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Longitudinal Bidirectional Relations Between Subtypes of Anxiety and Callous-Unemotional Traits in Early- to Mid-Adolescence

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LONGITUDINAL BIDIRECTIONAL RELATIONS BETWEEN SUBTYPES
OF ANXIETY AND CALLOUS-UNEMOTIONAL TRAITS IN
EARLY- TO MID-ADOLESCENCE

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science
at Virginia Commonwealth University

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Abstract

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A thesis submitted in partial fulfillment of the requirements for the Masters of Science at

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Callous-Unemotional (CU) traits are characterized by limited empathy, lack of guilt or remorse, and callous use of others. They are a risk factor for adult psychopathy, especially when comorbid with conduct problems. Thus, efforts to identify risk factors and consequences of CU traits have been prominent. One construct that may act as both a risk factor for and consequence of CU traits among youth is anxiety. While the most consistent finding is in this literature is a negative relation between CU traits and anxiety, findings have been mixed. The present study examined bidirectional relations between three subtypes of anxiety (i.e. physiological anxiety, fear and concentration problems, and worry and oversensitivity), CU traits, and conduct problems over six months among a sample of primarily African American middle school students. Results showed that CU traits at Time 1 were not associated with changes in physiological anxiety, fear and concentration problems, or worry and oversensitivity at Time 2. Similarly, physiological anxiety, fear and concentration problems, and worry and oversensitivity at Time 1 were not associated with increased CU traits at Time 2. Further, no longitudinal relations were found between CU traits and conduct problems. The six-month timeframe may have been too short to

see changes in anxiety and CU traits given their stability. The models tested also did not take into account the impact of factors such as distress and trauma which may influence bidirectional relations between CU traits and anxiety.

Introduction

Given the tremendous costs of adult psychopathy at individual, family, and societal

levels, efforts to establish developmental precursors for this outcome have been prominent (see

Frick, Ray, & Thorton, 2014 for a review). Psychopathy refers to a personality disorder

characterized by a superficial and manipulative interpersonal style. Represented in this construct

are a variety of traits including callousness, self-absorption, impulsivity, shallow affect, and a

lack of fear, guilt, and anxiety (Cleckley, 1976; Hare, 1993). Research on psychopathic traits

have identified two subgroups, including 'primary' and 'secondary' criteria. According to

Karpman (1946), individuals with primary psychopathy behave in an antisocial manner because

of an 'egocentric and deceitful' interpersonal style while individuals with secondary psychopathy

behave in such a manner because of an 'emotional disorder or neurosis' (p. 286). Moreover,

measures (e.g., the Psychopathy Checklist-Revised; Salekin, Rogers, & Sewell, 1996) have

supported a two-factor structure of psychopathy, with the first factor representing an affective

dimension (e.g., low anxiety, fear, and guilt) and the second factor capturing interpersonal traits.

Efforts to identify developmental precursors to adult psychopathy have centered on the

assessment of callous-unemotional (CU) traits in childhood and adolescence, and have gained

increasing attention among researchers over the past two decades. These traits are explicitly

related to the affective dimension of psychopathy in adulthood and are, in turn, present in most

conceptualizations of psychopathy (Cleckley, 1976; Hare, 1993). Additionally, findings have

indicated that high levels of CU traits in childhood and adolescence are predicative of

psychopathy, even after controlling for conduct disorder (Burke, Loeber, & Lahey, 2007). Thus,

CU traits have been referred to as 'deficient affective experiences' (Cooke, Michie, Hart, &

Clark, 2006) or the 'affective factor' (Hare, 1993). Specifically, CU traits are characterized by a

lack of concern about performance in important activities, lack of guilt, limited empathy, shallow affect, and callous use of others (Frick & Dickens, 2006; see Frick et al., 2014 for a review). While the specific factor structure of CU traits, as measured by the Inventory of Callous Unemotional Traits (ICU: Frick, 2004) has been a topic of debate, the most consistent finding is that CU traits consist of three subscales, namely: uncaring, unemotional, and callousness (e.g., Ezpeleta, de la Osa, Granero, Penelo, & Domenech, 2013; Fanti, Frick, & Georgiou, 2009; Roose, Bijttebier, Decoene, Claes, & Frick, 2010;). The uncaring subscale measures individuals' lack of concern about performance in school, not trying at school or work, and not caring about the feelings of others. The unemotional subscale assesses lack of and difficulty in emotional expression. Lastly, the callousness subscale measures the lack of guilt or empathy (Essau, Sasagawa, & Frick, 2006). Thus, examining the development of CU traits in childhood and adolescence is important to understand the more comprehensive construct of psychopathy.

Despite the moderate to high stability of CU traits across development, some findings have suggested individual variability and change in the development of CU traits from childhood to adulthood (Fontaine, McCrory, Boivin, Moffitt, & Viding, 2011; Fontaine, Rijsdijk, McCrory, & Viding, 2010; Pardini & Loeber, 2008). For example, Lynam, Caspi, Moffitt, Loeber, and Stouthamer-Loeber (2007) found that psychopathic traits were moderately stable ($r = .31$) from early adolescence (age 13) to emerging adulthood (age 24) among 250 boys at high-risk based on elevated ratings for disruptive behavior problems. However, less than 10% of the variance in scores on psychopathic traits in emerging adulthood were accounted for by the level of these traits in early adolescence (Lynam et al., 2007). Further, Hyde et al. (2016) identified both heritable and non-heritable pathways to early CU behaviors. Specifically, they suggest that environmental factors, such as positive reinforcement, may act as buffers of CU traits. This

suggests that CU traits are not immutable and underscores the importance of identifying malleable risk factors that increase the likelihood of elevated CU traits.

Some researchers have identified subgroups of children and adolescents with CU traits. Fontaine et al. (2010), for instance, explored the five-year stability for CU traits in a sample of seven-year-old girls and identified one subgroup of girls with an increasing trajectory of CU traits and another with decreasing CU traits. Eisenbarth, Demetriou, Kyranides, and Fanti (2016), in turn, examined CU traits longitudinally in an adolescent sample of youth aged 15 to 18. Specifically, the researchers identified a subgroup of adolescents characterized by increased levels of CU traits over time; however, no subgroup experienced a decrease in these traits. These results may suggest that although CU traits are malleable in childhood and early adolescence, they become more stable in late adolescence. Further, Eisenbarth and colleagues' (2016) findings indicated that internalizing and externalizing behaviors varied within subgroups of youth based on their levels of CU traits and conduct problems. More specifically, while youth with stable and high levels of CU traits and low levels of conduct problems experienced decreased levels of anxiety and depression, youth displaying increases in both CU traits and conduct problems demonstrated a parallel increase in anxiety, depression, and aggression.

It is important to identify factors that function as causes and consequences of CU traits. These types of factors may create a pattern of iterative influences that, when uninterrupted, result in an increasing trajectory of CU traits over time (Fanti, Colins, Andershed, & Sikki, 2016). A better understanding of such factors has implications for intervention, especially during early adolescence when social-cognitive and emotional growth and development may present a window of opportunity. One potential construct which may function as both a risk factor and consequence of CU traits among youth is anxiety. Anxiety is considered a higher-order feeling

state created by the brain mechanisms responsible for basic emotion (Damasio, 2003). It is the consequence of a complex response system that includes affective, physiological, behavioral, and cognitive mechanisms, and is likely to involve emotional dysregulation (Barlow, 2002). Although anxiety and related constructs (e.g., fearless temperament) have been significantly associated with CU traits among children and adolescents, several limitations exist in this literature (Derefinko, 2015). First, a number of studies are cross-sectional and thus prohibit the examination of temporal relations between anxiety and CU traits. Further, mixed findings exist in the longitudinal literature; some studies have found that low anxiety predicted increased levels of CU traits (e.g., Barker, Oliver, Viding, Salekin, & Maughan, 2011; Kochanska, 1995; Pardini, Lochman, & Powell, 2007), while others have reported no significant longitudinal relations between anxiety and CU traits (Fanti, Demetriou, & Kimonis, 2013). One reason for these discrepant findings may be that some studies have not accounted for levels of conduct problems (Waller et al., 2016a). For example, Pardini et al. (2007) found that the relation between anxiety and CU traits was strengthened when controlling for conduct problems. Lastly, despite theoretical models indicating that CU traits may predict decreases in anxiety, there is a paucity of research in this area.

Overall, the extant literature highlights the need for additional research to better understand the direction and strength of longitudinal relations between anxiety and CU traits among children and adolescents. Few studies examining prospective associations between levels of anxiety and CU traits have considered longitudinal relations between subtypes of anxiety and CU traits (Waller et al., 2016b). Researchers tend to examine anxiety as a composite measure and have not differentiated between fear and concentration problems, worry and oversensitivity, and physiological anxiety. While these subtypes of anxiety are related, they represent different

constructs (Reynolds & Richmond, 1978), and thus exploring them separately could yield meaningful results. Moreover, the majority of the literature has studied relations between anxiety and CU traits in the context of clinical and incarcerated samples, although researchers have underscored the importance of understanding CU traits and their causes and consequences in community samples (Frick, Cornell, Barry, Bodin, & Dane, 2003a). Even fewer studies have focused on urban community samples, and while relations between anxiety and CU traits have been explored at different developmental stages, little research has examined these associations in early- to mid-adolescence.

