ABSTRACT

Title of Document:	A LONGITUDINAL EXAMINATION OF THE RELATIONSHIP BETWEEN CHILDHOOD EMOTIONAL ABUSE AND ANXIETY AMONG YOUTH: DISTRESS TOLERANCE AS A MEDIATING AND MODERATING FACTOR
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Background: Anxiety is the most common psychological problem experienced by youth. A number of factors are associated with the emergence of anxiety, including individual and environmental factors. Two such factors include childhood emotional abuse (CEA) and low distress tolerance (DT). The current study aimed to understand how more severe CEA and lower DT impacted anxiety symptoms among community youth. Specifically, we examined low DT both as a moderator and mediator in the relationship between CEA and anxiety. Methods: Participants were two cohorts of community youth. Cohort 1 included 244 youth (54% male, 50% White, 35% Black, 3% Hispanic, 11% mixed/other) with a mean baseline age of 12.01 years ($SD = 0.82$) assessed annually over five years. Cohort 2 included 109 youth (60% male, 11% White, 79% Black, 10% mixed/other) with a mean baseline age of 10.87 years ($SD = $

1.28) assessed annually over three years. Measures included the Revised Child Anxiety and Depression Scale, Childhood Trauma Questionnaire, and Behavioral Indicator of Resiliency to Distress. Results: In cohort 1, more severe CEA was associated with higher anxiety at baseline and with sharper decreases in anxiety over time. Lower DT was associated with higher anxiety at baseline, but did not predict changes in anxiety over time. Distress tolerance significantly moderated the relationship between CEA and anxiety, such that youth with both low DT and more severe CEA had the highest anxiety across all five assessments. Results using data from cohort 2 were not significant. Conclusions: These findings suggest lower DT amplifies the relationship between CEA and anxiety, such that youth with lower DT, who have been abused, are less likely to experience normalization in anxiety symptoms over time compared to youth with higher DT. These findings are in line with diathesis-stress models common to developmental psychopathology.

A LONGITUDINAL EXAMINATION OF THE RELATIONSHIP BETWEEN
CHILDHOOD EMOTIONAL ABUSE AND ANXIETY AMONG YOUTH:
DISTRESS TOLERANCE AS A MEDIATING AND MODERATING FACTOR

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Chapter 1: Overview

Anxiety disorders are among the most persistent, recurrent (Bruce et al., 2005; Kessler et al., 2010; Wittchen, Lieb, Pfister, & Schuster 2000), and frequently diagnosed psychiatric conditions (Kessler, Chiu, Demler, & Walter, 2005; Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012; Kessler, Ruscio, Shear, & Wittchen, 2010). With 12-month prevalence rates at 18% and lifetime prevalence rates at 34% (Kessler, Chiu, Demler, & Walter, 2005; Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012; Kessler, Ruscio, Shear, & Wittchen, 2010) anxiety disorders affect a large proportion of the population. Anxiety disorders generally are both more likely to be comorbid with themselves, as well as with other disorders, than are other psychiatric disorders (Toft, Fink, Oernboel, Christensen, Frostholm, & Olesen, 2005). They impose significant societal costs, estimated to be $42.3 billion annually and accounting for 32% in psychiatric treatment costs (Greenberg et al., 1999). Being diagnosed with an anxiety disorder is associated with lower personal income, increased rates of physical conditions, elevated rates of hospitalization, increased numbers of visits to the emergency room, and significantly higher medical costs (Comer et al., 2011; Marciniak, Lage, Landbloom, Dunayevich, & Bowman, 2004). In developed countries, when solely considering panic disorder and obsessive compulsive disorder (Murray & Lopez, 1996), or when considering generalized anxiety disorder and social phobia (Mathers, Vos, & Stevenson, 1999), these two anxiety disorder couplings account for more total burden of disease than breast cancer, HIV, diabetes, cirrhosis of the liver, or melanoma.

Problems with anxiety typically emerge during childhood and early adolescence (Kessler et al., 2005; Roza, Hofstra, van der Ende, & Verhulst, 2003), with 10-25% of youth reporting clinically significant symptoms of anxiety (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Kessler et al., 2012). Across this developmental period, anxiety is the most commonly diagnosed disorder in epidemiological studies; lifetime prevalence rates of anxiety disorders are as high as 32% among adolescents (Merikangas et al., 2010), mirroring rates observed among adults. These rates demonstrate that this is a critical developmental period for understanding the emergence of anxiety. Importantly, even moderate levels of anxiety symptoms in youth are associated with functional impairments (Dell'Osso et al., 2003). Thus, the aforementioned disorder rates might not capture the scope of the problem of anxiety among youth. Indeed, significant disabilities can be present among youth who have symptoms of anxiety, but do not meet diagnostic criteria for an anxiety disorder (Angold, Costello, Farmer, Burns, & Erkanli, 1999; Copeland, Shanahan, Costello, & Angold, 2009). Overall, late childhood and early adolescence represents a critical time period to examine in order to understand the development of anxiety.

Although overall rates of anxiety disorders are generally stable across adolescence (Merikangas et al., 2010), both homotypic and heterotypic continuity are common for anxiety disorders during this developmental period (Bittner, Egger, Erkanli, Costello, Foley, & Angold, 2007; Gregory, Caspi, Moffitt, Koenen, Eley, & Poulton, 2007). In general, homotypic continuity is observed for anxiety disorders during the transition from childhood to adolescence, whereas heterotypic continuity is

observed during the transition from adolescence to adulthood, (see multi-site epidemiological longitudinal study: Copeland et al., 2013). Different types of anxiety have different ages on onset; for example, among adolescents, rates of PTSD, social phobia, and generalized anxiety disorder increase with age (Merikangas et al., 2010). Thus, there is considerable variability in rates of *specific* types of anxiety disorders over this developmental period, while overall rates of having *any* anxiety disorder more broadly appear fairly consistent throughout adolescence (Costello, Egger, Copeland, Erkanli, & Angold, 2011). Within a meta-analysis focused on anxiety emergence over time, all disorders except for separation anxiety disorder continued to be diagnosed through age 21 (Costello et al., 2011), suggesting that there is considerable variability in, and increases in, rates of particular types of anxiety throughout this developmental period.

When attempting to understand how and why symptoms of anxiety emerge across childhood and adolescent development, it is relevant to not only examine factors that predict changes in anxiety symptoms, but also to examine factors associated with the persistence of anxiety symptoms over time (e.g. Beesdo, Knappe, & Pine, 2009). Currently, it is unclear how a number of risk factors might interact to predict the presence of, persistence of, and increases in anxiety symptoms across development in youth. Understanding these early baseline characteristics that influence the course of anxiety is not only relevant in understanding how and why anxiety develops, but also in formulating appropriate targeted interventions for anxiety in youth. This is of particular relevance, as the majority of individuals do not receive treatment for anxiety until several years after being diagnosed (Wang et al.,

2007; Wang, Berglund, Olfson, Pincus, Wells, & Kessler, 2005), with adults retrospectively reporting waiting 9-23 years before seeking treatment after the initial onset of their anxiety disorders. Thus, by identifying early risk factors, preventative strategies could be employed prior to the emergence of significant anxiety problems.

Overview of Childhood Emotional Abuse

Childhood emotional abuse (CEA), defined as verbal assaults or humiliating/demeaning behavior directed towards a child by an adult (Bernstein & Fink 1998), is a particularly stressful life event associated with elevated rates of anxiety (Chu, Williams, Harris, Bryant, & Gatt, 2013; Gibb, Chelminski, & Zimmerman, 2006; Harkness & Wildes, 2002; Kent & Waller, 1998). It has been suggested that emotional abuse underlies all other forms of abuse, making it the common core of all childhood abuse (Claussen & Crittenden, 1991; Hart & Brassard, 1987). Although about six percent of children are frequently and severely emotionally abused (Cawson et al., 2000), more than 60% of youth experience less frequent or less severe CEA (Vissing, Straus, Gelles, & Harrop, 1991). In general, rates of emotional abuse, as measured via adult retrospective reports, range from 6-35%; however CEA is the most underreported form of abuse to child welfare agencies (Barnet, Miller-Perrin & Perrin, 2005; Edwards, Holden, Felitti, & Anda, 2003), suggesting this form of abuse may often go unnoticed. Because CEA is often ignored, it can occur over long periods of time and can significantly impact children's emotional and psychological functioning (Yates, 2007). Thus, CEA is a particularly relevant risk factor to examine when attempting to understand the emergence and persistence of anxiety symptoms among youth.

In the field, there have been difficulties defining what types of parental behavior constitute emotional (psychological) abuse with behaviors like spurning, terrorizing, isolating, exploiting/corrupting, denying emotional responsiveness, and overall neglect considered to be components of this type of abuse (e.g. Garbarino, Gutterman, & Seeley, 1986; Goldman, Salus, Wolcott, & Kennedy, 2003; Hart, Binggeli, & Brassard, 1998). Others have suggested that emotional abuse includes persistent hostility, inappropriate stimulation of the child's aggression and/or sexuality, grossly inconsistent care, exploiting the child for another person's needs, having seriously unrealistic expectations of the child, and failing to respond to children's needs (Glaser, 2002). More broadly, it has been suggested that CEA can be described as any parental behaviors negating children's self-esteem and developmental needs (O'Hagan, 1995). We initially consider emotional abuse here using the latter broader definition in order to more thoroughly understand the myriad negative outcomes associated with it. Thus, articles discussing emotional maltreatment/abuse, psychological maltreatment/abuse, and nonphysical harm will all be considered as patterns of caregiving that would convey to the child that he or she is "worthless, flawed, unloved, unwanted, endangered, or of value only in meeting another's needs" (American Professional Society on the Abuse of Children [APSAC], 1995, p. 2).

Childhood emotional abuse represents an important risk factor for anxiety for a number of reasons. First, factors associated with CEA, like parental rejection, coldness, and authoritarianism, have all been associated with the development of anxiety (Beesdo et al., 2009). Second, individuals who have experienced CEA have

increased amygdala reactivity to emotional faces (happy, sad, angry, fearful, and neutral), as compared to individuals who have not experienced CEA (Van Harmelen et al., 2013), which could explain why these individuals are more likely to be anxious. Third, CEA is specifically linked with elevated rates of "any anxiety disorder", with particularly elevated rates of social anxiety disorder (SAD; Gibb, et al., 2006). Among adults who have, versus have not experienced CEA (adults who experienced physical or sexual abuse were excluded from this study), higher rates of PTSD were observed among those who experienced CEA (Chirichella-Besemer & Motta, 2008). Fourth, CEA more strongly predicts individuals' automatic "self-anxiety associations" (on the Implicit Association Task, IAT, self-anxiety associations were measured by determining how rapidly individuals paired words like "anxiety" with "me" as compared to words like "calm" with "me") than do physical and sexual abuse (van Harmelen, Jong, Glashouwer, Spinhoven, Pennix, & Elzinga, 2010). Fourth, the experience of CEA is strongly linked to later endorsement of anxiety symptoms, with a larger effect size for CEA than physical abuse and an effect size of similar magnitude to sexual abuse, on later anxiety (Schneider, Baumrind, & Kimerling, 2007; Teicher, Samson, Polcari, & McGreenery, 2006). Multiple studies have demonstrated CEA is associated with elevated anxiety symptoms above and beyond childhood physical and sexual abuse (Kent & Waller, 1998; Spertus, Yehuda, Wong, Halligan, & Seremetis, 2003; Wright, Crawford, & Del Castillo, 2009). Fifth, CEA but not physical or sexual abuse, is associated with the presence and severity of both trait anxiety and social anxiety (He, Pan, & Meng, 2008; Kuo et al., 2011; Simon et al., 2009). Finally, the negative outcomes associated with CEA have been shown to

be more pervasive than those associated with other types of abuse (Kaplan, Pelcovitz, & Labruna, 1999) and to be associated with increased chronicity of anxiety (Hovens, Giltay, Spinhoven, Pennix, & Zitman, 2012). Thus, CEA may be a specific risk factor associated with the occurrence and persistence of anxiety among youth.

