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Cognitive Biases in Childhood Anxiety Disorders: Do Interpretive and Judgment Biases Distinguish Anxious Youth from their Non-anxious Peers?

Melinda Cannon
University of New Orleans

Cognitive Biases in Childhood Anxiety Disorders: Do Interpretive and Judgment Biases Distinguish Anxious Youth from their Non-anxious Peers?

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Melinda Fabian Cannon

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M.S. University of New Orleans, 2005

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Abstract

The purpose of this study was to examine cognitive biases in clinically anxious children compared to normal children and to determine if cognitive biases could discriminate anxious youth from non-anxious youth. Two specific cognitive biases were the focus of the present study—interpretive biases (i.e., the tendency to interpret neutral stimuli in a negative way) and judgment biases (i.e., a lowered estimate of one's ability to cope with a threatening situation). Twenty-four youth comprised the anxiety disordered sample and were each matched to two normal youth on four demographic variables (gender, age, ethnicity, and family income level), thus the matched comparison sample consisted of 48 youth (ages 7 to 17). Interpretive biases were assessed with the Children's Negative Cognitive Error Questionnaire (CNCEQ) and judgment biases were assessed with the Anxiety Control Questionnaire—child form (ACQ-C). In addition, self-reported symptoms of anxiety and depression and parent-reported internalizing and externalizing symptoms were measured. Results indicated that (1) children in the clinic sample exhibited significantly more interpretive biases and judgment biases relative to the control sample, and scored significantly higher on measures of anxiety, depression, and parent-reported internalizing and externalizing symptoms relative to the control sample, (2) the ACQ-C demonstrated incremental validity over the CNCEQ in predicting diagnostic status, (3) the ACQ-C predicted diagnostic status while controlling for Generalized Anxiety Disorder symptoms and parent-reported internalizing and externalizing symptoms, but not while controlling for RCMAS (anxiety) and CDI (depression) scores, and (4) the relationship between the CNCEQ and diagnostic status was moderated by age and gender. This study adds to the research literature by demonstrating elevated CNCEQ scores among youth with anxiety disorders compared to non-anxious youth and extends findings with the ACQ-C by showing its incremental validity beyond the CNCEQ. The results also add to the understanding of the assessment of negative cognitive

errors by highlighting developmental and sex differences in their association with anxiety disorder status in youth. Implications of the positive findings for theory and practice are noted and theoretical and methodological reasons for the negative results are discussed to highlight suggestions for future work in this area.

Key words: anxiety, children, cognitive biases, interpretive biases, judgment biases, negative cognitive errors, anxiety control beliefs

Introduction

The alarming prevalence of anxiety disorders in children and adolescents and the functional impairment and distress that they cause highlights the need to understand the origins and maintenance of this phenomenon. Anxiety disorders are among the most common forms of emotional problems in youth, with estimates as high as 20% (Albano, Chorpita, & Barlow, 1996; Costello, Egger, & Angold, 2004). In recent years, theoretical models of the development and maintenance of anxiety problems in childhood have suggested a need to address the cognitive dimension of anxiety (Chorpita & Barlow, 1998; Vasey & Dadds, 2001; Weems & Stickle, 2005; Weems & Silverman, 2006). Cognitive and information processing models propose that anxious youth exhibit biased ways of thinking. These models focus on the way that youth process information including attention toward threatening stimuli, the recall of past experiences, the interpretation of stimuli and situations, and the judgment of coping ability (Chorpita & Barlow, 1998; Vasey & Dadds, 2001; Weems & Stickle, 2005; Weems & Silverman, 2006). That is, anxious children presumably over-attend to threatening stimuli, recall disproportionately negative information about past experiences, interpret ambiguous stimuli in a negative way, etc. The manner in which anxious individuals process and interpret their life experiences may reveal possible etiological mechanisms in anxiety disorders. The cognitive view of childhood anxiety, though, is best understood within the broader framework of a developmental psychopathology model of anxiety, which suggests that there are biological, behavioral, social, and cognitive processes potentially interacting over the lifespan that lead to and maintain anxiety problems (Vasey & Dadds, 2001; Weems, 2008; Weems & Stickle, 2005). Anxiety problems are not the result of one cause but, rather, the outcome of a complex interaction of many factors.

This document is divided into four sections. The first section provides an overview of the concept of anxiety and its disorders (e.g., anxiety is defined; the anxiety disorders listed in the DSM-IV are delineated). In addition, the current treatment methods of anxiety disorders in children are briefly noted. In the next section, the etiology of anxiety disorders is reviewed in terms of the biological, behavioral, social, and cognitive processes that may have an effect on the development of anxiety. The third section focuses on the cognitive processes involved in pathological anxiety and these processes are examined in order to develop the rational for the current study. In the final section, the current study is delineated in terms of specific study hypotheses and goals.

I. Anxiety, Its Disorders, and their Treatment

Defining Anxiety

Biologists, psychologists, and psychiatrists have long acknowledged the functional purpose of anxiety (Beck, 1976). Anxiety is an emotional state produced by the brain systems involved in sympathetic arousal and fear responses. It also entails the negative affect and behavioral avoidance that may result from the activation of the anxiety response system (Baving, Laucht, & Schmidt, 2002; Davidson & Fox, 1989; Davidson, Marshall, Tomarken, & Henriques, 2000; LeDoux, 2000). It is a basic and essential biological mechanism used for motivation to act in response to threat or danger. Worry, a component of the anxiety response system, can be useful in that it prepares the individual to anticipate future danger (Weems & Silverman, 2008). The purpose of activating the anxiety response system is to effectively cope with the threat and increase one's chances of survival, and is therefore a necessary mechanism (Craske, 2003).

A defining feature of pathological anxiety is dysregulation of the normal response system (Barlow, 2002; Weems & Silverman, 2008). A reaction may be considered abnormal if no objective danger is present or the intensity of the anxiety is significantly disproportionate to the danger (Beck, 1976). If the anxiety response system is continually activated when the problem is not an actual danger but, rather, a misperception or exaggeration of the danger, this biological mechanism is inappropriate and ineffective (Beck, Emery, and Greenberg, 1985). Worry, for example, can be maladaptive if it is so intense that it actually interferes with a person's ability to deal with a dangerous situation. Beck (1976) described the problem of anxiety as an "overactive alarm system" (p. 155). An additional feature of pathological anxiety is the emotional distress and functional impairment caused by dysregulation of the anxiety response system. These features can emerge as physiological symptoms (e.g., racing heart), behavioral symptoms (e.g.,

avoidance), social symptoms (e.g., interpersonal difficulties), or cognitive symptoms (e.g., cognitive biases; Weems & Silverman, 2008).

DSM Anxiety Disorders

Anxiety disorders are some of the most common psychiatric disorders in childhood and adolescence. Current or short-term prevalence rates for anxiety are approximately 2% to 4%, while prevalence rates over 6 months, 12 months, or lifetime are approximately 10% to 20% (Costello et al., 2004). Anxiety disorders in youth can cause significant impairment in many areas of a child's life (e.g., school, peer relationships, family) and can lead to psychological problems later in life (Kendall, Safford, Flannery-Schroeder, & Webb, 2004; Pine, Cohen, Gurley, Brook, & Ma, 1998; Silverman & Berman, 2001; Silverman & Treffers, 2001).

The *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*, American Psychiatric Association, 1994) lists seven anxiety disorders and describes specific features of each disorder for diagnostic purposes. The main clinical traits of each disorder are as follows: (1) Separation Anxiety Disorder is characterized by developmentally inappropriate and excessive anxiety concerning separation from the home or from those to whom the individual is attached; (2) Social Phobia is characterized by an excessive, unwarranted fear of social or performance situations in which embarrassment may occur; (3) Specific phobias are characterized by extreme, unwarranted fears of a specific object or situation, such as storms, elevators, choking, certain animals, etc.; (4) Generalized Anxiety Disorder is characterized by unreasonable and persistent worry about a number of events or situations; (5) Obsessive Compulsive Disorder is characterized by recurrent thoughts or compulsions that are distressful, time consuming, and functionally impairing; (6) Panic Disorder is characterized by recurrent, unexpected panic attacks (i.e., pounding heart, sweating, shortness of breath, chest pain, fear of dying, etc.). A child with

Panic Disorder may show agoraphobia in which he or she avoids places or situations from which escape might be difficult in the event of an unexpected panic attack; (7) Posttraumatic Stress Disorder may develop in an individual who was exposed to an extreme traumatic stressor. Symptoms can include intense psychological distress, helplessness, recurrent and intrusive recollections of the event, efforts to avoid thoughts, feelings, places, or people that remind the child of the trauma, a restricted range of affect, and symptoms of increased arousal. With the exception of Separation Anxiety Disorder, the same diagnostic criteria apply to both children and adults for the anxiety disorders. This dissertation study will be comprised of youth who meet the criteria for any of the above anxiety disorders (including those with more than one anxiety disorder diagnosis).

Although the anxiety disorders can be distinguished by unique features, they all share what is common to pathological anxiety—emotional distress and functional impairment caused by dysregulation of the normal anxiety response. While specific anxiety disorder diagnoses may be unstable over time throughout childhood and adolescence, the presence of any anxiety disorder or another psychological disorder is a more stable occurrence (e.g., Last, Perrin, Hersen, & Kazdin, 1996). That is, the central pathological traits seem to be relatively stable. As recommended by Weems (2008), it may be beneficial to view the symptoms of anxiety disorders as core features (e.g., intense worry) and secondary features (i.e., those specific symptoms that differentiate the DSM anxiety disorders). Faulty cognitive processes, for example, such as viewing a neutral situation as dangerous or misjudging one's ability to cope, can be considered a core feature and can be characteristic of any anxiety disorder. A child's tendency toward cognitive distortions, for instance, may persist while he or she is diagnosed with Social Anxiety

Disorder at age 11 and Generalized Anxiety Disorder at age 16. This dissertation study will asses cognitive processes in youth diagnosed with any DSM anxiety disorder.

Treatment

Anxiety disorders are, unfortunately, very common in children and adolescents and can interfere with normal functioning in various areas (e.g., family, school, peer relations; McClure & Pine, 2006; Silverman & Berman, 2001). In addition, childhood anxiety disorders are often chronic and persist into adulthood (Keller et al., 1992; Ollendick & King, 1994). Anxiety disorders in childhood are associated with adult anxiety and depressive disorders, as well as substance abuse problems later in life (Kendall et al., 2004; Pine et al., 1998).

Fortunately, the past decade has shown substantial progress in the area of psychosocial treatments for anxiety disorders in children and adolescents. Cognitive Behavior Therapy (CBT) is becoming a commonly used treatment for anxiety disorders in youth. A main goal in CBT is to identify and change anxiety producing cognitions (Kendall, 1994). Individual CBT and Group CBT have met criteria for "probably efficacious treatments" (i.e., at least two good experiments have shown that the treatment is superior [statistically significantly so] to a wait-list control group; Chambless et al., 1998; Chambless et al., 1996). These interventions mainly involve: gradual exposures, relaxation, developing coping plans, the use of cognitive self-control, and the use of self-evaluation and self-reward (e.g., Barrett, 1998; Barrett, Dadds, & Rapee, 1996; Flannery-Schroeder & Kendall, 2000; Kendall, 1994; Kendall et al., 1997; Mendlowitz et al., 1999; Rapee, Abbott, & Lyneham, 2006; Silverman et al., 1999; Spence, Holmes, March, & Lipp, 2006; see Silverman, Pina, & Viswesvaran, 2008 for a review). These treatments have been used to target a variety of primary anxiety disorder diagnoses. Individual CBT and Group CBT have been shown to be similar in terms of relative efficacy (Flannery-Schroeder & Kendall,

2000; Manassis et al., 2002). In addition, treatment outcomes seem to be similar with and without parent involvement. While there is support for the use of cognitive intervention strategies in improving the symptoms of anxiety, it is not always clear whether there has been actual change in cognitive processes (Alfano, Beidel, & Turner, 2002). A better understanding of anxiety-related cognitions may help explain if changes in specific cognitive processes can account for reductions in anxiety (Weems & Watts, 2005).

Although several psychosocial treatments for anxiety disorders in children and adolescents have been shown to be efficacious, the rates of recovery are not perfect. Silverman and colleagues (Silverman et al., 2008) reviewed 32 group design treatment studies for childhood anxiety disorders, most of which evaluated a combination of therapeutic strategies and most considered methodologically rigorous, and found that diagnostic recovery rates ranged from 25% to 92%. While this is very promising research and has already benefited many children, it brings up some unexplained issues regarding exactly why and how the treatments worked and why some individuals did not improve.