Given the current limitations in the literature, the present study will explore the bidirectional longitudinal relations between self-reported anxiety subtypes (i.e. physiological anxiety, worry and oversensitivity, and fear and concentration problems) and CU traits among early- to mid-adolescents from an urban community sample. First, longitudinal bidirectional relations between each subtype of anxiety and CU traits were examined across six months. For each subtype of anxiety, two models were run with one controlling for rates of conduct problems and the other allowing rates of conduct problems to vary across participants. The last two models included all subtypes of anxiety and CU traits at Times 1 and 2 with one model controlling for conduct problems while the other does not.

Literature Review

In this section, literature on relations between CU traits and anxiety in adolescence is reviewed, including relevant theory and empirical findings. First, relevant developmental, neurobiological, and theoretical models are discussed that contribute to understanding relations between CU traits and anxiety. Next, empirical research assessing relations between CU traits and anxiety is presented including: (a) cross-sectional studies, (b) longitudinal studies assessing

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low levels of anxiety as a risk factor for CU traits, and (c) longitudinal studies examining low levels of anxiety as a consequence of CU traits. Finally, the literature reviewed in this section is summarized along with directions for future research.

The Etiology of CU Traits

CU traits are characterized by deficits in "affective experiences" that manifest in behaviors which show a lack of caring, adaptive emotion processing and expression, and empathy toward others (Cooke et al., 2006). Several theoretical models and perspectives from developmental psychopathology and neurobiology offer insight into the etiology of CU traits (e.g., Frick, Ray, Thornton, & Kahn, 2014; Marsh et al., 2008; Roose, Bijttebier, Claes, & Lilienfeld, 2011). In this section, these models and perspectives are reviewed.

Developmental Psychopathology Perspectives and CU Traits. Frick et al. (2014) highlight the importance of understanding CU traits from a developmental psychopathology perspective. Within this framework, factors are considered that include the degree to which CU traits are stable across developmental stages, relations between temperament and CU traits, and the comorbidity of CU traits with conduct problems in childhood and adolescence. CU traits are present from early childhood and relatively stable throughout childhood (Barry, Barry, Demiing, & Lochman, 2008; Dadds, Fraser, Frost, & Hawes, 2005), adolescence (Frick, Kimonos, Bandeaux, & Farrell, 2003; Munoz & Frick, 2007), and adulthood (Lynam et al., 2007). The stability of CU traits is comparable to that of other personality traits (Roberts & DelVecchio, 2000), aggression, conduct disorder symptoms, and attention deficit hyperactivity disorder (Loeber, Pardini, Stouthamer-Loeber, Hipwell, and Sembower, 2009). Some researchers suggested that the stability of CU traits is largely due to genetic effects, which account for 42% to 68% of the variation in these traits (Bezdijian, Raine, Baker, & Lynam, 2011). Further, twin

studies have consistently found that CU traits are heritable and that shared environmental influences are of lesser importance in their etiology (Larsson, Andershed, & Liechtenstein, 2006; Taylor, Loney, Bobadilla, Iacono, & McGue, 2003; Viding, Blair, Moffit, & Plomin, 2005).

Temperament and CU Traits. During early childhood, findings have indicated that temperamental fearlessness and being unresponsive to punishment may be "early emotional and biological manifestations of CU traits" (Fanti, Panayiotou, Lazarou, Michael, & Georgiou, 2016). This premise is based on theories of moral development suggesting that decreased anxiety and lack of arousal in response to fear impedes the typical development of morality (Fowles & Kochanska, 2000). Specifically, Kochanska (1995) found that toddlers who exhibited low anxiety and fearfulness by both mother and observer report may not be as distressed by punishment, and that these characteristics in combination with a lack of a close relationship with a caregiver may lead to the development of CU traits (Kochanska, 1995). In another study, longitudinal associations between maternal prenatal risk, child fearless temperament, parental warmth, CU traits, and conduct problems were assessed among 7,000 mothers and their children (51% male) from a population-based sample in the U.K. (Barker et al., 2011). Mother-report of a fearless temperament at age 2 predicted both mother-reported conduct problems and CU traits at age 13, controlling for prenatal risks and parenting factors. Overall, a fearless temperament, sex, and prenatal maternal risk predicted increases in CU traits (Barker et al., 2011).

Similarly, Waller et al. (2016a) tested the hypothesis that fearlessness and low levels of affiliative behavior (i.e., low warmth or affection) were precursors to CU traits among 561 infants ages 9, 18, and 17 months who were not being raised by their biological parents. Study findings indicated that increased observer-reported infant fearlessness and lower affiliative behavior at 18 months predicted increased observer-reported CU behaviors at 27 months of age,

controlling for ADHD symptoms and earlier CU behaviors. Further, biological mother fearlessness predicted child fearlessness, which in turn led to subsequent increases in CU traits, suggesting an indirect effect. In contrast, biological mothers' low affiliative behavior directly predicted higher levels of child CU traits. Similarly, Kahn, Deater-Deckard, King-Casas, and Kim-Spoon's (2016) findings suggest that hostile parenting may mediate the relation between parent and adolescent CU traits, but only in the context a chaotic home environment. These study findings provide support to both genetic research that documents the heritability of CU traits and behavioral factors in contributing to increased CU traits over time (Bezdjian et al., 2011).

   Co-morbidity of CU traits and conduct problems. A large body of literature documents the co-morbidity of CU traits and conduct problems (see Frick et al., 2014 for a review). Conduct problems usually begin in childhood and adolescence and are characterized by aggressive, destructive, and deceitful behavior (Nock, Kazdin, Hiripi, & Kessler, 2006). The prevalence of conduct problems, calculated by combining the prevalence for conduct disorder and oppositional defiant disorder (ODD), is approximately 11.3% (Cunninghan & Ollendick, 2010). Further, conduct problems are the primary presenting symptom for psychiatric referral among youth in the U.S. (Kazdin, 1995; Robins, 1991). Aggressive, antisocial behavior in childhood and adolescence places youth at increased risk for later mental health and delinquency problems. Conduct problems are also linked to future difficulties in terms of emotional and academic functioning, and delinquent behavior. In particular, they have been associated with substance abuse, poor social relationships, educational maladjustments, and mental and physical health difficulties (Odgers et al., 2007; 2008).

   Research has consistently indicated that CU traits are positively associated with conduct problems (e.g. Fanti et al., 2013; Pardini et al., 2007). In other words, youth with elevated CU

traits are more likely to engage in antisocial behavior than youth with low levels of CU traits. For example, Bauer, Whitman, and Kosson (2011) reported that in a forensic sample of adolescent boys aged 14 to 19, CU traits were linked to conduct disorder symptoms, total number of criminal infractions and charges, and age of first charge. Similarly, Basque, Toupin, and Cote (2012) found that, in a clinical sample of adolescent boys between the ages of 15 and 19, CU traits predicted recidivism and delinquency over 24 months, controlling for first arrest and number of prior offenses.

However, while the majority of the literature has examined CU traits in the presence of conduct problems, not all children with CU traits engage in antisocial behavior (Fanti et al, 2013; Rowe, Maughan, Moran, Ford, Briskman, & Goodman, 2010). Further, there is evidence to suggest that CU traits are a precursor of psychopathy only when there are co-occurring conduct problems (Fanti et al., 2013). Specifically, youth with co-occurring high levels of conduct problems and CU traits demonstrate a particular temperamental style similar to that of adults with psychopathy characterized by fearlessness, emotional insensitivity, and reward dominance.

One line of research has focused on distinguishing more severe antisocial behavior among a subset of youth with CU traits (Frick & White, 2008). In particular, youth with conduct problems who exhibit high levels of CU traits tend to show a more stable and severe pattern of aggressive behavior than those with low levels of CU traits. These findings are consistent across community, clinical, and forensic samples (Caputo, Frick, & Brodsky, 1999; Christian, Frick, Hill, Tyler,& Frazer, 1997; Frick, Cornell, Barry, Bodin, & Dane, 2003a; Kruh, Frick, & Clements, 2005; Vincent, Vitacco, Grisso, & Corrado, 2003), pre-adolescents and adolescents (Caputo et al., 1999; Christian et al., 1997; Frick et al., 2003a; Kruh et al., 2005), boys and girls (Caputo et al., 1999; Kruh et al., 2005; Marsee & Frick, 2007), and across informants including

self-, parent-, and teacher-report (Caputo et al., 1999; Frick et al., 2003a; Kruh et al., 2005; Marsee & Frick, 2007; Vincent et al., 2003).

