C, to increase over the course of the study.

*Hypothesis 1b.* To date, few studies have examined the longitudinal course of intolerance of uncertainty over time. Given the strong relationship between intolerance of uncertainty and worry (Dugas et al., 1997; Freeston et al., 1994; Laugesen et al., 2003), we expected mean levels of intolerance of uncertainty, as measured by the IUS, to increase over the course of the study.

*Hypothesis 1c.* Given the definition of fear of anxiety as the tendency to fear and avoid internal emotional experiences, particularly anxiety (Roemer et al., 2005), we hypothesized that levels of fear of anxiety might reasonably be expected to increase over time due to negative learning experiences associated with worry.

### *Hypotheses 2: Gender Differences in Trends Over Time*

*Hypothesis 2a.* Based on previous research (e.g., Spruijt-Metz & Spruijt-Metz, 1997), we expected adolescent girls to report significantly more worry than adolescent boys at all time points over the course of the study.

*Hypothesis 2b.* Previous research suggests a lack of gender differences in self-reported levels of intolerance of uncertainty (Laugesen et al., 2003; Robichaud et al., 2003). Correspondingly, we hypothesized that adolescent boys and girls would report similar rates of intolerance of uncertainty at all time points over the course of the study.

*Hypothesis 2c.* Few studies have examined gender differences on the ACS fear of anxiety subscale. One recent study conducted in a clinical sample of adult patients diagnosed with GAD found that women scored higher on the ACS fear of anxiety than men (Mennin et al., 2005). Accordingly, we expected these results to generalize to adolescents, with girls scoring significantly higher than boys on the ACS fear of anxiety at all time points over the course of the study.

*Hypotheses 3: Mediation Associations Between Change in Intolerance of Uncertainty and Change in Worry*

*Hypothesis 3a.* In accordance with Dugas, Gagnon, and colleagues' (1998) model of excessive worry, we expected that change in intolerance of uncertainty would mediate change in adolescent worry. We also considered the possibility that the strong relationship between intolerance of uncertainty and worry could reflect the influence of worry on beliefs about uncertainty. Consequently, we tested an alternate mediational model with change in worry mediating change in intolerance of uncertainty.

*Hypothesis 3b.* Current research with adults suggests that intolerance of uncertainty predicts adult worry above and beyond symptoms of depression and anxiety (Buhr & Dugas, 2002, 2006; Dugas et al., 1997; Lachance et al., 1999). Similarly, the results from Study 1 indicated that intolerance of uncertainty maintained its association with adolescent worry once the shared variance with depression and trait anxiety was removed. Hence, we predicted that intolerance of uncertainty would remain a significant mediator of change in adolescent worry when controlling for the effects of depression and trait anxiety.

*Hypotheses 4: Mediation Associations Between Change in Fear of Anxiety and Change in Worry*

*Hypothesis 4a.* The fear of emotional arousal involves the tendency to fear and avoid one's emotions and one's expression of emotions (Williams et al., 1997).

Accordingly, we speculated that change in worry and fear of anxiety would each mediate change in the other, but that change in worry would demonstrate a stronger mediational effect on fear of anxiety than vice versa.

*Hypothesis 4b.* The results from Study 1 indicated that the relationship between fear of anxiety and adolescent worry remained significant above and beyond depression and trait anxiety. Consequently, we hypothesized that change in worry and change in fear of anxiety would continue to mediate change in the other above and beyond the effects of depression and trait anxiety.

## Method

### *Participants*

The participants in this study were part of a longitudinal project which began in the year 2000. Adolescents from four public high schools located in the Montreal region agreed to participate in this study. At the beginning of the study, participants were in grade 7. By the end of the study, participants were finishing grade 11. Data were gathered from each adolescent a total of 10 times (twice per year for 5 years). Not all participants were present at every wave of data collection. A total of 336 adolescents were present for at least one assessment point (i.e., completed at least one package of questionnaires). Participant breakdown across schools were as follows: School 1: 67; School 2: 80; School 3: 33, and School 4: 156. Over the course of the entire study, the sample was

made up of 198 female participants and 138 male participants. The overall sample was 94% Caucasian, 1.2% Black, 1.2% Asian, 0.6% Hispanic, and 3% “other.” At the beginning of the study, the mean age was 12.52 years ( $SD = .60$ ). At that time, the majority of participants were from two-parent families; 72.3% of participants reported parents who were married or living together, 18.2% of participants reported a single parent household, and 9.5% of participants reported living with a parent and stepparent.

On average, 7.48 waves of data per participant were collected. Although no data were collected on the reasons for participant attrition, the school administrations provided several explanations, including students moving outside the school zones and students who were no longer interested in participating. Informed consent was obtained from the Ethics Committee at Concordia University, from the Sir Wilfrid Laurier School Board, from the individual schools (verbal consent), as well as from parents (see Appendix A and B) and students (see Appendix C).

### *Measures*

The questionnaires used in Study 2 were the same measures used in Study 1. Consequently, only a brief description will be provided here. For a more detailed description, including each measure’s respective psychometric properties, please refer to the Method section in Study 1. As in Study 1, all measures used 4-point Likert-type scales, ranging from 0 (“*Not at all true*”) to 3 (“*Always true*”).

The *demographic information* questionnaire was completed by each participant indicating their age, date of birth, gender, grade, type of family (nuclear, single parent household, or one or more parents remarried), and racial origin (e.g., Asian, Black, Caucasian, Hispanic, Other) (see Appendix D).

The *Penn State Worry Questionnaire for Children* (PSWQ-C; Chorpita et al., 1997) measures the tendency to worry in children aged 6 to 18 years (see appendix E).

The *Center for Epidemiological Studies Depression Scale* (CES-D; Radloff, 1977, 1991) measures cognitive, affective, motivational, and somatic symptoms associated with depression (see appendix F).

The *State-Trait Anxiety Inventory* (STAI; Spielberger et al., 1977) measures chronic and current levels of anxiety. Only the Trait version of the scale, which assesses characteristic tendencies to be anxious, was used in this study (see appendix G).

The *Intolerance of Uncertainty Scale* (IUS; Freeston et al., 1994) measures the extent of one's negative beliefs about uncertainty and its subsequent implications. These include the idea that uncertainty is unacceptable, reflects badly on a person, and leads to frustration, stress, and the inability to take action (see appendix H).

The *Affective Control Scale* (ACS; Williams & Chambless, 1997) measures the degree of fear over one's emotions as well as attempts to control one's emotions. For this study, only the Fear of Anxiety subscale was used (see appendix I).

Means and standard deviations for the study measures at each assessment point are presented in Table 8. Of note, due to an administrative error, the Intolerance of Uncertainty Scale (IUS) was not included in some of the questionnaire packages at time point 6. Accordingly, the mean and standard deviation for the IUS at time point 6 were included for descriptive purposes only, but the data were excluded from all other analyses. Reliability coefficients (i.e., Cronbach's alpha) for the study questionnaires for each assessment point were high and are presented in Table 9.

Table 8  
 Mean Scores and Standard Deviations for All Measures

Assessment Point	Measure											
	PSWQ-C		CES-D		STAI-Trait		IUS		ACS-Anx			
	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>		
1	17.64 (9.16)	285	17.68 (10.90)	290	21.92 (10.30)	279	26.24 (14.87)	282	7.95 (6.24)	282		
2	16.87 (8.96)	302	17.41 (11.25)	287	20.92 (10.69)	291	21.85 (16.36)	290	7.39 (6.31)	296		
3	16.58 (9.35)	291	17.46 (11.20)	284	21.31 (10.29)	289	22.44 (15.75)	288	7.70 (6.51)	285		
4	16.24 (9.79)	288	17.28 (11.00)	287	20.77 (11.15)	286	21.95 (16.12)	284	7.00 (6.05)	285		
5	15.29 (8.91)	260	17.00 (9.99)	260	21.05 (10.15)	261	21.30 (14.45)	258	7.74 (6.31)	259		
6	15.62 (9.37)	248	16.53 (10.95)	248	20.76 (10.71)	247	17.74 (18.23)	41	6.88 (5.82)	248		
7	15.97 (9.19)	213	16.96 (11.57)	212	20.82 (11.57)	212	20.85 (14.24)	209	7.46 (6.18)	212		
8	16.20 (9.17)	221	16.07 (10.59)	220	20.79 (11.77)	221	20.61 (14.54)	218	7.27 (6.19)	219		
9	17.44 (9.15)	201	17.87 (11.57)	201	21.55 (11.36)	201	22.54 (14.61)	200	7.58 (5.90)	201		
10	17.41 (9.37)	213	17.62 (12.25)	213	22.15 (11.75)	212	22.74 (15.96)	212	7.96 (6.20)	213		

Note: PSWQ-C = Penn State Worry Questionnaire for Children; CES-D = Center for Epidemiological Studies Depression Scale; STAI-Trait = State-Trait Anxiety Inventory, Trait subscale; IUS: Intolerance of Uncertainty Scale; ACS-Anx = Affective Control Scale-Anxiety subscale.

Table 9  
*Reliability Coefficients for All Measures*

Assessment Point	Measure				
	PSWQ-C	CES-D	STAI-Trait	IUS	ACS-Anx
1	.91	.88	.92	.96	.87
2	.92	.91	.91	.95	.90
3	.93	.91	.90	.95	.90
4	.93	.90	.92	.95	.90
5	.93	.88	.90	.95	.90
6	.93	.91	.91	.97	.89
7	.93	.92	.93	.95	.91
8	.93	.92	.93	.95	.91
9	.93	.93	.93	.95	.89
10	.94	.94	.94	.96	.91

*Note:* PSWQ-C = Penn State Worry Questionnaire for Children; CES-D = Center for Epidemiological Studies Depression Scale; STAI-Trait = State-Trait Anxiety Inventory, Trait subscale; IUS: Intolerance of Uncertainty Scale; ACS-Anx = Affective Control Scale-Anxiety subscale.



### *Procedure*

The procedure for Study 2 was the same across all assessment points. Data were gathered from each participant a total of 10 times (twice a year over a 5 year period). At each assessment point, adolescents completed a battery of questionnaires. In order to match participant responses over the course of the project, students were asked to indicate their name on the cover sheet of each questionnaire package. At each assessment point, participants were reminded that while their responses were confidential, they would not be anonymous. A code number was used to identify and match student questionnaires, and only the main investigators of the study had access to this information. Students participating in the study were also reminded of the voluntary nature of the study, and were told that they could discontinue at any time, without explanation or penalty. Prior to each administration of the test batteries, students were provided with instructions for questionnaire completion. Students were encouraged to ask questions about meaning or vocabulary, and had, on average, 45 minutes to complete the test batteries.

### Results

#### *Data Preparation and Screening*

To ensure the data files were accurate, the participant responses were entered twice by two different people. The files were then compared and corrections were made when necessary. When more than 1/3 of a participant's responses were missing on any given questionnaire, the participant's total score for that questionnaire was deleted. At each assessment point, SPSS software was used to analyze the data for each assessment point for univariate and multivariate outliers, normality, linearity, singularity, multicollinearity, and homoscedacity.

Standardized scores were obtained to detect the presence of univariate outliers. Cases with standardized scores above 3.29 or below -3.29 were considered outliers (Tabachnick & Fidell, 1996). The number of cases identified as univariate outliers for each assessment point was: Time point #1: 5 cases; Time point #2: 3 cases; Time point #3: 2 cases; Time point #4: 2 cases; Time point #5: 2 cases; Time point #6: 1 case; Time point #7: 0 cases; Time point #8: 1 case; Time point #9: 1 case; Time point #10: 0 cases. All cases identified as univariate outliers were deleted from subsequent analyses. In addition, the Mahalanobis distance with  $p < .001$  was computed to detect the presence of multivariate outliers. The number of cases identified as multivariate outliers for each assessment points was: Time point #1: 1 case; Time point #2: 2 cases; Time point #3: 0 cases; Time point #4: 1 case; Time point #5: 1 case; Time points 6 through 10: 0 cases. All cases identified as multivariate outliers were deleted from subsequent analyses. No departures from normality were detected, and scatterplots revealed a linear relationship between all variables. The tolerance levels indicated that none of the variables were singular or multicollinear.

#### *Overview of Data Analytic Strategy*

The longitudinal nature of this study produced a multilevel or nested data structure (Raudenbush & Bryk, 2002). As such, the analyses were conducted using the Hierarchical Linear Modeling program (HLM; Version 6.02, Raudenbush, Bryk, & Congdon, 2005). The data set represented a two level hierarchical model involving a series of repeated observations nested within individuals. The lower level or Level 1 data consisted of the repeated measures (i.e., PSWQ-C, CES-D, STAI-Trait, IUS, and ACS-Anx) collected approximately every 6 months for a period of 5 years. The Level 1 data

were viewed as being nested within an upper level or Level 2 (i.e., individuals). The Level 2 data captured the between-individual differences in the Level 1 parameters, i.e., differences in slopes and intercepts across individuals.