II. Etiology of Anxiety Disorders

A comprehensive theory of anxiety etiology may help in developing explanations of the developmental pathways to pathological anxiety and, in turn, in improving treatment methods targeted at anxious youth. Furthermore, it would be more beneficial to prevent a problem before it develops. That is, a clear understanding of etiology may aid in not only creating more efficacious treatments, but also in developing preventive interventions.

According to the developmental psychopathology model, etiology can be viewed as an interrelated system of constructs and processes, rather than a single disease process (Weems & Stickle, 2005). In keeping with this view, anxiety disorders are hypothesized to result from a complex interplay of biological (temperament, genetics, psychophysiology), behavioral (learning processes), social (attachment, interpersonal relationships), and cognitive (information processing/interpretation) factors (Askew & Field, 2007; Field & Lawson, 2003; Mineka & Zinbarg, 2006; Puliafico & Kendall, 2006; Vasey & Dadds, 2001; Weems & Silverman, 2008; Weems & Stickle, 2005). These causal mechanisms can potentially interact with each other over time to put an individual at risk for an anxiety disorder. They may create this risk, in theory, by causing deviations in normal levels of constructs such as intense worry, intense fear, negative affectivity, hyperarousal, avoidance/withdrawal, and cognitive biases. That is, the abnormal experience of these constructs may become maladaptive and functionally impairing, and lead to anxiety disorder diagnosis (Weems & Stickle, 2005).

On the other hand, the biological, behavioral, social, and cognitive processes can exist in any individual and will not necessarily lead to a disorder. There are biological, behavioral, social, and cognitive protective factors as well (Vasey & Dadds, 2001). Anxiety disorders (viewed as a product of the causal mechanisms), like any outcome of development, can be

reached from various risk factors and through various processes (i.e., “equifinality”; Cicchetti & Rogosch, 1996). Furthermore, particular risk factors and/or detrimental processes may not inevitably lead to the same outcome (e.g., anxiety disorder) in every individual (i.e., “multifinality”; Cicchetti & Rogosch, 1996). This situation emphasizes the need to appreciate the very complex manner in which an individual may come to experience pathological anxiety. In trying to understand the etiology of anxiety disorders in childhood more clearly, it seems useful to study diagnostic symptoms (such as those listed in the DSM) together with the underlying causal mechanisms of the disorder (Weems & Stickle, 2005).

Biological Basis

As mentioned, the cognitive view of childhood anxiety is best understood within the broader framework of biological, behavioral, social, and cognitive processes potentially interacting over the lifespan and leading to anxiety problems. Genetic theories hypothesize that risk for symptoms of anxiety is transmitted genetically and twin studies suggest that there is a moderate genetic risk for anxious symptoms (e.g, Distel et al., 2008; Eley, Gregory, Clark & Ehlers, 2007; Hettema, Neale, & Kendler, 2001; Kendler, Myers, Prescott, & Neale, 2001; Kendler, Neale, Kessler, Heath, & Eaves, 1992; Sundet, Skre, Okkenhaug, & Tambs, 2003). Biological theories are based on the biology of normal stress and anxiety and research has found abnormal sympathetic nervous system responding in anxious individuals (i.e., the sympathetic nervous system is activated too frequently and/or to a greater magnitude than is necessary based on the stressor; Beidel, 1991; Carrion et al., 2002; Weems, Zakem, Costa, Cannon, & Watts, 2005).

Other biologically based theories focus on genetically inherited temperamental characteristics such as behavioral inhibition, which has been proposed as a risk factor for

anxiety. Behavioral inhibition is defined as the consistent tendency to show marked fearfulness or behavioral restraint when encountering unfamiliar people, situations, or events; and, it has been shown to be largely genetically based (Kagan, Reznick, & Snidman, 1988; Robinson, Kagan, Reznick, & Corley, 1992). Behavioral inhibition is thought to represent a lower threshold to sympathetic nervous system arousal (Kagan et al., 1988) and research in this area has found associations between behavioral inhibition and risk for anxiety disorders, particularly social phobia (Biederman et al., 2001; Biederman et al., 1993; Biederman et al., 1990; Hayward, Killen, Kraemer, & Taylor, 1998; Hirshfeld-Becker et al., 2007; Hirshfeld et al., 1992; Schwartz, Snidman, & Kagan, 1999).

In regards to the origins of cognitive biases, it has been suggested that some individuals may have a genetically-based vulnerability (Muris & Field, 2008). Pine (2007) proposed a model in which brain circuitry involved in the shaping of threat responses is dysregulated, and is manifested in distorted information processing and, thus, pathological anxiety. In addition, there may be biological factors that serve to protect an individual from cognitive biases. There is some support for the idea that effortful control—a partly innate self-regulative process that concerns the ability to control one's cognitive processes (e.g., attention) and behavior when needed—can be a protective factor for cognitive biases (Derryberry & Reed, 2002; Lonigan, Vasey, Phillips, & Hazen, 2004; Muris, Meesters, & Rompelberg, 2007). While biological factors are important to consider in explaining the origins of anxiety, they likely interact with other complex processes (i.e., behavioral, social, cognitive) to produce pathological anxiety.

Behavioral Learning Basis

Most researchers today propose that there are several learning pathways to anxiety. Rachman (1977) suggested that fears can be acquired by three pathways: classical conditioning,

vicarious exposures, and the verbal transmission of information. Fears that can be traced to specific instances are more easily explained by the classical conditioning theory (e.g., exposure to traumatic events). Secondly, an individual may develop a fear by observing the actions of others (i.e., vicarious acquisition). Thirdly, an individual may acquire a fear by discussing fearful things with others.

Ollendick, Vasey, and King (2001) have added that operant conditioning mechanisms can be an additional pathway to anxiety. The authors have proposed that avoidance of feared stimuli can serve to exacerbate normal anxiety responses into problematic anxiety. That is, when a child avoids a fear-provoking stimulus, he or she may be negatively reinforced by the removal of anxiety. It is also possible that caregivers reinforce the child through approval of avoidance behaviors (Ollendick et al., 2001). Furthermore, researchers have suggested that it is unlikely that fear pathways work in isolation (Mineka & Zinbarg, 2006) and that the interaction of multiple pathways is the most common cause of fear (Merckelbach, de Ruiter, van den Hout, & Hoekstra, 1989; Muris, 2007; Ollendick & King, 1991).

There have been research experiments with adults that have shown that cognitive biases can be learned by non-anxious individuals. Mathews and colleagues (Mathews & Mackintosh, 2000; Mathews & MacLeod, 2002) created an experimental paradigm in which they induced interpretation bias in participants that lasted beyond training trials and, more importantly, demonstrated that state anxiety increased as a direct result of acquiring the interpretation bias. In addition, MacLeod, Rutherford, Campbell, Ebsworthy, and Holker (2002) trained participants to acquire an attention bias to threat by using a modified dot-probe task. The researchers also found that this bias led to increased negative mood during a later stress task. Although no studies have been conducted with children or adolescents, it seems possible that normal youth

can also acquire cognitive biases through learning processes. Research has suggested that behavioral factors are relevant when trying to understand the origins of childhood anxiety disorders; but, they do not give a complete picture and should be considered along with anxiety-related biological, social, and cognitive factors.

Social Basis

Social models used to explain the etiology of anxiety highlight the importance of a child's relationships with others. Research has shown that a child's social relationships may influence the development of anxiety disorders. The development of social relationships begins in infancy when the child must attach to the primary caregiver, and this is the foundation upon which other relationships are established. Insecure attachment is related to and predictive of maladaptive social behaviors (see Rubin & Parker, 2006) as well as a risk factor for psychological problems, including anxiety (Bowlby, 1973, 1980).

Parental psychological control, which is defined as a harmful way of controlling children that inhibits psychological development through the manipulation of the parent-child relationship, expressions of disappointment and shame, and excessive possessiveness or protectiveness (Barber, 1996; Becker, 1964; Schaefer, 1965), is a social factor thought to influence childhood anxiety. Studies have shown that psychological control is a significant predictor of internalizing problems in youth (Barber & Olsen, 1997; Eccles, Early, Frasier, Belansky, & McCarthy, 1997; Olsen et al., 2002). Parental over-control in general (i.e., also including behavioral control, which is simply the attempt to manage children's behaviors) may prevent children from facing fearful events, an important task that gives children practice in facing their fears, as well as giving the message that certain stimuli are threatening and

potentially harmful, which may reinforce a child's anxiety (Rapee, 1997; Rapee, Wignall, Hudson, & Schniering, 2000; Vasey & Ollendick, 2000).

In addition, a child's relationships with both parents and peers have an effect on the child's self-perception and perceived competence (Cole, Jacquez, & Maschman, 2001; Cole, Maxwell, & Martin, 1997). A child's view of his or her competence in facing stressful or anxiety-provoking situations, for example, can be influential in the experience of anxiety. As will be discussed in detail later, the idea of not being able to cope with stressors because of perceived personal incompetence is a part of what makes anxiety a "problem" (Weems, Silverman, Rapee, & Pina, 2003). Furthermore, social groups are typically very important to children and research has found that peer rejection is commonly associated with a range of indicators of emotional distress, such as anxiety, anger, and depressive symptoms (see Sandstrom & Zakriski, 2004). Longitudinal research has shown that chronic rejection in middle childhood predicted subsequent internalizing symptoms six years later (Burks, Dodge, & Price, 1995).

Regarding the more specific association between social factors and cognitive distortions, it seems plausible that when surrounded by anxious parents, siblings, or friends, a child's attention may repeatedly be drawn to threat cues. And, a child may more readily interpret neutral stimuli as dangerous when observing others do the same (Muris & Field, 2008). Parents with anxiety problems themselves may display cognitive biases which are then transferred to their children (Hadwin, Garner, & Perez-Olivas, 2006). Research in this area has shown that children of panic-disorder patients made more anxious interpretations of ambiguous situations compared to children in a control group (Schneider, Unnewehr, Florin, & Margraf, 2002), children of agoraphobic parents were more fearful, anxious and had a decreased sense of control

over various risks relative to comparison children (Capps, Sigman, Sena, Henker, & Whalen, 1996), and in non-clinical populations, maternal and child threat-related cognitions were correlated (Creswell & O'Connor, 2006; Creswell, O'Connor, & Brewin, 2006). Thus, the evidence suggests that the people in a child's environment have an effect, in various ways, on the development of cognitive biases. Social factors, biological factors, and behavioral factors associated with anxiety have each been studied separately but often do not operate in isolation. These processes, along with cognitive processes, can interact in many complex ways to put an individual at risk for pathological anxiety.

Cognitive Basis

Cognitive models suggest that anxiety disorders can originate from faulty or biased ways of thinking and the biased processing of information (e.g., Beck, 1976; Ellis, 1962). Beck, Emery, and Greenberg (1985) proposed that dysfunctional cognition is the core feature of emotional disorders. Over the past few decades, cognitive factors have been a focus in anxiety disorder interventions. As mentioned previously, a main goal in CBT is to identify and change anxiety producing cognitions (Kendall, 1994). This assumes that an anxious person's cognitions or thought processes are somehow defective and need to be fixed. The efficacy of cognitive behavioral interventions for treating anxiety disorders in children and adolescents points to the idea that addressing maladaptive cognitions in anxious youth is beneficial in improving the symptoms of anxiety. A better understanding of the unique cognitive processes exhibited by anxious youth may help to enhance the efficacy of CBT.

Additionally, as mentioned previously, there are biological factors, behavioral learning factors, and social factors that are related to the origins of cognitive biases in children. The

cognitive factors implicated in the origin of childhood anxiety disorders are discussed in detail in the following section.

III. Cognitive Processes

It has been suggested that understanding the way that children process information, such as attending to certain stimuli, interpreting events, and recalling past experiences can help to clarify the etiology of anxiety disorders (Weems & Watts, 2005). In investigating the origins of anxiety, researchers have questioned if cognitions truly cause anxiety disorders. If the primary pathology in anxiety is maladaptive cognitive processing, does this imply that cognitions cause anxiety disorders? Beck and colleagues (1985) have proposed that this is an idea "just as illogical as an assertion that hallucinations cause schizophrenia" (p.85). It may be that just as anxiety in general is a dysregulation of the normal response system, an anxious individual's cognitive system is dysregulated, which causes him to interpret ambiguous stimuli in a threatening way (Beck et al., 1985). Kendall (1985) proposed that this chronic over-activity focuses information processing resources on threat-relevant information, which leads to the development of cognitive biases. These faulty cognitions occur more frequently and become more established over time and, consequently, the anxiety response system is continually, unnecessarily activated. Furthermore, cognitive biases may interact with the physiological symptoms of anxiety (caused by activating the anxiety response system) to produce the negative affective symptoms of anxiety (Alfano et al., 2002). Beck and colleagues (1985) explained that the main problem in the anxiety disorders is "the overactive cognitive patterns relevant to danger that are continually structuring external and/or internal experiences as a sign of danger" (p. 15; Beck, 1971).