In addition, some youth with both high levels of conduct problems and CU traits show a preference for new and dangerous activities (Frick et al., 2003a), limited ability to recognize sad and fearful expressions (Blair & Coles, 2000), and lack of response to punishment when a reward oriented response is primed (Fisher & Blair, 1998). Prospective studies have also indicated that this subset of youth exhibited higher frequencies of relational aggression and bullying behavior (Pardini, Stepp, Hipwell, Stouthamer-Loeber, & Loeber, 2012) and lower rates of fear and anxiety (Frick, 2012) than youth with conduct problems alone. Further, there is evidence that CU traits may be clinically informative, as findings have indicated that youth with high levels of CU traits and conduct problems are less responsive to existing treatments for antisocial behavior and may require unique interventions (Hawes, Price, & Dadds, 2004). Thus, there is consistent evidence suggesting that youth with elevated CU traits and conduct problems differ from youth with conduct problems alone in terms of temperament and personality characteristics, cognitive factors, biological markers, and emotional characteristics.

Relations between CU traits, conduct problems, and anxiety. Another line of research on CU traits has focused on relations between these traits, conduct problems, and anxiety. Specifically, while the literature has explored different aspects within the domain of anxiety (i.e. fearlessness, state anxiety, trait anxiety, physiological anxiety) in relation to CU traits, the majority of these studies have focused on trait anxiety and fear (Derefinko, 2015). When considered alone, higher levels of CU traits have been associated with lower levels of anxiety and fear. In contrast, youth who exhibit higher levels of conduct problems and lower levels of CU traits tend to have higher levels of anxiety, impulsivity, and reactive aggression (Frick et al.,

1999). Following this, Fanti (2016) found that youth with conduct problems alone exhibited higher rates of anxiety and physiological arousal to emotional stimuli when compared to youth with high levels of CU traits. Pardini et al. (2007) found a suppressor effect when assessing relations between CU traits, conduct problems, and anxiety. Specifically, the negative relation between anxiety and CU traits was strengthened after controlling for concurrent levels of conduct problems among youth (Frick et al., 2014; Pardini et al., 2007). This highlights the importance of accounting for conduct problems when studying relations between anxiety and CU traits.

   Neurobiological Perspectives and CU Traits. Researchers have examined the neurobiology of CU traits and linked them to mechanisms such as amygdala dysfunction (Marsh et al., 2008), low cortisol levels (Hawes, Brennan, & Dadds, 2009), and malfunction of the behavioral inhibition system (BIS) (Gray, 1987). The amygdala plays a role in responses to distress-related emotional expression and controls the autonomic responses related to fear (Blair, Peschardt, Budhani, Mitchell, & Pine, 2006). Further, increased activation of the amygdala has been linked to the development of anxiety disorders (Forster, Novick, Scholl, & Watt, 2012). Study findings have indicated that CU traits are related to amygdala and orbitofrontal cortex dysfunction which is consistent with inverse relations found between CU traits and fear and anxiety (Birbaumer et al., 2005; Finger et al; 2008; Gordon, Baird, & End, 2004; Kiehl, Smith, & Hare, 2001). For example, Marsh et al. (2008) found that adolescents (aged 10 to 17) with high levels of parent-, self-, and clinician-reported CU traits had decreased amygdala activation, as assessed by functional magnetic resonance imaging (fMRI), compared to controls while exposed to fearful but not angry or neutral expressions.

   Other studies in this area have focused on cortisol, a steroid hormone produced by the

adrenal cortex and youths' physiological responses to peer provocation and pain. Among children and adolescents, high levels of cortisol have consistently been related to higher levels of anxiety (e.g., Granger, Weisz, McCracken, Ikeda, & Douglas, 1996; McBurnett et al., 1991; Susman, Granger, Murowchick, Ponirakis, & Worral, 1996). Researchers have found that low cortisol levels may act as a biological marker for CU traits (Hawes, Brennan, & Dadds, 2009). Specifically, Loney, Butler, Lima, Counts, and Eckel (2006) examined salivary measures of basal cortisol among a sample of adolescents with high and low scores on parent-reported CU traits. Findings indicated that high levels of CU traits were uniquely associated with low cortisol levels. Similarly, studies have demonstrated that, compared to youth with elevated CU traits and no conduct problems, youth with comorbid conduct problems and elevated CU traits have lower heart rates (resting and in response to fearful or sad emotional stimuli) and lower skin conductance reactivity in situations where they were provoked by peers or in pain (Kimonis, Frick, Fazekas, & Loney, 2006; Munoz, Frick, Kimonis, Aucoin, 2008; Northover, Thapar, Langley, & VanGoozen, 2015). Overall, youth with elevated CU traits, including those with comorbid CU traits and conduct problems, show low activation of the autonomic nervous system (Fung et al., 2005). This suggests that high levels of CU traits may be associated with lower levels of anxiety over time (Hawes et al., 2009).

Gray (1987) highlighted the malfunction of the BIS as a factor related to high levels of CU traits. Following the tenets of reinforcement sensitivity theory, Gray (1987) noted that behavior is motivated by two primary systems. The BIS is activated by aversive stimuli and leads to behavior that avoids punishment. In contrast, the behavioral activation system (BAS) is activated by appetitive stimuli and triggers behavior that results in rewards. Gray (1987) posited that the lack of anxiety exhibited by individuals with psychopathy may be due to BIS

malfunction which may be related to a lack of responsiveness to danger or threat. This theory further breaks down the BIS into BIS-Anxiety, which mediates anxiety and is concerned with the resolution of conflict, and a Fight Flight Freeze System which mediates fear. Roose et al. (2011) found that CU traits were inversely associated with BAS, BIS-Anxiety, and the Fight Flight Freeze System. This is consistent with Lyken's (1995) finding that individuals with CU traits are characterized by fearlessness. Further, the relation between Fight Flight Freeze System and CU traits was mediated by BIS-Anxiety. This suggests that low anxiety may be an underlying mechanism that partially explains the positive relation between fearlessness and CU traits (Corr, 2010).

Theoretical Models and CU Traits. Theoretical models such as operant conditioning propose that individuals learn behavior through reinforcement and punishment (Skinner, 1948). In other words, individuals learn from the consequences of their actions and readjust their behavior accordingly. For example, if an action is followed by a reward or the removal of a negative stimulus, it will usually be repeated. If, in turn, an action is followed by a punishment or the removal of a positive stimulus, it is unlikely to be repeated (Abramson, 1994).

However, the same process may not apply to individuals with high levels of CU traits, especially when co-morbid with conduct problems, given studies that showed this subgroup of youth may devalue punishment and underestimate reinforcement, particularly in conflictual peer interactions (Pardini, Lochman, & Frick, 2003). For example, Frick, Cornell, Bodin, Dane, and Barry (2003b) found that youth with high levels of parent- and teacher-reported psychopathic traits had deficient responses to punishment when reward oriented responses were primed. Muñoz Centifanti and Modecki (2013) found that adolescent boys with high levels of CU traits had a decreased sensitivity to punishment as compared to adolescent boys with lower levels of

CU traits. Blair, Colledge, and Mitchell (2001), in turn, found that adolescent boys with teacher-reported conduct problems and psychopathic traits were less likely to respond to gradual increases in punishment as compared to adolescent boys with conduct problems and no psychopathic traits. Additionally, Lorber, Huges, Miller, Crothers, and Martin (2011) found that adolescents with high levels of self-reported CU traits did not have positive expectations, such as tangible rewards or the demonstration of control, for the outcome of their behaviors.

Early adolescence is marked by the entrance to middle school, a bigger and more complex school (Eccles & Roeser, 2011; Waters, Bradely, & Mogg, 2014). This developmental period may be particularly challenging for youth as they are exposed to more social stressors and increased academic demands (Ohannessian, Milan, & Vanucci, 2016). The prevalence of mental health disorders increases dramatically in adolescence, including the rates of anxiety disorders (McLaughlin & King 2015; Negriff & Susman, 2011; Telzer & Fuligni, 2013). Further, while the predominant anxiety symptoms in childhood include separation anxiety and animal related fears, the predominant symptoms in early adolescence are social anxiety and performance related fears (Ohannessian, Milan, & Vanucci, 2016). As adolescents become more concerned about the opinions of others, reinforcement by their peers, and their ability to perform (e.g., in academic or athletics), their level of anxiety may increase.

In contrast, youth with higher versus lower levels of CU traits may not be as concerned with their ability to perform or succeed academically. For example, DeLisi et al. (2011) found that while youth with high levels of CU traits scored similarly to controls on intelligence tests, they scored lower on achievement tests. Youth with high versus low levels of teacher- and self-reported CU traits also scored worse on individually administered reading comprehension examinations, after controlling for ADHD symptoms and scores on intelligence tests (Vaughn et

al., 2011). The relative difficulty in the experience and expression of emotions like anxiety coupled with uncaring and unempathetic behavior patterns place adolescents with high levels of CU traits at risk for maladaptive peer relationships, poor academic achievement, and antisocial behavior (see Frick et al., 2014 for a review).