To understand how CEA might affect rates of anxiety over time, it is relevant to consider how CEA emerges and changes across childhood and adolescence. Studies focused on variations in rates of emotional abuse at different ages have demonstrated mixed findings. For example, some epidemiological studies demonstrate that rates of parent-reported CEA are highest during early childhood and are somewhat lower during adolescence (e.g. Straus & Field, 2003), whereas others show rates of past-year self-reported CEA to be higher among older youth as compared to younger youth (Finkelhor et al., 2005). Studies utilizing reviews of public records have also demonstrated mixed findings. In Canada, utilizing a national sample of youth involved in child welfare cases, rates of CEA appeared to be somewhat consistent at different ages, with the highest rates of CEA reported for boys between 8 and 11 years old and for girls between12 and 15 years old (Trocmé et al., 2005). In the United States, a review of child protective services reports found that rates of CEA were higher among 8-11 years-old youth and were lower among 12-17 year-old youth (Sobsey, Randall, & Parrila, 1997). Thus, based on a synthesis of these findings, the years from late childhood through early adolescence appear to be a critical range to examine in order to understand how CEA influences the emergence and persistence of anxiety, as some of the highest rates of CEA are observed during this time period.

When attempting to understand how CEA affects the emergence of anxiety, there have been fewer studies examining this relationship in youth than in adults. Studies have demonstrated that verbal abuse is associated with internalizing problems (Caples & Barrera, 2006) and anxiety symptoms (Teicher, Samson, Polcari, & McGreenery, 2006) in youth. Notably, when examining the effects of physical, sexual, and emotional abuse on Arab adolescents, emotional abuse by mothers was the most important predictor of anxiety (Al-Fayez, Ohaeri, & Gado, 2012). Within a large sample of 10-15 year-old Canadian youth, emotional abuse, as compared to physical and sexual abuse, was more strongly associated with elevated rates of anxiety (Tonmyr, Williams, Hovdestad, & Draca, 2011). When prospectively examining the effects of emotional maltreatment, emotional neglect, peer victimization, and hopelessness on anxiety and depression among adolescents, CEA predicted increases in both anxiety (total anxiety, physical anxiety, and social anxiety symptoms) and depression, whereas peer victimization predicted depressive, but not anxiety symptoms (Hamilton et al., 2013). Unfortunately, other studies focusing on the relationship between child abuse and anxiety focus on abuse more broadly, rather than examining the effects of different types of child abuse (e.g. CEA). However, there have been some studies focusing on mediators of this relationship, which will be discussed later in this proposal.

Mediators and Moderators of the Relationship between CEA and Anxiety

Despite the strong associations observed between CEA and anxiety, not all youth develop psychopathology following abuse (Collishaw, Pickles, Messer, Rutter, Shearer, & Maughan, 2007), which suggests there may be important domains of

resiliency moderating the post-abuse trajectory. Rates of abuse are highest during the transition from childhood to adolescence. Thus, this is a critical developmental period for exploring underlying characteristics moderating the trajectory of anxiety symptoms. Moreover, it is important to determine whether abuse during this period is associated with persistent problems with anxiety for particular youth throughout adolescence. Separately, when attempting to understand how CEA is associated with anxiety, it is critical to examine intermediary processes affected by CEA that contribute to anxiety. That is, how does the experience of CEA change the youth and why are these particular changes associated with anxiety? An examination of mediators of the relationship between CEA and anxiety can help to resolve some of these questions. More broadly, who goes on to develop anxiety after experiencing CEA, why do they develop anxiety, and how is this anxiety maintained over time? There have been a number of studies that have attempted to explore these intermediary processes and trait-like characteristics.

Low Distress Tolerance as a Potential Risk Factor for Anxiety

Low distress tolerance is an important factor that might help to explain who develops anxiety post-abuse, or why abuse leads to anxiety. Distress tolerance (DT) is conceptualized both as one's perceived ability to tolerate negative emotional or physical experiences, as well as the behavioral capacity to persist in goal-directed behavior in the face of distress (Leyro, Zvolensky, & Bernstein, 2010). The conceptual framework of DT assumes that a primary motivation of individuals with low DT is the escape or avoidance of negative emotions or physical sensations (Simons & Gaher, 2005), which suggests that individuals with low DT are likely to

respond in a maladaptive manner when exposed to distressing events (Leyro et al., 2010). Based on this, low DT could serve as a mediator of the relationship between CEA and anxiety if the experience of CEA led to decreases in DT, which then led to increases in anxiety. Another perspective might suggest that low DT is a moderator of this relationship; if low DT is a trait-like characteristic, then youth with low DT who experienced CEA might be those with the most elevated levels of anxiety.

Low distress tolerance (DT) has been implicated in increases in anxiety symptoms among adolescents and adults. Cross-sectional work demonstrates that low DT is associated with internalizing symptoms among young adolescent girls (Daughters et al., 2009); is uniquely associated with elevated levels of panic, obsessive compulsive, general worry, and social anxiety symptoms among adults (Keough, Riccardi, Timpano, Mitchell, & Schmidt, 2010); and predicts agoraphobia (Telch, Jacquin, Smits, & Powers, 2003), panic (Marshall, Zvolensky, Vujanovic, Gregor, Gibson, & Leyro, 2008), and hoarding (Timpano et al., 2009) among adults. Thus, low DT appears to be associated with a variety of internalizing symptoms. However, it is unclear how or why low DT is associated with anxiety.

Distress tolerance is linked with a number of other conceptually related risk factors that have been explored as mediators and moderators of the relationship between child abuse and anxiety. Related constructs include experiential avoidance, emotional suppression, avoidant coping, and emotion dysregulation (Leyro et al., 2010). A brief summary below, based on the review by Leyro and colleagues (2010), will outline the similarities and differences between these constructs. Experiential avoidance is described as a set of behaviors intended to change the form or frequency

of unpleasant internal experiences; it is suggested that DT may be a component of this. Emotional suppression involves the inhibition of emotional experiences, which differs from DT, as DT may or may not involve the suppression per se of emotions. Avoidant coping is a set of conscious, voluntary behaviors and cognitive processes that can be used to manage stressors that seem unmanageable; DT could be the driver, or be driven by this process but is conceptually distinct. Emotion dysregulation involves challenges related to regulating one's emotions and one's behavioral responses to emotional states; although DT is similar to this construct, it is likely a narrower construct, or perhaps a lower order component of this construct. Importantly, recent work demonstrated that low DT and poor emotion regulation strategies independently contribute to avoidance (McHugh, Reynolds, Leyro, & Otto, 2013). As these constructs are all related to DT, it is relevant to examine their impact on the relationship between CEA and anxiety.

DT as a Potential Mediator

Linehan's (1993) seminal work suggests that child abuse impedes the development of emotion regulation. Although this research is far from conclusive, it does hint at a possible early causal chain by which CEA decreases children's ability tolerate and regulate distress, which, in turn, increases levels of anxiety symptoms. Below, the relationship between CEA, anxiety, and constructs related to DT will be explored. These constructs include experiential avoidance, emotional inhibition, emotional non-acceptance, and emotion dysregulation.

Prior research demonstrates that children who have experienced CEA and emotional invalidation (comprised of psychological abuse, parental punishment,

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minimization, and distress in response to negative emotions) are more likely to use avoidance-based regulatory strategies and to have problems with emotion regulation (Eisenberg, Cumberland, & Spinrad, 1998). These avoidance-based regulatory strategies and emotion dysregulation challenges in turn have been associated with the development of anxiety. Similarly, chronic emotional inhibition in adulthood mediates the relationship between childhood emotional invalidation and anxiety symptoms in adulthood (Krause, Mendelson, & Lynch, 2002). More recently, cross-sectional research examining retrospective reports of CEA found that experiential avoidance and emotional non-acceptance were predicted by CEA (Gratz, Bornovalova, Delany-Brumsey, & Lejuez, 2007). Moreover, within a cross-sectional sample of college students, emotional inhibition mediated the relationship between CEA and psychological distress (Krause et al., 2003). Following this, Reddy and colleagues (2006) demonstrated that experiential avoidance significantly mediated the relationship between CEA and mental health symptoms (e.g. anxiety) in a cross-sectional undergraduate sample. They suggested that experiential avoidance serves as a coping strategy for youth experiencing CEA from caretakers because it allowed youth to mentally escape from their negative experiences, despite being physically present. In a study of 912 female undergraduates, CEA was the strongest predictor of emotion dysregulation (as compared to physical and sexual abuse), with emotion dysregulation partially mediating the relationship between CEA and symptoms of posttraumatic stress. (Burns, Jackson, & Harding, 2010). This suggests that emotional abuse, in particular, leads to emotion dysregulation and resulting symptoms of anxiety. The authors hypothesized that the greater frequency and chronicity of CEA,

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as compared to physical and sexual abuse, might place an overwhelming burden on children's ability to effectively regulate and manage negative emotions, thereby resulting in deficits in the development of emotion regulation skills. Finally, recent work suggests youth who have experienced trauma or who are anxious reallocate attentional resources to processing negative emotional states and away from executive functioning relevant to decision-making, which may lead to rash decision making (e.g. Gagnon, Daelman, McDuff, & Kocka, 2013; Kahneman & Treisman, 1984) and potentially lower distress tolerance. All of these studies suggest that anxiety develops as a function of avoidance of emotions and problems with emotions after CEA.

As previously noted, emotion dysregulation and low distress tolerance are related, but unique constructs (McHugh et al., 2013). Up until this point, low DT has not been examined as a critical component of the relationship between CEA and anxiety. Moreover, none of the aforementioned studies focused on experiential avoidance, emotion dysregulation, or avoidance coping using behavioral measures of these constructs. As prior work has demonstrated that self-report and behavioral measures of distress tolerance are not significantly associated with one another (McHugh et al., 2010), it is likely that the reliance on self-report measures has limited our understanding of some of these relationships. Finally, many of these studies were cross-sectional, limiting out interpretation of causality.

DT as a Potential Moderator

Previous research demonstrates that some individuals may be more sensitive to the deleterious effects of child abuse because of particular underlying characteristics. Indeed, there are a number of genetic, temperamental, and

personality-based characteristics that might help to explain the relationship between child abuse and anxiety (e.g. Cicchetti & Rogosch, 2007; DeYoung, Cicchetti, & Rogosch, 2011; Kagan, Snidman, Arcus, & Reznick, 1994; Moffitt et al., 2007; Prior, Smart, Sanson, & Oberklaid, 2000; Rubin & Mills, 1991; Schwartz, Snidman, & Kagan, 1999). Here, we explore evidence suggesting DT is a stable trait-like characteristic that would serve as a moderator of the relationship between CEA and anxiety.