The research literature is building with more support for the association between cognitive factors and childhood anxiety (e.g., Bogels & Zigterman, 2000; Chorpita, Albano, & Barlow, 1996; Kendall & Chansky, 1991; Reid, Salmon, & Lovibond, 2006; Weems, Berman,

Silverman, & Saavedra, 2001; Weems et al.,2003). There are various stages of cognitive processing that may be relevant to anxiety. Children encounter many different kinds of situations that require an appropriate response. In order to produce an appropriate response, the stimuli in a situation are scanned and encoded, with the aim of attending to relevant cues while ignoring irrelevant stimuli. The next stage of interpretation involves evaluating the encoded stimuli and giving them meaning (Muris & Field, 2008). If the child interprets the situation as dangerous, he or she may experience anxiety, as expressed in physiological, affective, and behavioral symptoms (Muris & Field, 2008).

In general, two basic modes of processing can be distinguished—automatic and controlled (Shiffrin & Schneider, 1977). Automatic processing occurs very quickly, is unintentional, and occurs outside of conscious awareness. A type of biased automatic processing that is associated with anxiety is *selective attention*, which involves hyperattention towards potentially threatening material. A predisposition for selectively attending to potentially threatening stimuli is thought to characterize anxious individuals and may maintain anxiety by allocating significantly more processing resources towards threat-related material (Mathews, 1990). Research studies have demonstrated a link between childhood anxiety and selective attention (e.g, Dalgleish et al., 2003; Vasey & Daleiden, 1996; Vasey, Daleiden, Williams, & Brown, 1995; Vasey, El-Hag, & Daleiden, 1996).

Controlled processing, on the other hand, is slower, deliberate, and available to conscious awareness. One type of controlled processing is *memory bias*, which refers to enhanced memory for information about danger. In relation to anxiety, this would entail recall of memories connected with the cause of one's anxiety, which influences a biased evaluation of current situations (Muris & Field, 2008). Memory biases have been shown in research studies to be

associated with anxiety problems in children and adolescents (Daleiden, 1998; Moradi, Taghavi, Neshat-Doost, Yule, & Dalgleish, 2000). A second type of controlled processing implicated in anxious cognitions is *interpretation bias*. This refers to the tendency to attach threatening meaning to neutral or ambiguous stimuli. Research has shown that clinically anxious youth are more likely to interpret ambiguous situations as threatening compared to nonanxious control youth (Barrett, Rapee, Dadds, & Ryan, 1996; Bogels & Zigterman, 2000; Chorpita et al., 1996; Dineen & Hadwin, 2004; Taghavi, Moradi, Neshat-Doost, Yule, & Dalgleish, 2000). A third type of controlled processing is *judgment bias*. This type of biased thinking involves negative and/or lowered estimates of one's coping ability (Weems & Watts, 2005). An anxious child is thought to have lowered expectations of his or her ability to deal with threatening situations. Common definitions of control (in relation to anxiety) involve a judgment of one's coping ability and have, therefore, been a common way to study judgment biases (Barlow, 2002; Capps et al., 1996; Cortez & Bugental, 1995; Granger, Weisz, & Kauneckis, 1994; Muris, Schouten, Meesters, & Gijsbers, 2003). Empirical research has demonstrated the importance of control cognitions in understanding pathological anxiety in children and adolescents (Ginsberg, Lambert, & Drake, 2004; Weems et al., 2003).

The two different modes of processing—automatic and controlled—have implications for the assessment of cognitive biases. Automatic processes are usually evaluated with reaction-time paradigms (e.g., modified Stroop task; dot-probe task). Controlled processes, in contrast, are easily assessed with self-report based measures (Harvey, Watkins, Mansell, & Shafran, 2004).

Weems and Watts (2005) developed a cognitive model of childhood anxiety, which proposes that attention biases encourage the encoding of threat-related stimuli into memory,

thereby increasing the amount of negatively biased threat-related memories. Memory biases are then incorporated into cognitive schemas and promote interpretive and judgment biases, due to a biased memory base used to interpret events (Weems & Watts, 2005).

Attention biases and memory biases are conceptually distinct and research has shown that they are uniquely related to anxiety in children (Watts and Weems, 2006). Interpretive biases and judgment biases, on the other hand, are not quite as distinct. Interpretive bias involves the tendency to interpret neutral or ambiguous stimuli as threatening. Judgment bias involves a negative and/or lowered estimate of one's ability to cope (e.g., the belief that one will not be able to deal with a threatening situation). Interpreting an external event negatively and interpreting personal capabilities negatively, for example, seem very similar. Weems and colleagues have proposed that both interpretive and judgment biases involve a similar cognitive style and, therefore, individuals who interpret events in a negatively biased way are likely to judge their own abilities negatively and vice versa (Weems & Watts, 2005). In order to measure these biases separately, the present study will utilize the conceptual definitions that judgment biases imply a believed lack of competence and are thus centered on the individual, while interpretive biases, which entail faulty, negative interpretations of stimuli, are centered on a context, situation, or external event (Weems & Watts, 2005). Preliminary research has provided evidence that interpretive biases and judgment biases are conceptually distinct (Weems, Costa, Watts, Taylor, & Cannon, 2007). The remainder of this dissertation and the empirical study described focuses on what have been termed interpretive and judgment biases that have been implicated in childhood anxiety disorders; and, it aims to add to the empirical literature on these biases.

Interpretive Biases

Theoretical Basis

Interpretive bias involves the tendency to interpret neutral stimuli in a negative way (Beck, 1976; Ellis, 1962). These interpretations are not usually justified by the given information in a situation. The thinking of an anxious person is taken over by themes of danger and attention is fixed to stimuli perceived as threatening (Beck et al., 1985). Beck, Rush, Shaw, and Emery (1979) proposed seven typical cognitive distortions involving interpretation bias: *overgernalization* (believing that a single negative outcome represents the outcomes of all similar future events), *selective abstraction* (selectively focusing on only the negative features of a situation in the belief that only the negative features matter), *assuming excessive responsibility or personal causality* (blaming oneself for all bad things), *predicting without sufficient evidence* (believing that if something bad happened in the past, bad things will always happen), *making self-references* (believing oneself, especially one's negative characteristics or failures, to be the center of everyone's attention), *catastrophizing* (expecting the worst possible outcome), and *thinking dichotomously* (viewing everything in extremes such as safe or unsafe). It should be noted that the "selective abstraction" cognitive distortion mentioned here refers to consciously paying attention to negative or potentially threatening stimuli, rather than the automatic process of selective attention mentioned earlier.

Lefebvre (1980, 1981) devised a measure to evaluate each of the seven cognitive errors described by Beck et al. (1979) in adults; however, in an initial study it was found that certain errors had considerable overlap. As a result, some errors were combined and a list of four reliably discriminative error categories was produced. These include: (1) *catastrophizing* (expecting an outcome to be catastrophic or misinterpreting an event as a catastrophe), (2)

overgeneralizing (combines Beck et al.'s overgeneralizing and predicting without sufficient evidence, and involves the belief that the outcome of a single experience will apply to a similar experience in the future), (3) *personalizing* (combines Beck et al.'s excessive responsibility and self-reference, and involves taking personal responsibility for negative events or giving personal meaning to such events), and (4) *selective abstraction* (combines Beck et al.'s selective abstraction and dichotomous thinking, and is defined as selectively focusing on the negative aspects of experiences). Lefebvre (1980, 1981) used hypothetical vignettes in his questionnaire followed by a negative interpretation of the vignette representing one of the cognitive distortions. Subjects were asked to rate on a 5-point scale how similar their own thoughts would be in that situation. Leitenberg, Yost, and Carroll-Wilson (1986) developed the Children's Negative Cognitive Error Questionnaire (CNCEQ), modeled after Lefebvre's Adult Cognitive Error Questionnaire. The CNCEQ has been shown to be a well-validated measure for assessing negative interpretation biases in youth (Leitenberg et al., 1986). Existing research on negative cognitive errors using the CNCEQ has shown that they are associated with symptoms of anxiety (Epkins, 1996; Leitenberg et al., 1986; Weems et al., 2001).

Research Involving Interpretive Biases in Youth

As noted above, previous research has consistently found that interpretive biases are correlated with anxiety in youth (Barrett, Rapee et al., 1996; Chorpita et al., 1996; Epkins, 1996; Leitenberg et al., 1986; Taghavi et al., 2000; Watts and Weems, 2006; Weems et al., 2001; Weems et al., 2007). However, results have not always provided clear evidence that interpretive biases are indicative of childhood anxiety disorders and can serve to differentiate these youth from non-anxious youth. Barrett and colleagues (Barrett, Rapee et al., 1996) examined the interpretation of ambiguous situations (referring to physical threats and social threats) in anxious

children, oppositional children, and normal children. Results indicated that the youth with anxiety disorders interpreted neutral situations as significantly more threatening compared to normal children, but the oppositional children exhibited significantly more threat perception bias than both of the other groups (Barrett, Rapee et al., 1996).

In a similar vein, Spence, Donovan, & Brechman-Toussaint (1999) assessed cognitive processes in a sample of children with social phobia compared to a control group. The authors assessed interpretive biases related to performance on a social-evaluative task and found that group differences on expectations of *negative* social outcomes were nonsignificant; however, socially phobic children were less likely to expect *positive* social outcomes. Thus, it is not conclusive whether these children experience a specifically negative cognitive style.

Also similar to Spence et al. (1999), Bogels and Zigterman (2000) examined interpretive biases among children diagnosed with separation anxiety, social phobia, or generalized anxiety disorder, compared to normal children and children with an externalizing disorder. Participants were asked to give their interpretations of ambiguous stories (concerning separation, social, and generalized anxiety situations) in open and closed responses, and their thoughts and judgments of the situations were assessed. Results indicated that youth with an anxiety disorder reported significantly more negative cognitions than children with externalizing disorders, which is in contrast to the results of Barrett, Rapee et al. (1996). Results also showed that anxious youth did not exhibit significantly more negative cognitions than normal children. Moreover, on the open responses, anxious children did not make more overestimations of danger relative to both comparison groups. On the closed responses, however, anxious children did judge the situations as more dangerous compared to both control groups.

In sum, these three studies (Barrett, Rapee et al., 1996; Bogels and Zigterman, 2000; Spence et al., 1999) provide some evidence but do not make it clear that the tendency toward interpretive biases will distinguish anxiety disordered youth from non-anxious children. Moreover, each of these studies used somewhat idiosyncratic ways to assess biases and the procedures were not standardized (i.e., these three studies [Barrett, Rapee et al., 1996; Spence et al., 1999; Bogels and Zigterman, 2000] did not use a measure like the Children's Negative Cognitive Error Questionnaire [CNCEQ; Leitenberg et al., 1986], nor did they use matched comparison samples). In the current study, interpretive biases are operationalized as negative cognitive errors using the CNCEQ.

In terms of studies using the CNCEQ, Weems and colleagues (2001) examined CNCEQ scores in youth with various anxiety disorders and found that each of the cognitive errors (i.e., catastrophizing, overgeneralization, personalizing, and selective abstraction) were significantly correlated with self-reported anxiety. The authors further tested the associations by controlling for depression and found that catastrophizing, overgeneralization, and personalizing were still correlated with two different measures of anxious symptoms while controlling for depression (Weems et al., 2001).

In two additional studies, Watts and Weems (2006) and Weems et al. (2007) used the CNCEQ to assess interpretive biases in community samples of youth. Results from both studies indicated that interpretive biases were significantly associated with self-reported anxiety symptoms. However, these studies did not include clinically anxious children and, thus, the issue of the discriminant ability of the CNCEQ was not examined.