An operant conditioning model, therefore, can be used to argue that low anxiety is a consequence of CU traits. Specifically, operant conditioning models posit that behavior is strengthened through rewards and weakened by punishment. However, previous studies have indicated that youth with CU traits tend to devalue punishment and underestimate reinforcement and, thus, may not be as worried about academic demands or the opinions of others (Pardini et al., 2003). The absence of these stressors, in turn, may result in lower levels of anxiety among adolescents with CU traits compared to adolescents without CU traits. In other words, given that adolescents with CU traits are less concerned with punishment and the opinions of their peers than youth without CU traits, CU traits are likely to predict decreased levels of anxiety. Further, given that findings have indicated that CU traits are heritable and are associated with physiological anxiety, it is reasonable to hypothesize that high CU traits are precursors of decreased anxiety levels.

However, from a different perspective, operant conditioning models could be used to argue that the lack of responsiveness to punishment cues among youth with high levels of CU traits are a consequence rather than a cause of low levels of fearlessness and anxiety. More specifically, an individual's low anxious disposition may result in a lower sensitivity to punishment and decreased expectations of positive reinforcement. Thus, youth with high levels of CU traits may have low levels of fearlessness and anxiety and, thus, be less responsive to typical socialization processes and not as concerned with the approval of their peers or parents

(Oxford, Cavell, & Hughes, 2003; Viding, Simmonds, Petrides, & Frederikson, 2009). Additionally, youth with fearless temperaments tend to have an impaired development of morality and conscience (Fowles, Kochanska, & Murray, 2000; Posner & Rothbart, 2000). Therefore, one argument would be that low anxiety and fearfulness are risk factors for CU traits.

Conclusion. Developmental psychopathology, neurobiology, and theoretical models such as operant conditioning and social learning theories offer support for potential bi-directional relations between anxiety and CU traits. In considering low anxiety as a predictor of increased levels of CU traits, studies have shown that beginning in early childhood, low anxiety and a fearless temperament led to elevated levels of CU traits in late childhood and adolescence (Barker et al., 2011). Additionally, several studies have found that low anxiety resulted in subsequent increases in levels of CU traits among youth (e.g., Pardini et al., 2007). Drawing from the principles of social learning theory, low anxiety among youth with CU traits may be linked to low levels of responsiveness to typical socialization processes by parents and peers (e.g., via lower sensitivity to punishment and decreased expectation of positive reinforcement; Bandura, 1986). Thus, maladaptive patterns of interactions with peers and parents may further strengthen CU traits. For example, studies indicated that youth with high levels of CU traits are more likely to associate with deviant peers and engage in antisocial behavior than youth with lower levels of CU traits (Kimonis, Frick, & Barry, 2004; Muñoz et al., 2008).

Low levels of anxiety may also be a consequence of CU traits. Dysfunctions in the amygdala and orbitofrontal cortex (Finger et al., 2008) may contribute to decreased reactivity to social stressors such as peer provocation based on physiological data (e.g., Northover, Thapar, Langley, & VanGoozen, 2015). From an operant conditioning perspective, youth with high levels of CU traits are not motivated by rewards and punishments to the same degree as youth

without CU traits in the context of social relationships and with respect to academic achievement (Vaughn et al., 2011). This is consistent with theories that highlight decreased reinforcement sensitivity (Gray, 1987) which have been empirically supported by findings that showed inverse relations between high levels of CU traits and the BAS, BIS-Anxiety, and Fight Flight Freeze System among youth (Roose et al., 2011). Youth with high levels of CU traits may react differently than youth with low levels of CU traits to external stressors (e.g., in peer relationships) due in part to low activation of the autonomic nervous system.

From a developmental psychopathology perspective, CU traits are relatively stable from childhood to adolescence. Yet some findings suggest that environmental factors and individual variability may contribute to changes in the developmental trajectories of CU traits (Fontaine et al., 2010; Fontaine et al., 2011; Pardini & Loeber, 2008). Studies have also indicated that while CU traits may be malleable in childhood and early adolescence, they become moderately stable from later adolescence to emerging adulthood (Lynam et al., 2007). This underscores the need to identify causes and consequences of CU traits in early adolescence.

Finally, given the high comorbidity between CU traits and conduct problems, it is important to account for them when exploring the links between anxiety and CU traits. While youth with conduct problems alone tend to have high levels of anxiety, youth with co-occurring conduct problems and CU traits tend to have low levels of anxiety (Frick et al., 1999). This differential association, along with the comorbid relation between conduct problems and CU traits, can create a suppressor effect when the variables are studied simultaneously (see Frick et al., 2014 for a review). This emphasizes the importance of accounting for conduct problems when examining the relation between CU traits and anxiety.

Empirical Relations between CU Traits and Anxiety

In this section, the empirical relation between CU traits and anxiety is discussed. First, cross-sectional studies with community, delinquent, and clinical samples are reviewed. Next longitudinal studies exploring anxiety and fearless temperament as predictors of CU traits among toddlers, elementary students, and high school students are explored. This is followed by a discussion of the limited empirical literature exploring CU traits as a predictor of anxiety. Finally, the literature reviewed in this section is summarized along with directions for future research.

Cross-sectional studies. Several concurrent studies have assessed associations between anxiety and CU traits. Frick et al. (1999) examined associations between trait anxiety, fearlessness, conduct problems, and CU traits among 143 children ages 6 to 13 who were clinically referred for mental health services. Initial correlations between CU traits and anxiety, overanxious anxiety disorder, anxious-depressed symptoms, and fearlessness were non-significant. However, after controlling for conduct problems, correlations between CU traits and all the anxiety measures were significant and negative. In contrast, a positive correlation was found between CU traits and fearlessness.

In another study, Dolan and Rennie (2007) examined relations between juvenile psychopathy, conduct problems, low state and trait anxiety, and fearfulness in a sample of primarily Caucasian (84.5%) incarcerated male British adolescents (mean age = 16). All measures were self-report. While no significant associations were found between trait anxiety and total psychopathy score, a significant negative association emerged between trait anxiety and the affective factor of psychopathy (i.e., CU traits). This association remained significant even after controlling for antisocial behavior and lifestyle components. These findings suggest that

deficient affective experience is related to under-arousal in threatening situations.

In a study by Andershed, Gustafson, Kerr, and Stattin (2002), associations between trait anxiety and psychopathic traits were examined among a community sample of 1,186 Swedish non-referred eighth graders (mean age = 14). Psychopathic traits, conduct problems, and trait anxiety were all assessed via self-report. Results indicated that boys with psychopathic traits and antisocial behavior had higher levels of impulsivity, were more prone to boredom, and had lower levels of trait anxiety than boys with antisocial behavior and no psychopathic traits. Youth with higher rates of psychopathic traits were more likely to engage in higher rates of antisocial behavior such as property and violent offenses and illegal drug use. Similar to other studies assessing CU traits, the negative relation between psychopathic traits and anxiety may indicate less reactivity and distress in reaction to emotional stimuli and punishment among youth with psychopathic traits (Blair, 1999; Frick et al., 2006).

Derefinko (2015) conducted a meta-analysis reviewing 102 studies that assessed relations between psychopathy and anxiety. Demographics varied across studies and included community, incarcerated, clinical, adult, and youth samples. Findings showed that while overall psychopathy had a negligible, positive relation to fear and anxiety, affective psychopathy scores had a small, negative relation with anxiety, fear, and inhibition. Thus, there is evidence to suggest that while low levels of anxiety and fear may not be related to psychopathy as a whole, it could be related to the affective dimension of psychopathy (i.e. CU traits). Accordingly, while the relation between CU traits and anxiety has also been a topic of debate throughout the past two decades, the most consistent finding remains that anxiety is negatively related to CU traits, especially when controlling for conduct problems (see Frick et al. 2014 for a review).

Lastly, Herpers, Rommelse, Bons, Buitelaar, and Scheepers (2016) examined the

concurrent relation between CU traits and quality of life amongst a clinical sample without conduct disorder diagnoses. Their sample consisted of 1,833 clinically referred youth, aged 6 and older, living in the Netherlands. Results indicated that parent-reported CU traits were positively associated to autistic spectrum disorder diagnoses and disruptive disorders, and negatively associated with a diagnosis of anxiety and/or other mood disorders. These results are consistent with previous findings that there is an inverse relation between internalizing disorders and CU traits.

In summary, while there has been some debate about whether psychopathy as a whole is associated with low anxiety, high levels of CU traits, the affective dimension of psychopathy, have been consistently associated with low anxiety and fearlessness (Derefinko, 2015; Dolan & Rennie, 2007). These findings have been replicated cross-culturally with incarcerated, clinical, and community samples, as well as with youth and adult participants. Additionally, research has indicated that CU traits are associated with dysfunctions in the amygdala, BAS, BIS-Anxiety, and Fight Flight Freeze System, which in turn is suggestive of an inverse relation between CU traits and anxiety (Marsh et al., 2008; Roose, et al., 2011).

