Family factors associated with anxiety sensitivity in youth

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FAMILY FACTORS ASSOCIATED WITH ANXIETY
SENSITIVITY IN YOUTH

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A thesis submitted in partial fulfillment
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MASTER OF ARTS - CLINICAL PSYCHOLOGY
ABSTRACT

Family Factors Associated with Anxiety Sensitivity in Youth

By

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The purpose of this study was to examine the relationship between various family variables and anxiety sensitivity (AS) in a community sample of 159 youth ages 7-18 years and their parents. Youth completed self-report measures of anxiety and AS and parents completed measures of AS, attachment, psychopathology, family environment, and parenting practices. The primary purpose was to examine the extent to which these family variables predicted child AS. Results indicated that a combination of family factors including parenting style, parental psychopathology, and family environment significantly predicted child AS. Specifically, parent's perceptions of their child's anxiety sensitivity and a secure attachment contributed the most to the prediction equation. These results are discussed in the context of their implications for both assessment and treatment of youth with AS.
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CHAPTER 1

INTRODUCTION

The systematic examination of anxiety disorders in youth is in its early stages. Until the past 20 years, the construct received very little attention from researchers and practitioners. Childhood fears and anxiety were thought to be transient and harmless. However, within the past two decades, a wealth of studies examining the prevalence and clinical characteristics of child anxiety have dispelled these myths (Clark, Smith, Neighbors, Skerlec, & Randall, 1994; Last, Francis, Hersen, Kazdin, & Strauss, 1987; Last, Perrin, Hersen, & Kazdin, 1992). Although some degree of fear and anxiety are part of normal development, excessive anxiety is now conceptualized as an enduring trait that can produce serious adverse consequences for children and their families. Indeed, current estimates purport that anxiety disorders are among the most common psychological disorders of childhood and adolescence (e.g., Clark et al., 1994; Kashani & Orvaschel, 1988). In addition, these disorders have been found to be highly comorbid with depression and substance abuse (Clark et al., 1994), and are associated with significant impairment in academic, social, and familial functioning (Albano, Chorpita, & Barlow, 1996).

Advances in the field of child anxiety are also apparent in the evolving taxonomy and nomenclature of the Diagnostic and Statistical Manual of Mental Disorders (DSM).
For example, in the third edition of the DSM (DSM-III; American Psychiatric Association, 1980), three distinct anxiety diagnoses for youth included separation anxiety disorder, avoidant disorder, and overanxious disorder. However, in the fourth edition of the DSM (DSM-IV; American Psychiatric Association, 1994), only separation anxiety disorder was kept as a distinct category under the rubric of “Other disorders of infancy, childhood, or adolescence.” Furthermore, stipulations were provided in the adult anxiety disorder section specifying special criteria for formulating a diagnosis with a child (e.g., children do not have to demonstrate insight to receive a diagnosis of specific phobia).

Currently, the field of child anxiety disorders is burgeoning with literature examining more effective modes of assessment and diagnosis, identification of subtypes, efficacy of treatment, and development of preventative strategies. At the same time, however, the field lacks consensus regarding the etiology of these disorders. In light of the prevalence and impairment associated with these disorders, research efforts have focused on delineating the underlying risk factors involved in the pathogenesis of child anxiety disorders. The delineation of risk factors implicated in the etiology of anxiety disorders is recognized as a valuable aspect of empirical research. In fact, when leading researchers in the field of anxiety were asked where they thought future research efforts should focus, the prevailing perspective was that more research efforts should be dedicated to exploring the underlying processes involved in anxiety, identifying risk factors, and investigating the efficacy of preventative/early intervention strategies (Norton, Asmundson, Cox, & Norton, 2000). The merit of risk factor identification resides in its ability to facilitate predictions. Being able to predict factors that predispose
A youngster to anxiety has important implications for etiology, prevention, and intervention. For example, a better understanding of the origin of child anxiety disorders can lead to more specific, brief, and cost-effective treatments—a driving force in the managed care of mental health services. If, for instance, specific parenting behaviors (e.g., modeling of avoidant behavior) are found to contribute to the development and maintenance of child anxiety, interventions can be designed to educate and train parents to behave in ways that will reduce their child's anxiety and foster more adaptive coping mechanisms (e.g., modeling approach rather than avoidant behavior).

Related to this, one construct receiving much attention is anxiety sensitivity (AS). Constituting one facet of Reiss and colleagues' (Reiss, 1987; 1991; Reiss & McNally, 1985) expectancy theory of anxiety development, AS is hypothesized to play a significant role in the development of anxiety disorders. AS is a cognitive activity that involves attributing catastrophic consequences to innocuous anxiety-induced symptoms. The expectancy theory of fear and anxiety consists of two cognitive components, expectancy and sensitivity (Reiss, 1987; 1991; Reiss & McNally, 1985). Anxiety expectancy refers to what the individual thinks will happen when the feared object/event is encountered (e.g., "I expect to get into a car accident," "I expect to have a panic attack while driving," "I expect others will notice that I'm afraid"). On the other hand, AS refers to the reasons a person holds that explain why the event produces fear (e.g., "I can't stand the thought of being terribly injured in a car accident." "A panic attack can cause a heart attack." "If others notice that I am afraid, they will laugh at me"). Furthermore, AS has been defined as the fear of anxiety symptoms arising from the belief that these symptoms have harmful physical, psychological, or social consequences.
as well as their immediate discomfort. Reiss' expectancy theory contends that AS magnifies the significance of the anxiety experience, and influences the individual to worry about additional anxiety experiences. Reiss and McNally (1985) suggest that the combination of catastrophic anticipation and preoccupation with anxiety-related bodily sensations intensifies anxiety states, and may lead to the development of an anxiety disorder. As will be discussed later, numerous studies have found evidence in support of Reiss' expectancy theory that postulates that AS is a cognitive risk factor for the development of anxiety.

In spite of the enthusiasm researchers have directed towards investigations of AS, there remain large gaps in our understanding of this phenomenon. What appears to be most lacking is a systematic exploration of the variables associated with the development of AS. Whereas a multitude of factors implicated in the etiology of child anxiety disorders in general have received much attention in the past 10 years (e.g., parenting, attachment, behavioral inhibition, genetics, etc.), the factors associated with the development of AS have received very little empirical attention. In particular, it is not clear what causes AS. Identification of the variables that contribute to high levels of AS may help researchers uncover the various factors associated with anxiety development. In addition, because the most pervasive and important influence throughout much of childhood is the family, it makes sense that familial factors both in terms of biology and environment should be explored as potential contributors to the origin of AS. Therefore, this paper begins with a brief review of a theory of anxiety development embedded within a family perspective followed by a description of the current status of family factors associated with anxiety development in children. This
section is followed by a review of AS, its assessment, and its relation to anxiety development in adults and youth.
CHAPTER 2

REVIEW OF RELATED LITERATURE

Two-Process Theory of Anxiety Development

Theoretical models guiding the conceptualization of anxiety typically involve an interaction between environmental and genetic factors. Given that the family environment is the most important environment for children for an extended period of time (Henderson, 1980), a theory attempting to explain the development of child anxiety would be deficient if it did not emphasize the family. One theory that attempts to explain the etiology of anxiety in terms of family functioning is the “two-process” model (Krohne, 1980, 1985b, 1990). The two-process model, based on the cognitive social learning theories of Bandura (1977), Rotter (1954), and Mischel (1974), acknowledges the potential role of heredity, but places more emphasis on socialization factors (i.e., childrearing). According to this model, particular childrearing practices explain how children develop competencies and expectancies that lead to anxiety. Krohne (1990) explains competencies in terms of an individual’s ability to generate various coping strategies during times of stress, while expectancies refer to beliefs about one’s ability to use coping strategies effectively (i.e., competence expectancy) as well as beliefs about the anticipated outcome of the event (i.e., consequence expectancy).
This model theorizes that anxiety develops when parents respond to their children in a critical, inconsistent, and controlling manner and children subsequently develop a low coping competency, low competence expectancy, and a negative consequence expectancy (Krohne, 1990). In other words, children reared in this type of environment (i.e., critical, inconsistent, and controlling) experience a chain-reaction of events beginning with a failure to acquire adequate coping responses and followed by a perceived inability to cope with problem situations. This leads to a belief that the outcome of the problem situation will be aversive. In support of this model, Krohne and colleagues (see Krohne, 1990 for a review) found that children's trait anxiety, as assessed by the STAIC-T (Spielberger, 1973), was highly related to the frequency, intensity, and inconsistency of parental criticism and control. Thus, the two-process model seems to have received some empirical support. Moreover, as will be seen in the following review of parenting factors associated with child anxiety, the childrearing constructs proposed in the model have been some of the most frequently investigated constructs.

Family Factors Related to the Development of Child Anxiety

Parenting Practices and Child Anxiety

Among the components of the environmental system that appear to be specifically related to anxiety are chronic stress, modeling, conditioning, and parenting. Rapee (1997) reviewed the extant literature examining the role of childrearing practices on anxiety and depression in youngsters and reported that most studies were not methodologically sound due to poor adherence to a guiding theory and lack of consistent and reliable measurement. These inconsistencies, both in terms of methodology and
results, preclude definitive conclusions. However, despite these limitations, Rapee (1997) reported that certain parenting practices may contribute to anxiety symptoms in youth. Specifically, a majority of studies employing a variety of methods have found that parents of children with anxiety disorders tend to be described as controlling and somewhat rejecting. Because various methodologies have distinct advantages and limitations, the literature pertaining to parenting and child anxiety will be discussed according to the method employed. Specifically, information regarding the relationship between parenting and child anxiety comes from four main sources (i.e., retrospective reports, child self-report, parent self-report, and observed interactions).

**Retrospective Reports**

Studies examining the retrospective reports from anxious adults reveal that they tend to perceive their parents as more controlling and more rejecting when compared with their nonanxious counterparts (Alnaes & Torgersen, 1990; Laraia, Stuart, Frye, Lydiard, & Ballenger, 1994; Tearman & Telch, 1988; Rapee, 1997). For example, Tearman and Telch (1988) administered the Critical Life Events Questionnaire (CLEQ; Tearman, 1982) to 36 participants with panic attacks plus agoraphobia and 37 non-clinical controls. The CLEQ consists of 47 items that inquire about early parental warmth, involvement, overprotection, childhood fears, social experiences, behavior problems, and mastery experiences. Several variables distinguished the two groups. First, those with agoraphobia described their parents as being less nurturing (i.e., offering less praise, affection, help, and involvement) than those in the control group. In addition, those with agoraphobia recalled being significantly more anxious than the control group in terms of social anxiety, separation anxiety, school fears, and
nightmares. Contrary to expectations, the two groups did not differ with respect to perceived parental overprotection or parental fearfulness.

These results must be tempered given that reliance on retrospective reports is subject to bias and recall errors. For example, adults who have an anxiety disorder may be especially motivated to explain their anxiety in terms of their parents' behavior (Muris & Merckelbach, 1998), putting greater emphasis on their parents' shortcomings. At the same time, most of the adults in these studies have lived outside of their parents' home for many years. This calls into question the accuracy of subjects' recall.

**Child Self-Report**

To correct this methodological flaw, some researchers have administered questionnaires directly to children and adolescents to gauge their perceptions of their parents' childrearing practices. For example, Muris, Bögels, Meesters, Van der Kamp, and Van Oosten (1996) examined the relation between perceived childrearing and fearfulness (Fear Survey Schedule for Children; Ollendick, 1983) in a sample of 64 clinically referred children. Children were referred for a variety of psychological disorders, among which 22% (n = 14) had a diagnosis of an anxiety disorder. Rearing behavior of both parents was assessed using the EMBU-C (Egna Minnen Betreaffende Uppfostran, My Memories of Upbringing: Castro, Toro, Van der Ende, & Arrindell, 1993). The EMBU-C, a widely used measure, consists of three factors: Emotional Warmth, Rejection, and Control. Results failed to find a relationship between fearfulness and any of the parenting practices assessed by the EMBU-C. Furthermore, children with an anxiety diagnosis described their parents similarly to those with other disorders. One explanation for this finding may be that fear, not anxiety, was the outcome measure.
While children with anxiety experience fear, fear does not necessarily indicate pervasive anxiety.