Prior research has demonstrated that DT is a stable, trait-like characteristic among youth (e.g. Cummings, Bornovalova, Ojanen, Hunt, MacPherson, & Lejuez, 2013), suggesting that youth who demonstrate lower levels of DT and are exposed to early stressful experiences may be at heightened risk for later psychopathology. Specifically, for children who are emotionally abused, concomitant deficits in distress tolerance might to lead to increases in anxiety symptoms, as compared to abused children who are better able to tolerate distress. However, to date, no study has examined these relations over the course of adolescence. It is possible that low DT acts as a diathesis that is activated in the context of an early stressor such as CEA. This finding is consistent with vulnerability-stress models common to overarching developmental psychopathology frameworks (e.g. Schulenberg, Maggs, Steinman & Zucker, 2001). Such models highlight the importance of considering both early personality variables and environmental factors in understanding the emergence of disorders across the early lifespan. This perspective is supported by recent work of Cummings and colleagues (2013) demonstrating that DT is a stable construct across adolescence. However, as prior work has demonstrated early trauma is associated

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with greater fluctuations in stress reactivity and psychopathology across developmental stages (e.g. Trickett, Noll & Putnam, 2011), it will be important to explore relationships between trauma, DT, and anxiety over time.

Measuring Distress Tolerance

When attempting to understand how low DT relates to CEA and anxiety, it is necessary to consider the most appropriate method for conceptualizing and measuring the construct of DT. There are a number of self-report and behavioral measures of distress tolerance that have been utilized (see Leyro et al., 2010 for a review). These include self-report measures of individuals' perceptions of their ability to withstand negative emotion and aversive states, as well as biobehavioral measures of withstanding these negative states. However, self-report and behavioral measures of DT likely capture different components of this construct, as scores on these measures generally are not significantly associated with one another (McHugh et al., 2010). There are a number of methodological and interpretive problems with self-report measures for youth more broadly, including youth's difficulties interpreting what questions mean, problems with accurately reporting inner experiences, and an unwillingness to report certain inner experiences (Hunt, Hopko, Bare, Lejuez, & Robinson, 2005; Lejuez et al., 2002; Wills, Sandy, & Yaeger, 2002). Thus, behavioral measures may be able to capture a unique aspect of DT different from those assessed by self-report measures. Moreover, behavioral measures do not rely on youth's ability to describe their inner states and motivations. Rather, behavioral measures of DT assess an individual's willingness to persist on an increasingly difficult and distressing task. Research demonstrates that individuals who do, versus do not quit on

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these tasks, experience similar levels of self-reported distress; thus, the task is thought to index an individual's willingness to persist, despite that distress (Daughters et al., 2009; MacPherson et al., 2010).

Current Study

The majority of studies attempting to understand the relationship between CEA and anxiety have utilized self-report measures of all variables assessed, including self-report measures of mediators and moderators. Additionally, studies focusing on mediators of the relationship between CEA and anxiety have utilized cross-sectional data, making it impossible to determine temporal sequencing between the variables assessed. Finally, in the literature, distress tolerance and related factors have been described both as stable trait-like characteristics, as well as process variables, making it difficult to determine their function (e.g. Cummings et al., 2013; Krause et al., 2002, 2003; Reddy et al., 2006). Thus, there is considerable room for methodological improvements to address these challenges.

In the current study, we examined how CEA and DT affected anxiety over time by examining DT both as a mediator and moderator of the relationship between CEA and anxiety. First, we examined both the specific effects of baseline CEA and baseline DT, as well as their interaction, on levels of anxiety from late-childhood through early-adolescence. We hypothesized that higher rates of self-reported CEA and lower DT, as measured by a behavioral task, would predict increases in anxiety symptoms over time. Second, we examined whether low DT was a mediator of the relationship between baseline CEA and later anxiety. We hypothesized that low DT would amplify the relationship between CEA and anxiety symptoms, such that youth

who experienced CEA would develop lower DT and would report the highest levels of anxiety symptoms over time.

Chapter 2: Specific Aims

Aim 1. To prospectively examine the relationship between baseline CEA, baseline DT, and anxiety symptoms measured annually among young adolescents.

>*Hypothesis 1a.* Youth who endorsed more severe CEA at baseline would evidence the highest levels of anxiety symptoms over time.

>*Hypothesis 1b.* Youth with the lowest DT scores at baseline would evidence the highest levels of anxiety symptoms over time.

Aim 2. To prospectively examine whether baseline DT moderated the relationship between baseline CEA and anxiety symptoms measured annually among young adolescents

>*Hypothesis 2.* Baseline DT would moderate the relationship between baseline CEA, such that youth with low DT and high CEA would have the highest levels of anxiety symptoms over time

Aim 3. To examine whether DT mediated the relationship between CEA and anxiety symptoms

>*Hypothesis 3.* Elevated CEA at baseline would lead to low DT measured at time 2. Low DT measured at time 2 would lead to elevated anxiety symptoms measured at time 3. The relationship between baseline CEA and time 3 anxiety symptoms would be mediated by time 2 DT.

Chapter 3: Conceptual Models

1. Mediation Model
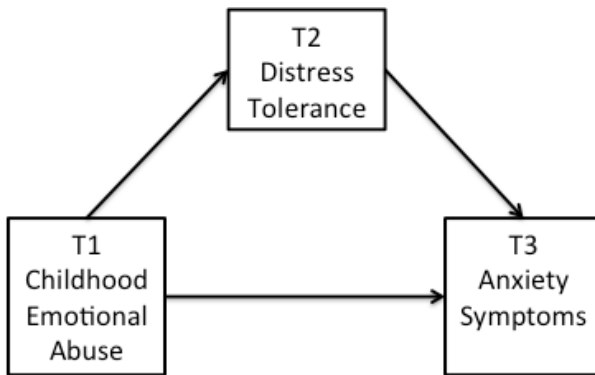
2. Moderation Model

Chapter 4: Method

Participants

The current study included two cohorts of youth and their families recruited in the Washington D.C. Metropolitan Area. The study was initially open to 5th and 6[t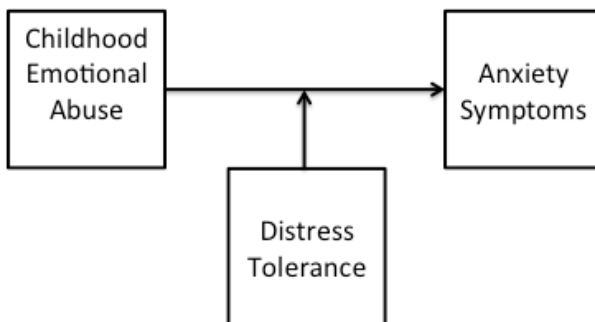h] grade youth proficient in English; no other exclusion criteria were employed. Youth and their families were recruited through media outreach and through postings and fliers at community centers, area schools, libraries, and Boys and Girls clubs. For the first cohort, we targeted recruitment more broadly, whereas for the second cohort, we targeted recruitment to include more minority and low socioeconomic status youth. The first cohort included 277 youth followed over six annual assessments; the current study utilized data collected during years 2-6 because measures of childhood emotional abuse were not administered during the first year of assessment. There were 244 youth in cohort 1 who attended the second annual assessment (50.0% White, 34.6% Black, 2.9% Hispanic, 12.3% mixed/other; see Table 1a), while the second cohort included 109 youth (11.3% White, 78.3% Black, 11.4% mixed/other; see Table 1b), who were followed over three annual assessments. Youth who participated in the first wave of data collection were invited to participate in all subsequent waves (regardless of whether they missed previous data collections; see Tables 1a and 1b for retention). To assess for the impact of attrition, we compared participation for all youth who completed measures at each wave of the study to those who did not complete measures at that particular wave, as a function of gender, race/ethnicity, DT, CEA, and anxiety symptoms.

Study procedures and confidentiality requirements were separately described to parents and youth at each assessment session; informed consent and assent were obtained. Youth and their parents were administered all measures in separate private rooms. The parents provided demographics, including age, annual family income, education, and race/ethnicity about themselves and their child. Youth completed a variety of self-report and computerized assessments. Parents and youth were compensated for study participation. The University of Maryland Institutional Review Board approved study procedures.

Measures

      Revised Child Anxiety and Depression Scale (RCADS; Chorpita et al., 2000). The RCADS is a reliable and valid self-report questionnaire for youth corresponding to DSM-IV anxiety and depressive disorders, including major depressive disorder, social phobia, panic disorder, separation anxiety disorder, generalized anxiety disorder, and obsessive–compulsive disorder. (Chorpita et al., 2000; Chorpita, Moffitt, & Gray, 2005). In line with previous studies, we created a Total Anxiety Scale composite, which included 37 items from the five anxiety disorder subscales (Ebesutani, Chorpita, Higa-McMillan, Nakamura, Regan, & Lynch, 2011; Ebesutani et al., 2012). Items in this composite score were ranked on a 4-point Likert scale on frequency of occurrence (e.g., never, sometimes, often, always). Items targeted anxiety symptoms experienced by youth (e.g., "I worry when I think I have done poorly at something", "When I have a problem, my heart beats really fast"), which all load onto a broad anxiety factor (Ebustani et al., 2012) that was examined continuously. The Total Anxiety Scale composite score has both

convergent and divergent validity when compared to other measures of anxiety and depression (Ebustani et al., 2011; Ebustani et al., 2012), with higher scores indicating higher levels of anxiety. The RCADS was administered at each annual assessment so that we could track changes in anxiety symptoms over time. Across all of the annual assessments in both cohorts, internal consistency of this Total Anxiety Scale was excellent (α = .93 - .97).

Childhood Trauma Questionnaire (CTQ; Bernstein & Fink 1998). We administered the Emotional Abuse subscale of the Childhood Trauma Questionnaire (CTQ) to all youth in the current study. The CTQ is a well-validated self-report measure of CEA. In the current study the Physical and Sexual Abuse subscales were not administered. Previous work demonstrates scores on the CTQ are stable over time and have discriminant and convergent validity with other measures of trauma (Bernstein, Fink, Handelman, & Foote, 1994). Additionally, when the CTQ is compared with trauma ratings from child welfare records and reports of family members and clinicians, it has good sensitivity and satisfactory specificity (Bernstein, Ahluvalia, Pogge, & Handelsman, 1997). Within cohort 1 of our sample, internal consistency of the CEA subscale was good (α = .84). Internal consistency of the CEA subscale was similarly good for cohort 2 (α = .75). The CEA subscale contained five items (e.g., "I thought that my parents wished I had never been born" and "I felt that someone in my family hated me") scored on a 5-point Likert scale (1 = never true, 2 = rarely true, 3 = sometimes true, 4 = often true, 5 = very often true) and examined whether participants experienced humiliating or demeaning behavior from adults in their lives, including threats to their well-being or verbal assaults. In the current

study, we examined baseline CEA scores continuously as a predictor of the Total

Anxiety score.