However, the cross-sectional research reviewed has some limitations. Relatively few studies assessing links between anxiety and CU traits have focused on community samples, particularly those within the U.S. There is also a paucity of research examining relations between CU traits and anxiety among a community sample of early adolescents residing in an urban context. Further, 'anxiety' is taken to mean different things and researchers have tested constructs such as fear and/or inhibition/constraint instead of anxiety. A distinction must be made between anxiety, fear, and inhibition/constraint as – while they may be related – represent different constructs. Finally, due to the cross-sectional nature of these studies, cause and effect

cannot be established. This highlights the importance of longitudinal research to better under the role of CU traits as a predictor of changes in anxiety levels and/or consequence of anxiety.

Anxiety as a Predictor of CU Traits. Few longitudinal studies have examined relations between CU traits and anxiety. Pardini et al. (2007) is one exception as these researchers explored longitudinal relations between anxiety, parenting, and CU traits in a community based sample of 120 elementary students aged 9 to 12. The sample was primarily African American (62.5%) and Caucasian (32.9%). Findings indicated that lower levels of parent-reported anxiety predicted increases in parent- and teacher-reported CU traits after a 1-year interval only when the child reported low parental warmth. Moreover, when controlling for antisocial behavior, the negative relation between anxiety and CU traits was strengthened.

In another prospective study, Eisenbarth et al. (2016) identified subgroups of youth with similar profiles of CU traits and conduct problems. Their sample consisted of 2038 community adolescents between the ages of 15 to 18 living in Cyprus, Greece. Self-report measures were used to assess conduct disorder symptoms and anxiety. Results of latent profile models supported a four-profile solution with subgroups including: (1) high, stable CU traits and conduct problems, (2) high, stable CU traits, (3) high, stable conduct problems, (4) increasing conduct problems and CU traits. Interestingly, a group that experienced a decrease in CU traits was not identified. Findings indicated that youth who exhibited increases in CU traits and conduct problems experienced a parallel increase in anxiety, depression, and narcissism. In contrast, participants with stable CU traits and low levels of conduct problems were less prone to anxiety, depression, and aggression, but not narcissism. Those with high levels of conduct problems but low levels of CU traits, in turn, had high scores on anxiety, reactive aggression, and sensation seeking. These findings are indicative that CU traits and conduct problems may co-occur as a

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result of both individual and contextual maladjustment. Additionally, these findings emphasized how varying levels of CU traits and conduct problems impacted internalizing symptoms including anxiety. However, it is important to note that this study did not address temporal precedence between CU traits and anxiety. In other words, causality between these constructs was not established.

Finally, Waller et al. (2016b) examined predictors of CU traits among a high-risk sample of adolescent males (mean age = 16), controlling for antisocial behavior. Specifically, they examined individual (i.e. anxiety and substance use), parenting (i.e. harshness and monitoring), and contextual (i.e. violence exposure) risk factors of CU traits and were the first study to date to explore whether anxiety subtypes (i.e. physiological anxiety, worry/oversensitivity, and fear/concentration problems) were uniquely related to CU trajectories. Findings indicated that adolescents with high CU traits reported elevated levels of physiological anxiety, substance use, maternal harshness, and violence exposure compared to adolescents with low or moderate CU traits.

These findings contradict developmental neurobiology and physiological studies indicating that there is an inverse relation between CU traits and cortisol levels, resting heart rates, and skin conductance reactivity (Hawes, Brennan, & Dadds, 2009; Kimonis, Frick, Fazekan, & Loney, 2006; Munoz, Frick, Kimonis, Aucoin, 2008; Northover, Thapar, Langley, & VanGoozen, 2015). Waller et al. (2016b) provide one interpretation of their findings by drawing from theoretical distinctions between primary and secondary psychopathy. Specifically, they suggest that their high-risk sample of adolescent males may belong to a subgroup of youth with CU traits that is characterized by high levels of physiological anxiety and exposure to trauma. However, findings may differ in a community sample and/or one that includes men and women,

thus, future research should explore the relation between subtypes of anxiety and CU traits among such samples.

In summary, support for the premise that low anxiety predicts higher levels of CU traits has been supported by several empirical studies. First, Pardini et al. (2007) found that lower as compared to higher rates of anxiety predicted increases in CU traits among a community sample of elementary students. In a community sample of adolescents, Eisenbarth et al. (2016) found the relation between anxiety and CU traits may differ by subgroups of youth based their rates of conduct problems. However, only one study to date study has differentiated between subtypes of anxiety, namely physiological anxiety, worry/oversensitivity, and fearfulness/concentration problems. In this study, Waller et al. (2016b) found that elevated physiological anxiety predicted high levels of CU traits in a sample of high-risk adolescent males. Further, no study has investigated longitudinal relations between anxiety and CU traits among urban middle school samples in the U.S. As early adolescence is characterized by contextual changes and growth in emotional and social cognitive, exploring relations between CU traits and anxiety is particularly important during this developmental period.

CU traits as a Predictor of Low Anxiety. Both physiological and theoretical models offer support for high levels of CU traits as a predictor of low rates of anxiety. However, little empirical research has been conducted to test this relation over time. One exception is a study by Pardini et al. (2012) that examined longitudinal relations between conduct disorder symptoms, CU traits, and internalizing disorders among young girls. Their sample consisted of 1,862 girls (53.5% African American and 40.7% Caucasian) who were aged 6-8 at the onset of the study and aged 12-14 at follow up. Conduct disorder symptoms were assessed by child, teacher, and caretaker report, while CU traits were assessed by teacher and caretaker report. Findings

indicated that girls with conduct disorder and CU traits had lower levels of self-reported anxiety after a period of six years compared to girls with conduct problems alone. Moreover, girls with elevated CU traits had the lowest overall anxiety at both assessments compared to the other groups. More research is needed to determine if these study findings generalize to other community samples.

Conclusion

In conclusion, this literature review highlights the complex relation between anxiety and CU traits. Specifically, it draws from developmental, physiological, and neurobiological models and perspectives in order to better understand the nature of their inverse relation. Social learning theory and operant conditioning also help explain relations between these constructs. Further, empirical evidence offers some support for concurrent relations between anxiety and CU traits, and for the roles of these constructs as causes and consequences of each other. However, the mixed findings of longitudinal studies examining anxiety as a predictor of CU traits and the paucity of research that assesses anxiety as a consequence of CU traits highlights the need for additional research in this area. Further, the majority of research on anxiety and CU traits has focused on clinical or incarcerated samples, and future research should explore this relation in community samples. Additionally, little research has explored relations between these constructs in early adolescence, a time where social stressors, academic demands, and mental health disorders rise sharply. Lastly, the vast majority of the literature has failed to distinguish between subtypes of anxiety (i.e. physiological anxiety, worry/oversensitivity, and fearfulness/concentration problems), which may be a potential explanation for some conflicting findings. Overall, there is a need for research exploring bi-directional longitudinal relations between CU traits and subtypes of anxiety among community samples and during the

developmental period of early adolescence.

The Present Study

The previous literature review emphasized the importance of understanding the risk factors and consequences of CU traits in adolescents. This is particularly important as CU traits are associated with detrimental outcomes in adulthood and substantial costs for individuals, families, and society (see Frick et al., 2014 for a review). While research documents associations between CU traits and anxiety, the direction and strength of relations between these constructs over time is less clear. Several gaps in the current literature were identified. First, the majority of the literature on CU traits has focused on clinical and incarcerated samples and few studies have examined longitudinal relations between CU traits and anxiety in community-based samples. Of these studies, only three have been conducted in the U.S. to date and have focused on infants, toddlers, and all-girls, respectively. Second, previous literature has examined either anxiety globally or fearfulness and has rarely differentiated between subtypes of anxiety. Third, there is a paucity of research investigating longitudinal relations between CU traits and anxiety in early adolescence, an important transitional period in development. Finally, to my knowledge, no study to date has examined the bidirectional relations between subtypes of anxiety and CU traits.

The present study added to the literature by exploring: (a) the degree to which lower rates of anxiety subtypes (i.e. physiological anxiety, worry/oversensitivity and fear/concentration problems) at Time 1 predicted higher levels of CU traits at Time 2, and (b) the degree to which higher levels of CU traits at Time 1 predicted lower rates of anxiety subtypes at Time 2 among urban middle school students. This study also addressed the potential effects of conduct problems on relations between anxiety and CU traits. Prior study findings revealed that conduct

problems suppressed the negative relations between anxiety and CU traits (Frick et al., 2014).

Thus, when conduct problems were controlled for, the relation between anxiety and CU traits

was strengthened (Frick et al., 1999; Roose et al., 2010).

For the current study, eight models were analyzed. First, relations between CU traits and

each subtype of anxiety were analyzed separately, based on the anticipated correlations between

anxiety subtypes. Two models were run for each anxiety subtype, one controlling for conduct

problems and another allowing the level of conduct problems to vary across participants. The

final two models included CU traits and all anxiety subtypes together, with one model

controlling for CU traits while the other did not.