Two similar studies were conducted with community samples of children with anxiety rather than fear. Muris and Merckelbach (1998) gave 45 children (8-12 years old) a revised version of the EMBU-C as well as the Screen for Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997). The new version of the EMBU-C (see Grüner, Muris, & Merckelbach, 1999) posed an additional factor to tap more directly the anxious rearing behaviors potentially linked to the development of child anxiety symptoms. Sample items of this new scale include: “My parents warn me of all kinds of possible dangers,” and “Your parents are scared when you do something on your own.” Findings revealed that the SCARED total score was positively related to anxious rearing and control for both parents. Neither emotional warmth nor rejection was significantly associated with level of anxiety. In addition, anxious rearing and control for both parents were predominantly related to the generalized anxiety and separation anxiety subscales of the SCARED. Therefore, children with higher levels of anxiety tended to describe their parents as anxious and controlling. The authors concluded that anxious rearing behaviors may teach children to pay more attention to potential threats in the environment, thereby increasing anxious apprehension/worry – a defining feature of generalized anxiety disorder. In addition, children who perceive their parents as overly controlling are likely to have fewer opportunities to experience unfamiliar events/people. Growing up in a strict household may contribute to a child’s shyness and dependence, two features commonly associated with separation anxiety disorder.
In a second study, Grünert et al. (1999) administered the EMBU-C and the Children’s Anxiety Scale (CAS; Spence, 1997) to 117 9-12 years olds. Similar to the Muris et al. (1996) study, results indicated that parental control and anxious rearing practices were positively, and significantly, related to anxiety scores. In addition, perceived emotional warmth was not related to child anxiety. However, unlike the findings of Muris and colleagues, rejection was most strongly related to anxiety symptoms and was the most important predictor of these symptoms. Thus, children who have high levels of anxiety tended to perceive their parents as rejecting, anxious, and controlling. However, because parents’ level of anxiety was not assessed in either study, it is difficult to determine whether these findings represent environmental transmission (i.e., via parenting practices), biological transmission (i.e., genetically), or their combined influence on the transmission of anxiety from parent to child.

Parent and Child Self-Reports

In studies that assessed parents and their children, anxious children tended to describe their parents as more controlling and/or overprotecting than parents of nonanxious children (Rubin & Mills, 1990; Rubin, Mills, & Krasnor, 1989). Moreover, Stark, Humphrey, Crook, and Lewis (1990) assessed both children (n = 51; 9-14 years old) and their mothers (n = 43) with respect to perceived family environment. Initially, a large community sample of children was screened for the presence of anxiety and depression using self-report measures (i.e., RCMAS, CDI, respectively). Children who scored above the cut-off participated in the study.

Using a semi-structured diagnostic interview (K-SADS), the following diagnoses were made: depression (n = 11), anxiety disorder (n = 10), mixed anxiety/depression (n
Both children and mothers completed the Self-Report Measure of Family Functioning (SRMFF; Bloom, 1985), a measure that consists of items from several commonly used family environment instruments (e.g., Family Environment Scale, Family Assessment Measure, etc.). In general, compared to children without a diagnosis, children in all three diagnostic groups perceived their families as lacking on all of the following dimensions: Cohesion, Democratic Family Style, Active/Recreational Orientation, Moral/Religious Emphasis, and Family Sociability. While children in all diagnostic groups reported higher levels of enmeshment, children in the mixed anxious/depressed group reported more overall distress (including conflict) than children with just anxiety or depression. Although Stark et al. (1990) reported low agreement between mother and child reports of family environment, mothers of anxious/depressed children experienced their families as less active, less religious, imperfect, autocratic, and more enmeshed than mothers of the non-clinical control children. In sum, while children in all diagnostic groups experienced their families as distressed, no important differences emerged between the pure depressed and pure anxious groups. It should be noted, however, that the above study relied solely on self-report measures. Using an observational methodology would provide further information regarding the particular mechanisms within the family that lead to elevations in anxiety.

Observations of Family Interactions

In this vein, several studies have attempted to clarify the role of family interactions related to anxiety in children. Barrett, Rapee, Dadds, and Ryan (1996) presented 152 clinically anxious children with ambiguous situations and asked them to provide an interpretation and response-solution for each situation. In addition, two
situations were selected for family discussions, following which children were asked for their final solution. Relevant findings suggest that anxious children perceive ambiguous situations as much more threatening than non-clinical children ($n = 26$) and demonstrate a strong preference for avoidant responses compared to non-clinical and oppositional ($n = 27$) children. Furthermore, for anxious children, avoidant responses dramatically increased following the family discussion. Anxious children seem to have a cognitive bias toward threat interpretations and avoidant response patterns, and these response patterns are exacerbated by interactions with their parents – a phenomenon termed “the family enhancement of avoidant responses” (Barrett et al., 1996). Adhering to a family-based social learning perspective, Barrett et al. (1996) postulated that parents of anxious children may contribute to the etiology and maintenance of their child’s anxiety by modeling and/or reinforcing an anxious/avoidant cognitive approach to problem-solving.

To clarify these findings, Dadds, Barrett, Rapee, and Ryan (1996) attempted to delineate the underlying mechanisms responsible for the FEAR effect. The authors coded a selection of videotapes reported in Barrett et al. (1996) for specific verbal and nonverbal communications between parents and children. They reported that mothers of anxious children tended to listen and agree less with their children than mothers of non-clinical and aggressive children. Interestingly, there were no group differences with respect to frequency of threat interpretations. This finding is inconsistent with the view that parental modeling of threat interpretation provides a sufficient explanation for a child’s anxious cognitive style. Furthermore, parents of anxious children were more likely to reward or reciprocate their child’s avoidant response-solutions, thereby strengthening the child’s plan to respond in an avoidant manner. Thus, while parents
may model anxious cognitions and behaviors, the findings from this study suggest that parental reinforcement of child avoidance may be a more important maintaining factor.

Siqueland, Kendall, and Steinberg (1996) conducted the first multimethod study to employ both parent and child self-report ratings as well as behavioral observations to examine the relationship between parenting and child anxiety. They compared 17 families with a child diagnosed as having an anxiety disorder with 27 non-clinical control families on several measures of parenting. Parents and children completed measures of anxiety, depression, and parenting behaviors (i.e., acceptance and psychological control). In addition, 20-minute family interactions were videotaped and coded by blind, independent raters on two dimensions: autonomy granting and warmth. Parents were considered granting of autonomy if they encouraged their child to think independently, solicited their child's opinion, tolerated differences, and avoided the use of coercion, guilt, power assertion, and/or love withdrawal. Warmth was defined as expressing affection, demonstrating positive regard, recognizing the child's feelings, and laughing and smiling. Comparisons revealed that, in families with an anxious child, children rated their parents as less accepting than control families. In addition, behavioral observations indicated that parents of anxious children granted less autonomy than their nonanxious counterparts. However, unlike studies that have found parents of anxious children to be controlling (e.g., Grüner et al., 1999; Muris & Merckelbach, 1998), Siqueland and colleagues (1996) failed to find differences with respect to this construct. Likewise, no differences were found between families on ratings of warmth or parental level of anxiety and/or depression. This latter result is somewhat surprising given the wealth of literature attesting to the biological/genetic transmission of anxiety.
from parent to child (see Eley, 1999 for a review). One explanation for the lack of differences may be the small size of the clinical sample; 17 parents in this sample may not have provided enough statistical power to reveal true differences. Future studies should attempt to replicate this study with larger and more diverse samples to test the biological/genetic hypothesis.

As Rapee (1997) pointed out, it is difficult to make definitive statements about the nature of parenting behaviors and subsequent anxiety symptoms in children when there are so many forms of assessment and so many discrepant results. While it is not clear what proportion of the variance in child anxiety is accounted for by specific parenting practices, it is clear that parenting behaviors impact the psychological adjustment of children and may put children at risk for developing anxiety disorders.

In sum, most studies were able to detect significant differences between anxious and non-anxious children with respect to parenting practices. Specifically, anxious children perceived their parents as more anxious, controlling, and rejecting than non-anxious peers. In addition, the aforementioned studies suggest that child anxiety may be the result of parental modeling of anxious behaviors, verbal transmission of anxious apprehension, and reinforcement of avoidant behavior. A probable conclusion, then, is that there are multiple pathways of anxiety transmission from parent to child. However, because not all children with anxious, controlling, and rejecting parents develop excessive anxiety, it is possible that AS mediates this relationship. Children who have anxious, controlling, and rejecting parents and who have a high level of AS may develop an anxiety disorder, whereas children with similar parents but a low level of AS may not develop a disorder. In this scenario, a low level of AS is a protective factor but a high
level of AS is a risk factor for developing clinical anxiety. What remains to be addressed in the literature, then, is how parenting practices relate to AS. One possibility is that anxious, controlling, and rejecting parenting progressively leads to greater levels of AS which, over time, leads to greater levels of anxiety.

**Parent-Child Attachment and Child Anxiety**

Another body of literature, closely related to the childrearing literature, has examined the relationship between anxiety and attachment. According to attachment theory (Bowlby, 1973), three main types of parent-child attachment include: secure, avoidant, and ambivalent. Secure attachments are seen in children who confidently explore their environments and are easily comforted in times of stress. Insecure attachments include a) those with an avoidant attachment who tend to ignore and/or avoid their caregiver and, b) those with an ambivalent attachment who are described as clingy and who respond to their caregiver with anger, hostility, and rejection.

Bowlby (1973) postulated that child anxiety is affected by the type of attachment with the caregiver. To gain empirical support of this claim, Warren, Huston, Egeland, and Sroufe (1997) conducted a longitudinal study spanning 16 years. They assessed pregnant women \( n = 267 \) for anxiety during the third trimester. Then, when the infant was twelve months old, mothers and infants participated in The Strange Situation Procedure (Ainsworth, Blehar, Waters, & Wall, 1978) to render an attachment classification. Finally, at the age of 17.5 years, 164 of the offspring were assessed for the presence of psychological maladjustment using a semi-structured interview, the Schedule for Affective Disorders and Schizophrenia for School-Age Children. Modified Present State/Epidemiologic version, (K-SADS-III-R-MPE; Orvaschel, Puig-Antich.
Chambers, Tabrizi, & Johnson, 1982). Of the 164 adolescents who continued in the study, 95 had been classified as securely attached, 37 avoidantly attached, and 32 ambivalently attached. Results indicated that 15% of the total sample of adolescents had at least one current or past anxiety disorder. Based on attachment style, 11% of those with a secure attachment, 16% with an avoidant attachment, and 28% of those identified as ambivalently attached developed an anxiety disorder. Thus, it seems that an ambivalent attachment puts children at greater risk for developing anxiety. However, given that most of those with an insecure attachment (avoidant and ambivalent, respectively) did not develop an anxiety disorder, one can only conclude that an insecure attachment is related to anxiety but it is neither sufficient nor necessary for anxiety to develop. Also of importance was the finding that maternal anxiety was not correlated with child anxiety.

More recently, Muris, Mayer, and Meesters (2000) obtained self-reports of attachment, anxiety, and depression in 91 twelve-year-olds. Specifically, children read three statements (corresponding to the three attachment styles) describing a pattern of friendships. Children were asked to select the one that best describes their friendships. In addition, children completed measures of anxiety (i.e., the Screen for Child Anxiety Related Emotional Disorders; Birmaher et al., 1997) and depression (the Depression Questionnaire for Children; De Wit, 1987). Children with an insecure attachment (i.e., avoidant and ambivalent) reported higher levels of depression and anxiety than securely attached children. A serious limitation of this study is the manner in which attachment was measured. Muris et al. (2000) used a measure originally designed for adults that consisted of only one item. Because children may not have fully understood the content
or had enough knowledge of their own relationships to reliably choose a description of their attachment style, this device does not seem appropriate. However, attempting to gauge the child's perception of attachment is a new and innovative strategy that future researchers should consider. Important information could be gained by comparing perceived attachment from multiple sources (i.e., parents, children, and observers).

Taken together, parenting and attachment studies suggest that the parent-child relationship may be fundamental to a child's psychological adjustment. To date, however, no study has examined the individual and combined influence of parenting and attachment as they relate to child anxiety and AS. Building upon the progression discussed previously, it is possible that an early insecure attachment that limits frustration tolerance and inhibits one's ability to be comforted in times of stress leads to a high level of AS and, if parents are perceived as anxious, controlling, and rejecting, anxiety may emerge. Of course, this hypothesized progression is not complete without considering the potential contribution of a biological vulnerability in the etiology of anxiety and AS. Though it was mentioned that two studies failed to find a relation between maternal and child anxiety (Siqueland et al., 1996; Warren et al., 1997), others have found evidence in support of a biological or genetic link between parent and child anxiety. Therefore, the following section is devoted to a brief review of the literature examining the biological component of anxiety development.