One of the main advantages of a multilevel modeling approach is that it offers tremendous flexibility with regard to data requirements. Because the repeated observations are viewed as nested within the individual rather than as the same fixed set for all individuals, both the number of observations and the timing of the observations are allowed to vary across participants (Raudenbush & Bryk, 2002). Multilevel modeling also simultaneously estimates the effects of Level 1 (e.g., within participant level) and Level 2 (e.g., between participant level) variables in nested data sets. By doing so, multilevel modeling takes into account and adjusts for any bias in standard errors and statistical tests caused from the nonindependence of observations typical of longitudinal data.

The analyses were conducted using a full maximum likelihood (MLF) approach. When a dataset is sufficiently large, this estimation procedure produces highly efficient estimates which are consistent with the true parameters (i.e., they will approximate the true parameter with high probability), asymptotically efficient such that they are largely unbiased and show minimum variance, and robust to nonnormality (Raudenbush & Bryk, 2002). For purposes of interpretability, all measures were grand-mean centered.

#### *Results for Hypothesis 1: Change Over Time*

*Approach to data analysis.* A series of random coefficient regression models were computed predicting initial levels and linear and curvilinear change over time. With the goal of modeling the linear and curvilinear functions of time for each repeated measure, a

*curvilinear polynomial approach* was used. The first step was to construct two separate variables accounting for the linear and curvilinear time components. Thus, each assessment point (i.e., 1 through 10) was assigned a categorical code. In order to capture linear time, the first time point was coded as 0, the second as 1, and so on, with the final time point being given a value of 9. Curvilinear time was captured by squaring the linear values, such that each assessment point was coded respectively as follows: 0, 1, 4, 9, 16, 25, 36, 49, 64, and 81. Linear and curvilinear time variables were then included as independent variables in the Level 1 of the analyses predicting each repeated measure. The first assessment point, time point 0, was chosen as the intercept because of our interest in the adolescents' initial status on each repeated measure at the beginning of the study (i.e., group mean initial status). In order to assess change over time for the whole sample, we examined the simplest person-level model with no Level 2 predictors.

The Level 1 model, computed for each of the repeated measures, examined the within-individual change over time for each repeated measure. The model's intercept represented the expected value of each respective repeated measure at the first time point (i.e., initial status). The model included a linear coefficient (i.e., slope), representing the increase, decrease, or stability of each repeated measure over time for each individual, and a curvilinear coefficient (i.e., slope) representing the curvilinear change for each respective repeated measure for each individual. Initial analyses also included cubic time effects for each of the repeated measures. As there was no evidence of cubic time effects, this higher-order effect was removed from the analyses. The Level 2 model was formulated for each repeated measure, and used the Level 1 intercepts and slopes as

outcomes to explore the mean intercept, linear time slope, and curvilinear time slope across individuals.

*The mean trajectory for the PSWQ-C.* The estimate of the intercept, or average score on the PSWQ-C at the first assessment point, was 17.83. The average slope, or semi-annual rate of change for the PSWQ-C, showed a significant linear decreasing slope,  $B = -.98, p < .001, r = .28$ , and a significant curvilinear increasing slope,  $B = .10, p < .001, r = .29$ . Accordingly, the mean trajectory for the PSWQ-C produced a concave upward curve (see Aiken & West, 1991, for interpreting curvilinear effects).

*The mean trajectory for the IUS.* The estimate of the intercept, or average score on the IUS at the first assessment point, was 25.10. The average slope, or semi-annual rate of change for the IUS, showed a significant linear decreasing slope,  $B = -1.81, p < .001, r = .28$ , and a significant curvilinear increasing slope,  $B = .17, p < .001, r = .27$ . Thus, the mean trajectory for the IUS produced a concave upward curve.

*The mean trajectory for the ACS-Anx.* The estimate of the intercept, or average score on the ACS-Anx at the first assessment point, was 7.92. The average slope, or semi-annual rate of change for the ACS-Anx, showed a significant linear decreasing slope,  $B = -.35, p < .01, r = .15$ , and a significant curvilinear increasing slope,  $B = .03, p < .01, r = .16$ . As such, the mean trajectory for the ACS-Anx produced a concave upward curve.

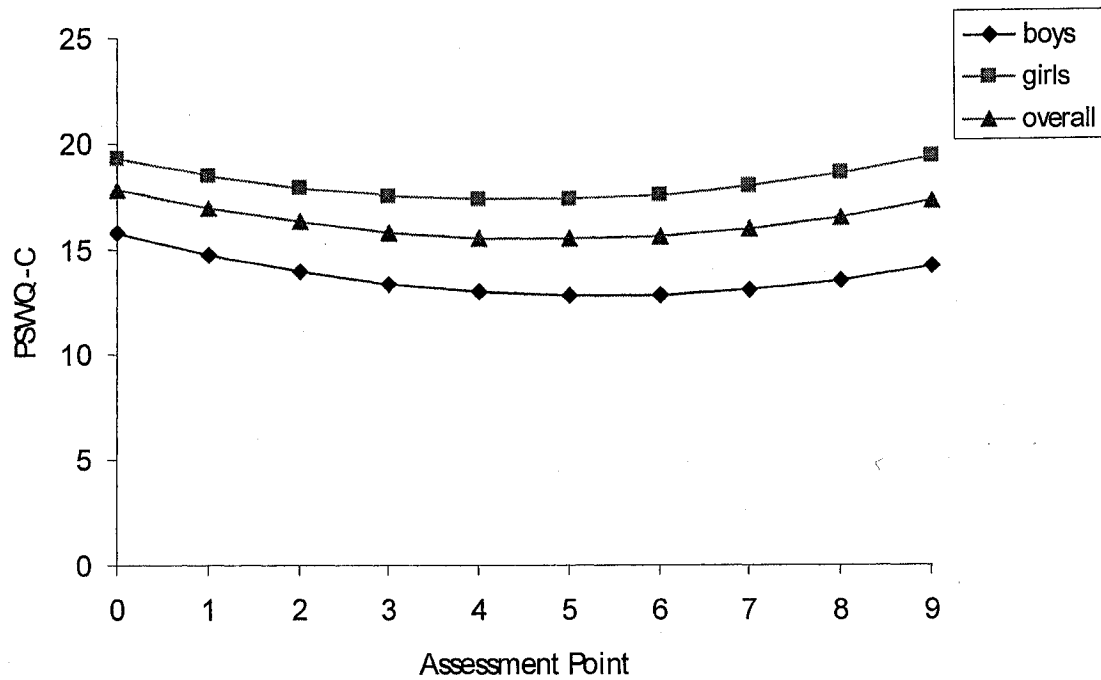
### *Results for Hypothesis 2: Change Over Time and Gender*

*Approach to data analysis.* As a follow-up to these analyses, gender was added to the Level 2 model to assess whether change over time for each of the repeated variables varied by gender (male or female). Separate analyses were conducted for each of the

study variables. The Level 1 model remained the same. The Level 2 model was expanded to include a Level 2 predictor, gender. The gender variable was labeled “Female” in order to represent the coding of the dummy variable as “1” for girls and “0” for boys. The coding of gender was then reversed, with the gender variable labeled “Male,” with “1” for boys and “0” for girls. Thus, the Level 2 model described between-subject change according to gender. The dependent variables were the mean intercepts, linear time slopes, and curvilinear time slopes derived from Level 1 analysis.

*The mean trajectories for the PSWQ-C according to gender.* Prior research suggested that girls would report higher rates of worry than boys. As expected, gender differences on the PSWQ-C were significant at the beginning of the study. For boys, the mean score on the PSWQ-C at the first assessment point was 15.75. Girls reported a significantly higher score on the PSWQ-C at the first assessment point,  $B = 3.52, t = 3.47, p < .001$ . Thus, the average initial score for adolescent girls was 19.28. While gender differences in the Level 1 intercept were significant, no significant difference for gender was found for either the linear ( $B = .25, t = .67, ns$ ) or curvilinear time effects ( $B = -.007, t = -.19, ns$ ), suggesting that girls consistently reported more worry than boys across all five years of the study. The results for boys, girls, and the overall sample are depicted graphically in Figure 1.

*The mean trajectories for the IUS according to gender.* On the basis of previous research (e.g., Laugesen et al., 2003; Robichaud et al., 2003), no gender differences were expected on the IUS. In keeping with our hypothesis, no significant gender differences were observed for the intercept, linear, and curvilinear slope for the IUS at the onset of the study. At the first assessment point, the mean score for boys was 24.07, and the mean



*Figure 1.* HLM estimates of linear and curvilinear trends over time for the PSWQ-C for boys, girls, and overall sample.

*Note:* PSWQ-C = Penn State Worry Questionnaire for Children.

score for girls was 25.81. The intercept coefficient for girls was not significantly different from that of boys,  $B = 1.74, t = 1.74, ns$ . Furthermore, no significant difference for gender was found for either the linear ( $B = .001, t = -.001, ns$ ) or curvilinear time effects ( $B = .04, t = .07, ns$ ). Thus, adolescent boys and girls were indistinguishable at the onset of the study. However, a visual examination of the trajectory of the IUS, as displayed in Figure 2, clearly indicated an emerging gender difference over time. In order to assess this difference statistically, we performed linear transformations for the time variable. First, time was recentered to 4.5, the study's midpoint, and again to 9, the study's endpoint (see Willet & Singer, 2003). Once these alternative variables were created, the analyses were rerun using the new temporal variables. It is of note that moving the centering constant will change the intercept, but will not impact the value of the slopes. Accordingly, only the results for the intercepts will be presented here.

When the IUS was centered at its midpoint (time point 4.5), the results suggested a nonsignificant trend towards a gender difference. The intercept coefficient for boys was 18.93. Girls showed a trend towards a higher score on the IUS at the midpoint,  $B = 2.57, t = 1.53, p = .093$ . Accordingly, the intercept coefficient for girls at the midpoint was 21.50. The model was then recalculated with the IUS centered at the endpoint of the study (time point 9). A significant gender difference emerged at this point. The intercept coefficient for boys was 18.93, and girls reported a significantly higher score on the IUS,  $B = 5.07, t = 1.81, p < .05$ . Accordingly, the average final score for adolescent girls was 23.99. Taken together, the findings indicated that while girls and boys were indistinguishable at the onset of the study, scores on the IUS increased significantly between the midpoint and endpoint for girls, while the scores for boys did not. The results for boys, girls, and