Age and gender differences were examined in the original study in which the CNCEQ was developed. Leitenberg and colleagues (1986) reported no significant main effect for gender

on the CNCEQ total score. The authors did, however, find age differences on the total CNCEQ score. They reported that the younger children (fourth graders) scored significantly higher on the CNCEQ compared to both sixth graders and eighth graders. The sixth graders and eighth graders were not significantly different from each other on the CNCEQ.

In addition to main effects, there is some evidence that age and gender may play a role in the association between CNCEQ scores and anxiety. For example, Weems et al. (2001) examined whether age and gender moderate the association between interpretive biases (as measured by the CNCEQ) and anxiety (as measured by the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978) and the State Trait Anxiety Inventory for Children—Trait Version (STAIC-T; Speilberger, 1973)) in a clinic referred sample of youth with anxiety disorders. Regression analyses were used to test if the association between CNCEQ scores and self-reported anxiety was moderated by age and results were consistent with age serving as a moderator. Overall, cognitive errors were more strongly related to anxiety levels in older youth. However, they did not find that gender moderated the link between self-reported anxiety and CNCEQ scores.

Weems et al. (2007) tested age and gender moderation in a similar way in a community sample of youth. In examining the relationships between each of the four cognitive errors measured by the CNCEQ and self-reported anxiety symptoms (as measured by the Revised Child Anxiety and Depression scale (RCADS; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000), they found that neither gender nor age moderated any of these relationships.

Summary. The data regarding interpretive biases in youth suggest that these biases are associated with anxious symptoms. However, the literature is unclear in terms of if a tendency toward interpretive biases is a distinctive feature of anxiety disorders in childhood and can

discriminate clinically anxious youth from non-anxious youth. First, there have been few studies to examine this in youth with anxiety disorders compared to non-anxious youth. Moreover, the studies that have examined this issue tended to use idiosyncratic ways of assessing biases and did not match on demographic variables (e.g., age, gender, ethnicity). This pattern of findings has led some researchers to question whether negative cognitive biases are truly indicative of clinically anxious youth (Alfano et al., 2002). Thus, it is theoretically important to determine the salience of CNCEQ scores in childhood anxiety disorders given the lack of clear findings and practically important because modifying cognitive errors is often a focus of treatment with anxious youth. Furthermore, it has been suggested by previous research that age may affect performance on the CNCEQ. It is unclear whether gender could affect scores on the CNCEQ. The present study uses the CNCEQ to test if the tendency toward interpretive biases is a distinctive characteristic of youth with anxiety disorders and if age and gender influence the relationship between CNCEQ scores and anxiety disorder status.

Judgment Biases

Theoretical Basis

As mentioned previously, researchers have proposed that both interpretive and judgment biases involve a similar cognitive style and, thus, individuals who interpret events in a negatively biased way are likely to judge their own abilities negatively and vice versa (Weems & Watts, 2005; Weems et al., 2007). Judgment biases in children involve lowered expectations of their ability to cope with threatening situations or events. For example, self-efficacy is the judgment of one's competence. Self-efficacy involves one's beliefs about the ability to successfully carry out behaviors that regulate life experiences (Bandura, 1977; 1982; Bandura, Adams, Hardy, & Howells, 1980). Self-efficacy is thought to have an effect on anxiety by fostering the cognitive

sense of control (Bandura, 1982). There have been some research studies to document the association between self-efficacy and anxiety. Yue (1996) found that self-efficacy was negatively correlated with test anxiety in a sample of junior high-school students. In another study, Messer and Beidel (1994) demonstrated that children with anxiety disorders had significantly lower scores on the Perceived Competence Scale for Children (Harter, 1982) compared to normal children.

In general, *control* involves a judgment of one's coping abilities and has often been used as a way to measure judgment biases (see Weems et al., 2007 for an expanded discussion of conceptual distinctions). Barlow's (1988; 2002) model of anxiety proposes that a perceived lack of control over external threats (i.e., events, objects, or situations that are fear producing) and/or negative internal emotional and bodily reactions is a major part of why anxiety is a "problem" (Weems et al., 2003). In other words, not having control over the situations and physical sensations associated with anxiety is typically distressing and problematic for individuals. The judgment of a situation when one is in control of the object/event and one's physical reaction would likely be very different from the experience of feeling helpless and not able to regulate one's heart rate, sweating, shaking, etc.

Research Involving Judgment Biases

Rapee, Craske, Brown, and Barlow (1996) examined the concept of control in adult samples using the Anxiety Control Questionnaire (ACQ) and found that low perceptions of control over external threats and internal anxious symptoms are correlated with elevated self-reported anxiety. They also found that individuals with diagnosed anxiety disorders had lower perceptions of control compared to nonreferred individuals (Rapee et al., 1996).

In order to study the concept of control in children and adolescents, Weems and colleagues (2003) modified the ACQ and developed the Anxiety Control Questionnaire for Children (ACQ-C). The ACQ-C is a 30-item self-report questionnaire in which children are asked to rate their agreement with each question. Approximately half of the questions assess lack of control over external threats, while the other half assess control over negative, internal emotional reactions associated with anxiety. The authors found that clinically anxious children had lower perceived control over external threats and lower perceived control over their internal emotional reactions compared to non-anxious children (Weems et al., 2003). Additionally, the authors found that anxiety control beliefs predicted anxiety disorder status while controlling for general anxiety symptoms (i.e., RCMAS scores) and another measure of control (i.e., the Nowicki-Strickland Locus of Control Scale [NSLOC; Nowicki & Strickland, 1973]). This study suggests that a perceived lack of control is a significant part of the experience of anxiety (Weems et al., 2003). In other words, pathological anxiety, as opposed to non-pathological anxiety, theoretically, is characterized by elevated levels of anxiety in response to threatening situations, but also by the belief that those experiences are out of one's control (Weems & Watts, 2005). However, the question of the distinctiveness of judgment biases versus interpretive biases was not addressed in Weems et al. (2003).

In another study, Weems and colleagues (2007) have found that judgment biases (measured by the ACQ-C) were significantly associated with self-reported anxiety levels while controlling for CNCEQ scores in a community sample of youth. ACQ-C scores also predicted anxiety while controlling for depression, but did not predict depression while controlling for anxiety (Weems et al., 2007). While this is an important finding, this study used a community sample and, thus, the incremental validity of the ACQ-C and CNCEQ in predicting anxiety

disorder status was not assessed. Further research is needed to understand whether ACQ-C scores and CNCEQ scores will both incrementally predict anxiety disorder status.

In regards to the effects of age and gender, Weems et al. (2003), in a sample of youth with anxiety disorders, found that ACQ-C scores predicted anxiety disorder status and that this relationship was not influenced by either age or gender. In another study, Weems et al. (2007) found that neither age nor gender affected the relationship between ACQ-C scores and self-reported anxiety symptoms in a community sample of youth.

Summary. Judgment biases do seem to be related to anxiety problems in youth. With the exception of Weems et al. (2003), there have been no other studies to assess anxiety-related judgment biases in clinically anxious children. Additional research is needed to determine the importance of this construct in the experience of anxiety and whether it should be more of a focus in interventions for anxiety disorders. Furthermore, the limited research suggests that performance on the ACQ-C is not affected by age and gender, but more support is needed and this issue is explored in the present study.

IV. The Present Study

To summarize the extant research, there is evidence to support that both interpretive biases (measured with the CNCEQ) and judgment biases (measured with the ACQ-C) are related to levels of self-reported anxiety symptoms in youth (Epkins, 1996; Leitenberg et al., 1986; Leung & Wong, 1998; Watts & Weems, 2006; Weems et al., 2001; Weems et al., 2003; Weems et al., 2007). However, it is unclear if CNCEQ scores and limited evidence that ACQ-C scores discriminate clinically anxious youth from non-anxious youth. Theoretically, the two are distinct cognitive features of anxiety disorders (Beck, 1976; Barlow, 2002; Weems & Watts, 2005) and evidence suggests that they each incrementally predict self-reported anxious symptoms in youth (Weems et al., 2007). However, research is needed to examine if CNCEQ scores and ACQ-C scores independently discriminate clinically anxious youth from non-anxious youth as predicted by theory (Barlow, 2001; Beck, 1976; Weems & Watts, 2005).

Furthermore, research is needed to determine if CNCEQ scores and ACQ-C scores can predict anxiety disorder status beyond that predicted by anxiety symptoms alone. Theoretically, interpretive and judgment biases are a unique facet of anxiety disorders. That is, an anxiety disorder has cognitive, behavioral (e.g., avoidance), and affective (e.g., anxious affect) components; so, CNCEQ scores and ACQ-C scores might predict anxiety disorder beyond levels of anxiety symptoms (and other emotional and behavioral symptoms). Lastly, there have been mixed findings from the literature with regards to the role of child age and child gender. Specifically, research has found evidence for age moderating the association between anxiety and CNCEQ scores in clinic samples of anxious youth (Weems et al., 2001), but not in community samples (Weems et al., 2007). Research comparing youth meeting diagnostic

criteria for anxiety disorders with non-referred youth may help clarify if (and how) age and gender influence the association between CNCEQ and ACQ-C scores and anxiety.

Hypotheses

It is hypothesized that (1) CNCEQ and ACQ-C scores will show that youth with anxiety disorders will have a greater tendency toward interpretive biases and lower perceived anxiety-related control (judgment biases) compared to the control sample. That is, youth meeting diagnostic criteria for anxiety disorders should, theoretically, have a significantly higher mean score on the CNCEQ and a significantly lower mean score on the ACQ-C relative to the control sample. It is also hypothesized that (2) CNCEQ scores and ACQ-C scores will each demonstrate incremental validity over each other in predicting diagnostic status given the theoretical uniqueness of the two constructs. Next, it is hypothesized that (3) the CNCEQ and ACQ-C will predict diagnostic status beyond measures of general anxiety, depression, and externalizing symptoms. Lastly, (4) analyses will test whether age and gender moderate the associations between diagnostic status and the two cognitive biases.

Method

Participants

The sample for the current study was drawn from the database of the Youth and Family Stress, Phobia, and Anxiety Research Laboratory at the University of New Orleans. Children in the clinic sample were referred from various sources including area schools and mental health clinics and from screenings conducted in the research laboratory. From this subject pool, 24 participants met criteria to comprise the anxiety disorder group. These children each have an anxiety disorder as the primary diagnosis or an anxiety disorder and an externalizing disorder as the comorbid primary diagnoses, as assessed by the Anxiety Disorders Interview Schedule for DSM-IV (ADIS). That is, each diagnosed disorder is given a "Clinician Severity Rating," which is based on the interviewer's clinical judgment and the information obtained from the child and parent, and most of these youth (75%) have an anxiety disorder considered the most clinically "severe," relative to other diagnoses (Albano & Silverman, 1996). Six children (25%) have an anxiety disorder and an externalizing disorder with equal severity ratings.[1] Diagnoses of the clinic sample are delineated in Table 1. All but one child in the clinic sample had comorbid diagnoses. The average number of anxiety disorders met was 3. The first half of Table 1 classifies all clinic youth (n = 24) in terms of clusters of diagnoses (i.e., anxiety disorders, externalizing disorders, affective disorders). The second half of Table 1 lists the number of clinic youth who met criteria for each disorder evaluated by the ADIS.

[1] These 6 youth did not differ from other youth in the clinic sample on any of the measures used in the present study (i.e., CNCEQ, ACQ-C, RCADS-GAD, CBCL internalizing and externalizing scales, RCMAS, and CDI); and, the main analyses of the study were run excluding these youth and the pattern of results remained the same.

Table 1. Diagnoses of the clinic sample

Clinic Sample (n = 24)		
Anxiety disorder(s) only	3	(12.5%)
Anxiety and externalizing disorder(s)	11	(45.8%)
Anxiety and an affective disorder	1	(4.2%)
Anxiety and externalizing disorder(s) and an affective disorder	9	(37.5%)
Number of youth meeting diagnosis for:		
Generalized Anxiety Disorder	19	(79.2%)
Specific Phobia	16	(66.7%)
Social Phobia	14	(58.3%)
Separation Anxiety Disorder	11	(45.8%)
Obsessive-Compulsive Disorder	6	(25.0%)
Posttraumatic Stress Disorder	4	(16.7%)
Panic Disorder	2	(8.3%)
Agoraphobia	1	(4.2%)
Attention-Deficit/Hyperactivity Disorder	19	(79.2%)
Oppositional Defiant Disorder	6	(25.0%)
Conduct Disorder	0	
Dysthymia	7	(29.2%)
Major Depressive Disorder	3	(12.5%)

Note: Externalizing disorder(s) includes Attention-deficit/hyperactivity disorder or Oppositional defiant disorder. Affective disorder includes Major depressive disorder or Dysthymia.