**Biological/Genetic Basis for Child Anxiety**

In addition to the environmental linkages outlined above, the high concordance rates between parents and children with anxiety disorders suggest a biological or genetic vulnerability. In terms of family aggregation of anxiety, many studies have found a
greater prevalence of anxiety disorders in children of parents with an anxiety disorder (Beidel & Turner, 1997; Turner, Beidel, & Costello, 1987; Warner, Mufson, & Weissman, 1995; Whaley, Pinto, & Sigman, 1999). For instance, Whaley et al. (1999) found that 50% (9 out of 18) of children of anxious mothers received a diagnosis of an anxiety disorder compared to 6% (1 out of 18) of children from non-clinical control mothers. These findings provide indirect evidence for the genetic transmission of anxiety from parent to child. In addition, Merikangas, Avenevoli, Dierker, and Grillon (1999) examined family and physiological factors in children at high risk for an anxiety disorder (i.e., children of parents with an anxiety disorder). Relevant findings revealed that children of parents with an anxiety disorder were significantly more likely to have an anxiety disorder than children of nonanxious parents. Anxious children exhibited an increased startle reflex and a higher baseline galvanic skin response (both measures of autonomic reactivity). Unexpectedly, however, these children did not report disturbances in family environment or deficiencies with respect to familial cohesion or adaptability. In this sample of children at risk for developing an anxiety disorder, biological/genetic factors were more related to child anxiety than environmental factors.

Although studies that have reported high intra-family prevalence rates of anxiety disorders provide indirect support of a parent-child link, it is difficult, if not impossible, to dismantle the unique contribution of biological variables free of the effects of environment. Moreover, consolidating the current status of biological transmission studies is an arduous task given the small number of studies and the large discrepancies within and among these studies (Eley, 1999). Twin and adoption studies provide purer measures of biological and environmental contributions to pathology. As such, a recent
A review of twin and adoption research found that environment accounted for a significant proportion of the variance (estimates ranged from 5% to 60%) in child anxiety and depression (Eley, 1999). In addition, Eley reported that genes accounted for approximately 33% of the variance in anxiety. Moreover, Torgersen (1993) suggested that the genetic underpinning of anxiety may be disorder specific: generalized anxiety disorder appears to be solely the result of environment, phobias and obsessions are genetically linked to a moderate degree, and panic attacks appear to be predominantly the product of genes.

In summary, high rates of anxiety among first-degree relatives supports the contention that genes likely play a role, albeit moderate, in the pathogenesis of anxiety. Additional support for a genetic hypothesis comes from behavioral inhibition theory, or the idea that physiological hypersensitivity contributes to a child’s vulnerability towards pathologic anxiety. The following section reviews the concept of behavioral inhibition and its relation to anxiety.

**Behavioral Inhibition and Child Anxiety**

Behavioral inhibition (BI) is a temperament involving elevated and stable heart rate and increased sympathetic arousal (Kagan, Resnick, & Snidman, 1987). Those who demonstrate BI tend to be irritable infants and shy, fearful, and withdrawn children (Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984). They will frequently seek comfort from a parent, exhibit inhibited play around unfamiliar people and events, and have an accelerated heart rate during stress (Kagan et al., 1984; Kagan et al., 1987). BI theorists contend that anxiety disorders develop when children inherit a physical predisposition toward inhibited behavior such that they have a lower tolerance for...
novelty and challenge. Thus, they are likely to avoid new situations and lessen their chances for developing coping skills and becoming sensitized to unfamiliar people or events (Kagan et al., 1987; Kagan et al., 1990). Rosenbaum, Biederman, Hirshfeld, Bolduc, and Chaloff (1991) assessed BI in 56 children of parents with various diagnoses. They found that BI was identified in 85% of children whose parent was diagnosed with panic disorder and agoraphobia (PDAG), 70% of children whose parent had both PDAG and major depression, 50% of children whose parent was depressed, and only 15% of children from a non-clinical control group. In addition, according to a structured diagnostic interview with parents, Rosenbaum et al. (1991) found that children who were identified as BI were significantly more likely to be diagnosed with multiple anxiety and phobic disorders than children who did not demonstrate BI. The authors concluded that BI is a risk factor for anxiety disorders in general and panic disorder and agoraphobia in particular.

Furthermore, in a review of the evidence in support of the relation between BI and anxiety, Turner, Beidel, and Wolff (1996) concluded that children with BI were more likely to develop anxiety disorders, especially those marked by social-evaluative anxiety (e.g., social phobia). However, they noted that while BI may make an individual more prone to fear and avoidance, a significant number of children with BI never develop an anxiety disorder (Turner et al., 1996). Therefore, it seems that BI is related to anxiety but it is neither necessary nor sufficient for the development of an anxiety disorder.

**Interactions Between Biological and Environmental Factors**

The relationship between biology and environment is typically thought to be
symbiotic in nature. In this vein, Manassis and Bradley (1994) proposed one of the first integrative models designed to explain the pathogenesis of child anxiety disorders. Their model incorporates both temperament and attachment as equally influential contributors. However, unlike previous conceptualizations espoused by temperament and attachment theorists, the Manassis and Bradley (1994) model allows for the interaction of these two factors as well as additional familial, environmental, and social factors. For instance, an insecure attachment accompanied by high sympathetic hyperarousal (as seen in children with BI) can decrease one's opportunities for developing coping strategies for regulating affect and increase one's anxiety level (Bradley, 1990). In addition, Kagan (1984; 1987) described the temperament of infants with behavioral inhibition as irritable and colicky. Such a disposition is likely to influence how parents respond to the infant. Reacting with anger or frustration may have a detrimental effect upon the parent-child attachment which may, in turn, increase the child's vulnerability towards anxiety (Manassis & Bradley, 1994).

Likewise, high levels of parental anxiety have been linked with disengaged and withdrawn parenting behaviors, behaviors that may contribute to child maladjustment (Pellegrin, Richie, & Woodruff-Borden, 1999). Studies have shown that parental pathology can have dramatic effects on the family environment. Using an observational methodology, Whaley et al. (1999) rated anxious mothers as less warm, less granting of autonomy, and more likely to catastrophize outcomes compared to non-anxious mothers. In addition, anxious mothers were also more critical and demonstrated less positivity during interactions with their children. These findings are consistent with those using alternative methodologies. For example, Silverman, Cerny, and Nelles (1988) used self-
reports of children whose mothers were diagnosed with panic disorder. Compared to children of non-anxious mothers, children whose mothers were panickers described their families as less cohesive and more dependent, conflictual, and controlling. Taken together, these studies provide evidence for a family-based social learning conceptualization of anxiety transmission (Krohne, 1980, 1985, 1990). In essence, anxious mothers may be contributing to a stressful family environment by behaving in a manner the child perceives as cold, distant, and critical. Meanwhile, mothers may unwittingly model anxious and avoidant behavior for their children, indirectly teaching them to fear the unknown and expect the worst.

To summarize, there are several theories to explain the origin of child anxiety. On one hand, those who espouse a family perspective have found mixed support although the overriding consensus is that parents of anxious children tend to be overcontrolling, anxious, rejecting, and lacking in nurturance. On the other hand, those who advocate a biological perspective have also found modest evidence from family aggregation, twin, and BI studies in support of their position. Others support a more complex view, one that regards both family environment and biology as potential contributors to the onset of anxiety. This latter perspective is consistent with the notion that maladjustment is complex and that there are multiple pathways in the development of psychopathology (Cicchetti & Rogosch, 1996). One potential pathway receiving substantial attention in the recent anxiety disorders literature is AS. Thus, AS theory as well as evidence in support of AS theory from both adult and child studies will be discussed next.
Anxiety Sensitivity

One of the latest developments in the child (as well as adult) anxiety literature is the notion of anxiety sensitivity. Departing from the biological explanations of panic disorder, Clark (1986) proposed a cognitive model of panic in which catastrophic misinterpretation of bodily sensations are a necessary precipitant of panic attacks. The model further states that the relation between catastrophic misinterpretation and panic is cyclical in that misperceiving internal threat cues (i.e., bodily sensations) amplifies those sensations and results in a panic attack. This cognitive bias has become known as anxiety sensitivity (AS). Reiss and colleagues (Reiss, 1987; 1991; Reiss & McNally, 1985) extended Clark's model to include all anxiety disorders in addition to panic. According to their expectancy theory of fear, Reiss et al. (1985) conceptualized AS as the belief that anxiety-related symptoms (e.g., tachycardia, dyspnea, dizziness, etc.) lead to harmful somatic, social, or psychological consequences (Reiss, 1987; 1991; Reiss & McNally, 1985). Thus, when a person with a high level of AS experiences somatic symptoms associated with anxiety (e.g., palpitations), she or he expects that the symptoms will have dire consequences (e.g., s/he will have a heart attack and die). In turn, this expectation amplifies anxiety, increases bodily symptoms, and leads to a vicious cycle that results in excessive anxiety and/or panic. As such, AS has been conceptualized as a cognitive risk factor for the development of anxiety disorders. Support for this hypothesis comes mainly from studies using adult samples that are briefly discussed next.
Anxiety Sensitivity in Adults

**Correlational Studies of Anxiety Sensitivity in Adults**

Most studies examining the phenomenology of AS have been conducted with adults, and many of these studies have investigated the unique relationship between AS and panic attacks. For instance, non-clinical individuals with high levels of AS are significantly more likely to experience spontaneous (Donnell & McNally, 1990) as well as cued (Cox, Endler, Norton, & Swinson, 1991) panic attacks when compared to individuals with low to moderate levels of AS. Similarly, others have reported that high AS was related to both spontaneous and cued panic attacks (Asmundson & Norton, 1993; Watt, Stewart, & Cox, 1998). In addition, high AS is not only related to panic but is highly associated with a wider range of anxiety disorders. Taylor, Koch, and McNally (1992) found that AS was substantially elevated in patients with panic disorder, posttraumatic stress disorder, generalized anxiety disorder, obsessive-compulsive disorder, and social phobia. Taken together, these findings provide evidence that AS is indeed associated with anxiety disorders. However, even more compelling documentation supporting AS as a premorbid risk factor in the pathogenesis of anxiety and panic is derived from longitudinal studies.

**Prospective Studies of Anxiety Sensitivity in Adults**

To date, four studies have examined AS using a prospective methodology. Maller and Reiss (1992) administered the ASI to 151 undergraduates. Three years later, they retested those who scored high and low on the ASI (N = 48). Time two administration consisted of the ASI, the Panic Attack Questionnaire (PAQ; Norton, Dorward, & Cox, 1987), the State-Trait Anxiety Inventory (STAI; Speilberger, Gorsuch, & Lushene, 1987), the State-Trait Anxiety Inventory (STAI; Speilberger, Gorsuch, & Lushene,
1970), and a semi-structured diagnostic interview. Findings revealed that subjects in the high AS group were 5 times more likely to develop an anxiety disorder compared to those in the low AS group. Furthermore, three out of the four subjects who reported the onset of panic attacks during the three years between Time 1 and Time 2 assessments had high AS at Time 1. Finally, high AS scores at Time 1 predicted the frequency and intensity of panic attacks at Time 2. Thus, elevations in AS, as measured by the ASI, were predictive of both panic attacks and anxiety disorders over time.

Ehlers (1995) conducted a study comparing a non-clinical sample (n = 45) with adults who received the following diagnoses: panic disorder with or without agoraphobia (n = 39), non-panicking simple phobia (n = 22), infrequent panic attacks (n = 46), and panic disorder in remission (n = 17). As part of the initial assessment, participants completed measures of panic frequency, depression, trait anxiety, and comorbidity as well as degree of agoraphobia avoidance, heartbeat perception, and AS. All participants were contacted one year following initial assessment, at which time they completed measures of trait anxiety, depression, avoidance, and panic attack symptomatology. Similar to findings reported by Maller and Reiss (1992), relevant results indicated that heightened AS was substantially associated with the onset of panic during the follow-up period in individuals who had never experienced one, the relapse of panic in those who were in remission at initial assessment, and the maintenance of panic in those originally diagnosed with panic disorder. Although examining AS was not the primary purpose of this study, and was therefore not included in the Time 2 battery, inclusion of this measure would have provided even more information into the nature and stability of AS over time. Future studies using a prospective design should examine how the course of
AS varies across time and intervening variables (i.e., treatment, onset or remission of pathology, life events, etc.).

Schmidt, Lerew, and Jackson (1997) investigated the role of AS in the development of anxiety pathology in a large sample of Air Force cadets. Cadets (N = 1172) were assessed prior to and upon completion of a highly stressful 5-week basic training program. In support of the hypothesis that AS presents a cognitive vulnerability in the pathogenesis of anxiety/panic, findings indicated that AS was a significant predictor of new onset panic attacks, anxiety symptomatology, depression, and impairment. In addition, AS contributed unique variance in the prediction of panic at time 2 above and beyond that of trait anxiety. This latter finding provides support for the contention that AS and trait anxiety are distinct concepts that relate differentially – not synergistically – to anxiety development.