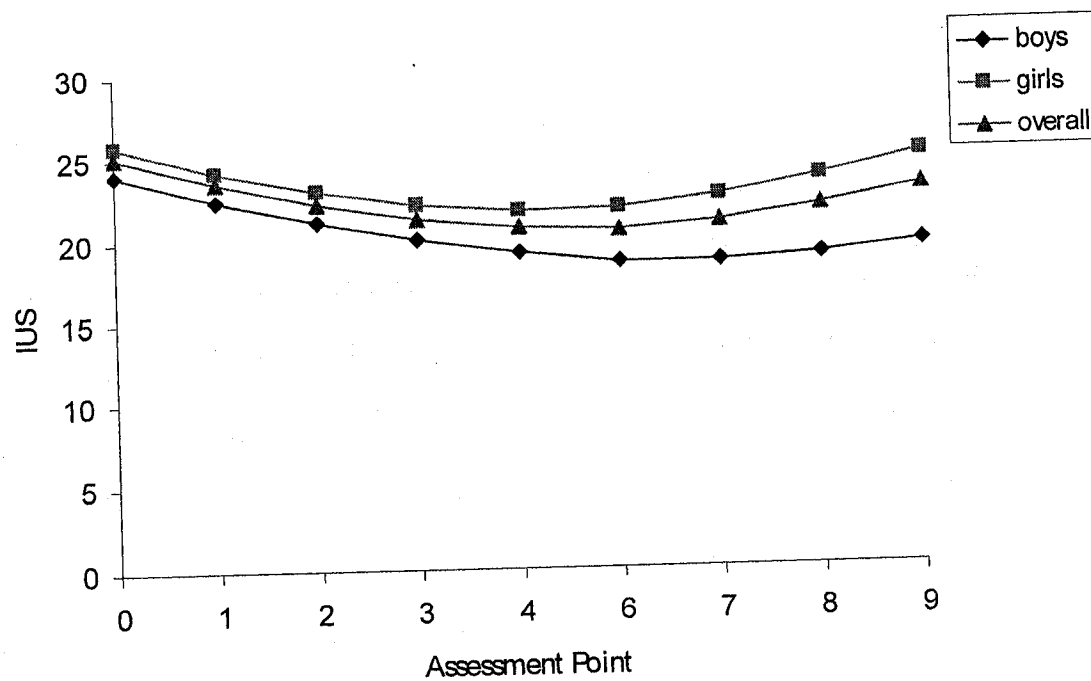
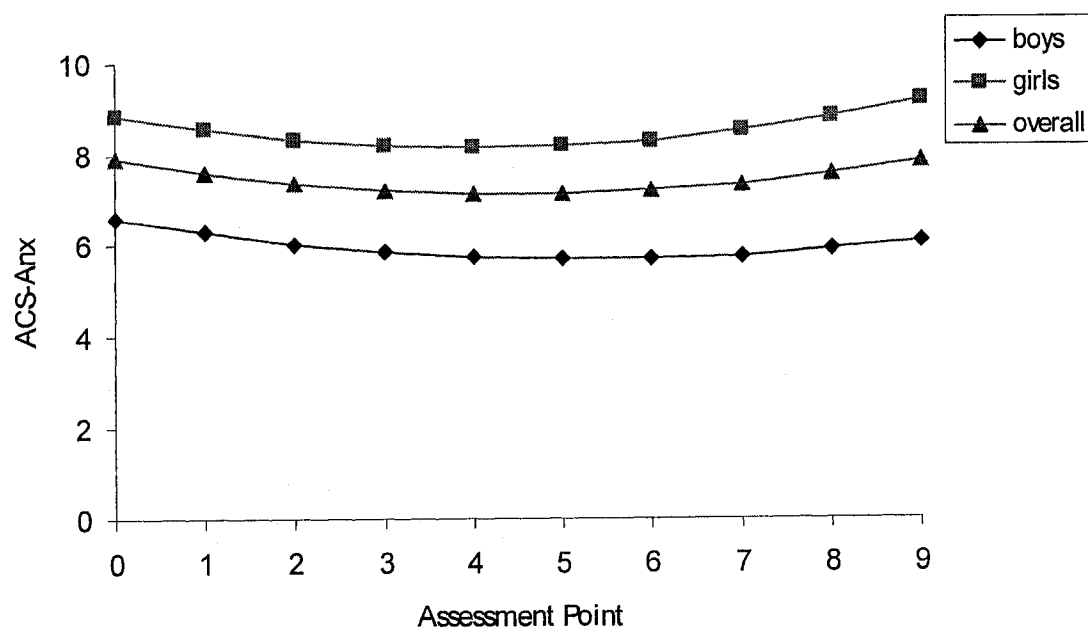


Figure 2. HLM estimates of linear and curvilinear trends over time for the IUS for boys, girls, and overall sample.

Note: IUS = Intolerance of Uncertainty Scale.

the overall sample are depicted graphically in Figure 2.

*The mean trajectories for the ACS-Anx according to gender.* In accordance with our hypothesis, girls reported significantly higher scores on the ACS-Anx at the beginning of the study compared to boys. For boys, the initial mean score on the ACS-Anx was 6.58. The initial mean score for girls was significantly higher on the ACS-Anx,  $B = 2.27, t = 3.40, p < .01$ . Accordingly, the average initial score for girls was 8.85. No significant difference for gender was found for either the linear ( $B = .01, t = .05, ns$ ) or curvilinear time effects ( $B = -.01, t = -.42, ns$ ), suggesting that girls consistently reported more fear of anxiety than boys across all five years of high school. The results for boys, girls, and the overall sample are presented graphically in Figure 3.



*Figure 3.* HLM estimates of linear and curvilinear trends over time for the ACS-Anx for boys, girls, and overall sample.

*Note:* ACS-Anx = Affective Control Scale, Anxiety subscale.

### *Results for Hypotheses 3 and 4: Mediation Analyses*

*Approach to data analysis.* The second set of analyses explored causal or predictive associations between intolerance of uncertainty and worry and between fear of anxiety and worry. Does change in intolerance of uncertainty and/or fear of anxiety mediate change in worry over time? Conversely, does change in worry mediate change in intolerance of uncertainty and/or fear of anxiety over time? Do self-reported rates of depression and trait anxiety have an impact on the mediational relationships described above? In order to address these questions, a lower level mediational approach was adopted.

With the goal of exploring mediation of change, we followed the analytic procedure initially described by Baron and Kenny (1986) and recently adapted for use in a multilevel context by Kenny, Korchmaros, and Bolger (2003). According to Baron and Kenny (1986), in order to demonstrate mediation, four statistical criteria must be met. First, the predictor variable must be significantly associated with the outcome variable (path *c*). This step determines whether there is an effect that may be mediated. Second, the predictor variable must be significantly associated with the mediator (path *a*). Third, when the outcome is regressed simultaneously on the predictor and mediator, the mediator must be significantly associated with the outcome (path *b*). Finally, the relationship between the predictor and the outcome with the mediator in the regression equation (path *c'*) must be significantly reduced compared to when the mediator is not in the model.

The significance of mediation was calculated using the Sobel's Z-test (1982). Recently applied to a multilevel framework (Krull & MacKinnon, 1999), Sobel's Z-test

determines the significance of the indirect effect of the predictor on the outcome via the mediator. The percentage of mediation was also calculated in order to determine the percentage of the total effect between the predictor and outcome that was accounted for by the mediated effect. In multilevel modeling, the calculation of the total effect of the predictor on the outcome may be impacted by the covariance between paths  $a$  and  $b$  across upper level units (Kenny et al., 2003). Accordingly, the covariance between paths  $a$  and  $b$  were tested for all mediational analyses. The results across all analyses clearly indicated that the covariances were not statistically significant. Given these results, coupled with the large dataset used in the current study, we decided not to include the nonsignificant covariance effects between paths  $a$  and  $b$  in our calculations for percent mediation.

Before the mediational models were tested, the linear and curvilinear functions of time were remodeled using a *orthogonal polynomial approach* (Ployhart, Holtz, & Bliese, 2002). Orthogonal polynomial terms permit the decomposition of the overall time trend into different and unique sources of variance. By contrast, the curvilinear approach (used in the previous section) has the disadvantage of producing linear and curvilinear terms which are highly correlated, resulting in variance terms which cannot be separated. Thus, the time variables were restructured so that each assessment point (i.e., 1 through 10) was assigned a new categorical code. In order to capture linear time, each assessment point was coded as follows: -9, -7, -5, -3, -1, 1, 3, 5, 7, and 9. In order to capture curvilinear time, each assessment point was coded respectively as: 6, 2, -1, -3, -4, -4, -3, -1, 2, and 6. Of note, there is no longer a zero value for time, and the intercept now represents the time period midway between the second and third assessment points

(Ployhart et al., 2002). The transformed linear and curvilinear orthogonal time variables were then included as independent variables in the Level 1 of the analyses predicting each repeated measure. The results of these analyses are presented in Table 10.

The findings indicated that very few of the linear time trends remained significant. Only the IUS continued to show a linear descending time effect over the 10 assessment points. All of the repeated measures, however, continued to show curvilinear linear trends, suggesting that a curvilinear growth model may be most appropriate in describing trends over time.

*Mediational associations between change on the IUS and change on the PSWQ-C.* A series of lower level mediational models were tested. In the proposed mediational model, we explored whether change on the PSWQ-C over time was mediated by change in the IUS. Accordingly, curvilinear time was the predictor variable, the IUS was the mediator, and the PSWQ-C was the outcome variable. A reverse mediational model was also tested (i.e., investigating whether change in the IUS over time was mediated by the PSWQ-C) by switching the mediator and the outcome in the analyses. For both models, linear time was also included in the Level 1 of the analyses in order to control for its effects. Because multilevel regression procedures do not generate standardized regression coefficients, partial regression coefficients were added to the results to enable comparisons using a common metric. The findings for the proposed mediational model are provided graphically in Figure 4.

When curvilinear time was entered into the Level 1 equation predicting the PSWQ-C (path *c*), the regression coefficient indicated that the PSWQ-C showed a significant curvilinear increase over the course of the study. Similarly, when curvilinear

Table 10

*Summary of Hierarchical Regression Analyses Examining Change Over Time Using Orthogonal Polynomial Contrasts*

Outcome	Predictor	<i>B</i>	<i>SE B</i>	<i>T (df)</i>	<i>pr</i>	$\Delta$ Sigma Squared Step
PSWQ-C						
Step 1						0.22
Step 2	Time Linear	-0.05	0.04	-1.44 (335)	0.08	0.08
	Time Linear	-0.03	0.03	-0.87 (335)	0.05	
	Time Curvilinear	0.20	0.04	5.51 (335)**	0.29	
IUS						
Step 1						0.20
Step 2	Time Linear	-0.16	0.06	-2.73 (335)**	0.15	0.09
	Time Linear	-0.13	0.06	-2.26 (335)*	0.12	
	Time Curvilinear	0.35	0.07	5.13 (335)**	0.27	
ACS-Anx						
Step 1						0.17
Step 2	Time Linear	-0.01	0.02	-0.49 (335)	0.03	0.05
	Time Linear	0.00	0.02	-0.19 (335)	0.01	
	Time Curvilinear	0.08	0.02	3.03 (335)**	0.16	

*Note:* PSWQ-C = Penn State Worry Questionnaire for Children; IUS = Intolerance of Uncertainty Scale; ACS-Anx = Fear of Anxiety - Anxiety Subscale

*Note:* *pr* = Partial Regression Coefficient.

\**p* < .05.      \*\**p* < .01.      \*\*\**p* < .001.

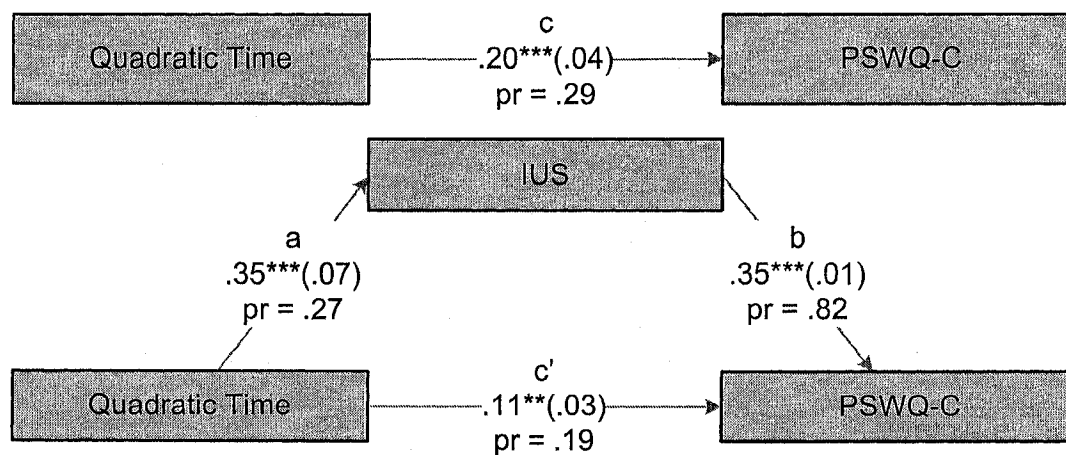


Figure 4. Lower level mediational model with the IUS as a mediator between curvilinear time and the PSWQ-C. Unstandardized regression coefficients are presented on top, standard errors in parenthesis, and partial regression coefficients (*pr*) are presented on the bottom.

Note: PSWQ-C = Penn State Worry Questionnaire for Children; IUS = Intolerance of Uncertainty Scale.

\* $p < .05$ .      \*\* $p < .01$ .      \*\*\* $p < .001$ .



time was entered into the Level 1 regression equation predicting the IUS (path  $a$ ), the regression coefficient also indicated that the IUS showed a significant curvilinear increase. When controlling for the IUS, the coefficient for curvilinear time predicting PSWQ-C scores (path  $c'$ ) remained significant but was reduced from  $B = 0.20$  to  $B = 0.11$ . The IUS was a significant predictor at this step (path  $b$ ), suggesting that adolescents reporting high scores on the IUS tended to score higher on the PSWQ-C when controlling for both curvilinear and linear time. Sobel's  $Z$ -test for the mediational effect of curvilinear time on PSWQ-C scores via the IUS was significant,  $Z = 5.04$ ,  $p < .001$ . Calculations for percent mediation revealed that the IUS accounted for approximately 53% of the relationship between curvilinear time and the PSWQ-C. Taken together, the results are an indication of partial mediation (when the path decreases but remains significant when controlling for the mediator).

Next, an alternate mediational model was tested by interchanging the mediator and the outcome variable in the analyses (i.e., reverse mediation). Figure 5 presents the diagram of the mediation results. The findings for the alternative mediational model were similar to the previous mediational test. Although the regression coefficient for curvilinear time predicting the IUS was reduced when the PSWQ-C was entered into the equation ( $B = 0.35$  vs.  $B = 0.13$ ), the relationship between curvilinear time and the IUS remained significant. The Sobel test confirmed the reductions attributed to the PSWQ-C,  $Z = 5.39$ ,  $p < .001$ . The percent mediation for the alternative model was approx. 60%, a slightly larger value than the 53% mediation from the proposed model above (see Figure 4). Thus, the findings of the alternative mediational model also revealed partial mediation.