Each child in the clinic sample (n = 24) was matched with two controls, thus the control sample is comprised of 48 participants. Youth in the control sample were recruited for a study on youth feelings and emotions (e.g., Weems & Costa, 2005; Cannon & Weems, 2006). Participants received a small monetary reward as compensation for participating in the research study. Children were excluded if parents indicated that the child had a history of one or more of the following diagnoses—all pervasive developmental disorders, mental retardation, selective mutism, organic mental disorders, schizophrenia, and other psychotic disorders, or were at risk for harm to self or others. Furthermore, in order to be included in the control sample for the

present study, youth had to have scores on the internalizing and externalizing scales of the Child Behavior Checklist (CBCL; Achenbach, 1991) in the non-clinical range.

The variables used to match participants were age, gender, ethnicity, and family income level. When possible, a clinic youth was matched to two control youth with exactly matching age, gender, ethnicity, and family income level. When exact matches were not available, clinic youth were matched to control youth who were as similar as possible on the four demographic variables. Gender was matched exactly for all clinic cases. Age was matched exactly for all but two clinic cases (a 12-year-old female who was matched with a 13-year-old female of the same race and a 7-year-old male who was matched with an 8-year-old male of the same race). Race was matched exactly in the majority of cases (both samples were composed of mostly Black or White participants). When family income level, which was denoted by a choice of six levels of income, was not matched exactly, the next closest available level was chosen for a match. Both samples are comprised of children ages 7-17 and one parent for each child (father or mother). The mean age of the clinic sample is 11 years and of the control sample is 11 years. The demographics of each sample are described in Table 2. As shown, matching produced very homogeneous groups in terms of demographics with only slight variation in income; no differences approached statistical significance.

Table 2. Demographic information for the clinic and control samples

		Clinic Sample, *n* = 24 (%)	Control Sample, *n* = 48 (%)
Age	7-11 years old	54.2	54.2
	12-17 years old	45.8	45.8
Sex	Female	54.2	54.2
	Male	45.8	45.8
Ethnicity	Black	29.2	33.3
	White	58.3	58.3
	Hispanic	0	2.1
	Other	12.5	6.2
Family Income Level	$0 - $11,999	16.7	12.5
	$12,000 - $20,999	4.2	8.3
	$21,000 - $30,999	12.5	25.0
	$31,000 - $40,999	12.5	6.2
	$41,000 - $50,999	29.2	12.5
	Over $51,000	25	35.4

Measures

The Anxiety Disorders Interview Schedule for DSM-IV: Child and Parent versions (ADIS-C and ADIS-P, respectively; Silverman & Albano, 1996) was administered to all children and parents in the clinic sample to determine diagnostic status. The ADIS-C and ADIS-P are semistructured interviews focused on the anxiety disorders, but do allow for the assessment and diagnosis of other major childhood disorders, including the externalizing and affective disorders, according to DSM-IV criteria. The authors of the ADIS recommend administration of both the child and parent interviews in order to obtain a composite diagnosis (Albano & Silverman, 1996). The interviewer assesses diagnostic criteria of each disorder as well as an "interference" rating, in which the interviewee rates the level of functional impairment that the disorder is

presently causing on a scale from 0 (the disorder has not interfered in the child's life) to 8 (the disorder has interfered very, very much). For each of the diagnoses met, the interviewer assigns a "Clinician Severity Rating" on the same scale from 0 to 8 based on clinical judgment and the degree of interference.

The diagnostic interviews were conducted by either a post-doctoral psychologist or advanced graduate students in psychology. All graduate students who conducted interviews had completed at least two graduate-level courses in psychological assessment. Diagnosticians were trained by observing videotaped interviews and were required to arrive at 100% agreement on at least two observed interviews before conducting an ADIS on their own. For the current study, 25% of the clinic sample (n = 6) was examined for reliability of the diagnoses. An interviewer blind to the diagnostic status of the child watched the full videotaped interview and coded a copy of the ADIS for diagnoses. The agreement between two interviewers on anxiety disorder and other diagnoses on these cases was 100%.

The Children's Negative Cognitive Error Questionnaire (CNCEQ; Leitenberg et al., 1986) was used to measure interpretive biases. The CNCEQ is a 24-item measure with items to assess cognitive errors—namely, catastrophizing, overgeneralization, personalizing, and selective abstraction. It assesses the four errors using four theoretically derived subscales, with each subscale containing six items. The CNCEQ can be used to obtain a "total cognitive distortion score" as well as subscale scores for each type of cognitive error (Leitenberg et al., 1986). Each item proposes a hypothetical vignette and a negative interpretation of the vignette. The child is asked if he or she would interpret the hypothetical situation in the same way (i.e., would he or she interpret the situation in a negatively biased way?). The child rates on a five-point scale how similar the thought is to his/her own thought in response to the vignette. Item

content covers three contexts—academic, social, and athletic—in each subscale (i.e., a 6-item subscale will contain two academic vignettes, two social vignettes, and two athletic vignettes). Leitenberg et al. (1986) computed reliability and internal consistency for the CNCEQ in a sample of 143 children in grades five through eight. Four-week test-retest reliability for the CNCEQ total score was determined to be .65 ($p<.001$; Leitenberg et al., 1986). The authors reported internal consistency for the CNCEQ total score, using Cronbach's alpha, as .89 (Leitenberg et al., 1986). In terms of convergent validity, Weems et al. (2001) found that each of the four subscales of the CNCEQ was significantly correlated with two self-report measures of anxious symptoms in a sample of children with anxiety disorders: the State-Trait Anxiety Scale for Children—Trait version (STAIC-T; Speilberger, 1973), *r*'s ranging from .39 to .42 ($p<.01$); and, the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978), *r*'s ranging from .36 to .43 ($p<.01$). In the current study, Cronbach's alpha for the CNCEQ total scale was .87 for the clinic sample and .89 for the control sample.

The Anxiety Control Questionnaire—child form (ACQ-C; Weems et al., 2003) is a developmentally adapted version of the Anxiety Control Questionnaire (Rapee et al., 1996), a measure of control in anxiety disorders used with adults. The ACQ-C was used to assess perceived lack of control over external threats (e.g., feared objects or situations) and control over negative, internal, emotional, and bodily reactions associated with anxiety (e.g., heart racing, trembling). In the current study, judgment biases are operationalized as anxiety control beliefs using the ACQ-C. Children rate their agreement on a 5-point scale with each of the thirty items assessing control-related self-competencies. An example item is "When I am in a place that gets me nervous or afraid, I can take charge over and control my feelings." Weems et al. (2003) reported internal consistency estimates of the ACQ-C, using Cronbach's alpha, to be .94 and .93

in two independent samples. Additionally, the ACQ-C demonstrated convergent validity with the RCMAS (r = -.47, p<.01) and the Nowicki-Strickland Locus of Control Scale (NSLOC; Nowicki & Strickland, 1973), one of the most widely used measures of locus of control in children (r = -.22, p<.05). In the current study, Cronbach's alpha for the ACQ-C was .94 for the clinic sample and .95 for the control sample.

The Revised Child Anxiety and Depression scale (RCADS; Chorpita et al., 2000) was used to measure symptoms of anxiety. The RCADS is a 47-item self-report questionnaire with each item scored on a 4-point scale. The symptoms measured by the RCADS are based on DSM-IV criteria for disorders. The authors have reported good convergent validity of the RCADS with other measures of childhood anxiety (Chorpita et al., 2000). Specifically, the GAD subscale was used as a covariate in the present study to test if CNCEQ and ACQ-C scores predicted anxiety disorder status beyond anxious affect. The GAD symptoms were used because they appear to best tap the general anxious affect component of anxiety disorders. Example items from this subscale are, "I worry that bad things will happen to me" and "I worry that something awful will happen to someone in my family." The RCADS GAD subscale evidenced adequate reliability in the clinic sample (Cronbach's alpha = .79) and the control sample (Cronbach's alpha = .74) of the present study.

The Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978) was also used to assess self-reported anxiety. The RCMAS is a well-researched 37-item scale designed to evaluate general anxiety in children. Twenty-eight items are summed from 'yes' or 'no' responses to yield a Total Anxiety score. The remaining nine items make up the lie scale. Example items are "I worry about what is going to happen" and "Often I have trouble getting my breath." Internal consistency coefficients of the RCMAS have ranged from .80 to .90 (Paget &

Reynolds, 1984), and three-week test-retest reliabilities have ranged from .90 to .99 (Pela & Reynolds, 1982). Reynolds (1980) reported good convergent validity of the RCMAS as evidenced by a significant correlation between the RCMAS and the State-Trait Anxiety Inventory for Children—trait scale (STAIC; Spielberger, 1973; $r = .85$, $p<.001$). In the current study, Cronbach's alpha for the clinic sample is .84 and for the control sample .88 on the RCMAS.

The Children's Depression Inventory (CDI; Kovacs, 1981, 1992) was used to assess depressive symptoms. It was developed from the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and it includes 27 items regarding the cognitive, behavioral, and affective signs of depression. Each item has three statements from which the child chooses which is true for him/her. An example item is "I hate myself," "I do not like myself," or "I like myself." Kovacs (1981) reported adequate internal consistency (.86) and one-month test-retest reliabilities (.72) for the CDI. The scale has been well validated and it correlates significantly ($r = .55$) with clinician-rated depression (Kovacs, 1992). The CDI was used as a covariate in order to control for depressive symptoms in the relationship between cognitive biases and anxiety disorder status. In the current study, Cronbach's alpha for the CDI is .82 in the clinic sample and .83 in the control sample.

The Child Behavior Checklist (CBCL; Achenbach, 1991) is a parent-report measure designed to assess the behaviors of youth ages 2 to 18. The internalizing scale and externalizing scale of the CBCL were used as covariates to test if CNCEQ scores and ACQ-C scores predicted diagnostic status beyond parent-reported internalizing and externalizing symptoms. Additionally, the internalizing and externalizing scales were used as criteria for inclusion in the control sample. The mean T-score on each scale is 50, with a standard deviation of 10

(Achenbach, 1991). As recommended by Achenbach, Howell, Quay, and Conners (1991), scores on the CBCL in the 90th percentile and above can be considered "clinical range." In the present sample, T-scores on the internalizing scale of 67 or higher and T-scores on the externalizing scale of 64 or higher were in the 90th percentile and, thus, considered "clinical." All youth in the control sample are below the clinical range on these two scales. The CBCL has been widely used and has shown to have good reliability and validity (Achenbach, 1991).

Procedures

The assessment of the cognitive variables (interpretive biases, judgment biases) and the behavioral/affective variables (self-reported symptoms of anxiety and depression, parent-reported internalizing and externalizing symptoms) were the same with both the clinic and non-clinic samples. The child and parent were greeted and given a general overview of the assessment procedures. Informed consent was obtained from the parent and informed assent from the child. Standardized specific instructions were given to the child and parent separately. The child completed the self-report measures in a separate room from the parent and was assisted as necessary by trained research assistants (e.g., a research assistant may have read each question to a young participant while monitoring the child's comprehension).

At this point, the procedures with the clinic versus control samples differed somewhat. Participants recruited for the control sample were finished with the assessment after the questionnaires were completed and were given a small monetary reward. Participants in the clinic sample did not receive a monetary reward because they were referred to the research laboratory at UNO in order to receive a comprehensive psychological evaluation, supervised by a licensed psychologist, free of charge or on a sliding fee scale. Children in the clinic sample continued with the assessment by taking part in the diagnostic interview—children were

administered the ADIS-C and parents the ADIS-P. The diagnostic interviews, like the questionnaires, were completed with the parent and child in separate rooms.

Results

Before conducting the main analyses of the study, descriptive and correlational analyses were run. Correlations among the cognitive measures, as well as the measures assessing anxiety, depression, and externalizing symptoms in the full sample are presented in Table 3. Means and standard deviations of all measures for the clinic sample and the control sample are presented in Table 4. Examination of the scores indicated acceptable ranges on all measures for the planned analyses. In addition, analyses of internal consistency were conducted. As reported in the Measures section, all measures showed acceptable internal consistency.

Table 3. Correlations among all measures used in the present study.