Finally, Schmidt, Lerew, and Jackson (1999) replicated their previous study using the same sampling procedures, assessment instruments, and methods. The only exception was that an additional assessment took place midway through basic training. Results were remarkably similar across the two studies. Again, AS was significantly associated with anxiety, panic, and depression. These finding support the view that AS plays a key role in the pathogenesis of anxiety and panic. Evidence that AS is not simply accounted for by shared variance with trait anxiety (Schmidt et al., 1997) as proposed by Lilienfeld and colleagues (1996; Lilienfeld, Turner, & Jacob, 1993) demonstrates that the rules of parsimony have not been violated and that further investigation of AS is warranted (see also McNally, 1996 for review).
Because the above studies utilized a prospective design, the findings are somewhat more provocative than their correlative counterparts. However, results from both types of methodologies provide impressive support for Reiss' expectancy theory. In all, it appears that AS is a significant cognitive vulnerability that is related to, and often precedes, the onset of pathological anxiety. Furthermore, these findings are robust, occurring in both clinical and non-clinical samples. Finally, as with most trends in the anxiety literature, the advances made in the field of adult AS provoked child researchers to question whether or not similar findings would occur in youth. This question is addressed in the following section. Initially, however, a review of the manner in which AS in youth is assessed is presented.

Anxiety Sensitivity in Youth

Assessment of Anxiety Sensitivity in Youth

The empirical literature examining the phenomenology of AS in youth is sparse. Until recently, the absence of an assessment device precluded researchers from conducting psychometrically sound research. To facilitate this endeavor, two measures of child AS were developed. Both were child appropriate modifications of the ASI, the most widely used measure of AS in adults. To improve comprehensibility for youth, items on the Anxiety Sensitivity Inventory for Children (ASIC; Laurent, 1989; Laurent, Schmidt, Catanzaro, Joiner, & Kelley, 1998) and the Child Anxiety Sensitivity Index (CASI; Silverman, Fleisig, Rabian, & Peterson, 1991) reflect minor changes in the wording of items on the ASI. However, for both measures, these changes were minimal to maintain the established construct validity of these measures.
Though it is not as frequently used as the CASI, the ASIC possesses adequate psychometric properties including good internal consistency and construct validity (Laurent et al., 1998). Furthermore, in response to recent criticisms regarding the dimensionality of measures of AS (see Lilienfeld, 1996; Lilienfeld et al., 1993), Laurent et al. (1998) subjected the measure to more rigorous psychometric standards. Initial analyses with non-clinical samples of children 9 to 15 years old prompted the removal of four items due to low item-total correlations ($r$’s < .30), poor inter-item correlations ($r$’s < .20), and inadequate factor loadings. Results of factor analysis suggest one, strong general factor. However, when they performed additional analyses, a hierarchical structure with one higher-order factor (general anxiety sensitivity) and two lower-order factors (“fear of physiological arousal” and “fear of mental catastrophe”) emerged. Thus, conclusions regarding the factor structure of the measure remain elusive. Although the measure was intended to be unifactorial, its multifactorial nature is still consistent with Reiss’ conceptualization of AS (i.e., that individuals fear physical, psychological, and social harm as a result of anxiety symptoms). One criticism of the ASI and its corresponding child versions, then, is that not enough consideration was devoted to scale development and analysis of potential subfactors.

Nevertheless, child anxiety researchers welcomed the addition of the CASI. Within a few years following its inception, several articles were published attesting to the psychometric merits and shortcomings of the CASI (see Silverman & Weems 1999 for a review). Initial analyses using the CASI were conducted using two samples of children: a community sample of 76 children aged 11 to 15 years ($M = 13$ years) and a clinical sample of 33 children aged 8 to 15 years ($M = 10$ years). Children in the clinical
sample were recruited from a private psychiatric clinic and had diagnoses determined prior to the study; these included adjustment disorder, attention deficit hyperactivity disorder, enuresis, dysthymic disorder, overanxious disorder, conduct disorder, and oppositional defiant disorder. Test-retest reliability coefficients were .76 for the community sample (two-week) and .79 for the clinic sample (one-week). Internal consistency was evaluated using item-total correlations. For both samples, the alpha was .87 for both Time 1 and Time 2. Furthermore, regression analysis with the CASI revealed that it accounted for more variance in fearfulness than measures of anxiety frequency and trait anxiety. From this, the authors suggest that the CASI assesses a construct that is distinct from both measures of trait anxiety and anxiety frequency.

Additional studies have found support for the construct validity of the CASI. For instance, Rabian, Peterson, Richters, and Jensen (1993) administered the CASI to three groups of children: anxious, externalizing, and controls. They found that children with an anxiety disorder reported the highest level of AS, followed by the externalizing group, and then the controls. This finding lends support to the position that children with a high level of anxiety also report a high level of AS. In addition, Rabian et al. (1993) reported that the CASI failed to significantly differentiate the anxious and externalizing groups. However, it is important to note that children in the externalizing group also reported high levels of anxiety. Therefore, it is possible that this finding is an artifact of poor sampling. On the other hand, future studies are needed to test the discriminative ability of the CASI. According to Reiss and colleagues (1987; 1991), AS is theorized to have a unique relationship with anxiety/panic symptoms and disorders. However, results
reported by Rabian and colleagues (1993) suggest that AS may be associated with children who have a wide range of disorders.

Chorpita, Albano, and Barlow (1996) tested the utility of the CASI with a sample of 112 children (n = 43; ages 7 to 11 years) and adolescents (n = 69; ages 7 to 17 years) with anxiety disorders. They found results similar to those obtained by Silverman et al. (1991) with respect to the ability of the CASI to account for a significant amount of the variance in trait anxiety beyond that predicted by measures of fear and physiological symptoms of anxiety. However, this was evident for the adolescent group only. For younger children, the CASI did not add to the prediction equation. The authors concluded that the construct may lack salience with younger children (under age 11) because they may not have the cognitive ability needed to make attributions about the adversity of anxiety symptoms.

In response to this proposition, Weems, Hammond-Laurence, Silverman, and Ginsburg (1998) sought to evaluate the properties of the CASI using a clinical sample of both children (n = 202; 6 to 11 years) and adolescents (n = 78; 12 to 17 years) with anxiety disorders. In addition to testing the appropriateness of the CASI for younger children, a second goal was to determine if scores on the CASI could predict variance in fearfulness beyond that predicted by trait anxiety and anxiety frequency. Unlike results obtained by Chorpita et al. (1996), Weems et al. (1998) found that the CASI was just as instrumental in predicting fearfulness for younger children as it was for adolescents. Thus, the authors contend that AS, as measured by the CASI, is a salient construct that may be reliably assessed in children as young as 6 years of age. These findings were also supported in a pair of studies using non-referred students ranging in age from 6 to 16.
years (Hale & Calamari, 1999a). In both studies, the CASI predicted variance in panic symptomatology above and beyond that accounted for by anxiety and depression. In addition, these results were robust – occurring in younger as well as older children.

In light of criticisms regarding the dimensionality of measures of AS (Lilienfeld, 1996), Silverman, Ginsburg, and Goedhart (1999) evaluated the factor structure of the CASI. Exploratory factor analysis yielded one strong factor containing items related to physical concerns/autonomic arousal. However, confirmatory analyses comparing multidimensional to unidimensional models revealed various second factors described in terms of non-autonomic properties (e.g., control, mental incapacitation, social concerns). Silverman et al. (1999) concluded that more studies are needed to determine the consistency of the CASI's factor structure across age groups.

Based on findings obtained by Silverman et al. (1999) and the discrepancies regarding the utility of the CASI with younger children (Chorpita et al., 1996; Weems & Silverman, 1998), Chorpita and Daleiden (in press) evaluated the factor structure of the CASI in a large sample of children (7-11 years) and adolescents (12-18 years) with anxiety disorders. Overall, the CASI performed similarly in children and adolescents. Exploratory factor analysis revealed one factor with the highest loadings pertaining to items that were predominantly autonomic in nature. Furthermore, Chorpita and Daleiden reported that items referring to autonomic arousal were better predictors of panic symptoms and items referring to non-autonomic phenomena were better predictors of generalized or trait anxiety. In addition, using clinician severity ratings of panic and generalized anxiety as criteria, Chorpita and Daleiden found support for convergent and discriminant validity with children and adolescents.
Most recently, Rabian, Embry, and MacIntyre (1999) employed a behavioral challenge procedure to test the construct validity of the CASI. Arousal level was manipulated using a stair-stepping procedure designed to elevate heart rate. Such a manipulation is reasonable given that increased heart rate is a commonly reported symptom of anxiety/panic that is perceived as dangerous. Self-report ratings of AS, anxiety, and fear were obtained prior to and following the challenge task. Results indicate that the CASI accounted for variance on the post-task measures of anxiety and fear beyond that accounted for by pre-task levels of anxiety/fear. Thus, it was concluded that earlier level of AS was a good predictor of anxiety and fear ratings following the arousal task. This study is particularly important as it is the first to employ a unique methodology to investigate the predictive validity of the CASI. When validating psychological instruments, it is necessary to incorporate multi-method assessments to establish both construct and predictive validity. In all, the CASI has demonstrated strong psychometric properties including incremental and predictive validity. In addition, although the following studies are discussed for the purpose of reviewing the extent knowledge regarding child AS, since most have used the CASI as the assessment of choice, they also provide support for the use of the CASI.

Correlational Studies of Anxiety Sensitivity in Youth

Since the advent of adequate measurement devices, a very small but growing body of literature is emerging that suggests that AS manifests similarly in children and adults in that it is a significant predictor of panic and anxiety symptoms. Similar to adult studies, youth with panic in both clinical (Kearney, Albano, Eisen, Allan, & Barlow, 1997) and non-clinical samples (Lau et al., 1996) report higher levels of AS. For
example, Kearney et al. (1997) investigated the phenomenology of panic in an outpatient sample of youth (8 to 17 years old) with panic disorder (n = 20) and non-panic anxiety disorders (n = 20). Findings revealed that the two groups did not differ on measures of general anxiety symptomatology, depression, or fearfulness. However, youth with panic disorder scored significantly higher on the CASI compared to their non-panic counterparts. Lau et al. (1996) obtained similar results when they administered the CASI and PAQ to a sample of high school students (N = 77) ages 14-18 years (mean age = 16.7 years). Based on endorsement of panic symptoms, adolescents classified as panickers (n = 30), compared to non-panickers (n = 47), scored significantly higher on the CASI.

Prospective Studies of Anxiety Sensitivity in Youth

Using a prospective design, Ginsburg and Drake (in press) examined the ability of the CASI to predict panic attack symptomatology six months later. The Time 1 sample consisted of 107 African-American adolescents ranging in age from 14 to 17 years. At Time 2, 66 students were re-evaluated. During both administrations, students completed the CASI and the panic subscale of the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997). In addition, the PAQ was given at Time 2 to determine the proportion of youth who had experienced panic attacks. Similar to studies with primarily Caucasian samples, Ginsburg and Drake found that adolescents with elevated AS reported higher levels of panic symptomatology when compared to those with low AS. In addition, panickers, compared to non-panickers, also reported significantly higher levels of AS. And, despite the finding that initial level of AS was correlated with panic symptoms six months later, AS did not predict later panic
symptoms once initial levels of panic were controlled. One explanation for this latter finding may be that the sample size (n = 66) was insufficient to permit adequate power for regression analyses.

Finally, Hayward et al. (2000) followed a large (N = 2,365), ethnically diverse sample of high school students (mean age = 15.4 years) over four years to test several predictors of panic attacks (i.e., AS, negative affect, female sex, and a history of separation anxiety in childhood). Because participants could enter the study at any time, there were varying lengths of follow-up. Questionnaires were used to assess AS and negative affectivity and a structured interview was used to obtain data pertinent to panic, depression, and separation anxiety. It is important to note, however, that neither the ASIC nor the CASI were available when the study began, so Hayward and colleagues used the ASI. Relevant findings support the proposed relation between AS and panic. Specifically, AS was a significant predictor of new onset panic attacks.