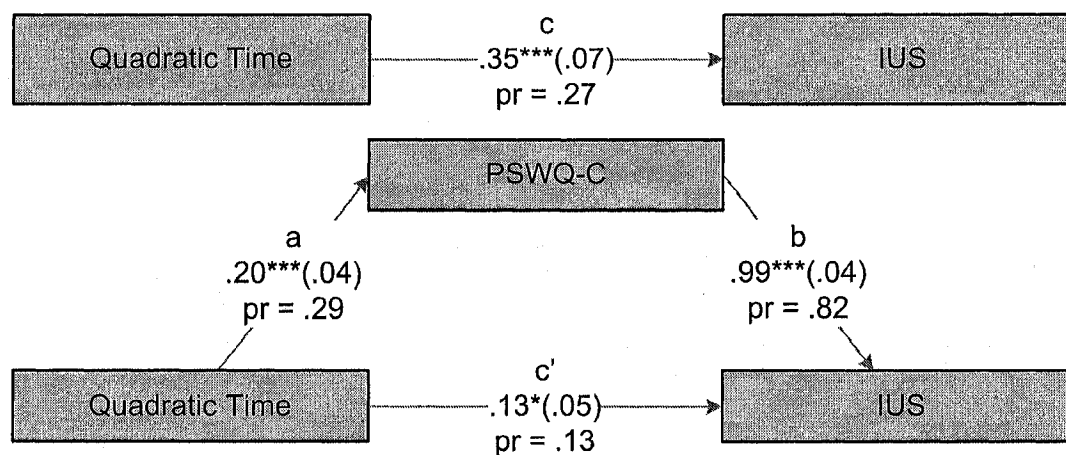


Figure 5. Lower level mediational model with the PSWQ-C as a mediator between curvilinear time and the IUS. Unstandardized regression coefficients are presented on top, standard errors are presented in parenthesis, and partial regression coefficients are presented on the bottom.

Note: PSWQ-C = Penn State Worry Questionnaire for Children; IUS = Intolerance of Uncertainty Scale.

\* $p < .05$ .      \*\* $p < .01$ .      \*\*\* $p < .001$ .

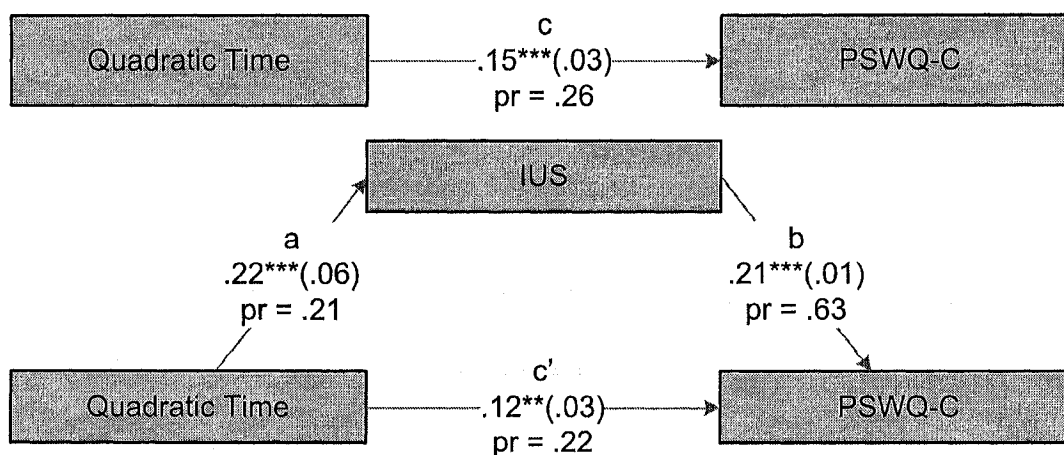
Taken together, the results of the two mediational models described above suggest a primarily reciprocal relationship between change in the IUS and change in the PSWQ-C for the overall adolescent sample over the course of the study.

*Specificity of mediation between change on the IUS and change on the PSWQ-C.*

Findings from cross-sectional research suggest that the association between intolerance of uncertainty and worry is largely independent of their respective associations with anxiety and depression (e.g., Dugas et al., 1997). However, research has yet to examine the specificity of this relationship within a longitudinal context. To address this issue, we elaborated on the two previous mediational models by including two time-varying covariates, depression as measured by the CES-D, and trait anxiety, as measured by the STAI-Trait in the Level 1 of the analyses.

We first explored whether change on the PSWQ-C over time was mediated by change in the IUS above and beyond the effects of the CES-D and STAI-Trait. Curvilinear time was the predictor variable, the IUS was the mediator, and the PSWQ-C was the outcome variable. A reverse mediational model was also examined, exploring whether change in the IUS over time was mediated by the PSWQ-C. In this case, curvilinear time was the predictor variable, the PSWQ-C was the mediator, and the IUS was the outcome variable. Linear time was included in the Level 1 of both analyses in order to control for its effects. The results are presented in Figures 6 and 7.

As shown in Figure 6, with scores on the CES-D and STAI-Trait as time-varying covariates, the regression coefficient for curvilinear time predicting the PSWQ-C was reduced from  $B = 0.15$  to  $B = 0.12$  when the IUS was included in the equation. The Sobel  $Z$ -test revealed a significant indirect path from curvilinear time to the PSWQ-C



*Figure 6.* Lower level mediational model with the IUS as a mediator between curvilinear time and the PSWQ-C controlling for scores on the CES-D and STAI-Trait.

Unstandardized regression coefficients are presented on top, standard errors are presented in parenthesis, and partial regression coefficients are presented on the bottom.

*Note:* PSWQ-C = Penn State Worry Questionnaire for Children; IUS = Intolerance of Uncertainty Scale; CES-D = Center for Epidemiological Studies Depression Scale; STAI-Trait = State-Trait Anxiety Inventory – Trait subscale.

\* $p < .05$       \*\* $p < .01$       \*\*\* $p < .001$

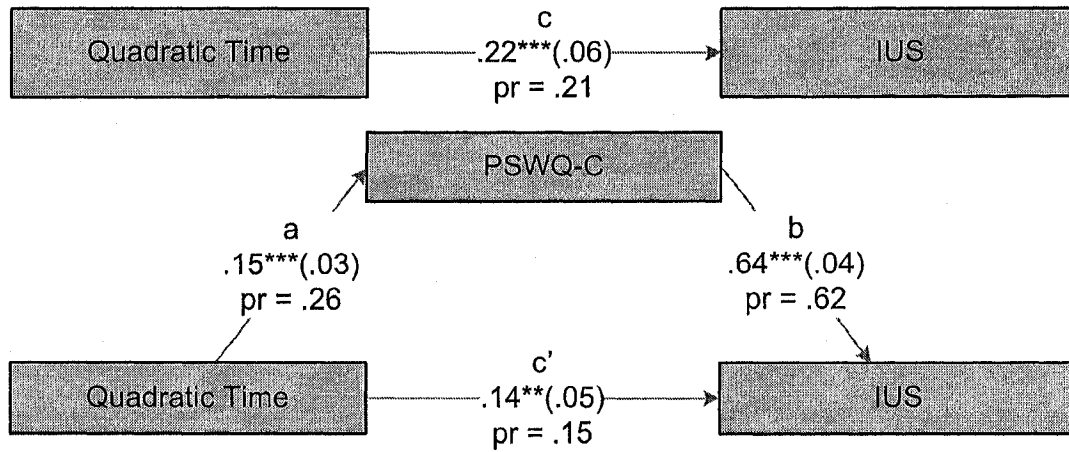


Figure 7. Lower level alternate mediational model with the PSWQ-C as a mediator between curvilinear time and the IUS controlling for scores on the CES-D and STAI-Trait. Unstandardized regression coefficients are presented on top, standard errors are presented in parenthesis, and partial regression coefficients are presented on the bottom.

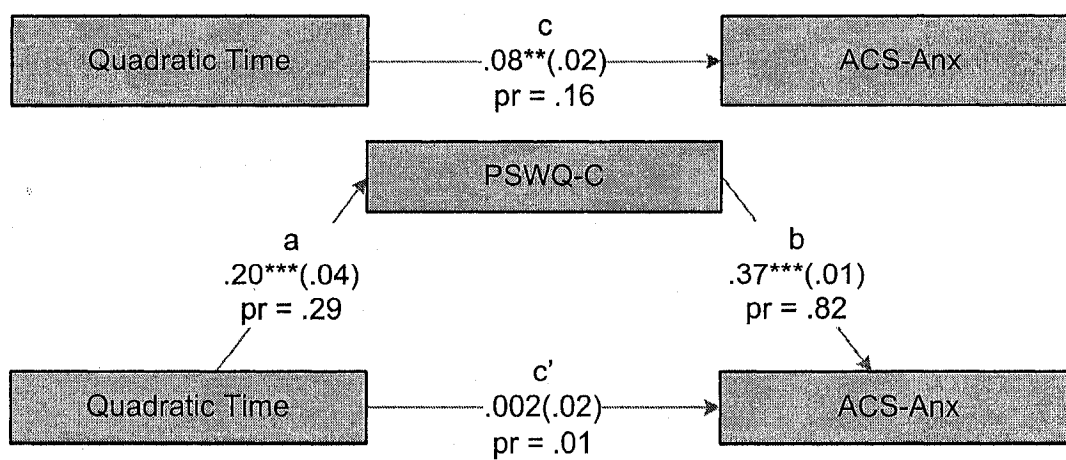
Note: PSWQ-C = Penn State Worry Questionnaire for Children; IUS = Intolerance of Uncertainty Scale; CES-D = Center for Epidemiological Studies Depression Scale; STAI-Trait = State-Trait Anxiety Inventory – Trait subscale.

\* $p < .05$ .      \*\* $p < .01$ .      \*\*\* $p < .001$ .

via the IUS,  $Z = 3.76, p < .001$ . While controlling for scores on the CES-D and the STAI-Trait, the IUS continued to account for approximately 28% of the total effect of curvilinear time on the PSWQ-C.

The regression coefficients in Figure 7 show that, with scores on the CES-D and STAI-Trait as time-varying covariates, the regression coefficient for curvilinear time predicting the IUS decreased from  $B = 0.22$  to  $B = 0.14$  when the PSWQ-C was included in the equation. The Sobel test revealed a significant indirect path from curvilinear time to the IUS via the PSWQ-C,  $Z = 4.69, p < .001$ . While controlling for scores on the CES-D and the STAI-Trait, the PSWQ-C continued to account for approximately 41% of the total effect of curvilinear time on the IUS.

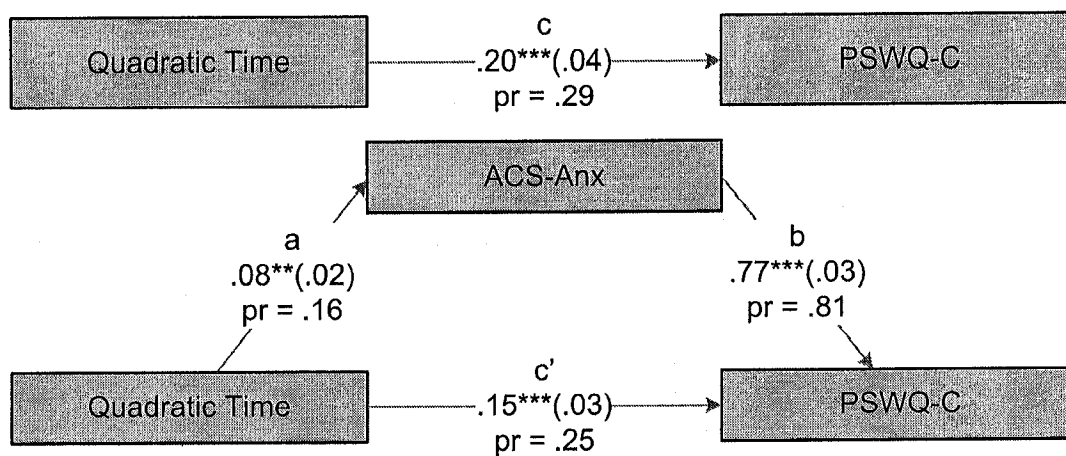
*Mediational associations between change on the ACS-Anx and change on the PSWQ-C.* With the goal of understanding the relationship between fear of anxiety (i.e., ACS-Anx) and adolescent worry (i.e., PSWQ-C), two lower level mediational models were tested. As per our hypothesis, in the proposed mediational model, we examined whether changes on the ACS-Anx over time were mediated by change in the PSWQ-C. Accordingly, curvilinear time was the predictor variable, the PSWQ-C was the mediator, and the ACS-Anx was the outcome variable. A reverse mediational model was also tested investigating whether change in the PSWQ-C over time was mediated by the ACS-Anx. For the reverse mediational model, curvilinear time was the predictor variable, the ACS-Anx was the mediator variable, and the PSWQ-C was the outcome. For both models, linear time was included in the Level 1 of the analyses in order to control for its effects. The findings for the hypothesized and reverse mediational models are provided graphically in Figures 8 and 9.