	CNCEQ	ACQ-C	RCADS-GAD	RCMAS	CBCL-int	CBCL-ext	CDI	Age	Sex
CNCEQ									
ACQ-C	-.33**								
RCADS-GAD	.26*	-.48**							
RCMAS	.44**	-.49**	.73**						
CBCL-int	.03	-.12	.05	.12					
CBCL-ext	.15	-.06	-.08	.06	.61**				
CDI	.45**	-.53**	.57**	.69**	.24*	.12			
Age	-.25*	-.01	.15	-.05	.21	.09	.08		
Sex	-.03	-.15	.19	.12	.08	.07	.05	.37**	

*p<.05, **p<.01
CNCEQ = Children's Negative Cognitive Error Questionnaire, ACQ-C = Anxiety Control Questionnaire—child form, RCADS-GAD = Revised Child Anxiety and Depression Scales—Generalized Anxiety Disorder subscale, RCMAS = Revised Children's Manifest Anxiety Scale, CBCL-int = Child Behavior Checklist internalizing scale T-score, CBCL-ext = Child Behavior Checklist externalizing scale T-score, CDI = Children's Depression Inventory.

Hypothesis 1: Interpretive and judgment biases—anxious vs. non-anxious youth

In order to test the hypothesis that the clinic sample will have a greater tendency toward interpretive biases (as assessed by the CNCEQ) and lower perceived anxiety-related control (as assessed by the ACQ-C) compared to the control sample, groups were compared using two-tailed independent samples *t* tests. Children in the clinic sample scored higher on the CNCEQ relative

to control children ($t(70) = 2.62$, $p<.05$), indicating more interpretive biases. Children in the clinic sample scored lower on the ACQ-C relative to control children ($t(70) = -3.80$, $p<.001$), indicating lower perceived anxiety-related control (i.e., more judgment biases). Clinic children also scored significantly higher on measures of anxiety (RCADS-GAD and RCMAS), depression (CDI), and parent-reported internalizing and externalizing symptoms (CBCL internalizing and externalizing scales), as reported in Table 4.

Table 4. Summary of comparisons of the clinic and control samples

	Clinic Sample *M* (*SD*)	Control Sample *M* (*SD*)	*t*	*p*	Cohen's *d*
CNCEQ	57.20 (16.29)	46.81 (15.63)	2.62	.011	.63
ACQ-C	51.82 (25.28)	75.71 (25.06)	-3.80	.000	-.91
RCADS—GAD	14.58 (4.38)	10.48 (3.13)	4.57	.000	1.09
RCMAS	18.20 (5.66)	8.92 (6.27)	6.11	.000	1.46
CBCL—internalizing	56.50 (17.36)	47.88 (9.60)	2.72	.008	.65
CBCL—externalizing	54.75 (12.78)	48.52 (7.96)	2.54	.013	.61
CDI	14.37 (7.61)	6.40 (5.66)	5.01	.000	1.20

CNCEQ = Children's Negative Cognitive Error Questionnaire, ACQ-C = Anxiety Control Questionnaire—child form, RCADS-GAD = Revised Child Anxiety and Depression Scales—Generalized Anxiety Disorder subscale, RCMAS = Revised Children's Manifest Anxiety Scale, CBCL—internalizing = Child Behavior Checklist internalizing scale T-score, CBCL—externalizing = Child Behavior Checklist externalizing scale T-score, CDI = Children's Depression Inventory. Cohen's *d*, effect size statistic.

Hypothesis 2: Incremental validity of CNCEQ and ACQ-C

Logistic regression (Tabachnick & Fidell, 2007) was used to test the hypothesis that the CNCEQ and ACQ-C scores would demonstrate incremental validity in predicting diagnostic status. In these logistic regression models, demographics were not used as covariates because the samples were matched on age, gender, ethnicity, and family income level and, thus, are not

different on those variables. In the analysis, anxiety disorder status was the dependent variable (coded as 1 for the clinic sample and 2 for the control sample), with CNCEQ scores and ACQ-C scores entered together as predictors. Overall classification accuracy of the full logistic regression model was 76.4% and the model was significant, $\chi^2(2) = 15.72$, $p<.001$. In addition, the ACQ-C was a significant predictor while controlling for CNCEQ scores, Wald = 7.81, $p<.01$. However, the CNCEQ was not a significant predictor while controlling for ACQ-C scores (Wald = 2.48, p=.12).[2]

The tests of incremental validity for the CNCEQ and ACQ-C were supplemented by using a methodological strategy wherein the continuous measures were coded in a categorical manner, as this can improve results if the assumption of linearity in the logit is violated (Tabachnick & Fidell, 2007). While the Box-Tidwell test indicated that linearity in the logit could reasonably be assumed, given the lack of incremental prediction by the CNCEQ using the continuous scale, this supplemental test seems appropriate as a check against type 2 error. The measures were coded in the same direction for consistency and clarity in reporting odds ratios using three broad increments. Specifically, scores on the CNCEQ and ACQ-C were divided into three categories to incorporate the range of each measure (CNCEQ: (0) 73-96, (1) 49-72, (2) 24-48; ACQ-C: (0) 0-39, (1) 40-79, (2) 80-120). As in the previous analysis, anxiety disorder status was entered as the dependent variable in the logistic regression model, with the recoded CNCEQ and ACQ-C entered together as predictors. Overall classification accuracy of the full model was 73.6% and the model was significant, $\chi^2(2) = 15.15$, $p<.01$. The ACQ-C again demonstrated incremental validity over the CNCEQ (Wald = 9.91, $p<.01$); but, the CNCEQ did not predict

[2] In order to explore whether the interaction of the CNCEQ and ACQ-C may be a better predictor of diagnostic status, an interaction term of CNCEQ scores x ACQ-C scores was entered into a sequential logistic regression model. Results indicated that this interaction term did not significantly predict diagnostic status beyond that predicted by the CNCEQ and ACQ-C (each entered individually in the model).

beyond the ACQ-C (Wald = .47, p=.49). The odds ratio for the ACQ-C in this analysis provides a more conceptually clear estimate—specifically, that for every 40 point decrease in ACQ-C scores, youth are 4.3 times more likely to be in the anxiety disorder group.

As a final test of the CNCEQ, subscale scores were used instead of the full scale. The CNCEQ can be used to assess four types of negative cognitive errors—catastrophizing (i.e., expecting an outcome to be catastrophic or misinterpreting an event as a catastrophe), overgeneralizing (i.e., believing that a single negative outcome is representative of all similar future experiences), personalizing (i.e., attributing control over negative outcomes to personal causes), and selective abstraction (i.e., selectively focusing on the negative aspects of experiences). And, these have been found to have some differentially strong associations with anxiety symptoms Epkins, 1996; Weems et al., 2001).

Four logistic regression analyses were run in which diagnostic status was used as the dependent variable, and the ACQ-C along with one CNCEQ subscale (at a time) were entered together as predictors. In the first model, the catastrophizing subscale and ACQ-C were entered together as predictors and the model was significant ($\chi^2(2) = 14.40$, p<.01). And, the ACQ-C (Wald = 9.26, p<.01) demonstrated incremental validity over the catastrophizing subscale (Wald = 1.22, p=.27). In the second model, the overgeneralizing subscale and ACQ-C were entered as predictors. Again, the model was significant ($\chi^2(2) = 22.32$, p<.001) and the ACQ-C (Wald = 6.17, p<.05) and overgeneralizing subscale (Wald = 7.57, p<.01) were both significant predictors. In the third model, the personalizing subscale and ACQ-C were entered as predictors. The overall model was significant ($\chi^2(2) = 13.22$, p<.01) and the ACQ-C (Wald = 9.86, p<.01) demonstrated incremental validity over the personalizing subscale (Wald = .03, p=.86). In the fourth model, the selective abstraction subscale and ACQ-C were entered as predictors. The

model was significant ($\chi^2(2) = 14.65$, $p<.01$) and the ACQ-C (Wald = 7.96, $p<.01$) demonstrated incremental validity over the selective abstraction subscale (Wald = 1.46, $p=.23$).

To summarize, the catastrophizing, personalizing, and selective abstraction subscales performed similarly to the CNCEQ total score (i.e., they did not demonstrate incremental validity over the ACQ-C). The overgeneralizing subscale, on the other hand, did demonstrate incremental validity over the ACQ-C and both were significant predictors in the model.

Hypothesis 3: Predicting diagnostic status beyond symptom measures

Given the evidence that the CNCEQ did not predict diagnostic status beyond that predicted by the ACQ-C, the ACQ-C was the focus of the next set of analyses. A series of sequential logistic regression analyses was used to test the hypothesis that the ACQ-C would predict diagnostic status while controlling for several covariates. Anxiety disorder status was used as the dependent variable in all five analyses. In each separate analysis, one covariate was put in the first block and the ACQ-C in the second block. Results are presented in Table 5. To summarize, the ACQ-C did predict diagnostic status while controlling for Generalized Anxiety Disorder symptoms (RCADS-GAD subscale) and parent-reported internalizing and externalizing symptoms (CBCL internalizing and externalizing scales), but was not a significant predictor while controlling for general anxiety (RCMAS) and depression (CDI) symptoms.[3]

[3] Due to the large amount of comorbid externalizing diagnoses of the clinic sample, it was explored whether the CBCL externalizing scale may function as a moderator on the relationships between the CNCEQ and diagnostic status and the ACQ-C and diagnostic status. Two sequential logistic regression analyses were run, for the CNCEQ and ACQ-C separately, to test whether the interaction terms (CNCEQ scores x CBCL externalizing T-scores; ACQ-C scores x CBCL externalizing T-scores) predicted diagnostic status beyond that predicted by the cognitive measure and the CBCL individually. Results indicated that the CBCL externalizing scale was not acting as a moderator on the relationship between CNCEQ scores and diagnostic status, nor on the relationship between ACQ-C scores and diagnostic status.

Table 5. Summary of logistic regression analyses predicting anxiety disorder status with ACQ-C scores, controlling for anxiety and other symptoms

Variables	Model χ^2	Model *p*	Wald	Odds Ratio	95% Confidence Interval	
					Lower	Upper
Model 1: ACQ-C predicting beyond RCADS-GAD subscale						
1. GAD	17.69	.000	12.13**	.74	.62	.88
2. GAD	22.72	.000	7.75**	.77	.64	.93
ACQ-C			4.57*	1.03	1.00	1.06
Model 2: ACQ-C predicting beyond CBCL internalizing scale						
1. CBCL-int	7.56	.006	6.17*	.94	.90	.99
2. CBCL-int	18.23	.000	4.33*	.95	.91	1.00
ACQ-C			8.67**	1.04	1.01	1.06
Model 3: ACQ-C predicting beyond CBCL externalizing scale						
1. CBCL-ext	6.18	.013	5.48*	.94	.89	.99
2. CBCL-ext	18.44	.000	4.63*	.94	.89	.99
ACQ-C			9.70**	1.04	1.01	1.06
Model 4: ACQ-C predicting beyond RCMAS						
1. RCMAS	28.01	.000	17.76**	.80	.72	.89
2. RCMAS	30.66	.000	12.74**	.83	.74	.92
ACQ-C			2.54	1.02	1.00	1.05
Model 5: ACQ-C predicting beyond CDI						
1. CDI	19.63	.000	14.41**	.85	.77	.92
2. CDI	22.35	.000	7.65**	.88	.80	.96
ACQ-C			2.63	1.02	1.00	1.05

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

Note: A Wald test is used to test the statistical significance of each coefficient in the model

Hypothesis 4: Age and gender moderation

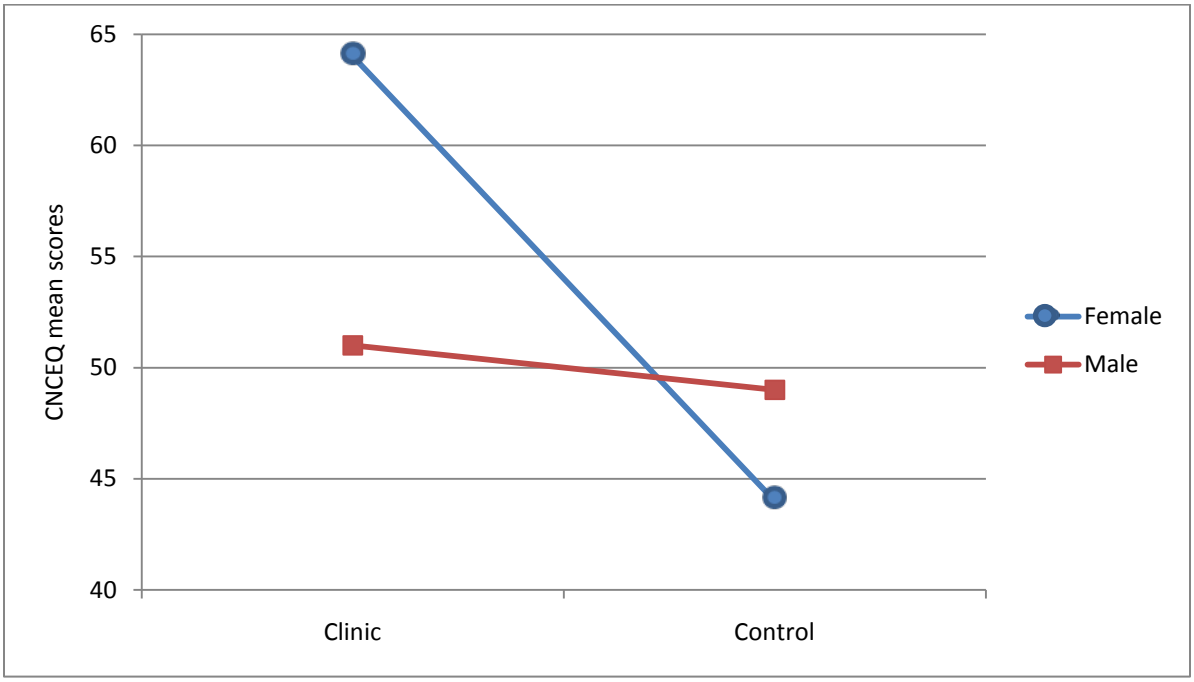
The potential that age and gender may moderate the link between the cognitive measures and anxiety disorder status was assessed in two ways—first, using ANOVAs (dichotomizing age as done in previous research; e.g., Weems et al., 2001) and examining significant interactions.