Study Hypotheses

The eight models were tested and hypotheses for each are detailed in this section.

The first two models tested bi-directional relations between CU traits and

fear/concentration problems at Times 1 and 2 controlling for, age, sex, and intervention

condition. One model controlled for conduct problems and the other model did not (see Figures 1

and 2). Hypotheses for model one were as follows:

> H1: Youth who reported lower levels of fear/concentration problems were anticipated
>
> to report higher levels of CU traits across six months, as compared to youth who
>
> reported higher levels of fear/concentration problems.
>
> H2: Youth who reported higher levels of CU traits were expected to report lower
>
> levels of fear/concentration problems across six months, as compared to youth who
>
> reported lower levels of CU traits.

Time 1   Time 2

| Callous-Unemotional Traits |
| Fear/Concentration Problems |

| Callous-Unemotional Traits |
| Fear/Concentration Problems |
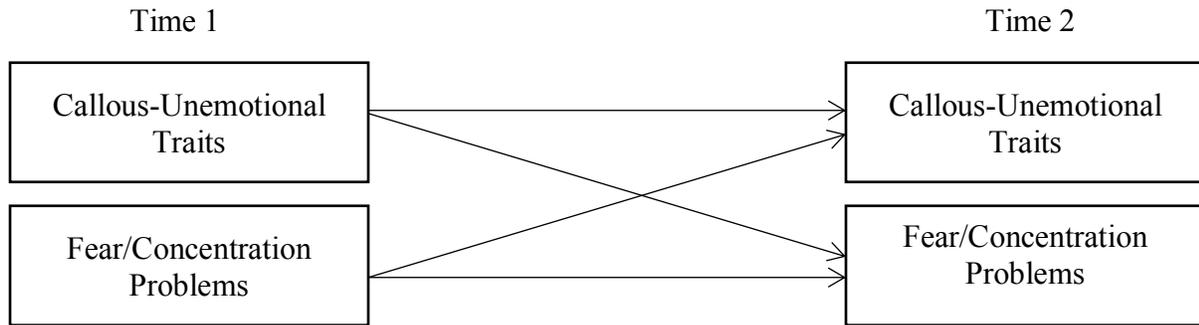
Figure 1. Longitudinal bi-directional relations between CU traits and Fear/Concentration Problems at Times 1 and 2, controlling for age, sex, and intervention condition

The hypothesis for model two was:

    H3: It was anticipated that the hypothesized bi-directional relations between fear/concentration problems and CU traits at Times 1 and 2 would be in the same direction as those found in model one when controlling for conduct problems, however they were predicted to be strengthened as compared to the relations found in the first model.

Time 1   Time 2

| Callous-Unemotional Traits |
| Fear/Concentration Problems |
| Conduct Problems |

| Callous-Unemotional Traits |
| Fear/Concentration Problems |
| Conduct Problems |
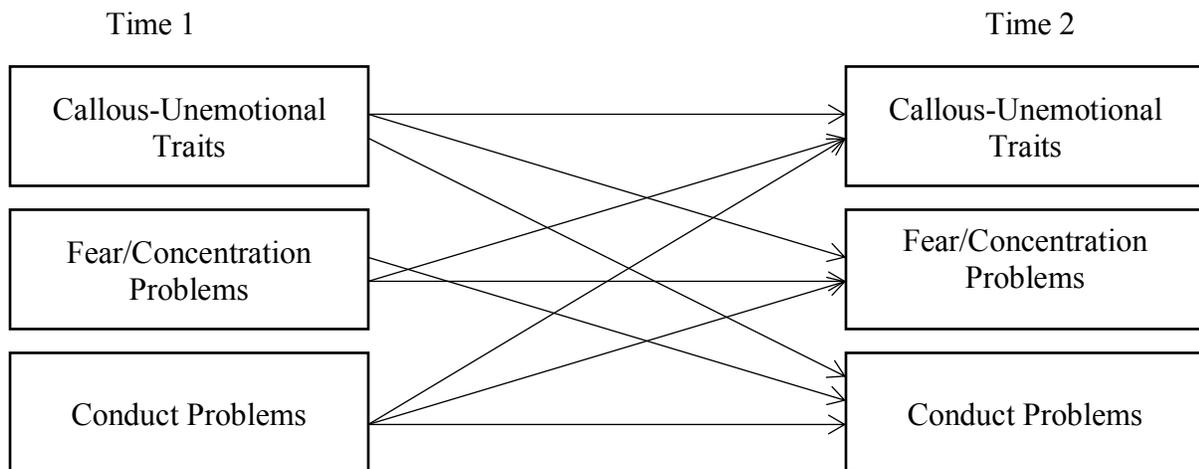
Figure 2. Longitudinal bi-directional relations between CU traits and Fear/Concentration Problems at Times 1 and 2, controlling for conduct problems, age, sex, and intervention condition.

The next two models tested bi-directional relations between CU traits and worry/oversensitivity at Times 1 and 2 controlling for age, sex, and intervention condition. One model controlled for conduct problems and the other model did not (see Figures 3 and 4). Hypotheses for model three were as follows:

> H4: Youth who reported lower levels of worry/oversensitivity were expected to report higher levels of CU traits across six months, as compared to youth who reported higher levels worry/oversensitivity.
>
> H5: Youth who reported higher levels of CU traits were anticipated to endorse lower levels of worry/oversensitivity across six months, as compared to youth who reported lower levels of CU traits.

Time 1   Time 2
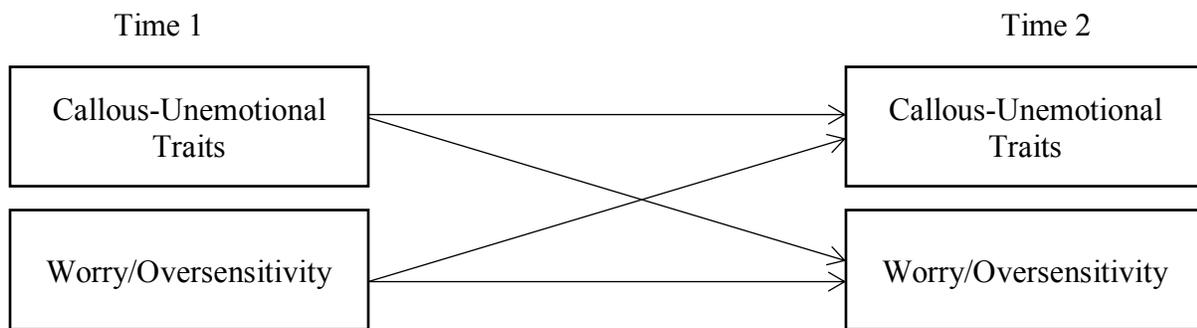
*Figure 3.* Longitudinal bi-directional relations between CU traits and Worry/Oversensitivity at Times 1 and 2, controlling for age, sex, and intervention condition.

The hypothesis for Model four was:

> H6: It was anticipated that the hypothesized bi-directional relations between worry and oversensitivity and CU traits at Times 1 and 2 would be in the same direction as

those found in model three when controlling for conduct problems, however they were predicted to be strengthened as compared to the relations found in the third model.

Time 1   Time 2
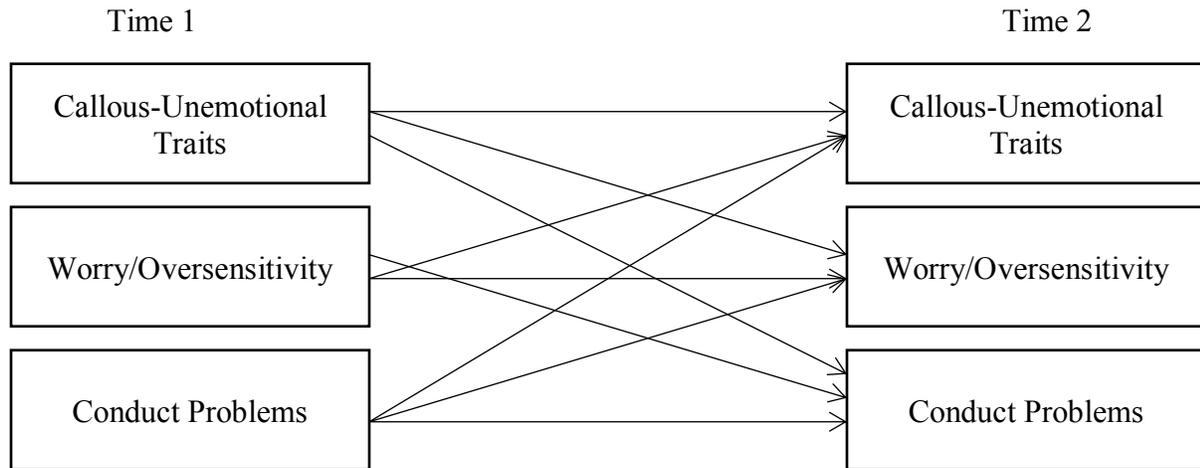
Figure 4. Longitudinal bi-directional relations between CU traits and worry/oversensitivity at Times 1 and 2, controlling for conduct problems, age, sex, and intervention condition.