The Behavioral Indicator of Resiliency to Distress (BIRD; Lejuez,

Daughters, Danielson, & Ruggiero, 2006) was developed as a computerized measure

of DT. Briefly, during the BIRD, youth used a computer mouse to click on a dot

appearing above one of ten numbered boxes. When a box was successfully clicked

before the dot moved, points were earned. If youth did not click the dot before it

moved or the wrong box was clicked, a loud and unpleasant noise was made and

points were not be earned. Throughout the task, the total number of points earned was

displayed. The BIRD had three levels that increased in difficulty, until success on the

task was impossible. The first level of the BIRD lasted 3 minutes and began with a 5-

second latency between dot presentations. This latency titrated (correct selections

reduced the latency by 0.5 seconds whereas incorrect selections increased the latency

by 0.5 seconds) and an average latency was calculated to index youths' skill levels.

The second level of the BIRD lasted 5 minutes and was more difficult; it began with

the average latency from the previous level for 4 minutes and halved the latency for

the final minute, making the task extremely difficult (challenge latency). Following a

brief rest period, the final level included the challenge latency for up to 5 minutes;

youth were informed they could quit the game at any time during the final level, but

that the magnitude of the prize earned would be dependent upon their performance on

the task. Persistence on this final level was used to measure DT and was examined

continuously as the number of seconds youth persisted on the task. This measure has

previously been used as an indicator of DT among community youth (Daughters et al., 2009).

Analyses

      Cohorts 1 and 2 path analyses. Initial hypotheses were tested using path analysis, which is an extension of the regression model, in Mplus 6 (Muthén & Muthén, 2010). We utilized a full information maximum likelihood (FIML) estimation method to handle missing data across the study waves, as FIML provides less biased parameter estimates than ad hoc procedures and is more robust to non-normal data (Little & Rubin, 1987). In order to examine the relationship between CEA, DT, and the RCADS Anxiety Total score (hereafter referred to as Anxiety), across three waves of data within both cohorts, we used a structural equation model (SEM) and estimated fit with four fit indices: the χ^2 statistic, the Comparative Fit Index (CFI; Bentler, 1990), the Tucker-Lewis Index (TLI, Tucker-Lewis, 1973) and the Root Mean Square Error of Approximation (RMSEA; Steiger, 1990). Good fit was indicated by CFI and TLI values $\geq$ .90, RMSEA values $\leq$ .08, and nonsignificant chi-square values (Schweizer, 2010). However, since chi-square values are sensitive to sample size, the CFI, TLI, and RMSEA served as the primary measures of model fit. In all models, we included gender, age, and race/ethnicity as potential covariates. We conducted preliminary analyses examining skewness for Anxiety scores to determine whether these scores deviated from normality.

      To examine hypotheses 1a and 1b in the first three waves of assessment across cohorts 1 and 2, time 3 Anxiety was regressed onto baseline CEA and baseline DT, controlling for prior levels of Anxiety (Figure 1). To examine hypothesis 2, time 3

Anxiety symptoms were regressed onto the interaction between baseline DT and baseline CEA, controlling for prior levels of Anxiety (Figure 1). We hypothesized that youth who endorsed more severe CEA and who quit on the BIRD at baseline would have the highest level of Anxiety at time 3.

To examine hypothesis 3, which suggested that (1) more severe CEA at time 1 would predict lower DT at time 2, (2) lower DT scores at time 2 would predict elevated Anxiety at time 3 and (3) time 2 DT would mediate the relationship between baseline CEA and time 3 Anxiety, we tested a longitudinal structural equation model. We examined the confidence interval around the indirect effect using the bootstrapping method, as described by Preacher and Hayes (2008), which does not assume normality. The indirect effect of CEA on Anxiety through DT was considered significant if the confidence interval did not include zero. The full model we tested is in Figure 2 with the hypothesized mediation pathway in red.

Cohort 1 hierarchical linear modeling analyses (HLM). To probe hypotheses 1 and 2 more thoroughly, we examined trajectories of Anxiety across five years using available data from youth in cohort 1 because cohort 2 was limited in the number of waves of data available and in the number of participants who attended follow-up assessments. Further, we were interested in examining moderation over a longer developmental period. We examined within-subjects variation in Anxiety and predictors of the course of Anxiety using multi-level modeling conducted with HLM 6 (Scientific Software International Inc., IL) to assess individual-level change (level 1) and prediction of individual-level differences in change (level 2). This multilevel approach allowed the analysis of covariation in data over time between repeated

measures of multiple variables, which are considered to be non-independent observations (Bryk & Raudenbush, 1987). This multilevel approach is able to model growth curves even when there are missing data for the outcome variable (Anxiety) by estimating the trajectory based on existing data for individuals. Within this type of growth model, main effects at level 2 implicitly represent a cross-level interaction with time (Curran, Bauer, & Willoughby, 2006).

For all analyses, Anxiety was treated as the dependent variable. Time was anchored at baseline (time = 0) so that the Anxiety intercept (β_{00}) reflected the average of individuals' Anxiety at baseline. To examine main effects and interactions of level 2 predictors on the intercept and slope of Anxiety trajectories, interaction terms were created by z-score transforming continuous variables, then multiplying the terms to reflect the product of level 2 predictors of interest (Aiken & West, 1991). All models included random slopes and random intercepts.

We utilized a model building approach to estimate the contributions of level 1 and 2 predictors. First, baseline trajectory models were estimated to examine any systematic change over time in Anxiety. We estimated linear and quadratic growth models to examine within-subjects regression of an individual's Anxiety onto the time of each assessment. Then, between-subjects level-2 independent variables were examined as predictors of Anxiety over time. In these analyses, within-subjects intercepts and slopes were treated as outcomes to be predicted by the between-subjects variables measured at baseline. We tested for the significance of main effects accounted for by covariates (gender, baseline age, race/ethnicity), baseline DT, and baseline CEA. Then, we tested a full model, including the interaction between

baseline DT and baseline CEA. In order to understand moderation, we probed

interaction terms with simple slopes tests (Aiken & West, 1991; Cohen & Cohen,

1983).

Chapter 5: Results

Cohorts 1 and 2 Descriptive Analyses

All means and standard deviations for key dependent and independent variables are presented in Tables 1a and 1b. Within cohort 1, 122 youth (50% of the sample) quit the BIRD task at Time 2, with an average persistence of 219 seconds (Table 1a) on the 300-second task. Within cohort 2, of the 40 youth who completed the BIRD task at Time 2, 52.5%, or 21 youth quit the BIRD task, with an average persistence of 191 seconds. Anxiety was fairly stable over time (Tables 1a and 1b) and on average, youth from the community reported low levels of CEA (Tables 1a and 1b).

Table 2a presents correlations between Anxiety scores at the five assessment points for cohort 1 and all major study independent variables. Anxiety measured at all five time points was highly positively correlated (rs = .40- .70). Child sex was negatively correlated with Anxiety at all assessment points, except for the baseline assessment, indicating that boys had lower Anxiety than girls over time (rs = -.20 - -.26). Childhood emotional abuse was significantly correlated with Anxiety at every assessment point, except for the final assessment, indicating that youth with more severe CEA had higher Anxiety (rs = .19 - .53). Low DT was significantly correlated with Anxiety at Years 2, 4, and 6 (rs = -.14 - -.26). Neither CEA nor DT was significantly correlated with any of the demographic variables. No other correlations were significant in cohort 1.

Table 2b presents correlations between Anxiety at the three assessment points for cohort 2 and all major study independent variables. In cohort 2, Anxiety assessed

at Years 2 and 3 were significantly positively correlated ($r = .46$); however, Year 1 Anxiety was not significantly correlated with either Year 2 or Year 3 Anxiety. Childhood emotional abuse was significantly positively correlated with Years 1 and Year 2 Anxiety (rs = .24 and .63, respectively), but not with Year 3 Anxiety. Distress tolerance was not significantly correlated with Anxiety at any of the three assessments; however gender was significantly correlated with DT, in that boys had higher DT than girls ($r = .34$). No other correlations were significant in cohort 2.

Examination of attrition. Within the full sample of 386 youth, 39 (10.1%) did not complete the Childhood Trauma Questionnaire, 45 (11.7%) did not complete the Time 1 BIRD, 38 (9.8%) did not complete the Time 1 RCADS, 125 (32.4%) did not complete the Time 2 BIRD, 87 (22.5%) did not complete the Time 2 RCADS, and 106 (27.5%) did not complete the Time 3 RCADS. Cohort 2 had particularly high attrition rates (see Table 1b), which impacted overall rates of missing data. There were a number of factors that contributed to high rates of attrition in cohort 2, including scheduling difficulties, staff turnover, and loss of contact with families. Rates of attrition were much lower in cohort 1 than in cohort 2.

For cohort 1, the majority of participants completed all assessments. Within this cohort, 56.7% completed all six assessments, 18.1% completed five assessments, 10.1% completed four assessments, 5.4% completed three assessments, 4.0% completed two assessments, and 5.8% solely completed the baseline assessment. We examined whether attrition was significantly associated with any baseline characteristics, or with any of our variables of interest. The number of assessments completed was not significantly associated with CEA, Anxiety, gender,

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race/ethnicity, or age. However, youth with lower DT completed significantly fewer assessments, whereas youth with higher DT completed a greater number of assessments (β = .199, $t(220)$ = 3.00, p = .003). This indicates for cohort 1 there is covariate dependent dropout, which can be controlled by including DT in the statistical model (Little, 1995; Little & Rubin, 1987).

For cohort 2, 35.8% completed all three assessments, 32.1% completed two assessments, and 32.1% only completed the baseline assessment. We examined whether attrition was significantly associated with any baseline characteristics, or with any of our variables of interest. The number of assessments completed was not significantly associated with CEA, DT, gender, race/ethnicity, age, or Anxiety in cohort 2. Thus, high attrition rates within this cohort could not be explained by any of our variables of interest.

Cohorts 1 and 2 Path Analyses.

To examine hypothesized main effects, as well as the interaction between CEA and DT, a fully-saturated model, including DT at Time 1 (T1), CEA (T1), the interaction between DT and CEA (T1), Anxiety (T1-T3), age, gender, and ethnicity was estimated. Time 3 Anxiety was regressed onto CEA (T1), DT (T1), the interaction between DT and CEA (T1), and covariates. Time 3 Anxiety was significantly predicted by T1 Anxiety (β = .30, SE = .06, p < .001) and gender (β = 3.78, SE = 1.42, p = .008). Childhood emotional abuse and DT were marginally significant (ps = .056 and .081, respectively) in predicting T3 Anxiety. Time 3 Anxiety was not significantly predicted by the interaction between CEA and DT, indicating moderation was not significant in this model.

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To examine hypothesized mediation, a model including DT (T1 and T2), CEA (T1), Anxiety (T1-T3), and the covariates age, gender, and ethnicity was estimated. Here, Anxiety (T3) was regressed onto Anxiety (T2), DT (T2), CEA (T1) and covariates. Then, DT (T2) and Anxiety (T2) were regressed onto Anxiety (T1), DT (T1), and CEA (T1). Finally, DT was examined as a mediator of the relationship between CEA (T1) and Anxiety (T3). The model fit the data well: *RMSEA* = .05, *CFI* = .95, *TLI* = .91, $\chi^2(26) = 240.38$, $p < .001$. Time 3 Anxiety was significantly predicted by T2 Anxiety ($p < .001$) and by gender ($p = .05$), but not by T2 DT or T1 CEA (*p's* > .05). Time 2 Anxiety was significantly predicted by T1 Anxiety ($p < .001$) and was marginally associated with T1 CEA ($p = .07$), but not with baseline DT ($p > .05$). Time 2 DT was not significantly predicted by any baseline characteristics or covariates (*p's* > .05). Time 2 DT did not mediate the relationship between baseline CEA and T3 Anxiety ($p > .05$). In order to determine whether high rates of attrition in cohort 2 might be affecting the data, we examined the above analyses only within cohort 1; similar results were obtained when only using cohort 1 participant data. Thus, these analyses did not support the model hypothesizing Time 2 DT as a mediator of the relationship between Time 1 CEA and Time 3 Anxiety.