*Figure 8.* Lower level mediational model with the PSWQ-C as a mediator between curvilinear time and the ACS-Anx. Unstandardized regression coefficients are presented on top, standard errors in parenthesis, and partial regression coefficients are presented on the bottom.

*Note:* PSWQ-C = Penn State Worry Questionnaire for Children; ACS-Anx = Affective Control Scale – Anxiety subscale.

\* $p < .05$ .      \*\* $p < .01$ .      \*\*\* $p < .001$ .



*Figure 9.* Lower level mediational model with the ACS-Anx as a mediator between curvilinear time and the PSWQ-C. Unstandardized regression coefficients are presented on top, standard errors are presented in parenthesis, and partial regression coefficients are presented on the bottom.

*Note:* PSWQ-C = Penn State Worry Questionnaire for Children; ACS-Anx = Affective Control Scale – Anxiety subscale.

\* $p < .05$ .      \*\* $p < .01$ .      \*\*\* $p < .001$ .



As indicated by Figure 8, when curvilinear time was entered into the Level 1 equation predicting scores on the ACS-Anx (path *c*), the ACS-Anx showed a significant curvilinear increase from grade 7 through 11. When curvilinear time was entered into the Level 1 regression equation predicting scores on the PSWQ-C (path *a*), the PSWQ-C also increased significantly from grade 7 through 11. When controlling for scores on the PSWQ-C, curvilinear time was no longer a significant predictor of the ACS-Anx (path *c'*). The PSWQ-C remained a significant predictor of the ACS-Anx at this step (path *b*), indicating that participants who reported higher scores on the PSWQ-C were also more likely to report higher scores on the ACS-Anx when controlling for both curvilinear and linear time. The decrease in the regression coefficient for time predicting the ACS-Anx when the PSWQ-C was not in the regression coefficient compared with when the PSWQ-C was in the equation ( $B = 0.08$  vs.  $B = 0.002$ ) is one indication of mediation. In addition, when the PSWQ-C was added to the equation, the significance level rose above the statistical cutoff of  $p < .05$ . This result suggests that the ACS-Anx was fully or completely mediated by scores on the PSWQ-C. Sobel's test for the mediational effect of time on the ACS-Anx via the PSWQ-C was significant  $Z = 5.39, p < .001$ . Ninety-seven (97) percent of the relationship between curvilinear time and ACS-Anx was mediated by change in the PSWQ-C. Overall, the results suggested that change in the ACS-Anx was fully mediated by the PSWQ-C over the course of the study.

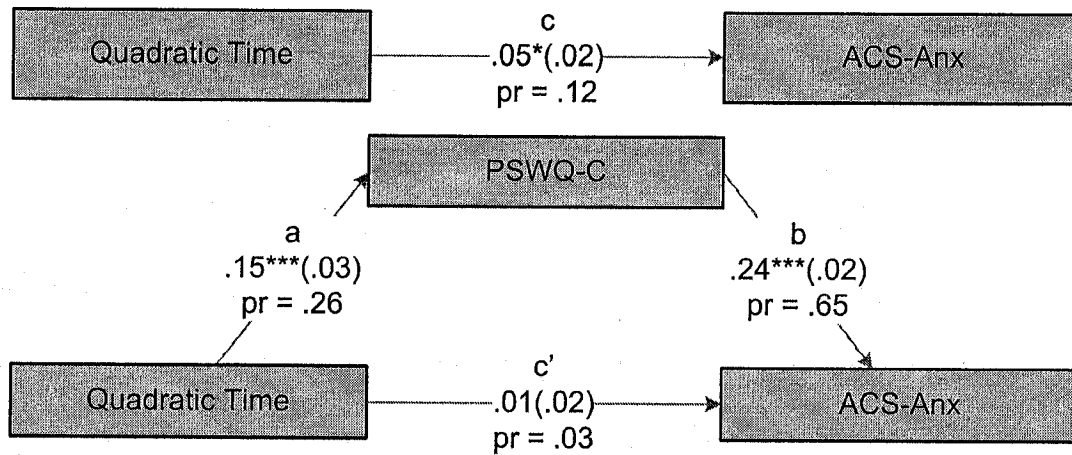
For the reverse mediational analysis (Figure 9), the regression coefficient for curvilinear time predicting the PSWQ-C decreased when the ACS-Anx was added to the equation ( $B = 0.20$  vs  $B = 0.15$ ). While Sobel's test of the indirect path was significant,  $Z = 3.01, p < .01$ , the relationship between curvilinear time and the PSWQ-C remained

significant. The percent mediation was 29%, a substantially smaller percentage than the 97% found in the proposed mediational model. Taken together, all indexes for strength of mediation pointed to partial mediation.

*Specificity of mediation between change on the ACS-Anx and change on the PSWQ-C.* With the goal of exploring the specificity of the association between fear of anxiety and adolescent worry, we next extended the two previous mediational models by including two time-varying covariates, depression and trait anxiety, in the Level 1 of the analyses.

First, we examined whether change on the ACS-Anx over time was mediated by change in the PSWQ-C above and beyond the effects of the CES-D and STAI-Trait. Curvilinear time was the predictor variable, the PSWQ-C was the mediator, and the ACS-Anx was the outcome variable. A reverse mediational model was also examined, exploring whether change in the PSWQ-C over time was mediated by the ACS-Anx. In this case, curvilinear time was the predictor variable, the ACS-Anx was the mediator, and the PSWQ-C was the outcome variable. Linear time was included in the Level 1 of both analyses in order to control for its effects. The results of the analyses are presented in Figures 10 and 11.

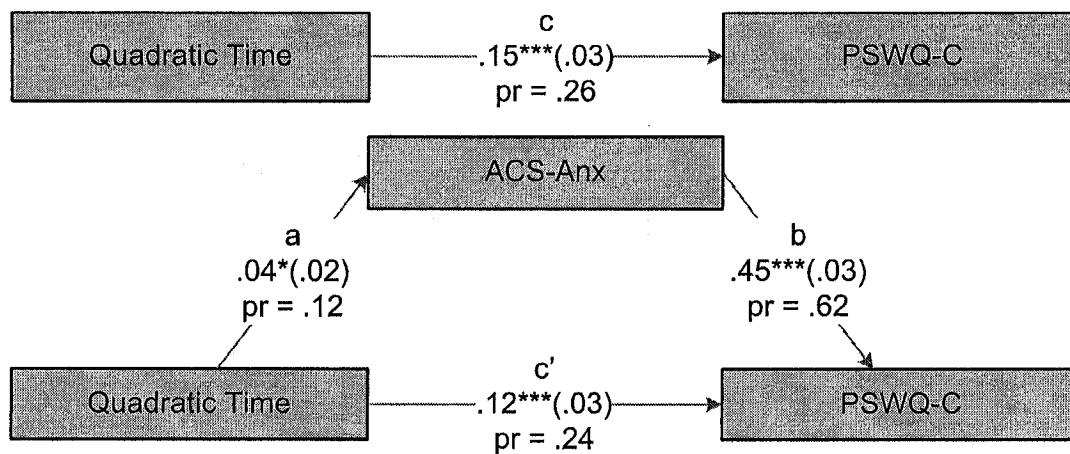
As illustrated in Figure 10, when scores on the CES-D and STAI-Trait were included as time-varying covariates, the regression coefficient for curvilinear time predicting the ACS-Anx was reduced from  $B = 0.05$  to  $B = 0.01$  when the PSWQ-C was included in the regression equation. Sobel's test revealed a significant indirect path from curvilinear time to the ACS-Anx via the PSWQ-C,  $Z = 4.73$ ,  $p < .001$ . Seventy-eight percent (78%) of the relationship between curvilinear time and the ACS-Anx was



*Figure 10.* Lower level mediational model with the PSWQ-C as a mediator between curvilinear time and the ACS-Anx controlling for scores on the CES-D and STAI-Trait. Unstandardized regression coefficients are presented on top, standard errors in parenthesis, and partial regression coefficients are presented on the bottom.

*Note:* PSWQ-C = Penn State Worry Questionnaire for Children; ACS-Anx = Affective Control Scale – Anxiety subscale; CES-D = Center for Epidemiological Studies Depression Scale; STAI-Trait = State-Trait Anxiety Inventory – Trait subscale.

\* $p < .05$ .      \*\* $p < .01$ .      \*\*\* $p < .001$ .



*Figure 11.* Lower level mediational model with the ACS-Anx as a mediator between curvilinear time and the PSWQ-C controlling for scores on the CES-D and STAI-Trait.

Unstandardized regression coefficients are presented on top, standard errors are presented in parenthesis, and partial regression coefficients are presented on the bottom.

*Note:* PSWQ-C = Penn State Worry Questionnaire for Children; ACS-Anx = Affective Control Scale – Anxiety subscale; CES-D = Center for Epidemiological Studies Depression Scale; STAI-Trait = State-Trait Anxiety Inventory – Trait subscale.

\* $p < .05$ .      \*\* $p < .01$ .      \*\*\* $p < .001$ .

mediated by change in the PSWQ-C, above and beyond linear time, the CES-D, and the STAI-Trait. Finally, the association between curvilinear time and the ACS-Anx rose above the significance level of  $p < .05$ , thus indicating full mediation.

The results of the alternate model are presented in Figure 11. The findings revealed that, with scores on the CES-D and STAI-Trait as time-varying covariates, the regression coefficient for curvilinear time predicting the PSWQ-C was attenuated modestly from  $B = 0.15$  to  $B = 0.12$  when the ACS-Anx was included in the equation. Sobel's test revealed a significant indirect path from curvilinear time to the PSWQ-C via the ACS-Anx,  $Z = 2.18$ ,  $p < .05$ . The association between curvilinear time and the PSWQ-C remained significant, and the percentage mediation was a modest 13%.

## Discussion

Study 2 was a prospective, longitudinal investigation exploring the relationship between worry, intolerance of uncertainty, and fear of anxiety in a community sample of adolescents. The purpose of this investigation was to extend the results of Study 1 by prospectively examining the nature of the associations between worry, intolerance of uncertainty, and fear of anxiety over time. The current study had three broad objectives. The first objective was to delineate the normative adolescent trajectories of worry, intolerance of uncertainty, and fear of anxiety over ten assessment points. The second objective was to explore the emergence of gender differences in these developmental trajectories over time. The final objective was to examine the interactional processes and sequences of change between intolerance of uncertainty and worry, and between fear of anxiety and worry.

A number of findings emerged from the present study. First, worry, intolerance of uncertainty, and fear of anxiety all demonstrated concave upward (i.e., U-shaped) trajectories over the ten assessment points. Second, adolescent girls reported significantly more worry and fear of anxiety than adolescent boys at all time points. Contrary to expectations, a gender difference in intolerance of uncertainty emerged over time; intolerance of uncertainty increased significantly between the midpoint and endpoint of the study for girls, but not for boys. Third, change in adolescent worry and intolerance of uncertainty each partially mediated change in the other over time. Moreover, change in worry and intolerance of uncertainty continued to mediate change in the other once the shared variance with depression and trait anxiety were partialled out. Fourth, change in worry and fear of anxiety each mediated change in the other over time, but change in

worry showed a stronger mediational effect on change in fear of anxiety than vice versa. Finally, change in worry continued to show a stronger mediational effect on change in fear of anxiety once shared variance with depression and trait anxiety were partialled out. The results and their implications are discussed below.

### *Mean Developmental Trajectories*

According to our initial hypotheses, mean levels of worry, intolerance of uncertainty, and fear of anxiety were expected to increase over the adolescent period. Contrary to our expectations, worry, intolerance of uncertainty, and fear of anxiety all demonstrated modest but significant concave upward (i.e., U-shaped) trajectories over the ten assessment points. For all three trajectories, the coefficients for the linear slopes were negative, reflecting initial declines from the beginning of the study. The coefficients for the curvilinear slopes were positive, reflecting curvilinear trajectories over time. The pattern which emerged for the overall sample was an initial decrease in worry, intolerance of uncertainty, and fear of anxiety over the first half of the study, followed by a leveling off at the approximate midpoints (time points 5 and 6), and ending with an upward turn towards the last part of the study. The results revealed a significant amount of variability in the trajectories, suggesting that there were interindividual differences in the developmental trends over time. When the time variables were restructured using orthogonal terms, both worry and fear of anxiety demonstrated curvilinear change only. Intolerance of uncertainty showed a different pattern, with both the linear and curvilinear orthogonal terms remaining significant. Thus, the findings suggest that the most appropriate adolescent model to represent normative change in worry and fear of anxiety

involves primarily curvilinear change, while change for intolerance of uncertainty involves both linear and curvilinear components.