Second, because dichotomizing age can limit the power of the analysis, moderation was also tested with moderated logistic regression analyses, in which age was used as a continuous variable.

Moderation—ANOVA

In terms of the ANOVA strategy, a 2 (clinic or control) by 2 [age group (7-11 years and 12-17 years)] by 2 (gender) ANOVA, with the CNCEQ as the dependent variable, showed a non-significant main effect for age ($F(1, 71) = 1.88$, $p=.18$) and for gender ($F(1, 71) = 1.08$, $p=.30$), a non-significant interaction between sample (clinic or control) and age group ($F(1, 71) = .37$, $p=.55$), and no three-way interaction ($F(1, 71) = .57$, $p=.45$). However, there was a significant interaction between sample and gender ($F(1, 71) = 4.66$, $p<.05$), indicating that the relationship between CNCEQ scores and diagnostic status is influenced by gender. This interaction is depicted in Figure 1. To further explore this significant interaction, two two-tailed independent samples *t* tests were performed and results indicated that females in the clinic sample significantly differed on the CNCEQ from females in the control sample [clinic females ($n = 13$) $M = 63.00$ ($SD = 17.85$); control females ($n = 26$) $M = 43.26$ ($SD = 12.11$); $t(37) = 4.09$, $p<.001$]. However, males did not differ on the CNCEQ [clinic males ($n = 11$) $M = 50.35$ ($SD = 11.53$); control males ($n = 22$) $M = 51.00$ ($SD = 18.40$); $t(31) = -.11$, p=.92]. A second 2 (clinic or control) by 2 (age group) by 2 (gender) ANOVA was performed with the ACQ-C as the dependent variable. This analysis showed a non-significant main effect for age ($F(1, 71) = .00$, $p=.95$) and for gender($F(1, 71) = 1.06$, $p=.31$), no significant interactions between sample and age group ($F(1, 71) = .11$, $p=.75$) or between sample and gender ($F(1, 71) = .06$, $p=.80$), and no three-way interaction ($F(1, 71) = .20$, $p=.66$).

Figure 1. CNCEQ scores by sample and gender.



Moderation—Logistic Regression

The moderating effects of age and gender were also tested using moderated logistic regression analyses. It was examined whether age or gender moderated the relationship between interpretive biases (CNCEQ scores) and anxiety disorder status. In order to test gender as a potential moderator, anxiety disorder status was used as the dependent variable in the logistic regression model, then CNCEQ scores were entered into the first predictor block, gender into the second block, and the interaction term of gender x CNCEQ scores into the third block. Block 1 (CNCEQ scores) was significant ($\chi^2 = 6.42$, $p<.05$), and block 2 (gender) was not a significant step in the model ($\chi^2 = .01$, $p=.94$). Block 3 was a significant step in the model ($\chi^2 = 6.69$, $p<.05$), Wald = 5.71, $p<.05$ for the interaction term, indicating that gender did moderate the relationship between interpretive biases and diagnostic status.

In order to further explore the significant interaction, post-hoc probing was conducted, as recommended by Holmbeck (2002). The findings of the previous logistic regression analysis

illustrated that the association between CNCEQ scores and diagnostic status is conditional on values of the moderator (gender); but, those analyses did not identify the specific conditions (males/females) by which CNCEQ scores are significantly related to diagnostic status (Holmbeck, 2002). This post-hoc analysis is based on Holmbeck's (2002) use of linear regressions for post-hoc probing, although the present study employs a logistic regression model due to the dichotomous nature of the dependent variable (clinic vs. control samples). To examine the conditions of the moderator, the effects of gender (moderator) on the relationship between CNCEQ scores (predictor) and diagnostic status (outcome) were tested. Results of post-hoc probing showed that the CNCEQ was a significant predictor of diagnostic status for females (Wald = 8.52, $p<.01$, odds ratio = .92) but was not a significant predictor for males (Wald = .01, $p=.91$, odds ratio = 1.00).

In order to test age as a potential moderator in a logistic regression model, anxiety disorder status was used as the dependent variable, then CNCEQ scores were entered into the first predictor block, age as a continuous variable into the second block, and the interaction term of age x CNCEQ scores into the third block; and, age was centered in order to reduce the effects of multicolinearity (Tabachnick & Fidell, 2007). Results indicated that block 1 (CNCEQ scores) was significant ($\chi^2 = 6.42$, $p<.05$), and block 2 (age) was not a significant step in the regression model ($\chi^2 = .31$, $p=.58$). Block 3 was a statistically significant step in the model ($\chi^2 = 5.36$, $p<.05$), Wald = 4.29, $p<.05$ for the interaction term, indicating that age did moderate the relationship. Although results from the ANOVA indicated that age did not influence the relationship between CNCEQ scores and diagnostic status, age was dichotomized in the ANOVA (7 to 11-year-olds vs. 12 to 17-year-olds), but in the logistic regression analysis, age was used as a continuous variable.

Post-hoc probing of the significant interaction was conducted in the same way as with gender. To examine the conditions of the moderator, the effects of age (moderator) on the association between CNCEQ scores (predictor) and diagnostic status (outcome) were tested. Because age is a continuous moderator, it was centered prior to conducting the analysis in order to reduce the effects of multicollinearity; and, this allowed for the creation of slopes (representing relationships between predictor and outcome) for values of the moderator one standard deviation above and below the mean (Holmbeck, 2002). The mean age of the full sample is 10.97 years and the standard deviation is 3.29 years. Results of post-hoc probing indicated that the CNCEQ significantly predicted diagnostic status for values of age one standard deviation above the mean (older children; Wald = 7.75, $p<.01$, odds ratio = .91) but not for values of age one standard deviation below the mean (younger children; Wald = .10, $p=.75$, odds ratio = .99). Thus, results suggest that the predictive ability of the CNCEQ improved as a function of older age.[45]

In an additional set of logistic regression analyses, it was examined whether age or gender moderated the relationship between judgment biases (ACQ-C scores) and anxiety disorder status. These analyses were conducted in the same way as reported with the CNCEQ, and results indicated that neither age nor gender moderated the relationship.

[4] Due to the lack of incremental validity of the CNCEQ over the ACQ-C, it was explored whether the interaction terms (gender x CNCEQ scores, age x CNCEQ scores, as created in the previous logistic regression analyses) significantly predicted diagnostic status beyond that predicted by the ACQ-C. Results indicated that neither interaction term was a significant predictor while controlling for the ACQ-C.

[5] Due to the large amount of comorbid externalizing diagnoses of the clinic sample, it was also explored whether these interaction terms (gender x CNCEQ scores, age x CNCEQ scores) significantly predicted diagnostic status beyond that predicted by the CBCL externalizing scale. Results indicated that these interaction terms remained significant while controlling for the CBCL externalizing scale.

Discussion

This study adds to the research literature by demonstrating that interpretive biases (operationalized as negative cognitive errors and measured by the CNCEQ) differentiate youth with anxiety disorders from non-anxious youth, as suggested by theory (Beck, 1976; Weems & Watts, 2005) but until now not empirically tested. This study also adds to the literature by incrementing evidence that judgment biases (operationalized as anxiety control beliefs and measured by the ACQ-C) differentiate youth with anxiety disorders from non-anxious youth (Weems et al., 2003). It is also the first study to demonstrate significant differences in both types of cognitive biases across a sample of youth with anxiety disorders and a comparison sample matched on age, gender, ethnicity, and family income level. These results suggest that youth with anxiety disorders are more likely to have interpretive and judgment biases than their non-anxious peers.

Results add a congruent line of evidence to research showing a link between anxiety problems and interpretive and judgment biases in terms of the extant research showing that these biases are linearly related to anxiety symptoms in youth (Epkins, 1996; Leitenberg et al.,1986; Leung & Wong, 1998; Watts & Weems, 2006; Weems et al., 2001; Weems et al., 2003; Weems et al., 2007). Furthermore, while several of the previous studies used youth with non-clinical levels of anxiety and demonstrated relationships between cognitive biases and anxious symptoms, rather than diagnoses (Leitenberg et al., 1986; Watts & Weems, 2006; Weems et al., 2007), the present study was able to demonstrate differences in the cognitive biases by diagnostic status. While the results are consistent with theory, results also suggest that not every youth with an anxiety disorder exhibits more interpretive and judgment biases compared to their non-anxious peers (the role of moderators will be discussed) and results of the incremental analyses

were mixed. Results do suggest, though, that youth with anxiety disorders are more likely to score higher on the measures of these biases.

In examining the incremental validity of the CNCEQ and the ACQ-C, it was found that the ACQ-C predicted anxiety disorder status while controlling for the CNCEQ, but the CNCEQ did not predict anxiety disorder status while controlling for the ACQ-C. Although previous research has demonstrated the incremental validity of both the CNCEQ and ACQ-C in predicting anxious symptoms in a community sample (Weems et al., 2007), in the present study the full scale CNCEQ did not significantly add to the prediction of diagnostic status beyond that predicted by the ACQ-C. A number of reasons may account for this finding. The first is that a perceived lack of control over external threats and/or negative internal emotional and bodily reactions (i.e., judgment bias) is a more salient feature in the experience of an anxiety disorder relative to interpreting neutral stimuli in a negative way (i.e., interpretive bias). The clinic and control samples did significantly differ on CNCEQ scores, but this group difference was not as large as that with the ACQ-C (Cohen's d = .63 for CNCEQ, -.91 for ACQ-C).

Another explanation may be that the ACQ-C is a better specific predictor of anxiety than the CNCEQ. Evidence and theory suggests there may be content specificity in the type of cognitions that differentiate individuals with emotional disorders (Beck, 1976; Laurent & Stark, 1993; Leung & Poon, 2001; Weems et al., 2007). That is, the cognitive processes (e.g., to catastrophize, to overgeneralize) may not show specificity to different psychological disorders; the content of the cognitive schemas (e.g., loss/failure, fear of harm) may be more important (Beck & Emery, 1985; Beck et al., 1979). The content of the ACQ-C is focused on anxiety-related events and sensations and may, thus, be a better specific predictor of anxiety. The vignettes of the CNCEQ, on the other hand, primarily involve events of loss and failure (Leung

& Wong, 1998) and, due to its content, may not be as effective at predicting membership in an anxiety disordered sample compared to the ACQ-C. However, some evidence of incremental validity was found using the subscales of the CNCEQ.

In terms of incremental validity with the ACQ-C, the overgeneralizing subscale performed differently compared to the CNCEQ total score. Results of logistic regression analyses indicated that the overgeneralizing subscale did demonstrate incremental validity over the ACQ-C in predicting diagnostic status. The tendency to overgeneralize (i.e., to believe that a single negative outcome is representative of all similar future experiences) may be a more important cognitive feature in distinguishing clinically anxious youth compared to the other types of negative cognitive errors. While the relatively small size of the clinic sample should be considered and these analyses should be replicated with a larger sample of youth with anxiety disorders, the results pointing to differential findings depending on the use of CNCEQ subscale scores are consistent with past research showing differential associations with aspects of anxiety and depression (Epkins, 1996; Leung & Wong, 1998; Weems et al., 2001; Weems et al., 2007).