Cohort 1 HLM Analyses.

In order to examine hypothesized main effects, as well as the interaction between CEA and DT, in cohort 1 across five waves of data, two levels of equations were estimated. On level-1, we estimated each individual's Anxiety at baseline (i.e., intercept) and their change in Anxiety over time (i.e., slope). We examined models of linear and quadratic changes in Anxiety. The level-1 model demonstrated a

significant linear decrease in Anxiety over time (Table 3), but not a significant

quadratic effect. Thus, we included a linear term, but not a quadratic term, in our

equation estimating changes in Anxiety over time. Within this model, the random

error terms associated with the intercept and slope were significant, demonstrating

variability among youth Anxiety and thereby supporting the examination of between-

person predictors of these components.

On level-2, we initially examined three covariates potentially associated with

youth Anxiety. Here, baseline age and race/ethnicity were not associated with the

slope or intercept of Anxiety (p's > .05). Additionally, gender was not significantly

associated with the intercept (p > .05). However, gender was significantly negatively

associated with the slope of Anxiety, indicating boys experienced significant

decreases in Anxiety over time as compared to girls (β = -1.54, SE = 0.50, t = -3.05, p

= .003, see Figure 3). Because of this, we included gender as a level-2 covariate in

our final model. Additionally, since gender was a significant predictor of the slope of

Anxiety, we also examined whether it moderated the relationship between CEA and

Anxiety, or DT and Anxiety. When examining these models, neither the interaction

between gender and DT, nor gender and CEA was significantly associated the

intercept or slope of Anxiety (all p's > .05).

We used the following equations to estimate our model effects:

Level-1:

$Anxiety_{ij} = \beta_{0j} + \beta_{1j}*(TIME_{ti}) + r_{ij}$

Level-2:

Intercept: $Anxiety_{0j} = \gamma_{00} + \gamma_{01}*(MALE_i) + \gamma_{02}*(CEA_i) + \gamma_{03}*(DT_i) +$

$$\gamma_{04}*(CEAxDT_i) + r_{0j}$$

Slope: $Anxiety_{1j} = \gamma_{10} + \gamma_{11}*(MALE_i) + \gamma_{12}*(CEA_i) + \gamma_{13}*(DT_i) +$

$$\gamma_{14}*(CEAxDT_i) + r_{1j}$$

In order to explore our hypotheses, we separately examined the main effects of baseline childhood emotional abuse and distress tolerance on baseline Anxiety and on the Anxiety trajectory on level-2. In our sample, more severe baseline CEA was significantly associated with higher baseline levels of Anxiety ($\beta = 6.57$, $SE = 0.70$, $t = 9.40$, $p < .001$) and with a greater decrease in Anxiety over time ($\beta = -1.49$, $SE = 0.24$, $t = -6.18$, $p < .001$; Figure 4). Lower baseline DT was significantly associated with higher baseline levels of Anxiety ($\beta = -1.81$, $SE = 0.81$, $t = -2.23$, $p = .027$; Figure 5), but was not associated with the Anxiety trajectory ($p > .05$).

To determine whether DT was a moderator of the relationship between CEA and Anxiety, the interaction between DT and CEA was added to the level-2 model. As shown in Table 3, there was a significant interaction between baseline DT and baseline CEA on baseline Anxiety and on the Anxiety trajectory. To better understand this interaction, we substituted values one standard deviation above the mean DT score and one standard deviation below the mean DT score into the HLM equations so that model coefficients would reflect the effects of CEA when DT was at high and low levels (Aiken & West, 1991; Cohen & Cohen, 1983). For youth with lower DT, CEA was associated with higher baseline Anxiety ($\beta = 9.93$, $SE = 1.10$, $t = 9.06$, $p < .001$) and with a greater decrease in Anxiety over time ($\beta = -2.15$, $SE = 0.38$, $t = -5.73$, $p < .001$). For youth with higher DT, CEA was associated with lower

baseline Anxiety ($\beta = 4.23$, $SE = 0.90$, $t = 4.72$, $p < .001$) and less decrease in Anxiety

over time ($\beta = -0.99$, $SE = 0.32$, $t = -3.14$, $p < .01$). Closer examination of these

findings suggest that that youth with lower DT have higher initial levels of Anxiety

and a sharper decline in Anxiety over time as a function of CEA, as compared to

youth with higher DT (Figure 6). Importantly, although the youth with lower DT and

more severe CEA had a steeper decline in their Anxiety slope over time as compared

to youth with higher DT and more severe CEA, the former group sustained the

highest levels of Anxiety across all time points examined (Figure 6). In contrast,

youth with higher DT and more severe CEA had similar levels of Anxiety to youth

with less severe CEA at the final assessment point (Figure 6). This suggests low DT

magnifies the effects of CEA on Anxiety over time.

Chapter 6: Discussion

Late childhood to early adolescence is a critical period in which to examine the development of anxiety symptoms in youth. Because anxiety typically emerges during this developmental period (Kessler et al., 2005; Roza et al., 2003) and is the most commonly diagnosed disorder in this group (Merikangas et al., 2010), it is critical to understand factors underlying its progression. A better understanding of these factors not only is important for understanding the relationship between environmental and individual characteristics leading to anxiety, but also is relevant to developing targeted intervention approaches. Thus, the current study focused on individual and environmental factors previously shown to be associated with elevated anxiety symptoms among youth: childhood emotional abuse and low distress tolerance. Further, we examined the main effects of these factors, as well as mediation and moderation by distress tolerance, on the relationship between childhood emotional abuse and anxiety symptoms trajectory during this critical developmental period.

Main Effects

In cohort 1, across the five assessment years, anxiety symptoms decreased as a function of time, consistent with previous research demonstrating decreases in anxiety among young adolescents during a three-year assessment period (Gullone, King, & Ollendick, 2001). In line with this, the majority of our analyses focused on examining factors associated with sustainment of anxiety symptoms over time and factors associated with decreases in anxiety symptoms over time.

Similar to previous work, girls had higher levels of anxiety symptoms across adolescent development as compared to boys, who experienced decreases in anxiety as a function of time (Albano & Krain, 2005; Lewinsohn, Gotlib, Lewinsohn, Seeley, & Allen, 1998; Silverman & Carter, 2006). Disparities in anxiety symptoms as a function of gender emerged during the study period and persisted across the five years assessed, which also is in line with previous work (Roza et al., 2003). Interestingly, gender was not associated with CEA or DT in the current study, as boys and girls reported similar rates of CEA and performed similarly on the BIRD. In addition, gender did not act as a moderator of the relationship between CEA and anxiety or DT and anxiety. Thus, gender independently predicted levels of anxiety symptoms across time. Although the current study was not designed to address gender-based disparities in rates of anxiety, our findings are in line with a rich body of work that has repeatedly demonstrated similar patterns of results.

Youth with more severe CEA had the highest levels of anxiety symptoms at baseline, which is in line with previous work (e.g. Tonmyr et al., 2011; Wright et al., 2009). Further, more severe CEA predicted having the highest average level of anxiety symptoms across the five assessment points in cohort 1. When examining anxiety as a function of time, youth with the highest initial levels of anxiety showed the sharpest decreases in anxiety over time, which is in concordance with previous findings (Gullone et al., 2001). Following this, more severe CEA was associated with the sharpest declines in anxiety over time. However, despite decreases in levels of anxiety over time as a function of CEA, more severe CEA was associated with persistence in anxiety over time. Thus, while more severe CEA predicted the sharpest

decrease in anxiety over time, it also predicted the highest levels of anxiety across all five assessment points.

Although we did not test the impact of childhood physical or sexual abuse on anxiety, CEA may be a more potent predictor of anxiety as compared to these other types of abuse. Indeed, previous research demonstrates emotional abuse is as strong of a predictor as, or is a stronger predictor of anxiety compared to physical or sexual abuse in college students, young adults, and Arab and Canadian adolescents (Al-Fayez et al., 2012; Gibb et al., 2006; He et al., 2008; Kent & Waller, 1998; Kuo et al., 2011; Schneider et al., 2007; Simon et al., 2009; Spertus et al., 2003; Teicher et al., 2006; Tonmyr et al., 2011; Wright et al., 2009). Furthermore, negative outcomes associated with CEA have been shown to be more pervasive and to be associated with increased chronicity of anxiety, as compared to other types of abuse (Hovens et al., 2012; Kaplan et al., 1999). Despite this, it will be important to identify whether our pattern of findings extends to physical and sexual abuse in youth. Overall, our findings do meaningfully extend this body of research by demonstrating a relationship between CEA and anxiety among a sample of youth, assessed across five years, during a critical developmental period.

Following this, youth with low DT had the highest levels of anxiety at baseline. Additionally, lower DT was associated with higher average levels of anxiety across all five assessment points. In contrast to CEA, however, DT was not associated with changes in anxiety over time, but rather showed a consistent effect on symptom levels over time. These findings are in line with previous cross-sectional work demonstrating relationships between low DT and anxiety across a variety of samples

(e.g. Daughters et al., 2009; Keough et al., 2010; Marshall et al., 2008; Telch et al., 2003; Timpano et al., 2009) and extend these results to both boys and girls. This relationship between low DT and high anxiety persisted in the current study, despite the fact that youth with lower DT were more likely to drop out of our study. Had these youth remained in the current study, it is possible that even higher levels of anxiety symptoms may have been observed among youth with lower DT over time. These higher rates of dropout among youth with lower DT is in line with patterns of attrition observed in treatment research, where low DT participants are more likely to drop out of treatment compared to high DT participants (e.g. Daughters, Lejuez, Bornovalova, Kahler, Strong, & Brown, 2005; MacPherson, Stipelman, Duplinsky, Brown, & Lejuez, 2008). Thus, in order to better understand the effects of low DT on anxiety symptom trajectories, it will be important in future research to ensure the retention of participants with lower DT. Our findings are also in line with previous work that prospectively examined the relationship between low DT, life stressors and obsessions among college students, which demonstrated low DT predicted increased daily obsessions among those experiencing greater daily negative events (Macatee, Capron, Schmidt, & Cougle, 2013). Our work broadens and extends those findings by prospectively examining the effects of lower DT on anxiety symptom trajectories across a multi-year period. Further, our study extends across anxiety symptoms more broadly and helps explicate the relationship between distress tolerance and childhood emotional abuse.