The current results provide useful information about average levels of, and changes in, adolescent worry, intolerance of uncertainty, and fear of anxiety over time. The data confirm that a certain degree of worry, intolerance of uncertainty, and fear of anxiety is common among adolescent youth. The overall changes in the trajectories, however, were relatively modest, and the pattern which emerged was one of relative stability, a pattern which is rather typical in adolescent research (Compas, Hinden, & Gerhardt, 1995). This may reflect, in part, the previously reported notion that adolescents typically adapt well to the many challenges encountered during this period (e.g., Lerner & Galambos, 1998; Petersen, 1988).

The finding that worry did not increase with age was unexpected. Previous data have indicated that the number of worry themes and overall severity of worry both increase with age (e.g., Kashani & Orvaschel, 1988, 1990; Strauss et al., 1988). Methodological differences may partially account for these discrepant findings. First, a number of previous examinations have focused on the emergence of OAD, rather than examining worry specifically (e.g., Kashani & Orvaschel, 1988, 1990). Accordingly, it may be that whereas worry levels remain relatively stable across adolescence, the incidence of OAD increases during this time. For instance, given that the tendency to worry tends to be chronic in nature, older youth may have struggled with worry for a longer time, resulting in increased impairment and increased rates of OAD, compared with their younger counterparts (Strauss et al., 1988). A second methodological difference is that previous studies examining worry in adolescence have relied primarily



on cross-sectional data, examining groups of younger versus older adolescents (e.g., Strauss et al., 1988).

It is notable that the peak periods of worry, intolerance of uncertainty, and fear of anxiety all coincided with periods of time when adolescents are confronted with a number of simultaneous changes across both internal (e.g., biological, cognitive, emotional, and identity-related) and external (e.g., social relations and settings) domains (e.g., Cicchetti & Rogosch, 2002; Eyberg, Schuhmann, & Rey, 1998; Feldman & Elliott, 1990; Holmbeck, 2002; Spear, 2000a, 2000b; Steinberg, 2005). Although the effect of any one of these transitions on its own may not be particularly problematic (Eccles, Wigfield, & Flanagan, 1989; Harter, Whitesell, & Kowalski, 1992), there may be a cumulative effect when multiple transitions across a number of domains occur simultaneously (Cole et al, 1998; Lerner & Galambos, 1998). For the current sample, students transitioned from elementary to high school between grades 6 and 7, and were scheduled to graduate from high school at the end of grade 11. Accordingly, the current results raise the possibility that simultaneous life changes (including, for instance, biological, cognitive, and social changes) occurring during educational transitions may influence levels of intolerance of uncertainty, worry, and fear of anxiety. This study, however, did not specifically examine the impact of individual or concomitant transitions on worry levels. Clearly elucidating the mechanisms for change in worry, intolerance of uncertainty, and fear of anxiety will require additional investigation.

In sum, future research is needed to replicate these findings and to determine why adolescents show this concave upward trajectory. The present findings also underscore the importance of examining the emergence of worry, intolerance of uncertainty and fear

of anxiety at a younger age, and of following the evolution of these trends into adolescence and adulthood. Despite these unknowns, the current results represent an important first step in our understanding of the development of worry and its associated cognitive variables during this important second decade of life. By establishing the normative developmental paths of adolescents, we are provided with an essential empirical foundation from which we may begin to explore individual differences in these paths of development (Compas et al., 1995). Future studies examining why and how trajectories differ for different individuals would ameliorate our understanding of worry in adolescence.

#### *Mean Developmental Trajectories According to Gender*

The second set of hypotheses predicted that adolescent girls would report greater levels of worry and fear of anxiety than adolescent boys over the course of the study. No gender difference was expected for intolerance of uncertainty. In accordance with our predictions, adolescent girls showed more worry and fear of anxiety than adolescent boys at the onset of the study. Furthermore, no significant gender differences were found for the linear or curvilinear time effects, indicating that girls consistently reported more worry and more fear of anxiety than boys across the entire study period. Contrary to our initial prediction, a gender difference also emerged for intolerance of uncertainty. Although adolescent girls and boys did not differ at the start of the study, intolerance of uncertainty increased significantly between the midpoint and endpoint of the study for girls, but not for boys. In terms of level of worry, the results are consistent with previous research showing that adolescent girls report higher levels of worry than boys (e.g., Kaufman et al., 1993; Spruijt-Metz & Spruijt-Metz, 1997). The findings also provide

preliminary evidence for a gender difference in adolescent fear of anxiety. Finally, the data suggest that gender differences in worry and fear of anxiety may occur sometime prior to grade 7, whereas gender differences in intolerance of uncertainty emerge sometime during grade 9 and 10.

The gender difference that emerged for intolerance of uncertainty, with girls reporting higher levels than boys during the second half of the study, was unanticipated. Although a few previous studies have reported a gender difference for intolerance of uncertainty (e.g., Dugas et al., 2001; Norton et al., 2005), the majority of investigations have found no clear gender differences for this construct (e.g., Dugas, Schwartz et al., 2004; Hedayati, Dugas, Buhr, & Francis, 2003; Holaway et al., 2006; Robichaud et al., 2003). At present, the reasons for this discrepant result are unclear, and future longitudinal research is needed to address this issue. Methodological differences may partially account for this inconsistent finding. For instance, previous investigations have predominantly been cross-sectional in nature, measuring levels of intolerance of uncertainty at a particular point in time by creating a composite score across several age groups. Another possibility is that the differences observed are due to the modifications of the Likert-type scale used for the current investigation. Finally, few studies have focused on intolerance of uncertainty during the adolescent period; thus, it is unclear if the findings for adults (i.e., relative absence of gender differences) also apply for younger individuals. Clearly, additional research examining intolerance of uncertainty in adolescents is required. Nevertheless, the current results suggest that older adolescent girls report greater negative beliefs about uncertainty than boys. Given the strong relationship between intolerance of uncertainty and worry, this finding may help to

explain the gender difference in worry which was observed in the latter part of the study for this sample of adolescents.

In sum, the results provide clear support for the importance of gender in understanding worry during adolescence. The gender differences observed in the current study provide a base for delineating the specific factors that impact on the course of adolescent worry. Understanding when, how, and why gender affects level of worry remains an important gap in the literature.

*Mediational Associations and Specificity Between Change in Intolerance of Uncertainty and Change in Worry*

Lower level mediational analyses were used to examine the mutual influences of change in intolerance of uncertainty and adolescent worry over a five year period. In partial support of our hypothesis, change in intolerance of uncertainty partially mediated change in adolescent worry, accounting for approximately 53% of the mediational association. The results also indicated that adolescent worry partially mediated change in intolerance of uncertainty, accounting for 60% of the mediational relationship. These findings provide preliminary evidence that the link between adolescent worry and intolerance of uncertainty is largely bidirectional in nature, and that change in these constructs occur in a predominantly reciprocal manner. The results also revealed that change in worry and intolerance of uncertainty continued to mediate change in the other above and beyond their respective associations with depression and trait anxiety. Specifically, once the variance for depression and trait anxiety was removed, change in intolerance of uncertainty accounted for 28% of the mediational change in worry, and change in worry accounted for 41% of mediational change in intolerance of uncertainty.

Accordingly, the reciprocal relationship between intolerance of uncertainty and adolescent worry appears to demonstrate some degree of specificity with regards to depression and trait anxiety.

A central premise underlying cognitive models of excessive worry and GAD is that worriers have a bias in the way they cognitively process information (e.g., Beck & Clark, 1997; Mogg & Bradley, 1998). Consistent with this hypothesis, experimental data suggest that adult worriers demonstrate automatic and controlled biases towards threat. Furthermore, adult worriers are more likely to interpret ambiguous material as threatening (e.g., MacLeod & Rutherford, 2004; Mathews, 1990; Mathews & Mackintosh, 1998). Although it is only possible to speculate at this time, it may be that biases in information processing partly explain the reciprocal, bidirectional association between intolerance of uncertainty and worry observed during the current investigation.

*Potential pathways from intolerance of uncertainty to worry.* In their model of excessive worry and GAD, Dugas and Robichaud (2007) suggest three pathways in which intolerance of uncertainty might lead to adult worry. These pathways include the tendency for adults high on intolerance of uncertainty to interpret ambiguous information as negative and threatening (Dugas, Hedayati et al., 2005), to perform poorly on tasks involving ambiguity (Tallis et al., 1991), and to be less confident in their decisions regarding ambiguous situations while anxious (Talbot et al., 1999).

Accordingly, there are several potential pathways in which intolerance of uncertainty might lead to the tendency to worry in adolescence. First, adolescents high on intolerance of uncertainty may have greater difficulty tolerating the uncertainty of ambiguous situations, resulting in an increased likelihood of appraising the situations in a

negative manner. Consistent with this hypothesis, research findings suggest that anxious youth have a tendency to make threatening interpretations of ambiguous information (Bogels & Zigterman, 2000; Hadwin et al., 1997), and are likely to predict negative over neutral outcomes (Barrett et al., 1996). Adolescent high worriers may also have particular difficulty dealing with the uncertainty of moderately ambiguous situations. This is consistent with research showing that anxious youth tend to interpret relatively moderately ambiguous cues as threatening (Dagleish et al., 2003). Finally, anxious adolescents who are intolerant of uncertainty may feel less confident when faced with ambiguous situations, leading to worry about the possible implications of their decisions. This is similar to recent findings showing that anxious youth feel less able to cope when faced with a threatening situation (Dagleish et al., 2003). Thus, the above findings suggest a number of potential pathways leading from intolerance of uncertainty to adolescent worry, and may represent some of the specific mechanisms through which change in intolerance of uncertainty partially mediates change in worry.

*Potential pathways from worry to intolerance of uncertainty.* The results of the current study also indicated that change in adolescent worry significantly mediated change in intolerance of uncertainty, and that this occurred above and beyond depression and trait anxiety. A review of the present literature clearly indicates a need to more explicitly delineate the possible pathways from worry to intolerance of uncertainty. Because worry involves elaborating on potential negative outcomes, one possibility is that worry reinforces an individual's vulnerability to intolerance of uncertainty by confirming the perception that uncertainty is threatening, uncontrollable, and should be avoided. Alternatively, Butler and Mathews (1983) argue that certain features of worry

may increase an individual's estimate of the probability that negative outcomes will occur. These features include the number of worry events, the ability to recall these events, the length of time between worry events, and the degree to which these worry events are relevant. As such, the characteristics of the worry process may impact the way in which adolescents view uncertainty.

Because worry utilizes a significant portion of cognitive resources, it leaves little resources available for the worrier to objectively evaluate the probability and resulting implications of feared outcomes, to initiate problem solving and carry out a plan of action, or to emotionally process one's fear, all of which might disconfirm a worrier's negative beliefs about uncertainty and its implications. Threatening meanings are therefore maintained. Even when an anticipated threatening outcome does not occur (which is usually the case given that worries typically involve low probability events), a worrier may continue to worry in the future because a threatening outcome "could have occurred," reinforcing the belief that catastrophe was "barely avoided." This may also have the additional adverse effect of confirming catastrophic beliefs about uncertainty regardless of the actual outcome. Furthermore, although research findings are mixed, there are some data to suggest that extensive attention and processing of ambiguous stimuli may lead to increased encoding of threat-related information into long-term memory, resulting in biased recall for threat-related information (Burke & Mathews, 1992, MacLeod & McLaughlin, 1995). Taken together, it may be that high levels of worry lead to more threatening interpretations in working memory, which then leads to more negative beliefs about uncertainty and ambiguity. Thus, over the longer term,

individuals may develop an increased awareness of situations involving uncertainty and ambiguity, and may be more likely to view them as unwanted and threatening.

In summary, the overall outcome can be conceptualized as a positive feedback loop, with intolerance of uncertainty leading to biases in information processing and increased worry, which, in turn, also contributes to biases in information processing and negative beliefs about uncertainty. Although the discussion of the relationships between intolerance of uncertainty and worry were reviewed separately, we believe that the interaction between these two constructs occurs in a dynamic and reciprocal fashion in that each influences the other throughout the worry event. Further research is needed, however, to elucidate the extent to which information processing plays a role in the relationship between intolerance of uncertainty and adolescent worry.