In sum, the striking similarities between the child and adult literature suggest that the construct is robust with respect to age and development such that it occurs throughout the lifespan. Relatedly, AS is a stable and enduring trait that is uniquely related to the development of anxiety and panic in youth as well as adults. Together, these findings imply that a high level of AS is a constant negative force in an individual's life that often leads to serious complications in the form of anxiety disorders. With this in mind, research endeavors need to focus attention on the phenomenology of AS, including its etiology, course, treatment, and prevention. As is evident from the above review of AS, most of the research on AS has been devoted to identifying the factors predicted by AS (e.g., AS predicts panic attacks). However, very
little research has examined the factors that predict AS. Without this knowledge, our understanding of the origin of AS and how it is best treated in the clinical setting is inadequate.

**Origin of Anxiety Sensitivity**

Few attempts have been made to decipher the origin of AS. Initially, the fear of anxiety was considered a secondary consequence of experiences with panic attacks (Goldstein & Chambless, 1978). However, expectancy theory suggests that AS can precede anxiety and panic. To test the directional relation between AS and panic, Donnell and McNally (1990) found that panickers, compared to non-panickers, were significantly more likely to report high levels of AS. However, over 67% of undergraduates with high AS claimed to have never experienced a panic attack. These findings suggest that panic is not a necessary precursor (or consequence) of high levels of AS. Instead, a more appropriate hypothesis of the etiology of AS incorporates the combined influence of multiple pathways.

Commensurate with this view, Reiss and McNally (1985) proposed that AS may be the result of learning and/or genetic influences. Two studies have directly tested this supposition. First, Watt, Stewart, and Cox (1998) examined the potential role of learning in the development of AS. In a non-clinical sample of young adults (N = 551), Watt et al. (1998) compared levels of AS with retrospective self-reports of instrumental and vicarious learning experiences with respect to anxiety and cold symptoms (e.g., “When you had these symptoms prior to age 18 did your parents encourage you to stay home from school?” “Did your parents warn you of the possible dangers of your symptoms?”). Participants with high AS reported more parental encouragement of sick-role behavior.
related to their anxiety and cold symptoms compared to those with low AS (evidence of instrumental learning). In addition, high, compared to low, AS individuals reported observing their parents demonstrating more sick-role behavior related to anxiety (evidence of vicarious learning). High AS subjects also reported significantly more childhood anxiety and cold symptoms. These findings suggest that early learning experiences are correlated with AS. It is important to note, however, that learning experiences were related not only to anxiety symptoms but also benign cold symptoms. Therefore, it appears that parents who model and reinforce generalized sick-role behavior may be contributing to the rise of AS in their child.

Second, Stein, Jang, and Livesley (1999) found considerable evidence attesting to the genetic transmission of AS. Specifically, genetic heritability accounted for almost half of the variance in AS (as measured by the ASI) in a sample of 179 monozygotic and 158 dizygotic adult twins. Thus, there is some evidence that supports both of the etiological pathways (i.e., learning and genetic) proposed by Reiss and McNally (1985).

McNally, Hornig, Hoffman, and Han (1999) tested the hypothesis that individuals with elevated ASI scores would exhibit the same information-processing bias that is seen in patients with panic disorder. Since AS refers to the misperception of benign bodily sensations as dangerous, it seems likely that those with high AS would display a tendency towards a threat-related cognitive bias. Contrary to expectations, individuals with high AS (and no history of panic) did not evince an interpretative, attentional, or memory bias towards threat cues. Thus, it would seem that there are multiple cognitive processes involved in AS and panic and they are likely to operate
independently. That is, beliefs about the harmfulness of innocuous symptoms function independently of the threat-bias seen in patients with panic disorder.

In addition, the high rates of family aggregation of anxiety disorders suggest that the same would be true for AS. For example, children of parents with a high level of AS would also be expected to evince a high level of AS. To date, only one study has examined the relation between parent-child AS and related anxiety/depressive symptomatology (Weems, Hammond-Laurence, Silverman, & Ferguson, 1997). In this study, a sample of 144 youth with anxiety disorders (6 to 17 years old) and one of their parents completed measures of AS, depression, and anxiety frequency. Weems et al. (1997) found that there was a reciprocal relationship between depression and AS such that parental depression predicted child AS and parental AS predicted child depression, but the relation between parent and child AS was not significant. This latter finding is surprising in light of the prevalence of anxiety disorders among family members and the wealth of evidence indicating that AS is a risk factor for these disorders. It should be mentioned, however, that the relation between parent and child AS has not been examined in non-referred populations.

Taken together, the aforementioned studies provide evidence that AS is associated with anxiety disorders and may be a significant risk factor for the development of anxiety and panic in adults as well as youth. Specifically, findings from prospective studies suggest that AS is an important predictor of anxiety and panic in both adults (Ehlers, 1995; Maller & Reiss, 1992; Schmidt, Lerew, & Jackson, 1997; 1999) and youth (Lau, Calamari, & Waraczynski, 1996; Ginsburg & Drake, in press; Hayward, Killen, Kraemer, & Taylor, 2000). In light of these findings, it is evident that
AS holds promise as an important construct that may have vast implications for etiology, maintenance, treatment, and prevention of anxiety disorders in youth. Although familial and biological contributions to anxiety in children have been investigated, much less is known about how these factors contribute to the development of AS. To date, no study has attempted to delineate the family factors that may lead to AS in children.

**Purpose of the Present Study**

The purpose of the present study was to examine the influence of various family factors on the level of AS in youth. This study has the potential to expand the current knowledge base by examining the individual and combined influence of parenting, attachment, family climate, and parental pathology on AS in youth. The main goal of this study was to enhance an understanding of the factors that are associated with, and predict, AS in youth. In doing so, this information may help researchers and practitioners identify youth at risk for developing anxiety disorders. Early detection can lead to the development of preventative programs designed to educate individuals about anxiety and teach them more effective coping strategies. In addition, uncovering patterns of parenting or familial interactions that are associated with greater levels of AS can provide useful information for practitioners who work with families who have been affected by childhood anxiety. For example, if certain parenting practices are predictive of child AS, practitioners can assess for them and implement parent training/child-management classes that address these issues before negative consequences are evinced in children. Similarly, if parental pathology is an indicator of child maladjustment (i.e., elevated AS), it would make sense for clinicians who work with anxious children to assess parental psychopathology. Indeed, parental pathology may maintain or exacerbate
anxiety in children, and thus, compromise the child’s progress in treatment may be compromised. Furthermore, the advent of managed care necessitates quick and effective treatments. Therefore, it behooves clinicians to address potential obstacles before treatment is initiated so that valuable resources are utilized effectively. In an effort to further the extant AS literature, several hypotheses were tested. These are discussed in the following section.

**Hypotheses**

The present study tested the hypothesis that the following 23 variables would significantly predict level of AS in children. The rationale for each prediction is based on the literature reviewed herein. The following section is a brief description of the predictor variables and their anticipated relationship with child AS.

**Parental Anxiety Sensitivity (ASI)**

Based on the work of Stein et al. (1999) who found support for a genetic transmission of AS, it was hypothesized that scores on the ASI would significantly predict child AS scores. Although one might expect AS to aggregate in families in much the same way as anxiety disorders, this expectation may be untenable given findings reported by Weems et al. (1997) who did not find a relationship between parent and child AS. Thus, one goal was to examine the concordance between parent and child AS.

**Parental Perception of Child Anxiety Sensitivity (ASIP)**

To evaluate the extent to which parents are able to report the internal states of their children, a measure was created to assess parent’s perceptions of their child’s AS. Although some studies have reported low rates of parent-child agreement on measures of family environment (Stark et al., 1990) and parenting (Frick, 1991), others have reported
that parents are better at reporting child symptoms that are likely to be witnessed by the parent (Beasley & Kearney, 1996). This particular analysis was explorative in nature.

**Parental Psychopathology (SCL-R-90)**

Of the 9 subscales of the SCL-R-90, only the Phobic Anxiety, Depression, Somatization, and Obsessive-Compulsive subscales were examined. In addition, of the three indexes, only the Global Severity Index (GSI) of the SCL-R-90 was used as an indicator of general psychological distress. It was anticipated that each of these scales would predict AS. These subscales (and corresponding hypotheses) were selected based on the following evidence: 1) child anxiety disorders are more prevalent in children of parents with an anxiety disorder (Turner, Beidel, & Costello, 1987), 2) individuals with a high level of AS are more likely to report a family history of panic than those with moderate and low levels of AS (Donnell & McNally, 1990), and 3) parental depression significantly predicts child level of AS (Weems et al., 1997). Thus, it was anticipated that general psychopathology in addition to specific anxious, depressive, and somatic symptomatology would positively predict child AS. In addition, scores on these factors were expected to be significantly higher in children with a high level of AS (compared to children with medium and low levels of AS).

**Parenting Style (APQ)**

Due to children’s proneness to response sets (Shelton, Frick, & Wootton, 1996), a parent- rather than a child-perspective of parenting behavior was desired. Therefore, the present study utilized the Alabama Parenting Questionnaire (APQ; Frick, 1991). The APQ assesses the following parenting practices: Involvement (IN), Positive Parenting (PP), Poor Monitoring/Supervision (MS), Inconsistent Discipline (ID), and Corporal
Punishment (CP). However, given the poor reliability of the CP scale, it was not included in the present analyses.

Frick (1991) found that parents of clinically-referred children scored significantly below the mean on the positive scales (IN, PP) and above the mean on the negative scales (MS, ID). Based on these and other findings (e.g., Rapee, 1997), it was anticipated that all four scales would predict AS. Furthermore, it was expected that the positive scales (IN, PP) would be associated with low and moderate levels of AS while the negative scales (MS, ID) would be associated with a high level of child AS.

**Family Environment (FES)**

The Family Environment Scale (FES; Moos & Moos, 1981) assesses 10 domains of family climate: Control, Conflict, Cohesion, Expressiveness, Independence, Achievement Orientation, Intellectual-Cultural Orientation, Active-Recreational Orientation, Moral-Religious Emphasis, and Organization. For the purpose of the present study, only the first five of the subscales mentioned were examined. Given that parents of anxious children tend to be more controlling (Alnaes & Torgersen, 1990; Grüner et al., 1999; Laraia et al., 1994; Muris & Merckelbach, 1998), conflictual, less cohesive (Stark et al., 1990), less granting of autonomy (Siqueland et al., 1996; Whaley et al., 1999), and less expressive of nurturance (Tearman & Telch, 1988) than parents of non-anxious children, it was hypothesized that all five scales would predict AS. In addition, high levels of Control and Conflict were expected to be related to high AS while high levels of Cohesion, Independence, Expressiveness were expected to be related to low and moderate AS.
Parent-Child Attachment (PCRI)

Although the ideal assessment of attachment would involve observations of the interactions between the infant and the primary caregiver, attachment theory (Bowlby, 1973) suggests that attachment is an enduring trait that is evident throughout the lifespan. In addition, Muris et al. (2000) found that attachment was reliably assessed in late childhood using a self-report questionnaire. Thus, for the purpose of the present study, the Parent/Child Reunion Inventory (PCRI; Marcus, 1988) was employed to classify participants as insecurely or securely attached. The preceding review of the attachment literature strongly suggests that children who exhibit an insecure attachment are more likely than those with a secure attachment to develop excessive anxiety (Muris et al., 2000; Warren et al., 1997). Therefore, it was hypothesized that an insecure, but not a secure, attachment will predict AS. Furthermore, it was anticipated that an insecure attachment will be related to high AS while a secure attachment will be related to moderate and low AS.

Parent Responses to Child Fearfulness (CDQ)

The Child Development Questionnaire (CDQ; Zabin & Melamed, 1980) assesses five domains of parents' responses to children's fears (Modeling and Reassurance, Positive Reinforcement, Reinforcement of Dependency, Punishment, and Use of Force). Based on literature indicating that parents of anxious children tend to be controlling, rejecting, anxious, and lack nurturance (Rapee, 1997; Tearnan & Telch, 1988), as well as findings that parents model and reinforce anxious and avoidant behavior (Barrett et al., 1996; Dadds et al., 1996), all five scales were expected to predict AS. It was also hypothesized that the Reinforcement of Dependency, Punishment, and Use of Force...
subscales would be associated with a high level of AS whereas the Modeling and Reassurance, Positive Reinforcement subscales will be associated with low and moderate levels of AS.
CHAPTER 3

METHODOLOGY

Participants

Participants were \( N = 159 \) youth and their parents who were recruited from several public and private elementary, middle, and high schools in Nevada and Arizona. Specifically, 11.32% of the participants were recruited from a private school in Nevada, 47.17% were from public schools in Nevada, an additional 14.47% were part of a mass mailing to parents of public high school students in Nevada, and 27.04% were from a public school in Arizona. Youngsters ranged in age from 7 to 18 years (\( M = 11.85, \ SD = 2.6 \) years). In both child and parent groups, there were more females than males (59.1% and 82.4%, respectively). The sample was predominantly Caucasian (76.7%) with the remaining 23.3% consisting of Hispanic (8.7%), African-American (5.3%), multiracial (5.3%), Asian (2.7%), and Native-American (1.3%) participants. Of those who reported annual income (73% of participants), the average annual family income of this sample was $53,400 (\( SD = 50,700 \)). In addition, 65.3% of the parent raters were married, 8.7% were never married, 6.0% were separated, and 20.0% were divorced. The aforementioned descriptives do not include those participants with missing data (5 children and 9 parents).
Child Measures

**Child Anxiety Sensitivity Index (CASI; Silverman et al., 1991)**. The CASI, an age appropriate modification of the ASI (Reiss, Peterson, Gursky, & McNally, 1986), consists of 18 items that assess the extent to which children believe the experience of anxiety will result in negative consequences. Sample items include: "It scares me when I feel like I am going to throw up" and "It scares me when my heart beats fast."