Moderation and Mediation

One purpose of the current study was to explore whether we should conceptualize distress tolerance as a mediator or moderator of the relationship between CEA and anxiety. This is an important issue when considering DT more broadly and it has not been satisfactorily explored in previous research. Although prior work has shown that DT is stable, across multiple assessments in youth (Cummings et al., 2013), it is possible the constricted time frame assessed in that study (3 year period) did not allow a sufficient examination of variability in DT. Thus, the findings of the current study and prior work potentially raise more questions than they answer. Currently, it is unclear what types of factors might influence levels of DT among youth and at what ages these factors might be relevant. It is possible there is a developmental period where environmental factors influence overall levels of distress tolerance that have not been captured by extant research. Conversely, it is possible DT is a stable temperamental factor that is consistent across childhood and adolescence. This is an empirical question deserving further exploration.

Beyond Cummings and colleagues' (2013) study and the current study, little work has been conducted examining distress tolerance longitudinally or its impact on psychopathology over time. Furthermore, although the current study supported moderation and did not find an effect for mediation, it is possible that we were unable to detect underlying mediation because of limited power or the time frame examined. Thus, replication of this pattern of findings is critical. Interestingly, there have been a number of recent studies among adults that have examined DT as a moderator of the relationship between relevant factors and anxiety, where low DT amplified the magnitude of these relationships (e.g. Kraemer, Luberto, & McLeish, 2013; Macatee

et al., 2013; Vujanovic, Hart, Potter, Berenz, Niles, & Bernstein, 2013). The findings of this body of research are in line with the current study and provide a basis for suggesting youth with low DT, who are exposed to early stressful experiences like emotional abuse, may be at heightened risk for persistent anxiety symptoms. Thus, low DT may act as a diathesis that becomes activated when experiencing a stressor like CEA, which is in line with vulnerability-stress models (e.g. Schulenberg et al., 2001). Such models highlight the importance of considering both early personality variables and environmental factors in understanding the emergence of disorders across the early lifespan. However, it is possible these studies of adults examine DT after it has stabilized, whereas research with younger children might be able to capture more variability in DT as a function of environmental factors.

Broadly, our study stresses the detrimental effects likely to be experienced by all youth exposed to CEA and highlights a potential pathway of vulnerability uniquely contributing to differences in anxiety symptoms observed among youth with low DT. As hypothesized, youth who had the lowest levels of DT and the most severe CEA had the highest levels of anxiety symptoms over five years. Although youth with both high DT and more severe CEA had a similar trajectory of anxiety symptoms as youth with low DT and more severe CEA, at the final assessment the former had similar levels of anxiety as youth with less severe CEA. This suggests lower DT, in particular, might increase the persistence of higher levels of anxiety symptoms over time among youth who have experienced more severe CEA, making it difficult for these youth to experience a normalization of anxiety symptom levels.

Limitations and Future Directions

In sum, our findings contribute to the conceptualization of DT as a moderator of the relationship between CEA and anxiety; however, there are a number of factors complicating these findings. There were a variety of challenges when determining whether DT should be conceptualized as a mediator or moderator of the relationship between CEA and anxiety. Difficulties determining when CEA began, high rates of attrition in cohort 2, and higher attrition rates in cohort 1 as a function of low DT, made it difficult to explore DT as a mediator of the relationship between CEA and anxiety. First, our assessment of CEA administered at baseline asked youth whether they had ever experienced specific abusive behaviors from adults in their lives. Because of this, we were not able to determine when these abusive behaviors were initiated, which made it difficult to assess whether this abuse caused changes in DT prior to our first year of data collection. It is possible early abuse experiences did contribute to decreases in DT that we were unable to capture in the current study, since we recruited 10-12 year-old youth. It will be important in future research examining this relationship to attempt to capture when these types of abusive experiences begin in order to determine whether DT is affected by CEA. Thus, it will be important to examine this relationship in younger adolescents and to assess CEA onset. Second, although we had a large sample and sufficient power to examine meditational relationships, it is possible that high rates of attrition in cohort 2 obfuscated potential mediation. It will be important to better ensure participant retention in future work. Finally, as youth with lower DT in cohort 1 were less likely to complete assessments than youth with higher DT, it is possible this differential attrition impacted our ability to observe mediation. Although our findings

demonstrate that DT moderates the relationship between CEA and anxiety within the age range examined, it will be necessary in future work to examine whether DT may also mediate this relationship, as described above. Increasing participant retention, better capturing when CEA begins, and prospectively assessing DT and CEA at younger ages will help explicate the relationships between these variables.

There were a number of broader limitations unrelated to the moderation versus mediation question in the current study that must be considered when interpreting our findings. First, we utilized self-report measures of childhood emotional abuse and anxiety, which could be subject to information biases or inaccurate reporting; for example, it is possible youth who reported more severe CEA were also more likely to self-report higher levels of anxiety symptoms. However, self-reported CTQ scores are highly concordant with child welfare reports and reports on abuse from family member (Bernstein et al., 1997) and youth-reported RCADS scores are highly concordant with interview-based assessments of symptomatology (Chorpita et al., 2000), suggesting youth were able to accurately report their abuse experiences and anxiety symptoms. Further, since parents are unlikely to report this type of behavior, youth reports of CEA are likely the most valid assessment method for this type of abuse. Thus, although it would be beneficial to include informant reports of symptomatology and abuse in future work, findings in the current study are not minimized by youth reported outcomes. Second, we were unable to examine whether this relationship is specific to CEA, or whether DT also acts as a moderator of the relationship between physical/sexual abuse and anxiety. It will be important in future work to determine whether DT amplifies the effect of all types of abuse on

anxiety. Finally, this was a convenience-based community sample. It will be

important to determine whether this relationship holds in randomly selected and

clinical samples in order to determine its relevance to prevention and treatment.

Despite these limitations, there are a number of strengths of the current work.

First, we had a diverse sample of youth who participated in the current study. Second,

we prospectively examined the effects of CEA on anxiety, which has not previously

been done in any study, to our knowledge. Third, we also prospectively examined the

effect of DT on anxiety symptoms, which also has not previously been done in any

study, to our knowledge. Fourth, we examined both mediation and moderation to

better understand the nature of the effect of distress tolerance on the relationship

between CEA and anxiety. Finally, and perhaps most importantly, our study is the

first to demonstrate a prospective relationship between all of these factors on anxiety

in youth. These findings suggest the importance of targeting all of these factors to

decrease their impact on anxiety symptoms. However, further replications and

extensions of this work are necessary in order to better understand causality and

determine mechanisms underlying these patterns.

Clinical and Research Implications

There are a number of broader clinical and research implications of these

findings. Our work suggests the importance of considering CEA in the development

and maintenance of anxiety symptoms. Too often, researchers and clinicians focus on

physical and sexual abuse to the exclusion of emotional abuse, which frequently co-

occurs with other forms of abuse, is associated with a host of negative outcomes, and

amplifies the effects of other forms of abuse (Clemmons, Walsh, DeLillio, &

Messman-Moore, 2007). Indeed, emotional abuse predicts emotion dysregulation above and beyond physical or sexual abuse (Banducci, Hoffman, Lejuez, & Koenen, 2014). Thus, although emotional abuse has often been ignored, our findings suggest it must be assessed within research and addressed within therapy because of its strong associations with anxiety symptoms.

Traditional treatments targeting traumatic childhood experiences, like prolonged exposure therapy (e.g., Gilboa-Schechtman, Foa, Shafran, Aderka, Powers, Rachamim, & Apter, 2010) and cognitive processing therapy (e.g., Matulis, Resick, Rosner, & Steil, 2013) are more appropriate for physical or sexual abuse experiences. Thus, clinicians may struggle when determining how to effectively address emotional abuse among youth presenting to treatment with anxiety symptoms or other psychopathology. These findings raise the possibility that certain youth (i.e., low DT youth) who experience emotional trauma early in life might be particularly vulnerable to anxiety, which suggests targeted intervention strategies might be most helpful for these individuals. Simultaneously focusing efforts toward reducing CEA, when this type of parental behavior is detected, and enhancing DT might result in the best outcomes for youth.

Following this, there are a number of potential areas to target. First, it is possible intervening on low DT among youth who have experienced CEA could contribute to their anxiety symptoms normalizing as their DT increased. As previous research demonstrates changes in DT can be targeted in brief interventions (e.g. Bornovalova et al., 2012), it is possible increasing DT could improve youth resiliency to CEA. Second, it is important to focus concurrently on reducing problematic

parental behaviors such as CEA. Targeted interventions could be developed for parents of anxious youth, if youth reported parental CEA, to help their parents become more aware of how their behaviors affected their children. Clearly, there are a number of challenges associated with targeting CEA, as it is less observable than physical or sexual abuse, occurs at a much higher frequency than other forms of abuse, and is the most underreported form of abuse to child welfare agencies (Barnet et al., 2005; Edwards et al., 2003; Medrano et al., 1999; Mullen et al., 1996; Vissing et al., 1991). However, despite these challenges, it is important to target environmental factors like CEA both within prevention and intervention efforts, while simultaneously addressing low DT. Beyond increasing low DT among youth, interventions targeting elevated levels of anxiety symptoms due to CEA experiences may be critical within the treatment process and are an additional area of future research. Clearly, additional work is necessary in this area to understand how these factors interact and to determine how to best intervene with youth who have pre-existing characteristics that increase their vulnerability to abusive adult behaviors.

Conclusions

Currently, it is unclear *how* the experience of childhood emotional abuse leads to elevated anxiety symptoms; thus, it will be necessary to examine more thoroughly this relationship. The lack of clarity not only is challenging within research, but also is problematic for treatment providers, who may be uncertain of how they should best address anxiety symptoms among youth that may be linked to their emotional abuse experiences. Our findings do suggest youth with low DT are more sensitive to CEA, but these findings must be replicated before it would be appropriate to integrate them

into treatment. Overall, emotional abuse can be traumatic for many youth, but is often unaddressed by therapists because of a lack of evidence-based therapies for its treatment and a lack of understanding of factors underlying the relationship between CEA and anxiety.

In conclusion, our work demonstrates lower DT and more severe CEA are potent predictors of anxiety symptoms trajectories across adolescent development. Low DT potentiates the effects of CEA, such that anxiety symptoms are more likely to be maintained over time and at a higher level, as a function of low DT. This complex relationship hints that CEA acts as a stressor to the pre-existing diathesis of low DT. Future extensions and replications of these main effects and interactions are necessary to ensure our findings extend to other groups and within clinical populations. Overall, youth anxiety symptom trajectories across adolescence are influenced by a number of important individual and environmental factors, including gender, childhood emotional abuse, and distress tolerance.

Tables

Table 1a. Means and Standard Deviations of Dependent and Independent Variables in Cohort 1.

Factor M (SD)	Wave 2 N = 244	Wave 3 N = 246	Wave 4 N = 231	Wave 5 N = 210	Wave 6 N = 179
RCADS Anxiety	22.41 (13.38)	20.60 (13.01)	19.92 (12.70)	18.69 (11.58)	17.63 (12.19)
Age	12.01 (0.82)	13.05 (0.89)	14.01 (0.89)	15.04 (0.95)	16.02 (0.99)
Persistence on BIRD	219 (102.53)	216 (102.63)			
CEA	7.54 (3.50)				
Sex	54.5% male				
Annual Income	$97,809 $\pm$ $55,163				

Table 1b. Means and Standard Deviations of Dependent and Independent Variables in Cohort 2.