*Mediational Associations and Specificity Between Change in Fear of Anxiety and Change in Worry*

Consistent with our prediction, change in worry and fear of anxiety each mediated change in the other over time, with change in worry showing a stronger mediational effect on fear of anxiety than vice versa. Specifically, change in worry fully mediated change in fear of anxiety, accounting for 97% of this mediational association. Conversely, change in fear of anxiety partially mediated change in worry, accounting for 29% of the mediational relationship. These findings provide preliminary evidence that change in fear of anxiety occurs primarily due to change in worry, whereas change in worry is largely unaffected by change in fear of anxiety, suggesting that adolescent worry may change largely via other mechanisms. Finally, change in worry continued to show a full mediational effect on change in fear of anxiety (78%) once shared variance with



depression and anxiety were partialled out. Change in fear of anxiety also continued to partially mediate change in worry, but its impact was substantially reduced, accounting for only 13% mediational relationship. Taken together, it appears that the reciprocal, bidirectional relationship between worry and fear of anxiety shows some degree of specificity with regards to depression and trait anxiety.

In terms of the influencing role of worry on fear of anxiety, the current results are consistent with the proposal that high fear of anxiety is largely the result of repeated experiences with anxiety (Goldstein & Chambless, 1978). The current findings are in line with Roemer and Orsillo's (2002, 2005) integrative account of excessive worry and GAD which posits that high worriers view their emotional experiences as negative and threatening, and that repeated experiences with worry lead to repeated efforts to avoid, control, or change their internal experiences. Similarly, the metacognitive theory of worry (Wells, 2004) holds that elevated levels of worry lead to the development of negative beliefs about worry and its consequences. Taken together, these data suggest that repeated experiences with worry lead to the development of negative beliefs regarding the experience and expression of worry and anxiety. Stated differently, fear of anxiety likely represents a "cognitive reaction" to frequent and excessive worry episodes. The results of the current study are consistent with this conceptualization.

Regarding the relatively modest impact of fear of anxiety on worry, previous research has shown that individuals who hold more negative beliefs about worry report a greater tendency to worry (Davey, Talls, & Capuzzo, 1996; Wells, 1995, 2004). According to Wells, the activation of negative beliefs about worry (i.e., worry is dangerous and uncontrollable) leads to increased threat appraisals, which, in turn, leads to

heightened anxiety and prolonged worry episodes. In response to negative beliefs, worriers engage in thought control strategies, including attempts to suppress unwanted thoughts regarding threat-related information. This has the adverse consequence, however, of increasing the occurrence of these unwanted thoughts, thereby leading to increased worry over the longer term (Wegner, Schneider, Carter, & White, 1987). Given these data, it follows that individuals who hold more negative beliefs about the consequences of their worry and anxiety may also experience increased levels of worry.

In sum, it appears that changes in fear of anxiety are largely the result of changes in worry, whereas worry is largely unaffected by changes in fear of anxiety. Accordingly, the data support a predominantly unidirectional impact of worry on negative beliefs about anxiety. Nevertheless, these data provide evidence that fear of anxiety is an important cognitive variable in our understanding of worry. In addition, contrary to previous speculations (e.g., Hayes et al., 1996; Roemer et al., 2005), the results found for the current sample suggest that there is a somewhat unique association between worry and fear of anxiety not accounted for by depression and trait anxiety. Together, these findings suggest that fear of anxiety may play an important role in the maintenance of excessive worry and GAD in adolescence. The findings provide a basis for exploring the impact of targeting and modifying negative beliefs about anxiety during treatment with clinical samples.

#### *Limitations and Future Directions*

The current investigation has a number of limitations which suggest possible directions for future research. First, because this research is an initial foray into the field of adolescent worry, it did not examine many of the developmental issues discussed in

the general introduction. Accordingly, future research could include developmental constructs such as social support and cognitive development. Moreover, the longitudinal nature of this study required the selection of self-report measures that were suitable and appropriate for adolescent respondents across a wide age range. Unfortunately, the current availability of reliable and well-validated self-report adolescent questionnaires is limited. Thus, except for the Penn State Worry Questionnaire for Children and the Center for Epidemiological Studies Depression Scale, none of the other measures has been specifically validated in adolescent populations. One consideration, therefore, is that adolescents may have experienced difficulties with certain items, especially during the earlier stages of the study. Similarly, it is significant that the adolescent participants underwent considerable biological and cognitive changes over the course of the study. Accordingly, the results may have been influenced, in part, by the participants' evolving capabilities rather than actual change in symptoms. It would be useful for future research to consider alternative research methodologies, such as laboratory investigations or structured interviews, and include information from multiple informants, such as peers, parents, teachers, or clinicians. In an attempt to address adolescent abilities during the early stages of the study, some of the anchors and Likert scales were modified to maintain uniformity across study questionnaires, and reverse-worded items were removed from measures not previously validated with youth. These latter adjustments, however, may have impacted the psychometric properties of the study questionnaires (Clarke et al., 2005). As discussed here and in Study 1, these limitations emphasize the need to develop and validate measures specifically for use with adolescents. Another limitation centers on the generalizability of the findings. Specifically, the sample was predominantly

Caucasian, and different results may have been obtained had the sample included participants from more varied ethnic and cultural backgrounds. Future research including a more heterogeneous sample is needed to assess whether these current findings can be extended to individuals from other ethnic groups.

The current investigation used HLM (Version 6.02, Raudenbush et al., 2005) to conduct lower level mediational analyses. Given the preliminary nature of this study, accounting for the impact of a number of upper levels was beyond the scope of the current project. Accordingly, future research aimed at the examination of the impact of multiple upper level contexts, including, for example, race, families, schools, or neighbourhoods, would provide additional insight into the hierarchical nature of the findings. Furthermore, while the specificity of the mediational analyses was examined with regards to depressive symptomatology and trait anxiety, specificity was not assessed with regards to other anxiety-related symptoms such as social anxiety, panic symptoms, or obsessions and compulsions. Additional research is needed to elucidate the specificity of the observed relationships with regards to these constructs. Likewise, it is always possible that some unmeasured third variable is responsible for the observed effects in this investigation. Including additional measures of other associated worry constructs, such as positive beliefs about worry and negative problem orientation, would be invaluable. In addition, a substantial amount of research with both adults (e.g., Beck & Clark, 1997; Dugas & Robichaud, 2007) and children (Bogels & Zigterman, 2000; Dalglish et al., 2003) suggests that biases in information processing may play an important role in the development of worry. Accordingly, experimental studies

examining attentional, interpretative, and memory biases are essential to our understanding of adolescent worry.

The overall trajectories for adolescent worry, intolerance of uncertainty, and fear of anxiety all demonstrated concave upwards trends. In terms of future research, one possible avenue would be to examine different developmental pathways in worry, intolerance of uncertainty, and fear of anxiety over time. For instance, cluster analyses may provide information regarding various developmental pathways. Another limitation involved the notable stability of the study constructs over time, leaving less variance to be explained by potential predictor variables. Finally, the current study used the assessment points as a marker of time. However, another metric for time could have been used to model change, such as, for example, respondent age.

Despite the aforementioned limitations, the present study had some notable strengths worth emphasizing, including a relatively large sample size and a substantial number of observations per participant spanning a significant length of time. In addition, the data were collected at multiple sites and the sample showed a fairly even gender distribution. The use of HLM as an analytic tool permitted the use of all available data, including responses from participants who missed one or more assessment periods, leading to increased statistical power and decreased bias which may have occurred had participants with incomplete response patterns been excluded (Hedeker & Gibbons, 2006). Finally, HLM allowed participants to be measured at different time schedules, an important feature given scheduling issues that can arise when collecting data across a number of schools.

In sum, in spite of its many limitations, the current study represents an important first step in increasing our knowledge of worry, intolerance of uncertainty, and fear of anxiety in adolescence. The results have several notable implications for the prevention and treatment of adolescent excessive worry. First, the ability to identify the age periods when normative worry is at its highest can provide researchers and clinicians with an important backdrop for understanding problematic worry. Similarly, this knowledge can help with the development of timely and accurate assessment and treatment strategies for excessive worry. Moreover, filling this developmental gap in the literature may lead to better assessment and intervention strategies for excessive and uncontrollable worry and GAD across the lifespan. Specifically, research has documented that excessive worry is chronic in nature, and may persist from adolescence into adulthood. In addition, the present results indicate that there is, to some extent, continuity in the characteristics of worry. In other words, it appears that intolerance of uncertainty and fear anxiety, which are cognitive processes involved in adult worry, are similarly present in adolescent populations. Accordingly, understanding the phenomenology of adolescent worry, and treating worry during the adolescent period, may decrease the incidence of excessive worry in adolescence and in adulthood.

The findings suggest that adolescent worriers may benefit from psychoeducation and cognitive restructuring of maladaptive thoughts and beliefs regarding worry, uncertainty, and anxiety. The results of the current study also provide preliminary evidence that adding emotion-focused techniques to traditional cognitive-behavioural approaches may increase the efficacy of current treatments (e.g., Roemer & Orsillo, 2002; Turk, Heimberg, Luterek, Mennin, & Fresco, 2005).

## General Conclusions

The primary purpose of this thesis was to extend the current body of research related to adolescent worry. Study 1 represented a first step towards confirming the relationship between worry, intolerance of uncertainty, and fear of anxiety in adolescence. The results revealed that adolescent worry was significantly associated with intolerance of uncertainty and fear of anxiety above and beyond trait anxiety and depressive symptomatology. Study 2 is, to the best of our knowledge, one of the first longitudinal explorations to specifically examine the degree to which cognitive factors play a role in adolescent worry. The results demonstrated that the overall developmental trajectories for adolescent worry, intolerance of uncertainty, and fear of anxiety all showed concave upward (U-shaped) trends from grades 7 to 11. Differences were noted between the results for the girls and those for the boys. The girls, on average, reported more worry and fear of anxiety than the boys across the adolescent period. Intolerance of uncertainty, however, showed a different longitudinal course, with intolerance of uncertainty showing no gender differences until the approximate midpoint of the study, at which point the trajectories began to diverge. At the point of divergence, intolerance of uncertainty began to increase for girls, but remained relatively stable for boys. Finally, the lower level mediational analyses indicated that the relationship between worry and intolerance of uncertainty was predominantly bidirectional in nature, whereas the association between worry and fear of anxiety was primarily unidirectional, with changes in worry showing a stronger influence on fear of anxiety than vice versa. It is important to note that these latter findings remained significant even when statistically controlling for trait anxiety and depression.

This thesis represents an attempt to fill in some of the gaps in the literature related to worry across the adolescent period. The findings of this thesis highlight several key points. First, the current findings confirm the presence of worry, intolerance of uncertainty, and fear of anxiety in adolescence. The findings also reveal that, while these constructs generally display modest concave upward trajectories, they are remarkably stable over time. Finally, the finding that intolerance of uncertainty and fear of anxiety are strongly related to adolescent worry reinforces the notion that these cognitive processes represent important risk factors for the development and maintenance of worry not only in adults, but also in adolescence.

From a developmental psychopathological framework, describing the specific developmental trajectory of normative adolescent worry, intolerance of uncertainty, and fear of anxiety provides researchers and practitioners with a context from which to distinguish what is normal from what is pathological. Normative data is essential as, even before the emergence of psychopathology, certain developmental trajectories and cognitive characteristics may place some individuals at risk for later difficulties (Cicchetti & Toth, 2002). The current study suggests that some of the cognitive processes (i.e., intolerance of uncertainty and fear of anxiety) relevant to understanding adult worry are also present in adolescent worry. Thus, adolescents who are high on intolerance of uncertainty and who have developed a fear of their anxious experiences may have developed a style of thinking that puts them at risk for developing difficulties both in adolescence and later in life.

It is noteworthy that the anxiety treatment literature as a whole has undergone a considerable shift from nonfocused, open-ended interventions towards more empirically-



based treatments targeting specific disorders (Albano & Hack, 2004; Albano & Kendall, 2002; Chambless & Ollendick, 2001). Consistent with this movement, researchers investigating adult worry have highlighted the importance of identifying the specific cognitive processes that may be involved in the development and maintenance of excessive worry (Borkovec & Inz, 1990; Dugas, Gagnon, et al., 1998). Thus, the current findings contribute to the existing literature by providing a preliminary empirical basis for addressing specific cognitive processes during interventions with worried youth. For instance, it may be that interventions which incorporate strategies to modify negative beliefs about uncertainty and decrease one's fear of anxiety may have a positive impact on decreasing excessive worry in adolescence and across the life course. Further study is needed, however, to assess the degree to which targeting these cognitive processes is helpful in increasing the effectiveness of treatment. As research in the area of adolescent worry progresses, it is hoped that these findings may help in developing more targeted interventions for worry in youth.