The next two models tested bi-directional relations between CU traits and physiological anxiety at Times 1 and 2 controlling for age, sex, and intervention condition. One model controlled for conduct problems and the other model did not (see Figures 5 and 6). As there has been only one study to date that has explored the longitudinal relations between physiological anxiety and CU traits, which differed from the current study in terms of its sample and data collection, these analyses were exploratory with no hypotheses specified.

Time 1   Time 2

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┌─────────────────────┐                              ┌─────────────────────┐
│ Callous-Unemotional │──────────────────────────────▶│ Callous-Unemotional │
│      Traits         │╲                            ╱ │      Traits         │
└─────────────────────┘ ╲                          ╱  └─────────────────────┘
                         ╲                        ╱
┌─────────────────────┐   ╲                      ╱   ┌─────────────────────┐
│Physiological Anxiety│────╳──────────────────────▶│Physiological Anxiety│
└─────────────────────┘                              └─────────────────────┘
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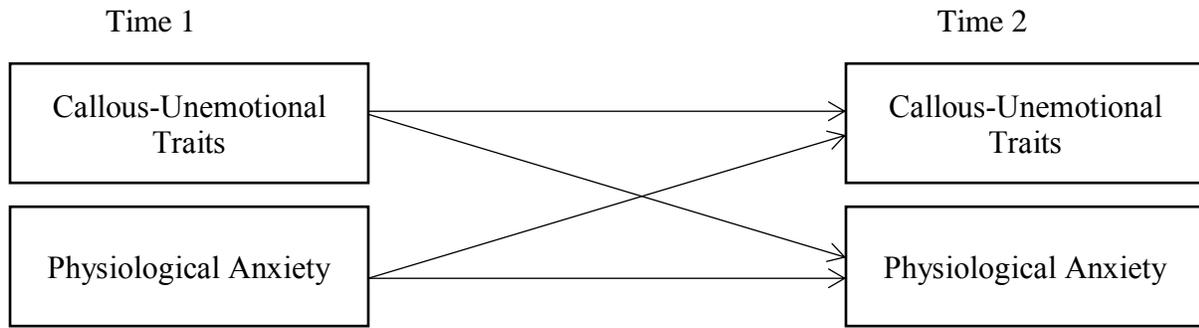
Figure 5. Longitudinal bi-directional relations between CU traits and physiological anxiety at Times 1 and 2, controlling for age, sex, and intervention condition.

Time 1   Time 2

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┌─────────────────────┐                              ┌─────────────────────┐
│ Callous-Unemotional │──────────────────────────────▶│ Callous-Unemotional │
│      Traits         │                              │      Traits         │
└─────────────────────┘                              └─────────────────────┘

┌─────────────────────┐                              ┌─────────────────────┐
│Physiological Anxiety│──────────────────────────────▶│Physiological Anxiety│
└─────────────────────┘                              └─────────────────────┘

┌─────────────────────┐                              ┌─────────────────────┐
│  Conduct Problems   │──────────────────────────────▶│  Conduct Problems   │
└─────────────────────┘                              └─────────────────────┘
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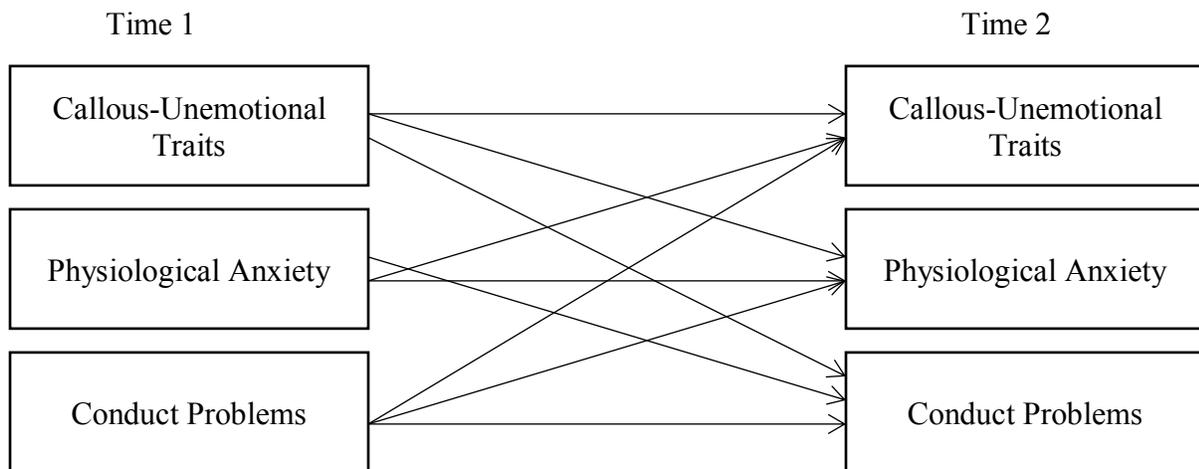
Figure 6. Longitudinal bi-directional relations between CU traits and physiological anxiety at Times 1 and 2, controlling for conduct problems, age, sex, and intervention condition.

The final two models tested bi-directional relations between CU traits and anxiety subtypes (i.e., physiological anxiety, worry and oversensitivity, and fear and concentration problems) at Times 1 and 2, controlling for age, sex, and intervention condition. One model controlled for conduct problems and the other model did not (see Figures 7 and 8). Hypotheses for model seven are as follows:

H7: Youth who reported lower levels of worry/oversensitivity and fear/concentration problems were anticipated to report higher levels of CU traits across six months, as compared to youth who reported higher levels of physiological anxiety, worry and oversensitivity, and fear and concentration problems. The analyses of relations between physiological anxiety and CU traits were exploratory.

H8: Youth who report higher levels of CU traits were expected to report lower levels of fear/concentration problems and worry/oversensitivity across six months, as compared to youth who reported lower levels of CU traits. The analyses of relations between CU traits and physiological anxiety were exploratory.
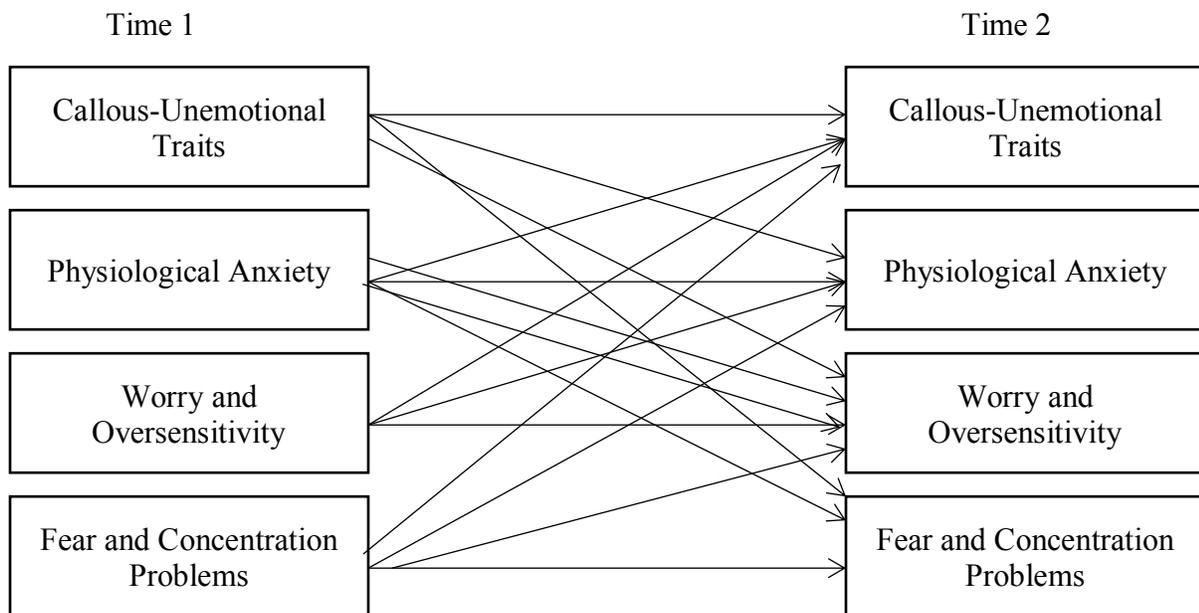
Figure 7. Longitudinal bi-directional relations between CU traits and anxiety subtypes (i.e., physiological anxiety, worry and oversensitivity, and fear and concentration problems) at Times 1 and 2, controlling for age, sex, and intervention condition.

The hypothesis for model eight was:

H9: It was anticipated that the hypothesized bi-directional relations between anxiety subtypes and CU traits at Times 1 and 2 would be in the same direction as those

found in model one when controlling for conduct problems, however they were

predicted to be strengthened as compared to the relations found in the first model.