Youngsters respond to each item using a 3-point Likert-type scale (none, some, a lot). The CASI yields a total score obtained by summing ratings across all items, with higher scores reflecting higher levels of AS (scores can range from 18 to 54). Psychometric data on the CASI is promising with test-retest reliability coefficients ranging between .76 to .79 (over one- to two-week periods) and internal consistency coefficients of .87 for both clinical and community samples (Silverman et al., 1991). As noted above, the construct validity of the CASI has also been supported (e.g., Chorpita et al., 1996; Chorpita & Daleiden, in press; Rabian et al., 1999; Silverman et al., 1991; Weems et al., 1998).

**Anxiety Sensitivity Inventory for Children (ASIC; Laurent 1989)** The ASIC is a 16-item measure of the extent to which youngsters fear symptoms of anxiety. Again, items were derived by modifying the ASI for children. Examples of items include: "When I notice that my heart is beating fast, I worry that something really bad is going to happen to me," and "It scares me when I can’t catch my breath." Youth are asked to select the phrase that best describes how much they agree with each item (not true, sometimes true, mostly true, and true). A total score is derived by summing all items. Thus, total scores can range from 0 to 48 with higher scores indicating higher levels of AS. Good internal consistency as well as a reliable factor structure have been noted.
While this device has not been used as frequently as the CASI, it was included to facilitate comparisons with the CASI and obtain more information related to its psychometric properties.

**Multidimensional Anxiety Scale for Children** (MASC; March, Parker, Sullivan, Stallings, & Conners, 1997). The MASC consists of 39 items and four main factors: 1) Physical Symptoms (tense/restless and somatic/autonomic), 2) Social Anxiety (humiliation/rejection and fear of public performance), 3) Harm Avoidance (perfectionism and anxious coping), and 4) Separation Anxiety. Sample items include: “I worry about other people laughing at me” and “I get shaky or jittery.” Children respond to items using a 4-point Likert-type scale describing the degree to which statements are true about them (never, rarely, sometimes, and often). In addition to the four factor scores, the MASC yields a total score obtained by summing all 39 items. Thus, total scores can range from 0 to 117. The instrument has been used with children and adolescents ranging in age from 6 to 18 years old. Analysis of the psychometric properties indicates good internal reliability, satisfactory to excellent test-retest reliability, and adequate convergent and divergent validity with clinical (March et al., 1997) and non-clinical samples (March, Sullivan, & Parker, 1999).

**Parent Measures**

**Alabama Parenting Questionnaire** (APQ; Frick, 1991). The APQ global form consists of 42 items that inquire about the typical frequency of parenting practices such as Involvement (IN). Positive Parenting (PP; measures the use of positive reinforcement), Monitoring/Supervision (MS), Inconsistent Discipline (ID), and Corporal Punishment (CP). Sample items include, “You ask your child about his/her day
in school (IN),” and “You threaten to punish your child and then do not actually punish him/her (ID).” Parents respond to all items using a five-point Likert-type scale (never, almost never, sometimes, often, always) and receive a score for each subscale. Higher scores indicate a greater frequency of that particular parenting practice.

Initial psychometric testing conducted by Shelton, Frick, and Wootton (1996) suggests that the APQ has satisfactory internal consistencies (using unstandardized coefficient alpha) ranging from .45 to .80 for a clinic-referred sample (n = 124) and from .49 to .85 for a community sample (n = 36). The lowest of these coefficients (.45 and .49) were on the CP scale and, therefore, may be lower than expected given the potential influence of social desirability. Without the CP scale, alphas ranged from .64 to .80 and .74 to .85 for the clinical and community samples, respectively. The temporal stability of the global form has not yet been examined. However, test-retest reliability of the corresponding telephone interview format (using the same questions) ranged from .66 to .89 for the total sample. Most scales showed good divergent validity with low intercorrelations. However, the PP and IN scales were highly intercorrelated suggesting that these two scales may be measuring a single construct. In terms of construct validity, scores on the APQ reliably distinguished between the clinical and community samples such that parents in the clinical sample tended to score significantly below the mean on the positive scales (IN, PP) and above the mean on the negative scales (MS, ID, CP).

Although there is a corresponding child self-report version of this scale, it was not used because initial reports indicate that the parent measure was more reliable and useful than the child report. Specifically, parent-child agreement was very low (r’s ranged from .08 to .28), all scales from the child form were highly intercorrelated (r’s
ranged from .33-.86), and the pattern of children’s scores (i.e., that the two positive scales were positively correlated with the three negative scales) strongly suggests the use of a response set (Shelton et al., 1996).

Parent/Child Reunion Inventory (PCRI; Marcus, 1988). The PCRI is a 20-item instrument that assesses the quality of the parent/child attachment based on behaviors that occur following a brief separation. The measure was constructed to tap the attachment constructs outlined by attachment theorists and related research (e.g., Main & Cassidy, 1988; Ainsworth et al., 1978). Parents are instructed to recall a recent separation lasting at least one hour and respond to items based on how they perceived their child’s reunion behavior. Items such as “Child reacts positively to parent initiations (requests, touches, etc.)” and “Child ignores presence or words of parent” are rated by parents using a 3-point scale (usually, occasionally, never). Rather than a total score, the 6 items on the Secure Attachment scale and 14 items on the Insecure Attachment scale are summed and a separate score is obtained for each scale. Higher scores reflect a greater degree of the attachment style. Preliminary data with 26 parents of children 1-12 years old indicates a significant negative correlation between the two scales (r = - .42, p < .05) suggesting that the measure has adequate construct validity in that it successfully taps two constructs theorized to be dichotomous. Furthermore, Marcus (1988) reported adequate internal consistency for both the secure and insecure attachment scales (.76 and .77, respectively). In a study designed to examine the relationship between attachment and behavior problems in a sample of 52 foster children (4-13 years old) and their foster parents, Marcus (1991) found significant correlations between Insecure Attachment and internalizing and externalizing behavior problems (assessed via the Child Behavior
Checklist: Achenbach & Edelbrock, 1983). Finally, although an ideal assessment of attachment would occur during infancy, attachment theory (Bowlby, 1973) as well as empirical studies (Muris et al., 2000) have shown that attachment is an enduring trait that can be reliably assessed in late childhood using self-report methods.

**Child Development Questionnaire** (CDQ; Zabin & Melamed, 1980). The CDQ is a 14-item instrument originally designed to assess parents’ disciplinary strategies in the context of child fearfulness. Items describe a scenario in which a child is afraid/anxious and wants to escape or avoid the particular situation. The scenario is followed by six options that describe five different response-styles (Modeling and Reassurance, Positive Reinforcement, Reinforcement of Dependency, Punishment, and Use of Force) and one designated “Other” for instances in which none of the options accurately describe how a parent would respond. Parents are asked to indicate which one best describes how they would respond to their child’s fears and avoid, if possible, using the “Other” option. By counting the frequency of endorsements for all five categories, parents receive a score for each of the five scales. Any response in the “Other” category is coded as one of the five response-styles that it most closely resembles. Preliminary testing revealed that all items endorsed in the “Other” category were reliably coded as one of the five response-styles 100% of the time (Zabin & Melamed, 1980).

As part of the initial evaluation of the CDQ, a sample (n = 60) of children (ages 4-12 years) awaiting surgery completed several measures of anxiety while their parents (n = 66) completed the CDQ. Results indicated that children of parents who endorsed using Positive Reinforcement reported less anxiety while children of parents who claimed to use Force experienced greater levels of anxiety. However, contrary to
expectations, the correlation between Modeling and Reassurance and anxiety was not significant. Information regarding the internal consistency and stability of this measure over time were not reported. Thus, while the CDQ has not been subjected to the rigorous psychometric evaluation fundamental to contemporary test construction, it does provide useful information about how parents may be contributing to and maintaining anxious and avoidant behavior in their children.

**Family Environment Scale (FES; Moos & Moos, 1981).** The FES is a widely used questionnaire that assesses general family climate. Consisting of 90 true/false items, the FES evaluates 10 dimensions of a family including: Cohesion, Expressiveness, Conflict, Independence, Achievement Orientation, Intellectual-Cultural Orientation, Active-Recreational Orientation, Moral-Religious Emphasis, Organization, and Control. Sample items include, “Family members often criticize each other,” and “There is plenty of time and attention for everyone in our family.” Moos and Moos (1986) reported an average internal consistency across the 10 subscales of .75, and a 12-month test-retest reliability of .80. To facilitate comparisons, the FES was normed on 1,125 distressed and non-distressed families (Moos & Moos, 1986). In addition, numerous studies have supported the construct validity of the FES (Karoly & Rosenthal, 1977; Moos & Moos, 1981; 1984; Scoresby & Christensen, 1976). More recently, Jacob & Windle (1999) reported significant correspondence across ratings by different family members. This finding is important as if reflects the ability of scores on the FES from one family member to generalize to other members.

**Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1992).** The SCL-90-R is a widely used measure that assesses current symptoms of psychological distress in
adults. The 90-item instrument requires respondents to endorse the degree of distress accompanied by symptoms that occurred in the past 7 days. Distress is gauged using a 5-point scale (not at all, a little bit, moderately, quite a bit, extremely). The SCL-90-R yields 9 subscales (Somatization, Obsessive-Compulsive, Interpersonal Sensitivity, Depression, Anxiety, Hostility, Phobic Anxiety, Paranoid Ideation, and Psychoticism) and 3 indices of distress (Global Severity Index, Positive Symptom Total, and Positive Symptom Distress Index). Respondents received t scores based on normative data; high t scores indicate the presence of psychopathology and low t scores imply the absence of psychopathology. Across all scales, estimates of internal consistency range from .77 to .90 and test-retest correlations range from .78 to .90. Because it includes both the frequency and intensity of symptomatology, the Global Severity Index (GSI) is the best indicator of distress. Validity studies indicate that the SCL-90-R is correlated with other popular measures of psychological functioning (e.g., the MMPI-2) and is sensitive to change resulting from treatment (e.g., Vonk & Thyer, 1999).

Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986). The ASI is a 16-item measure of anxiety sensitivity that assesses the degree to which an individual believes that physical symptoms will result in negative consequences (e.g., the belief that shortness of breath will result in suffocation). Using a 4-point scale (very little, a little, some, much), parents rate the extent to which they agree with items (e.g., “Unusual body sensations scare me,” and “It scares me when I am nauseous”). A total score is obtained by summing the items (scores can range from 0 to 64). Despite its brevity, the ASI has demonstrated adequate internal consistency (Telch, Shermis & Lucas, 1989) and test-retest reliability (Maller & Reiss, 1992). Evidence supporting the
Construct validity of the ASI has also been provided (e.g., Maller & Reiss, 1992; Peterson & Reiss, 1987; Reiss, 1991; Reiss et al., 1986).

Parental Perception of Child Anxiety Sensitivity is an 18-item measure designed to assess parent's perceptions of their child's anxiety sensitivity. Created for the purpose of this study, the measure was constructed by taking the items from the CASI and changing the wording to reflect how parents view their child's reactions to their anxiety symptoms. For example, the item "It scares me when I feel like I am going to faint" was changed to "It scares my child when s/he feels faint." Endorsement of all items utilized the same 3-point scale (none, some, a lot) as the CASI.

The extent to which parents are able to accurately report the internal states of their children can have a serious impact upon the reliability of the clinical diagnostic assessment. With this in mind, Beasley and Kearney (1996) investigated patterns of variance in parent and child ratings of child's stress and negative affect. Overall, they found a significant correlation between parent and child ratings with greater concordance occurring for items that described situations in which the parents were likely to be active participants (e.g., difficulty going to school, being sick) compared to items describing situations in which the parents are not likely to be present (e.g., uncomfortable at lunchtime, hard to discuss personal things with friends).