Factor M (SD)	Wave 1 N = 109	Wave 2 N = 56	Wave 3 N = 49
RCADS Anxiety	21.87 (15.89)	16.91 (15.71)	18.27 (19.26)
Age	10.87 (1.28)	12.00 (1.22)	13.14 (1.17)
Persistence on BIRD	180.51 (127.28)	190.93 (130.05)	
CEA	7.30 (3.02)		
Sex	60.2% male		
Annual Income	$55,977 $\pm$ 54,603		

CEA is childhood emotional abuse, BIRD is the behavioral indicator of resiliency to distress; the measurement is in seconds (maximum 300 seconds), RCADS is the revised child anxiety and depression scale.

Table 2a. Correlation Matrix of Dependent and Independent Variables in Cohort 1.

	Male	Y2_Anx	Y3_Anx	Y4_Anx	Y5_Anx	Y6_Anx	White	CEA
Male	___							
Y2_Anx	-.001	___						
Y3_Anx	-.195**	.597**	___					
Y4_Anx	-.223*	.431**	.573**	___				
Y5_Anx	-.255*	.406**	.572**	.677**	___			
Y6_Anx	-.258**	.400**	.479**	.596**	.696**	___		
White	.018	-.010	.024	.052	.104	.175*	___	
CEA	.050	.532**	.290**	.275**	.188**	.065	-.034	___
DT	.010	-.140*	-.100	-.189**	1.144	-.255**	.039	-.032

Table 2b. Correlation Matric of Dependent and Independent Variables in Cohort 2

	Male	White	CEA	DT	Y1_Anx	Y2_Anx
Male	___					
White	.075	___				
CEA	-.063	.031	___			
DT	.341*	.234	-.126	___		
Y1_Anx	-.117	-.059	.235*	.012	___	
Y2_Anx	.092	.046	.632**	-.240	.025	___
Y3_Anx	-.035	.127	.184	-.152	.055	.461**

*Note: $^*p < .05$; $^{**}p < .01$. Phi coefficients are reported for correlations within dichotomous variables over time. Otherwise, Pearson correlations are presented. Gender is dichotomized as female = 0, male = 1. Race is dichotomized as 0 = non-White, 1 = White.

Table 3. Full Model for Cohort 1.

	β	*SE*	*t*	Var. Component	*SD*	χ^2 test of variance
				Baseline Trajectory Model		
Intercept	22.30	0.87	25.63***	134.40	11.59	834.23***
Time (slope)	-1.69	0.70	-2.42**	42.35	6.51	326.90***
Time² (curvature)	0.16	0.16	1.00	1.35	1.16	278.37**
				Effects of CEA and DT on Anxiety		
Intercept				77.00	8.77	713.70***
Intercept	21.98	0.69	31.84***			
CEA	6.50	0.69	9.38***			
DT	-1.66	0.69	-2.40**			
Slope				5.13	2.26	416.71***
Intercept	-1.09	0.23	-4.66***			
CEA	-1.50	0.24	-6.27***			
DT	-0.07	0.23	-0.29			
				Full Model with Moderation		
Intercept				70.88	8.42	673.54***
Intercept	23.13	1.00	23.18***			
CEA	7.07	0.69	10.29***			
DT	-1.52	0.67	-2.25*			
Gender	-2.28	1.35	-1.69			
CEAxDT	-2.85	0.73	-3.92***			
Slope				4.66	2.16	398.47***
Intercept	-0.32	0.34	-0.94			
CEA	-1.57	0.24	-6.60***			
DT	-0.10	0.23	-0.45			
Gender	-1.36	0.50	-2.97**			
CEAxDT	0.58	0.25	2.31*			

* *p* < .05, ** *p* < .01, *** *p* < .001.
CEA is childhood emotional abuse, DT is distress tolerance, CEAxDT is the interaction between CEA and DT. Gender is coded as 0 = girls, 1 = boys.

Figures

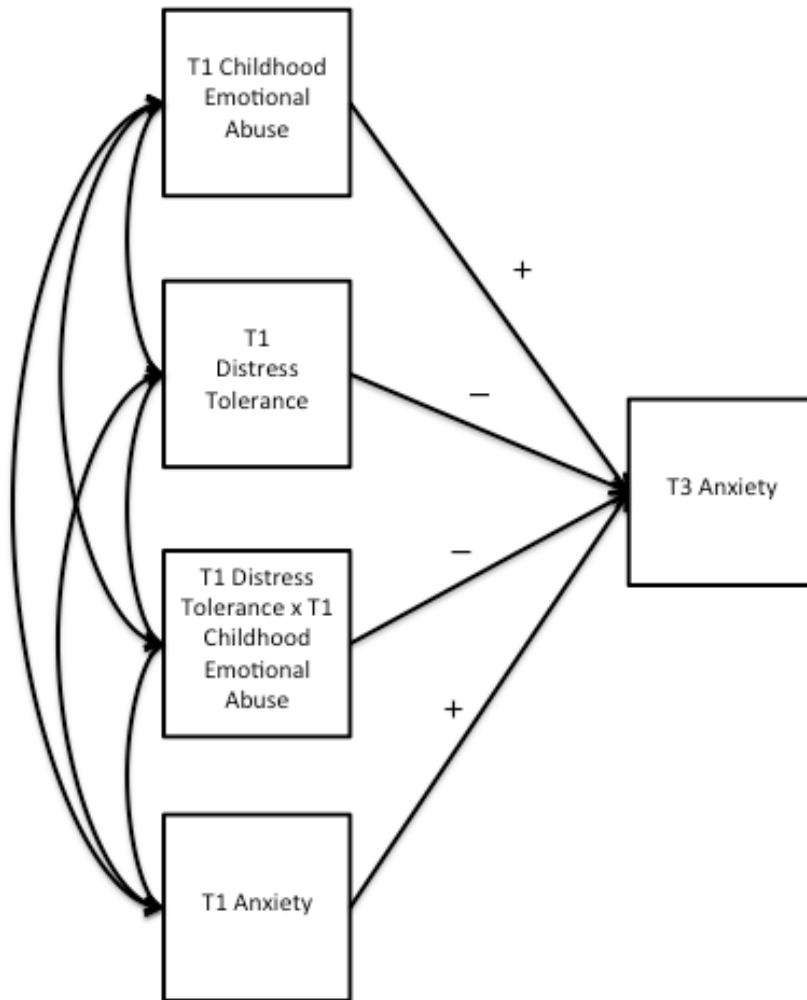**Figure 1. Hypothesized Moderation Model for Cohorts 1 and 2.**

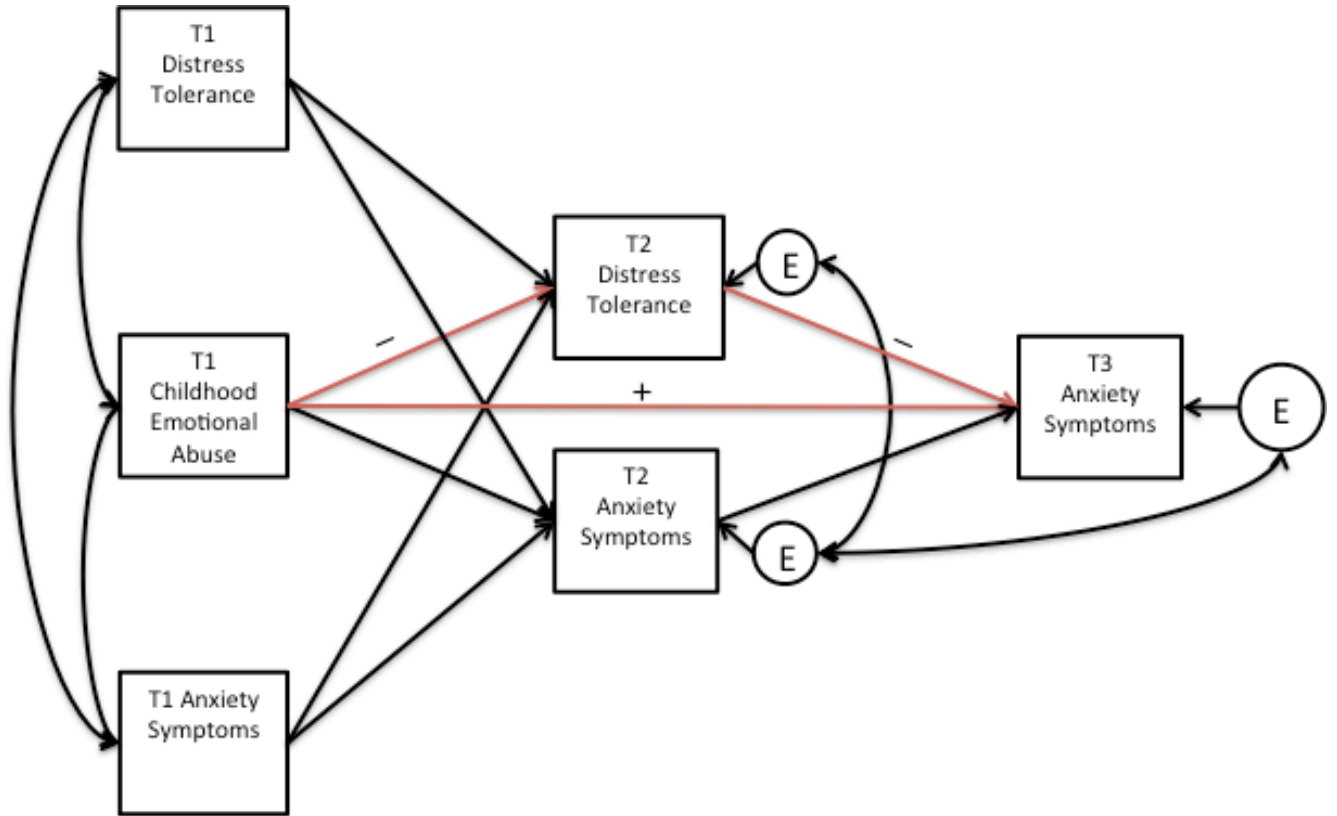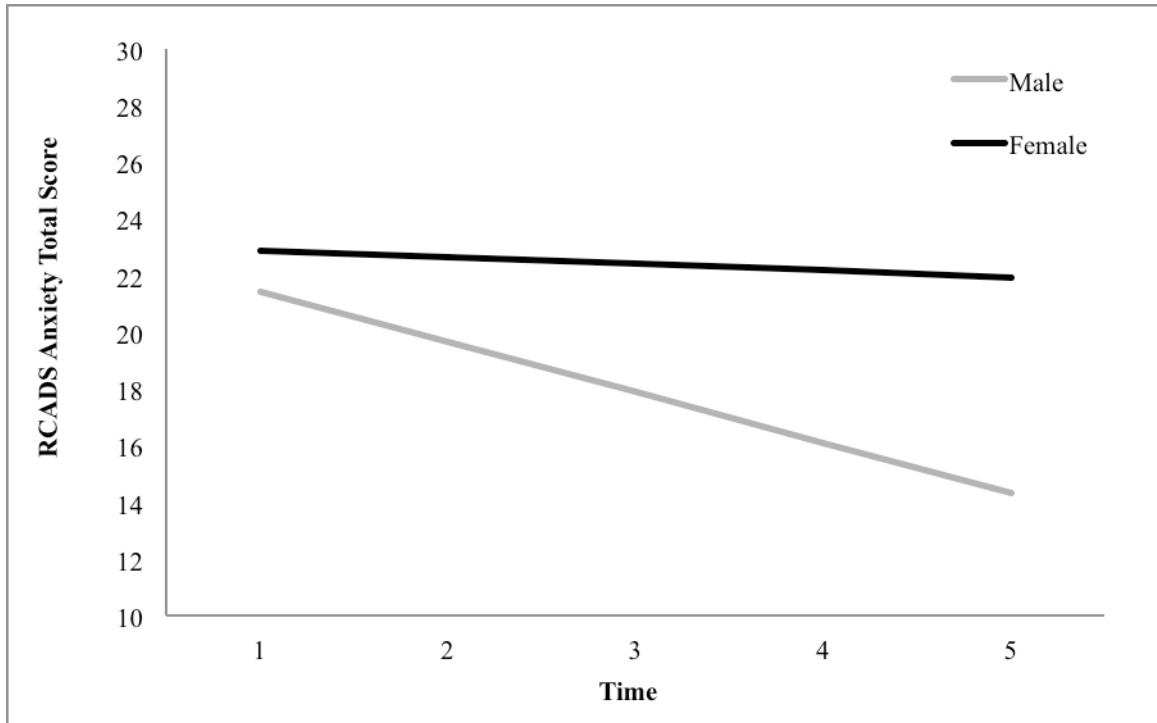**Figure 2. Hypothesized Mediation Model for Cohorts 1 and 2.**