In summary, the current findings highlight the role of cognitive processes in the development and maintenance of adolescent worry. Additional research is needed, however, to more thoroughly examine the interplay between adolescent worry, underlying cognitive processes, and developmental issues.

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Appendix A

Initial Letter to Parents

Date

Dear Parents,

I am a doctoral student in clinical psychology conducting research under the supervision of Dr. Michel Dugas at Concordia University. Our research team is interested in identifying factors that lead to the development of high levels of worry and anxiety in adolescents. I am writing to tell you about a study we are conducting with grade 7 students at \_\_\_\_\_ High School. This study will help us learn more about the development of worry and anxiety in adolescents.

The purpose of this research project is to investigate the course of worry and anxiety in adolescents. Some of the questions we are interested in include the influence of mood, uncertainty, perceived social support, and life events on the course of worry. By taking into account the specific developmental challenges of adolescence, this study will provide a more complete picture of adolescent worry and allow researchers like ourselves to develop intervention programs for adolescents suffering from high levels of worry.

Students will be assessed twice a year (once in the fall, once in the spring) over the five years they will spend in high school. They will be asked to complete a few brief questionnaires in their classrooms during regular school hours, with the total administration time being approximately 40 minutes. Participation in this study is completely voluntary. Your daughter/son may withdraw from the study at any time without negative consequences. In addition, all information collected is strictly confidential and will NOT be shown to anyone. All questionnaires will be given a code number and will be stored in a locked cabinet in our offices at the university.

Even if you have already given your consent, the researchers will also ask the students individually whether they wish to take part in the study. They will be told that participation is voluntary, and that they may stop participating at any time they wish. I will be present at all testing times in order to answer any questions your daughter/son may have.

This study is funded by the Conseil Québécoise de la Recherche Sociale (CQRS) and has been approved by the Sir Wilfrid Laurier School Board, by Joliette High School, and by the Research Ethics Committee of the Psychology Department at Concordia University. One of our priorities is to present the findings of this study to teachers and school counselors at participating schools in order to help them better understand/assist students who are highly worried and anxious. The results of this study will also be presented to participating students at the end of the five year period.

If you have any questions or concerns, please call me at (514) 848-2229, send me a letter at Department of Psychology, Concordia University, 7141 Sherbrooke St. Ouest, Montreal, Qc, H4B 1R6, or email me at [laugesen@vax2.concordia.ca](mailto:laugesen@vax2.concordia.ca).

In an effort to thank students for returning the permission slip, any student who returns the slip, regardless of whether her/his parent has given permission for participation, will be part of a drawing. The winner will receive either free tickets to a movie at a cinema or a gift certificate to a music store in your area.

Thank you for considering this request. This letter is yours to keep. Please fill out the attached form and have your daughter/son return it to his or her teacher.

Sincerely,

Nina Laugesen, M.A.

Appendix B  
Parent Consent Form

**Parental Permission Form**

**Research Project Title:** The course of worry and anxiety in adolescence

**Site:** \_\_\_\_\_ High School

**Investigators:** Nina Laugesen, M.A.; Ph.D. candidate in psychology  
 Michel J. Dugas, Ph.D., Assistant Professor, Concordia University  
 William M. Bukowski, Ph.D. Professor, Concordia University

**Purpose:** I have been informed that the purpose of this research project is to investigate the course of worry and anxiety in adolescents. My son/daughter will be asked to sign a consent form and fill out a general information sheet. She/he will also be asked to fill out a set of brief questionnaires assessing aspects of mood, reactions to uncertainty, perceived social support, and current life events.

**Conditions of participation:**

- I understand that my daughter's/son's participation in this study is voluntary. I also know that even if she/he starts to take part in the study, she/he can withdraw at any time without negative consequences.
- I understand that my daughter's/son's participation in this study, and the information she/he will provide, is strictly confidential and will NOT be shown to anyone. All questionnaires will be given a code number and will be stored with complete security throughout the entire investigation.
- I understand that the results from this study may be published, but that no names or identifying information will be included for publication.
- I understand the purpose of this study and know that there is no hidden motive of which I have not been fully informed. I understand that my daughter/son will not be required to do any task other than those described above.

Please check one of the following:

\_\_\_\_\_ My daughter/son has my permission to participate in the study described above.

\_\_\_\_\_ My daughter/son does not have my permission to take part in the study.

Child's name (please print) \_\_\_\_\_

Name of parent/guardian (please print) \_\_\_\_\_

Signature of parent/guardian \_\_\_\_\_

Date: \_\_\_\_\_

Appendix C  
Student Consent Form

**Student Consent Form**

**Research Project Title:** The course of worry and anxiety in adolescence

**Site:** \_\_\_\_\_ High School

**Investigators:** Nina Laugesen, M.A.; Ph.D. candidate in psychology  
Michel J. Dugas, Ph.D., Assistant Professor, Concordia University  
William M. Bukowski, Ph.D. Professor, Concordia University

**Purpose:** I have been informed that the purpose of this study is to examine the course of worry and anxiety in adolescents. I understand that I will be asked to sign a consent form and fill out a general information sheet. I also know that I will be asked to fill out a set of brief questionnaires assessing aspects of mood, reactions to uncertainty, perceived social support, and current life events.

**Conditions of participation:**

- I understand that my participation in this study is voluntary. I also understand that even if I decide to participate, I am free to stop at any time.
- I understand that the information I will provide is strictly confidential and will NOT be shown to anyone. The questionnaires will be kept under lock and key throughout the entire investigation.
- I understand that results from this study may be published, but that no names or identifying information will be included for publication.
- I understand the purpose of this study and know that there is no hidden motive of which I have not been fully informed. I also understand that I will not be required to do any task other than those described above.

I have currently studied the above and understand this agreement. I, \_\_\_\_\_, freely consent and agree to participate in this study.

**NAME** (please print) \_\_\_\_\_

**SIGNATURE** \_\_\_\_\_

**WITNESS SIGNATURE** \_\_\_\_\_

**DATE** \_\_\_\_\_

Appendix D

Demographic Information questionnaire



GENERAL INFORMATION

ID #: 

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This information will help us describe the participants in our study.

1. Age: 

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Date of birth: 

Day		Month		Year	

2. Sex:  Female  
 Male

3. Grade:  7  
 8  
 9  
 10  
 11

4. Type of family:  Nuclear family  
 Single parent household  
 One or more parents remarried

5. Racial origin:  Asian  
 Black  
 Caucasian  
 Hispanic  
 Other (please specify) \_\_\_\_\_

Appendix E

Penn State Worry Questionnaire for Children (PSWQ-C)



41227

## PSWQ-C

PSWQ-C 1 of 1

ID#:

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After reading each item, please darken the box beneath the number (0 to 3) that best describes to what extent the statement is true for you. **PLEASE USE A PEN.**

	Not at all true	A little true	Often true	Always true
1. My worries really bother me.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
2. I don't really worry about things.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
3. Many things make me worry.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
4. I know I shouldn't worry, but I just can't help it.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
5. When I am under pressure, I worry a lot.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
6. I am always worrying about something.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
7. I find it easy to stop worrying when I want.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
8. When I finish one thing, I start to worry about everything else.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
9. I never worry about anything.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
10. I've been a worrier all my life.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
11. I notice that I have been worrying about things.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
12. Once I start worrying, I can't stop.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
13. I worry all the time.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
14. I worry about things until they are done.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>

Chorpita, B.F., Tracey, S.A., Brown, T.A., Collica, T.J., & Barlow, D.H. (1997). Assessment of worry in children and adolescents: An adaptation of the Penn State Worry Questionnaire. *Behavior Research and Therapy*, 35, 569-581.

## Appendix F

Center for Epidemiologic Studies Depression Scale (CES-D)

225

CES-D

CES-D 1 of 2

ID#:

Please read each statement carefully and, using the scale below, darken the box beneath the number (0 to 3) to indicate how often you have felt this way during the past week. **PLEASE USE A PEN.**

	Not at all true	A little true	Often true	Always true
1. I was bothered by things that usually don't bother me.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
2. I did not feel like eating; my appetite was poor.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
3. I felt that could not shake off the blues even with help from my family or friends.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
4. I felt that I was just as good as other people.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
5. I had trouble keeping my mind on what I was doing.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
6. I felt depressed.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
7. I felt that everything I did was an effort.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
8. I felt hopeful about the future.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
9. I thought my life has been a failure.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
10. I felt fearful.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
11. My sleep was restless.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
12. I was happy.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>

225

	Not at all true	A little true	Often true	Always true
13. I talked less than usual.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
14. I felt lonely.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
15. People were unfriendly.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
16. I enjoyed life.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
17. I had crying spells.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
18. I felt sad.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
19. I felt that people dislike me.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
20. I could not get going.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>

Appendix G

State-Trait Anxiety Inventory – Trait Version (STAI Form Y-2)



63221

## STAI Form Y-2

STAI Form Y-2 1 of 2

ID#:

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Read each statement and then darken the box beneath the number (0 to 3) to indicate how you generally feel.  
**PLEASE USE A PEN.**

	Not at all true	A little true	Often true	Always true
1. I feel pleasant	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
2. I feel nervous and restless.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
3. I feel satisfied with myself.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
4. I wish I could be as happy as others seem to be.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
5. I feel like a failure.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
6. I feel rested.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
7. I am "calm, cool, and collected".	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
8. I feel that difficulties are piling up so that I cannot overcome them.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
9. I worry too much over something that really doesn't matter.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
10. I am happy.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
11. I have disturbing thoughts.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
12. I lack self-confidence.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>





63221

STAI Form Y-2, 2 of 2

	Not at all true	A little true	Often true	Always true
13. I feel secure.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
14. I make decisions easily.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
15. I feel inadequate.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
16. I am content.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
17. Some unimportant thought runs through my mind and bothers me.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
18. I take disappointments so keenly that I can't put them out of my mind.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
19. I am a steady person.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
20. I get in a state of tension or turmoil as I think over my recent concerns and interests.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>

Appendix H

Intolerance of Uncertainty Scale (IUS)



42275

IUS

IUS 1 of 2

ID#:

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Please darken the box beneath the number (0 to 3) that describes you best. **PLEASE USE A PEN.**

	Not at all true	A little true	Often true	Always true
1. When I feel uncertain, I can't have a firm opinion.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
2. The fact that I'm uncertain means I'm a disorganized person.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
3. I can't stand life when I feel uncertain.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
4. It's not fair that there are no guarantees in life.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
5. I can't feel relaxed if I don't know what will happen tomorrow.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
6. I feel uneasy, anxious, or stressed when I'm uncertain.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
7. I get very upset when unexpected things happen.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
8. I feel frustrated when I don't get all the information I need.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
9. Feeling uncertain stops me from doing things I want to do.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
10. I always look ahead so as to avoid surprises.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
11. A small unexpected event can spoil everything, even when I plan carefully.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
12. I can't take action when I feel uncertain.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
13. Feeling uncertain means that I am not good enough.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>



42275

IUS 2 of 2

	Not at all true	A little true	Often true	Always true
14. When I feel uncertain, I can't go forward.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
15. When I feel uncertain I can't function very well.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
16. Unlike me, other people always seem to know where they are going with their lives.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
17. Feeling uncertain makes me unhappy or sad.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
18. I always want to know what the future has in store for me.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
19. I can't stand being taken by surprise.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
20. Even a little doubt can stop me from acting.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
21. I feel like I should be able to organize everything in advance.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
22. The fact that I'm uncertain means I'm a person who lacks confidence.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
23. I think it's unfair that other people seem sure about their future.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
24. Feeling uncertain keeps me from sleeping well.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
25. I feel like I have to get away from all uncertain situations.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
26. Unclear or ambiguous situations stress me.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
27. I can't stand being undecided about my future.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>

Appendix I

Affective Control Scale – Anxiety Subscale (ACS-Anx)



44907

ACS

ACS 1 of 1

ID#:

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Please rate the extent of your agreement with each of the statements below by darkening the box beneath the appropriate number (0 to 3). **PLEASE USE A PEN.**

	Not at all true	A little true	Often true	Always true
1. I get so rattled when I am nervous that I cannot think clearly.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
2. It scares me when I feel "shaky" (trembling).	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
3. When I get nervous, I think that I am going to go crazy.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
4. It scares me when I am nervous.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
5. There is nothing I can do to stop anxiety once it has started.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
6. When I start feeling "down", I think I might let the sadness go too far.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
7. Once I get nervous, I think that my anxiety might get out of hand.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
8. When I get nervous, I feel as if I am going to scream.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
9. I get nervous about being angry because I am afraid I will go too far, and I'll regret it later.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
10. I am afraid that I will babble or talk funny when I am nervous.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>
11. When I get nervous, I am afraid that I will act foolish.	0 <input type="checkbox"/>	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>