Procedure

A letter was sent home to parents explaining the nature and procedures of the study, as well as issues related to confidentiality and contact information for the investigators. Parents were asked if they and their child would voluntarily complete several questionnaires. Only one parent was asked to complete the questionnaires. The
following day, an envelope was given to each child participant. The envelope contained two packets of questionnaires, one for the child and one for the parent. Also included in the packets was an informed consent form to be signed by the parent and an assent form to be signed by the child – prior to completing the questionnaires. They were instructed to complete the questionnaires, place them in the envelope provided, seal it, and have the child return it to his or her homeroom teacher where it was collected by the author. Once collected, questionnaires were checked for errors and omissions.

A second method was used to supplement data collection. A list of parents of school children was obtained with permission of the Clark County School District. Approximately 500 families were randomly selected from the list and all of the materials described above (i.e., a letter describing nature and procedures of the study, informed consent/assent forms, and questionnaires) including a self-addressed, stamped envelope were mailed.

**Data Analyses**

Two parallel sets of data analysis were used to evaluate the 23 variables listed earlier. One set of analyses was used to predict level of AS using the CASI and one set of analyses was used to predict level of AS using the ASIC. These 23 variables were initially subjected to factor analysis to determine if any cluster together. Those variables that loaded on the same factor and were conceptually considered to be measuring the same construct were eliminated from the regression analyses but not the analyses of variance.

Following factor analysis, multiple regression analyses were used to identify whether the variables significantly predicted level of AS. In addition, participants in the
upper third percentile of AS scores, middle third percentile of AS scores, and lower third percentile of AS scores were compared on each variable. These comparisons were made using analyses of variance (ANOVAs). Given the large number of comparisons, Tukey’s Honestly Significant Difference (HSD) was used to control for experimentwise alpha level (Type I error). This post hoc test was chosen because it restricts alpha with a moderate level of conservatism (more conservative than Bonferroni, less than Scheffé) and it allows for a comprehensive series of comparisons.
CHAPTER 4

FINDINGS FROM THE STUDY

Response Rates

The overall response rate was 10.2%. For public schools in Nevada, the response rate was 19.6%. For private schools in Nevada, it was 10.2%. Of the packets distributed in Arizona, 5.2% were returned. Finally, 5.7% of those packets mailed to families in the Las Vegas area responded.

Group Differences

Because participants were recruited from several locations (i.e., five different schools), it was necessary to determine whether they differed with respect to demographics and anxiety sensitivity (AS). One-way ANOVA indicated no differences among the five groups regarding CASI, ASIC, or MASC scores. Therefore, the remaining analyses examined the total sample. The groups did, however, differ with respect to age and income. For age, the overall $F(4, 149) = 103.86, p < .001$ and Tukey tests revealed that groups were significantly different (mean ages were 9.24 years for Pahrump, 10.46 years for Tonopah, and 15.61 years for the Las Vegas mailing) with the exception of the comparison between Kingman ($M = 13.00$) and Trinity ($M = 12.83$).

For income, all groups differed from Trinity and the Las Vegas mailing, $F(4, 111) = 9.3, p < .001$ ($M = $96,430.00 and $M = $95,000.00, respectively). Mean incomes for Pahrump.
Tonopah and Kingman were $35,860.00, $49,430.00, and $37,320.00, respectively.

This latter finding needs to be interpreted with caution because 27% of the total sample did not report annual income.

Factor Analysis

Given the poor response rate and the possibility of shared variance among the measures (i.e., that some measures were assessing similar constructs), it was necessary to determine the number of distinguishable factors present in the data and the extent to which theoretically similar variables loaded on the same factor. This process was a desirable means of ensuring parsimony (by eliminating redundant variables) and facilitating the maintenance of an acceptable degree of power (by maximizing the number of subjects per variable). Results of exploratory factor analysis with varimax rotation using total scores and total subscale scores are presented in Table 1 (in Appendix 1).

These results indicated that all of the SCL-R-90 scales loaded on Factor 1 with factor loadings ranging from .643 to .952, the highest of which was the Global Severity Index (GSI). Therefore, only the GSI was used in the regression analyses. In addition, three FES subscales loaded on Factor 2. Because Conflict had a higher factor loading (.809) than Cohesion (-.758) and Expression (-.626), only Conflict was retained. Finally, three APQ subscales loaded on Factor 3. Since Involvement (.842) and Positive Parenting (.843) were deemed conceptually similar while Poor Monitoring/Supervision (-.478) appeared somewhat theoretically unique, only Involvement was eliminated. Thus, the remaining 16 variables were retained for the following regression analyses. Those variables were: Anxiety Sensitivity Index (ASI); Parent Perception of Child
Anxiety Sensitivity (ASIP); Child Development Questionnaire (CDQ - Positive Reinforcement, Punishment, Use of Force, Reinforcement of Dependence. Modeling/Reinforcement); Alabama Parenting Questionnaire (APQ - Positive Parenting, Monitoring/Supervision, Discipline); Parent-Child Reunion Inventory (PCRI - Secure Attachment, Insecure Attachment); Symptom Checklist-90-Revised (SCL-R-90 - Global Severity Index); Family Environment Scale (FES - Conflict, Independence, Control).

**Anxiety Sensitivity and General Level of Anxiety**

Compared to published norms, total scores on the CASI (M = 28.72; SD = 6.55) and the ASIC (M = 11.58; SD = 8.56) were consistent with other studies using community samples of youth. In addition, Pearson's correlation between the two AS measures was very strong (r = .88, p < .0001). Also, scores on the MASC (M = 44.03; SD = 18.14) were compatible with normative samples of youth. Gender differences were examined using independent samples t-tests. There were no gender differences for the ASIC or the MASC. However, females scored significantly higher (M = 29.83, SD = 6.00) than males (M = 26.71, SD = 7.71) on the CASI, t(149) = -2.63, p < .01. In addition, results of one-way ANOVA found no differences between racial groups with respect to CASI, ASIC, or MASC scores.

**Family Factors and Anxiety Sensitivity**

To examine the predictive relationship between various family variables and child AS, two stepwise multiple regression analyses were conducted (see Table 2). Using CASI total score as the dependent variable, the overall regression was highly significant (p < .0001) and the best predictor variables were the ASIP total score and PCRI Secure Attachment, accounting for almost 17% of the variance in child AS; F (2,
With ASIC total score as the dependent variable, the results were identical; however, the combination of predictor variables (ASIP and PCRI Secure Attachment) accounted for slightly less variance (13%): F (2, 156) = 11.61, p < .001.

In addition, Pearson's correlation coefficients were calculated to determine relationships among all of the AS variables (i.e., parent's AS, child's AS, and parent's perceptions of child AS). As Table 3 demonstrates, all variables were significantly related.

Analysis of Family Factors as a Function of Degree of AS

Participants were classified as having high, medium, or low AS according to their total scores on the CASI and ASIC. For the CASI, the upper, middle, and lower third percentiles (indicating high, medium, and low AS, respectively) consisted of 51, 54, and 48 individuals. For the ASIC, the upper, middle, and lower third percentiles contained 53, 46, and 54 participants, respectively.

CASI

Overall, (1) parents of children with high AS tended to score higher on most measures than parents of children with medium and low AS, and (2) parents of children with medium AS tended to score higher than parents of children with low AS. Results of one-way ANOVA using Tukey's HSD for subsequent comparisons are presented in Table 4. As can be seen, several group differences emerged. First, parent's perceptions of their child's anxiety sensitivity (ASIP) was significantly lower for the low AS group than for either the medium or high AS group. Second, parents of children with medium AS scored significantly higher on the SCL-R-90 Phobia subscale than parents of children with low AS. Third, parents of high AS children were significantly more likely
to endorse an independent family environment (FES-Independent) compared to parents of medium AS children. Finally, there was a trend for children with high AS to have parents scoring higher on the ASI (M = 23.09; SD = 4.64) than those with low AS (M = 20.87; SD = 4.00).

**ASIC**

Using parallel procedures for ASIC total scores, many group differences were found. For ASI scores, parents of children with high AS scored significantly higher than parents of children with low AS. Parents of low AS children scored lower on the ASIP than parents of both medium and high AS children. Next, compared to parents of children with low AS, those with high AS children scored significantly higher on the SCL-R-90 Depression and Anxiety subscales as well as the index (GSI). In addition, parents of children with medium AS scored higher than parents of children with low AS on the GSI.

**Developmental Analysis**

To determine if AS varies as a function of age, the sample was divided into 3 age groups: 7-10 years (n = 54), 11-13 years (n = 56), and 14-18 (n = 41) years. A one-way ANOVA detected no differences among the three age groups with respect to CASI, ASIC, and MASC scores (p > .05).
CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of Results

The present study adds to a growing body of research on anxiety sensitivity (AS) in youth by examining the relation between family factors and AS. Results indicated that familial influences do indeed contribute to AS in children and adolescents. Specifically, a combination of family factors including parenting style, parental psychopathology, and family environment significantly predicted child AS. Furthermore, these results were robust in that they occurred across two different measures of AS (i.e., the CASI and the ASIC). These results will be discussed below, followed by a discussion of the implications and limitations of the present study.

The major contributors to the prediction of child AS were parent's perceptions of their child's anxiety sensitivity (ASIP) and the Secure Attachment subscale of the Parent-Child Reunion Inventory (PCRI). Together, these measures accounted for 13 to 17% of the variance in child AS. Each of these variables will be discussed next.

The ASIP was a measure specifically designed for the present study. It was constructed to evaluate the degree to which parents are able to assess the amount of distress their child experiences as a result of anxiety symptoms. Based on the present results, parents in this sample seem to be keenly aware of how symptoms of anxiety...
were affecting (or not affecting) their child. There are several possible explanations for this finding. Perhaps parents in this sample were alert to their child’s feelings either because the child communicated them directly (e.g., the child saying “I don’t want to go to my piano recital. I get butterflies in my stomach and feel like I’m going to throw-up”), or because the parents were able to decipher the meaning behind their child’s avoidant behavior (e.g., not going to school on the day he/she was supposed to present an oral report). Conversely, parents of a child not bothered by anxiety-related sensations may have engaged in fewer conversations about anxious feelings as well as fewer attempts by the child to avoid particular events or situations due to fear/anxiety. Their children may be more willing to take risks, they may enjoy performing in front of others, or they may be less vigilant of mild bodily disturbances.

Another potential explanation is that children of parents with high AS also have high AS. Therefore, the parents may be more alert to signs of anxiety and AS because of their own experiences. In fact, parents in this sample who themselves experience high AS also rated their children as having high AS, and their children rated themselves as having high AS. This finding is especially relevant as it lends support for a family model of anxiety transmission. Hale and Calamari (1999b) found an indirect relationship between parental AS, child AS, and child anxiety symptoms. They concluded that elevated levels of AS in parents might intensify children’s level of AS and anxiety symptomatology. The present study, however, does not allow for conclusions regarding the nature of this transmission. That is, we cannot state whether the transmission is biological, environmental, or a combination of both influences. Other methodologies might be useful in attempting to delineate the specific and combined influences of
biology and environment in the development of AS. For example, studies comparing the concordance of AS in mono and dizygotic twins could help determine the degree of genetic impact. In addition, studies designed to observe the interactions between parents and their children might provide useful insight regarding communication and modeling of anxiety-related information. Parents and children could be observed as they are subjected to different conditions intended to elicit anxiety such as giving an oral presentation to a group of strangers, or a behavioral challenge that produces bodily changes consistent with those associated with anxiety (e.g., increased heart rate, sweating, shortness of breath). Rabian, Embry, and MacIntyre (1999) used a stair-stepping procedure to mimic the symptoms of anxiety. They found that the arousal generated from that procedure permitted pre- and post-task differences to be detected. Although they are complex and time consuming, innovative experimental and observational designs such as the one used by Rabian et al. (1999) diversify the body of data available by utilizing a multi-method approach.