While the present results were consistent in part with past research, the pattern of linkages between anxiety and CNCEQ subscales has not always been consistent. For example, in a community sample of youth, Epkins (1996) used the Social Anxiety Scale for Children—Revised (SASC-R; La Greca & Stone, 1993) and the Children's Depression Inventory (CDI; Kovacs, 1981, 1992) to form groups of socially anxious children and dysphoric children, and found that the overgeneralizing and personalizing subscale scores were significantly higher in the social anxiety group compared to the dysphoric group. In a clinic referred sample of youth, Weems et al. (2001), found that the overgeneralizing subscale was the best predictor of trait anxiety (as measured by the State-Trait Anxiety Inventory for Children—trait scale (STAIC;

Spielberger, 1973)), while the selective abstraction subscale was the best predictor of depression (as measured by the CDI). So, while there seems to be some specificity in terms of subscales' links to anxiety, there also seems to be considerable sample variation. Thus, the results of the present study on the CNCEQ need to be understood in light of the moderators of the CNCEQ, as will be discussed next.

This study also adds to the research literature by describing the effects of age and gender on the relationships between interpretive and judgment biases and diagnostic status. Moderating effects were found for the CNCEQ but not for the ACQ-C. Results are consistent with previous research using the ACQ-C in finding that neither gender nor age had an effect on the relationship between judgment biases and anxiety in youth (Weems et al., 2003; Weems et al., 2007). Regarding the effects of age and gender on CNCEQ scores, previous findings have been mixed (e.g., Weems et al., 2001; Weems et al., 2007). Results from the present study show that both age and gender moderated the relationship between CNCEQ scores (interpretive biases) and anxiety disorder status. This finding is partially in contrast to Weems et al. (2001), who found that age but not gender moderated the relationship between interpretive biases and self-reported anxiety symptoms in a clinically anxious sample of youth; and, it is in contrast to Weems et al. (2007), who found that neither age nor gender moderated the relationship between interpretive biases and self-reported anxiety symptoms in a community sample of youth. However, the present study differs from both of the previously mentioned studies (Weems et al., 2001; Weems et al., 2007) in that it tested moderation on the relationship between interpretive biases and diagnostic status, not self-reported anxiety symptoms.

Regarding the influence of gender, results from post-hoc analyses suggested that CNCEQ scores are significantly related to diagnostic status for females but not males. That is, males in

the clinic sample were not differentiated from males in the control sample based on CNCEQ scores. As mentioned previously, CNCEQ scores did not predict diagnostic status beyond that predicted by the ACQ-C and may not be as salient in the experience of clinical anxiety. Perhaps this is true in the experience of clinical anxiety for males. That is, male youth with anxiety disorders may not be characterized by a tendency toward interpretive biases; this may be more of a characteristic of female youth with anxiety disorders. Research has shown that there is approximately a 2:1 girl to boy ratio for anxiety disorders (Costello et al., 2004) and that girls report more fears than boys (Ginsburg & Silverman, 2000; Ollendick, King, & Frary, 1989; Ollendick, Langley, Jones, & Kephart, 2001; Ollendick, Matson, & Helsel, 1985). It may be possible that biased ways of thinking and, specifically, interpretive biases could occur more often in anxious females and contribute to the increased rates of anxiety in girls. With the inconsistencies in the literature regarding sex differences in the occurrence of interpretive biases in anxious youth (Leitenberg et al., 1986; Weems et al., 2001; Weems et al., 2007), the effects of moderation on the CNCEQ should be tested in future studies using larger samples of youth with anxiety disorders.

Regarding the influence of age, findings from the post-hoc analyses suggest that CNCEQ scores are significantly related to diagnostic status for older children but not younger children. That is, the CNCEQ may be better able to predict diagnostic status in samples of older children. Furthermore, while there was not a significant difference across the age groups on the total amount of negative cognitive errors made (i.e., CNCEQ total scores), age was negatively linearly (as a continuous variable) associated with CNCEQ scores (Table 3). Together, these findings are consistent with other studies in which younger children (in community and clinic samples) tend to report more interpretive biases (Leitenberg et al., 1986) but these biases tend to be less

associated with anxiety levels (Weems et al., 2001). Thus, the interpretive biases exhibited by younger children may not be indicative of anxious symptoms or anxiety disorders, but of normal cognitive development (Weems et al., 2001). When older children report interpretive biases, it may be more strongly related to clinical levels of anxiety.

The present study also assessed the ability of the ACQ-C to predict diagnostic status beyond measures of anxiety and other psychological symptoms. Theoretically, cognitive biases and anxious symptoms (e.g., excessive fear) are two separate facets of childhood anxiety disorders and each should be able to predict diagnostic status on their own. The ACQ-C did predict diagnostic status beyond the RCADS-GAD subscale—a measure of DSM-based Generalized Anxiety Disorder symptoms, indicating that judgment biases distinguished the anxious children from the non-anxious children while controlling for self-reported symptoms of anxiety. This is particularly relevant because GAD was the most common anxiety diagnosis of the clinic sample. The ACQ-C also predicted diagnostic status beyond the CBCL internalizing scale—a parent-report measure of general internalizing symptoms and behaviors in his/her child. In addition, due to the comorbid diagnoses of the clinic sample, especially ADHD, the CBCL externalizing scale was also used as a covariate and results show that the ACQ-C did predict diagnostic status while controlling for parent-reported externalizing symptoms and behaviors. These results are noteworthy because they suggest that not only do judgment biases (anxiety control beliefs) differentiate youth with anxiety disorders from non-anxious youth, but they also expand the picture of childhood anxiety disorders beyond emotional disorder symptoms alone. That is, assessing judgment biases adds a description of anxiety disorders not evaluated by measures of affective and behavioral anxious symptoms.

The two remaining covariates in the logistic regression analyses were the RCMAS (a measure of self-reported anxiety symptoms) and the CDI (a self-report measure of depression). The ACQ-C did not predict diagnostic status while controlling for the RCMAS or the CDI. The RCMAS and CDI were each very strong predictors on their own with the largest effect sizes. This may be due to the fact that the RCMAS and the CDI both have large negative affectivity and cognitive components (Stark & Laurent, 2001). For example, the CDI includes questions that assess negative thinking (e.g., "I worry that bad things will happen to me," "I cannot make up my mind about things") and so does the RCMAS (e.g., "I have trouble making up my mind," "I often worry about something bad happening to me"). Moreover, research has shown that the RCMAS is good at identifying anxious versus non-anxious children and the CDI is good at identifying depressed versus non-depressed children, but they both lack discriminant validity in differentiating anxiety and depression (Brady & Kendall, 1992; Hodges, 1990; Stark, Kaslow, & Laurent, 1993; Wolfe et al., 1987). Taken together, it seems that the RCMAS and CDI are both excellent measures of general psychological distress—what many individuals with psychological disorders are likely to experience, and so it is not completely surprising that the cognitive measures did not predict beyond the RCMAS and CDI in this relatively small sample of anxious youth.

Limitations & Future Directions

This study is limited by the small size of the clinic sample and their varied comorbid diagnoses. A larger clinic sample as well as a sample of youth with anxiety disorders only may have increased the predictive abilities of the CNCEQ and ACQ-C. However, comorbidity is, in general, more the rule than the exception in childhood (Costello et al., 2004). The generalizability of these findings to other types of clinic samples is unknown. Future studies would benefit from including a sample of youth with anxiety disorders as well as a sample with

externalizing disorders and a sample with affective disorders. Another limitation is the cross-sectional nature of the present study. It is unclear whether interpretive and judgment biases are predictive of anxiety disorders in youth or simply associated with them. In addition, two other types of cognitive biases—attention and memory biases—were not assessed in the present study. Research is needed to investigate the relationships among interpretive, judgment, attention, and memory biases in samples of youth with anxiety disorders. Finally, self-report was the only method used to assess cognitive biases. However, child and parent report on diagnostic criteria (ADIS-C and ADIS-P) were used together to give diagnoses. It is important to note that in this literature in general, the outcome variable (e.g., levels of anxiety, cognitive biases, anxiety disorder status) has typically been limited to self-report and diagnoses (e.g., Weems et al., 2001; Weems et al., 2003). Although, Weems and colleagues (2007) did find that CNCEQ and ACQ-C scores predicted variance in levels of anxiety using a combined child and parent report of anxiety symptoms. The next generation of research on this topic may benefit from using other methods of outcome evaluation (e.g., behavioral observations, teacher report, avoidance behaviors, etc.).

Some issues examined in the present study remain unclear. The CNCEQ, for example, did not predict group membership in the anxiety disordered sample beyond that predicted by the ACQ-C and was significantly influenced by developmental and sex differences, which is both consistent with and in contrast to previous research (Weems et al., 2001; Weems et al., 2007). It is unclear from the present results if the clinic nature of the sample influences age moderation. Specifically, the sample size of the clinic youth was too small to test age as a continuous moderator of the cognitive symptoms' linear relation to RCMAS scores (e.g., the three-way interaction in the ANOVA was not significant but the cell size for these analyses was relatively small).

The substantial amount of comorbid diagnoses among the anxious youth may have limited the theoretical test of the role of cognitive distortions in anxiety disordered youth. That is, the incremental predictive ability of the CNCEQ and ACQ-C in a sample of youth with "pure" anxiety disorders (i.e., no comorbid externalizing or affective disorders) remains unknown. However, comorbidity between anxiety and externalizing problems and between anxiety and depression is extremely common (Costello et al., 2004). It should be noted that the rates of comorbidity in this sample were unusually high, especially with Attention-Deficit Hyperactivity Disorder (approximately 79% of the clinic sample met criteria for ADHD). Typical rates of children referred for anxiety problems who also have a comorbid externalizing disorder are around 20 to 30 percent (Franco, Saavedra, & Silverman, 2007; Masi et al., 2004).

Finally, it was found that not all anxious youth exhibit cognitive biases, particularly interpretive biases (e.g., males). Researchers have noted that because the role of cognition in childhood anxiety disorders is unclear, specific cognitive intervention for the treatment of childhood anxiety disorders may be unnecessary (Alfano et al., 2002). However, the results of this study suggest that some youth with anxiety disorders do indeed exhibit cognitive biases, and because biased cognitive processing is likely a significant part of the experience of anxiety at least for them, it is more relevant to address these biases in treatment for these youth. That is, it may be practically useful, in terms of treatment for anxiety disorders, to use the CNCEQ and ACQ-C to determine which children are exhibiting interpretive and judgment biases. Researchers have acknowledged the benefit of prescribing treatment to specific patient characteristics (Beutler, 1991; Eisen & Silverman, 1998; Kazdin, 1993). In the case of interpretive and judgment biases, some anxious youth may benefit from a more cognitive

treatment approach focused on these issues while others may benefit from a more behavioral treatment approach.

Despite its limitations, this study shows that interpretive and judgment biases are a significant part of the experience of anxiety disorders for many youth. These biases, which are not typically evaluated by commonly used measures of anxious symptoms or by DSM-based clinical interviews, may be important in choosing treatment methods that are best matched to the individual's unique characteristics. The efficacy of Cognitive Behavioral Therapy over the past decade points to the usefulness of addressing faulty or biased ways of thinking in anxious youth. In addition to changing negative cognitive errors, which some cognitive behavioral interventions may already focus on, it would likely be beneficial to also address anxiety control beliefs and foster a positive sense of control in anxious children.

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Vita

Melinda Cannon was born in New Orleans, LA and graduated from St. Mary's Dominican High School in 1999. She graduated Magna Cum Laude from Louisiana State University in May 2003 receiving her B.S. in Psychology. In August 2003, she entered the Applied Developmental Psychology doctoral program at the University of New Orleans. From August 2003 to May 2010, she conducted research with Dr. Carl Weems in the Youth and Family Stress, Phobia, and Anxiety Research Laboratory. She received her M.S. in Applied Developmental Psychology in August 2005 and her thesis was titled, "Comorbid anxiety and depression: Do they cluster as distinct groups in youth?" She will receive her Ph.D. in Applied Developmental Psychology in May 2010 from the University of New Orleans.