Figure 3. RCADS Anxiety Scores over Time as a Function of Gender
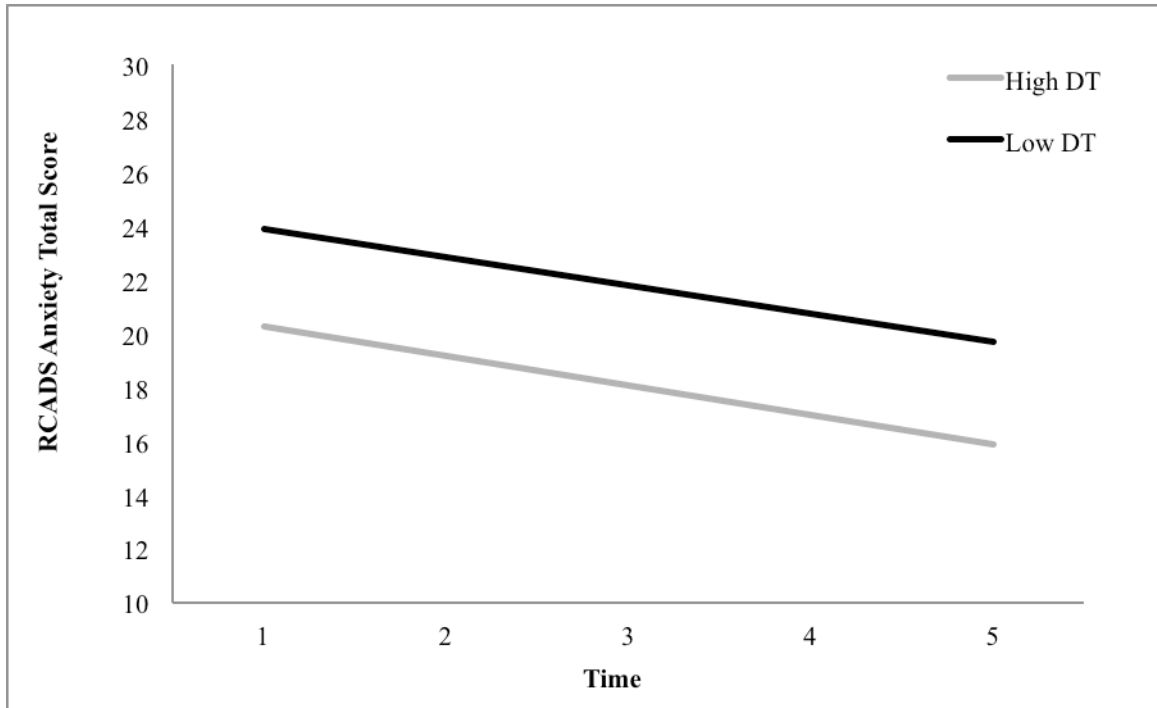

Multilevel regression coefficients indicating youth anxiety as a function of sex. The graph shows coefficients calculated for the five anxiety symptom assessments for boys and girls.

Figure 4. RCADS Anxiety Score over Time as a Function of Baseline CEA
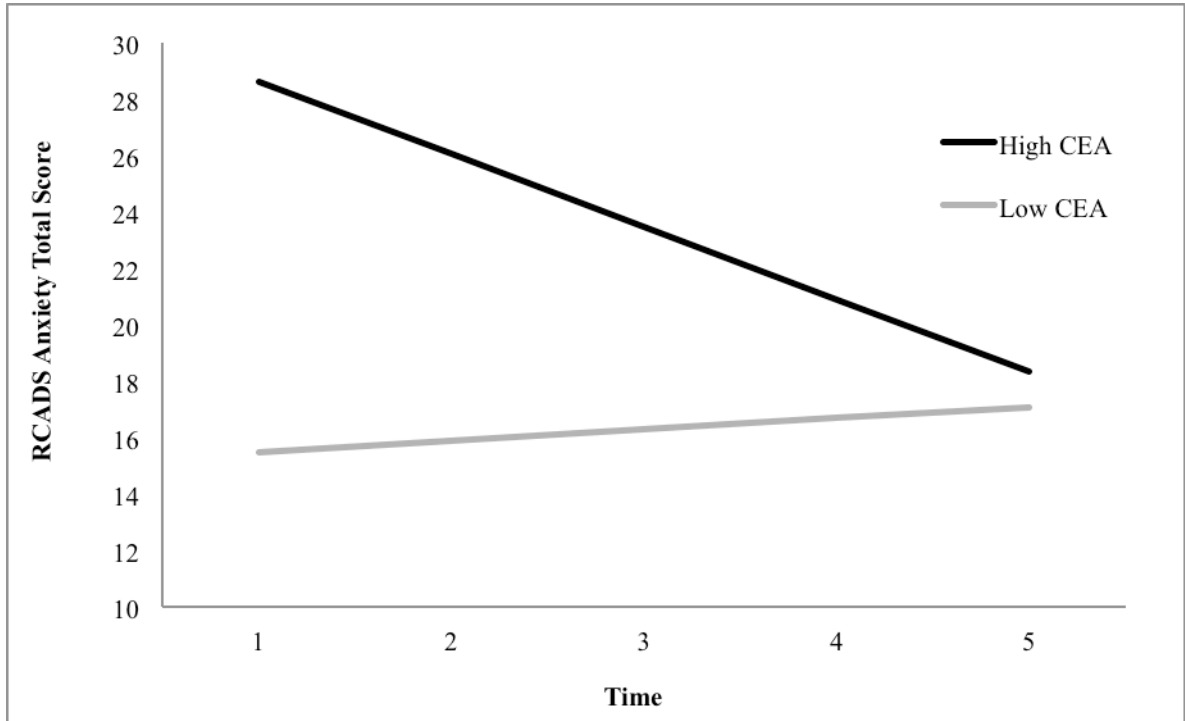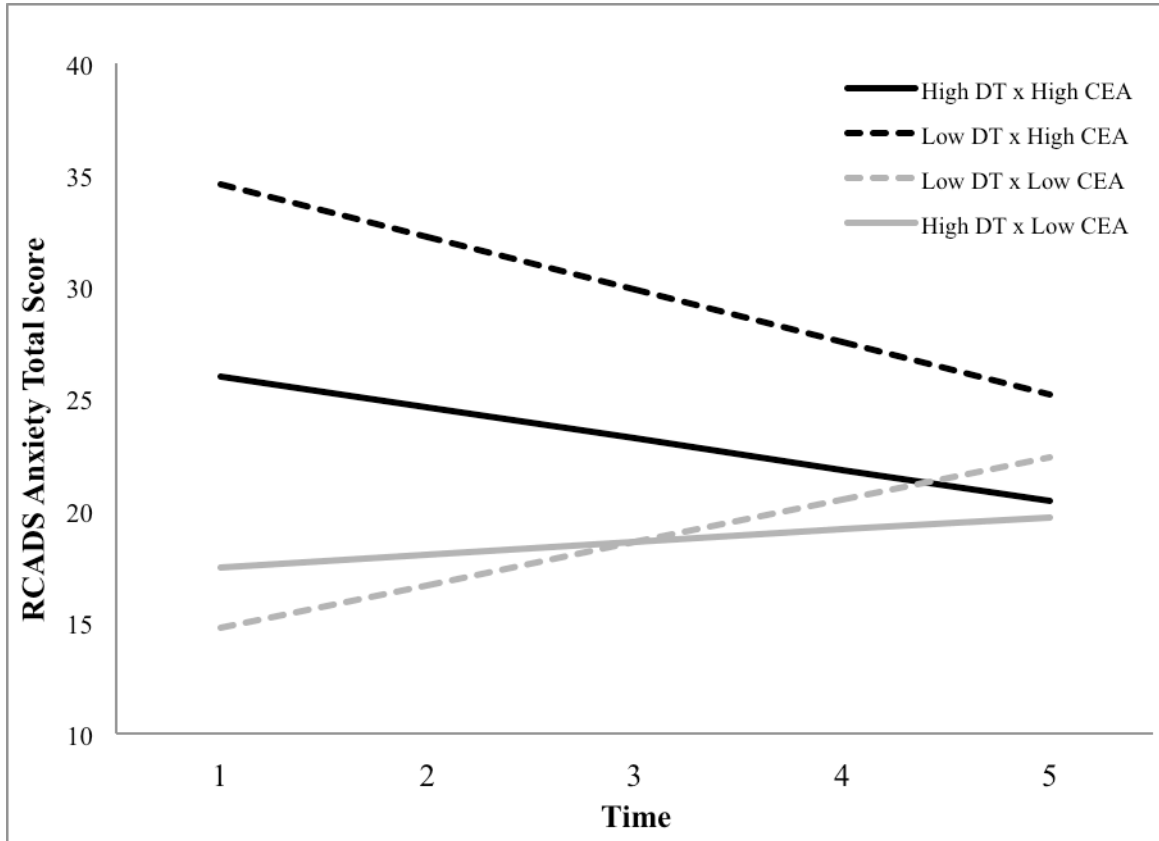

Multilevel regression coefficients indicating youth anxiety as a function of low and high Childhood Emotional Abuse (CEA). The graph shows coefficients calculated for the five anxiety symptom assessments at scores one standard deviation above and below the mean value for CEA.

Figure 5. RCADS Anxiety Scores as a Function of Distress Tolerance

Multilevel regression coefficients indicating youth anxiety as a function of low and high distress tolerance (DT). The graph shows coefficients calculated for the five anxiety symptom assessments at scores one standard deviation above and below the mean value for DT.

Figure 6. RCADS Anxiety Scores as a Function of the Interaction between Distress Tolerance and Childhood Emotional Abuse.

Multilevel regression coefficients indicating youth anxiety as a function of the interaction of baseline childhood emotional abuse (CEA) and distress tolerance (DT). The graph shows coefficients calculated for the five anxiety symptom assessments at scores one standard deviation above and below the mean value for CEA and DT.

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