Regardless, the congruence between child and parent reports of child AS has implications for practitioners and researchers who assess various features of child AS. While some reports indicate that parents are better reporters of their children's externalizing behaviors (e.g., symptoms of aggression or hyperactivity) compared to internal states such as fear and anxiety (DiBartolo, Albano, Barlow, & Heimberg, 1998; McConaughy, 1993), these findings lend support to the notion that parents are aware of their child's emotional experiences and can report them fairly accurately. This is a benefit for researchers who are interested in conducting studies in which information about parents and children is desired but children may not be available to participate.
The second largest contributor to the prediction of child AS was scores on the PCRI Secure Attachment scale. On this measure, most parents tended to describe their attachment with their child as secure. Although differences between the high, medium, and low AS groups were not significant with respect to secure attachment, there was a trend for low AS youth to have the highest secure attachment scores, while those with high AS had the lowest attachment scores. Therefore, it seems that having a mutually warm, loving, caring relationship with one's primary caregiver may reduce the negative impact of anxiety and prevent one from becoming hypervigilant to the physical symptoms of anxiety.

Bowlby (1973) postulated that child anxiety may be the result of an insecure attachment because the uncertainty of the availability and nurturance of the caregiver can lead to significant levels of distress, apprehension, and fear. In the present study, the trend toward children with high AS having lower secure attachment scores than children in the medium and low AS groups may lend credence to Bowlby's theory of anxiety development. Additional support for this notion comes from the finding that parents of children with high AS reported a much more independent family environment compared to parents of children with a medium level of AS. As such, parents who encourage a greater level of independence may be sacrificing cohesion for the sake of autonomy. Stark, Humphrey, Crook, and Lewis (1990) found that anxious children perceived their families as being less cohesive than their non-clinical counterparts. Thus, children reared in overly independent households may lack the nurturance and guidance of a cohesive family environment and therefore be at risk for developing symptoms of anxiety.

When family variables were analyzed according to child AS status, several
differences emerged with respect to parental psychopathology. Specifically, parents of children with medium and/or high AS tended to score higher than parents of children with low AS on measures of phobic anxiety, general anxiety, depression, and the global index of severity. In addition, parents of children with high AS reported significantly higher levels of AS themselves. Thus, it seems that parents who experience mood disturbances such as anxiety, fear, and depression are more likely to have children who fear these symptoms. On one hand, there may be a biological component responsible for the transmission of anxiety and anxiety-related fears. On the other hand, children may learn by observing their parent's apprehensive, melancholic, and panic-like behaviors. For example, a child whose mother experiences panic attacks while driving may witness firsthand the overpowering fear that is produced by the attack. He may see her clutch her chest, struggle to breathe, and/or hyperventilate. At the same time, the mother may communicate her fears to the child by making panicky statements such as, "Oh no, it's raining, I hate driving in the rain, this is really scary."

The investigation into early learning and family environment as mechanisms of anxiety transmission is not a new practice. Rachman (1977) delineated three components of fear/anxiety acquisition: direct conditioning which is usually the result of a traumatic experience; indirect/vicarious conditioning which typically occurs via observation; and information and/or instruction which is generally transmitted from parents to children or through various forms of media. Rachman proposed that severe/clinical fears and phobias would be more likely to result from direct conditioning, whereas nonclinical fears would probably be due to indirect pathways. Ollendick and King (1991) tested this model on a large sample (N = 1092) of American and Australian children and
adolescents. They found that the majority of youth attributed the onset of their fears to vicarious and instructional factors. Because most subjects did not ascribe their fear acquisition to only one of the three pathways, the authors concluded that fears are multiply determined and that the three pathways are more likely to be interactive than independent. While this model does not take into account a biological link, it does help explain what may be happening in families with anxious children. That is, parents may be modeling their fears and/or communicating to their children a sense of foreboding and apprehension that may lead to anxiety.

Gender and developmental differences were also investigated. The finding that females scored higher than males on the CASI was not surprising given a wealth of studies reporting similar gender differences with respect to self-reported anxiety (Ginsburg & Silverman, 2000; Lewinsohn, Gotlib, Lewinsohn, Seeley, & Allen, 1998). However, what is more surprising is that males and females did not score differently on the ASIC or the MASC. One potential explanation is that the CASI is more sensitive in detecting group differences. On the other hand, it is possible that methodological issues such as unequal group sizes, large number of subjects, or bias within the instrument itself may have resulted in the capitalization of chance (Nunnally & Bernstein, 1994).

In addition, CASI and ASIC scores were similar across age groups, indicating that AS may remain stable overtime. This interpretation is consistent with literature that has found both anxiety and AS to be trait-like and enduring. Knowing that AS is stable over time is useful information for parents, teachers, and clinicians who work with children. Because many childhood fears are transient (e.g., fear of the dark, fear of monsters), it is important for those involved with children to be aware that some fears
are more enduring and may even lead to more severe anxiety pathology. Moreover, the nature of the fear associated with AS is unique and unlike those fears that are considered part of normal development (such as the fear of the dark). Being afraid of common bodily sensations such as rapid heartbeat, sweaty palms, and shortness of breath is atypical during childhood. Thus, parents and professionals involved with children should be watchful of these symptoms and consider treatment for fears that seem unusual or unrelenting.

Implications

Findings from the present study have implications for both assessment and treatment of children with anxiety-related difficulties. For instance, because AS has been found to positively predict panic symptoms in children and adolescents, instruments such as the CASI or the ASIC can be used to screen children who may be at risk for developing anxiety pathology. Prior to this study, the concordance between the CASI and the ASIC had not been established. Most researchers relied solely on the CASI to assess child AS. Thus, the strong relationship between the two measures ought to provide researchers interested in assessing child AS the freedom to choose between the two measures or use both measures to examine the reliability of AS ratings. Moreover, the finding that parents are fairly accurate reporters of their child's AS (i.e., ASIP) also affords researchers and practitioners the freedom to assess parents if children are unavailable or unable to complete the child measures. In addition, assessing family environment, parental pathology, and parent-child attachment may also prove useful in the screening process.
A main contribution of this study is that it adds more flexibility to the assessment process. Children can be assessed directly using either the ASIC or the CASI. Parents can be asked to report their children's AS using the ASIP. Finally, key family components implicated in child AS have been identified and serve as additional areas to be included in a comprehensive assessment of youth and their families.

With respect to treatment, information regarding the family should help guide the selection of treatment targets for children presenting with excessive anxiety. For example, if a child's father is depressed, he should be referred for treatment to alleviate his depression. If the parents are overly permissive, family therapy or parent training may be warranted. These family factors can also be used as markers of treatment outcome. Because psychopathology within families may have a reciprocal relationship (i.e., that an increase in pathology in one member may cause an increase in another member and vice versa), a practitioner who is successfully treating a child's anxiety may also notice a reduction in the parent's symptoms. Therefore, those working with children and their families must be astute in tracking changes in all members of the family unit and redirecting the focus of therapy if one member's symptoms worsen.

Finally, there is a small but growing body of literature endorsing the use of "prescribed treatments," or those tailored to the individual's own cognitive idiosyncrasies (e.g., Eisen & Silverman, 1998; Kearney & Silverman, 1990). Silverman and Weems (1999) suggested that the CASI may also be a useful instrument in this endeavor. Specifically, in patients seeking treatment for anxiety disorders, the CASI or the ASIC can be used to detect important cognitive characteristics to be addressed and modified throughout the course of treatment. For example, recent investigations
regarding the factor structure of the CASI have identified several underlying subfactors. Chorpita and Daleiden (2000) reported a subset of items (describing autonomic sensations) that had psychometric properties superior to the total score. Thus, youth who score high on these items may benefit from a treatment focusing on relaxation to diminish physiological arousal, cognitive restructuring to correct and decatastrophize faulty cognitions, psychoeducation regarding the autonomic nervous system and the benign nature of physiological manifestations of fear/arousal, and invivo exposure to increasing levels of physiological arousal.

Limitations

While this study contributes to an understanding of the interplay between various family variables and AS in youth, overall findings should be interpreted in light of several limitations. First, the overall response rate was poor. In general, researchers using a mass mailing methodology often anticipate a response rate of approximately 30%. However, some claim that response rates between 10% and 30% are not uncommon (Boyd & Westfall, 1972; Luck, Wales & Taylor, 1970). In their meta-analysis of 93 studies, Yu and Cooper (1983) report an average response rate of 47% but only a small relation between response rate and effect size.

In the present study, the best response came from public and private schools in Nevada. The lowest response came from a public school in Arizona and the mass mailing to parents of Las Vegas high school students. Possible explanations for the higher response rate in Nevada schools include: (1) the author was able to make a public appearance in student’s classrooms, (2) the author was able to converse with school officials more frequently, and (3) the author was able to send reminder notices home to
parents. For the Arizona school, reports from school officials indicated that several bombs were found on school premises shortly after students received the questionnaire packets. It is likely that this event prevented many families from participating because the school was in disarray and parents were fearful of their children’s safety. Possible explanations for the low response rate in general and for the Las Vegas mailing in particular include: (1) too many questions, (2) no tangible incentive or monetary reward, (3) too inconvenient for both parent and child to participate, (4) no telephone contact, and (5) no follow up. Future studies using a similar design would benefit from addressing these factors to maximize their response rates. It is important to note, however, that despite the poor response, scores on the dependent measure were consistent with those reported in normative samples.

Another limitation was the sole reliance on self-report measures. While this technique provides valuable information and is advantageous to the extent that they are inexpensive, easy to administer and score, and more readily exposed to psychometric analysis, self-report measures do not allow researchers to observe the interactions of participants. Information gathered from observational designs may help researchers elucidate the particular mechanisms within the family that lead to elevated levels of anxiety. However, the cost (both in time and money) of conducting an observational study was prohibitive.

Furthermore, because only self-report measures were used to gather information about these relations, it is unknown to what degree shared method variance contributed to the present findings. Future studies that incorporate multiple methods (i.e., questionnaires, interviews, behavioral observations) would reduce the likelihood of this
type of error and provide more insight into the nature of these phenomena across an array of information gathering techniques.

Likewise, attachment was assessed only from the parent's perspective. Whether the children in this sample would have reported similar attachment patterns remains unknown. As with any survey of sensitive content, parents may have been motivated to describe their attachment in an overly favorable light to avoid some form of perceived shame, embarrassment, or scrutiny. Because attachment to one's primary caregiver can have a vast impact on the quality of one's relationships and emotional wellbeing, researchers are urged to continue to develop ways of assessing attachment in youth and their parents in such a way that will minimize the confounding effects of social desirability and other demand characteristics.

Finally, the bomb scare at the school in Arizona may have exerted some undetectable influence on the scores. Although, students from all locations scored similarly on the dependent measures, and their scores were consistent with those reported in other studies, it is possible that students in this group may have had lower AS scores but these scores were elevated by the recent bomb scare.

Conclusions

This was the first study to investigate the relationship between AS and various family variables that have been implicated in the development of anxiety disorders. Based on the present findings, several conclusions can be drawn. First, child AS can be predicted by a combination of family factors including parent's perceptions of their child's AS and parent-child attachment. These two variables significantly and reliably predicted child AS using two different measures of AS. Second, other family factors
such as independent family environment and parental psychopathology (e.g., phobic anxiety, general anxiety, depression) varied as a function of AS. thus providing additional evidence for a family-based model of anxiety transmission (e.g., modeling/vicarious learning, information/instruction). Third, parents appear to be accurate reporters of their child’s AS. Fourth, there is now preliminary evidence that the CASI and ASIC can be used interchangeably. Given that children with high levels of AS are presumed to have a cognitive vulnerability that places them at risk for developing anxiety disorders (Reiss, 1987; 1991; Reiss & McNally, 1985), it is imperative that researchers continue making strides towards enhancing an understanding of the nature of AS including its etiology, course, and treatment.
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<th>Factor 3</th>
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<th>Factor 5</th>
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Table 2

**Stepwise Multiple Regression Analysis for Family Variables Predicting Child AS**

(N = 159)

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<th>β</th>
<th>t</th>
<th>R²</th>
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</table>

**Note.** CASI = Child Anxiety Sensitivity Index; ASIC = Anxiety Sensitivity Index for Children; ASIP = Parent's Perceptions of Children's Anxiety Sensitivity; PCRI-SEC = Parent-Child Reunion Inventory – Secure Attachment. * p < .05. *** p < .001.
Table 3

Pearson’s Correlations among all Anxiety Sensitivity Variables

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Note. CASI = Child Anxiety Sensitivity Index; ASIC = Anxiety Sensitivity Index for Children; ASI = Anxiety Sensitivity Index; ASIP = Parent’s Perceptions of Children’s Anxiety Sensitivity. * p < .05. ** p < .01.
Table 4

Differences in Family Factors as a Function of Level of Anxiety Sensitivity: Results of One-Way ANOVA with Tukey HSD

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<th>df</th>
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Note. Means with the same superscript were significantly different.
* p < .05. ** p < .01. *** p < .001.
REFERENCES


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