Time 1   Time 2
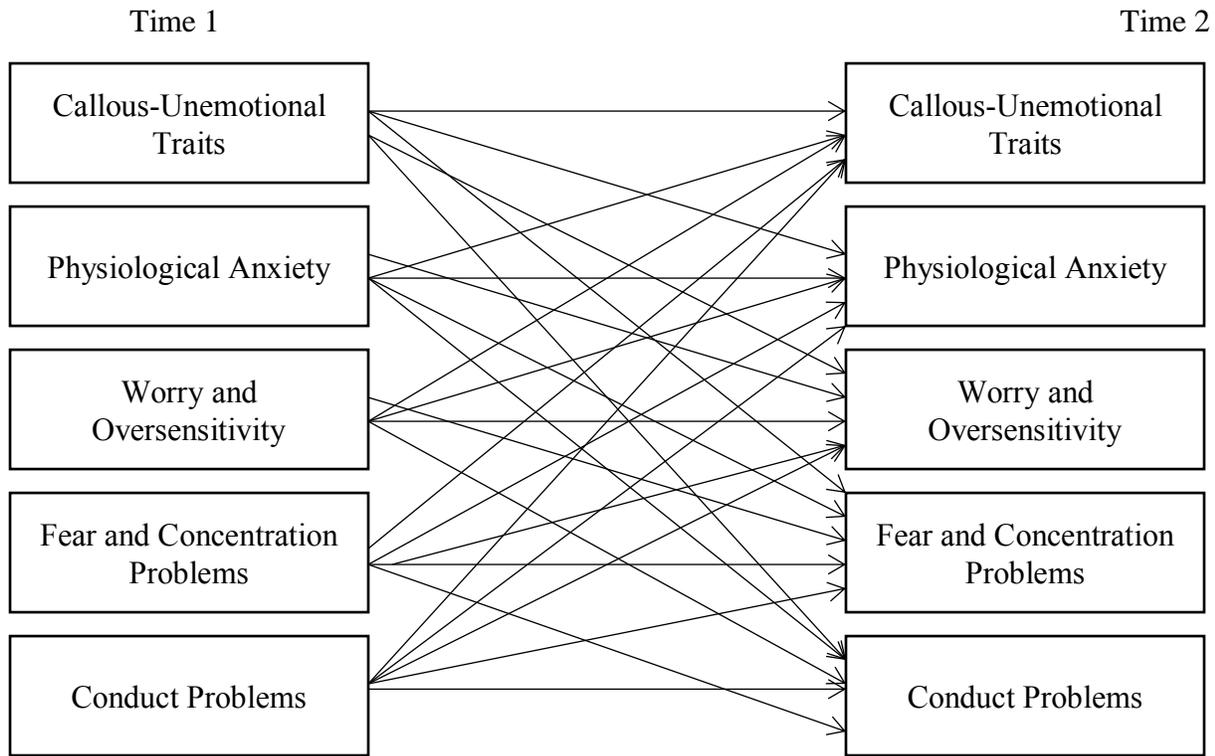
Figure 8. Longitudinal bi-directional relations between CU traits and anxiety subtypes (i.e., physiological anxiety, worry and oversensitivity, and fear and concentration problems) at Times 1 and 2, controlling for conduct problems, age, sex, and intervention condition.

Method

Setting and Participants

The present study used data previously collected from a larger project evaluating the

effectiveness of a school-based violence prevention program. The participants included sixth,

seventh, and eighth graders between the ages of 11 and 15 ($M = 12.27$, $SD = 0.95$) who attended

a middle school in an urban public school district in the Southeastern United States. Of 354

students, 272 (77%) provided written parental consent and student assent and 265 (97%)

completed the survey at Time 1. Data were collected at two timepoints spanning October to March of the 2010-2011 school year. Approximately half of the participants were female (52%) and most (82%) identified themselves as African American or Black. The remainder of the sample identified themselves as Multi-racial (8%), Hispanic or Latino (3%), European American or White (1%), and another race/ethnicity (6%). The majority of students enrolled in this school (88%) were eligible for the federally subsidized school lunch program.

Procedures

All procedures for the current study were approved by a University Institutional Review Board. Each participant provided written parental permission (including permission to collect the teacher-report data) and student assent prior to data collection. Students completed surveys at Times 1 and 2 during elective classes using a computer-assisted survey where they could opt to read and/or listen to each question. Study staff were present during the assessments and available to answer questions. The surveys took approximately 45 to 60 minutes to complete. Students received a $10 gift card each time they completed a survey for their time and effort. Concurrent with the student assessments, a core academic teacher (i.e., who taught Science, Math, History, or English) completed a behavior assessment for each student. Teachers received $20 for each assessment completed.

Measures

Callous-Unemotional Traits. The English Youth Self Report Version of the Inventory of Callous-Unemotional Traits (ICU: Frick, 2004) was used to assess CU traits among adolescents at Times 1 and 2. This 22-item scale uses the following 4-point response options: 1 = *Not at All True,* 2 = *Somewhat True,* 3 = *Very True,* and 4 = *Definitely True.* The scale consists of three subscales, namely: Callousness (e.g., "I do not care if I get into trouble"), Uncaring (e.g.,

"I try not to hurt others' feelings"), and Unemotional (e.g., "I do not show my emotions to others"). The scoring of this measure was based on a recent validation of the CU traits scale which eliminated two items from the Callousness subscale (Ciucci, Baroncelli, Franci, & Frick, 2014). All items assessing uncaring traits, as well as some items assessing callousness and unemotional behaviors, were reverse coded such that for all items, a higher score reflected higher levels of CU traits. The scale score represented the mean of the items. Alpha coefficients for this scale were .76 at Time 1 and .75 at Time 2.

Anxiety. Anxiety was assessed at Time 1 and Time 2 using the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978), a 28-item self-report scale with 2 response options: $0 = Yes$ and $1 = No$. The RCMAS was based on a trait theory of anxiety and findings indicate that the RCAMS has high positive correlations ($r = .85, p < .05$) with the Trait Anxiety Scale of the State-Trait Anxiety Inventory for Children (STAIC; Spielberger, Gorsuch, & Lushene, 1970) and lower correlations ($r = .24, p > .05$) with the State Anxiety Scale of the STAIC. The RCMAS scale consisted of three subscales including the 9-item Physiological Anxiety subscale (e.g., "I am tired a lot"), the 10-item Worry/Oversensitivity subscale (e.g., "I worry a lot of the time"), and the 10-item Fear/Concentration Problems subscale (e.g., "A lot of people are against me"). The mean score for each subscale was calculated; higher scores reflect higher levels of anxiety. The alpha coefficients for the subscales at Time 1 and 2, respectively, were .73 and .75 for Physiological Anxiety, .83 and .85 for Worry/Oversensitivity, and .70 and .82 for Fear/Concentration Problems.

Conduct Problems. Conduct problems were assessed at Time 1 and Time 2 using the teacher-reported Externalizing Problems subscale (e.g., "How often does this student fight with others?") of the Social Skills Improvement System (SSIS-RS; Elliott & Gresham, 2008). The

SSIS-RS is an 84-item nationally-normed measure that includes subscales assessing social, behavioral, and academic skills and difficulties. Teachers indicated the frequency that students engaged in these behaviors in the past two months using the following 4-point response scale: 1 = *Never*, 2 = *Seldom*, 3 = *Often*, and 4 = *Almost Always*. The mean score was calculated for the scale, and higher scores represent higher levels of externalizing problems. The alpha coefficient for this scale was .94 at Times 1 and 2.

Demographics. Demographic questions were included to assess age, race/ethnicity, and sex.

Data Analysis Plan

Data was cleaned using IBM SPSS Version 24 software (IBM Corp, 2013). For each study variable, the range of responses for each item were examined to ensure that they fell within the possible range of responses. Data was then be exported into Mplus 7.3 (Muthen & Muthen, 1998-2013), where all analyses will be conducted. Descriptive statistics including means, standard deviations, and correlations among variables were run. The skewness and kurtosis of each variable was examined. Maximum likelihood estimation with robust standard errors (MLR) were used to adjust for non-normally distributed continuous data. The maximum likelihood estimator addressed missing data by using full information maximum likelihood. Prior to analysis of the autoregressive cross-lagged models, the potential impact of the intervention condition on callous-unemotional traits and anxiety was tested. Controlling for levels of callous-unemotional traits at Time 1, the intervention condition (dummy-coded with 0 = control and 1 = intervention) were regressed on callous-unemotional traits at Time 2 to determine if there was a significant intervention effect for this outcome. Similarly, controlling for baseline levels of each subtype of anxiety at Time 1, the intervention condition was regressed on each anxiety subtype at

Time 2.

Eight autoregressive cross-lagged models were run to assess reciprocal associations between callous-unemotional traits and anxiety over six months from Time 1 to 2. For each model, covariates included age, sex (dummy-coded with 0 = female and 1 = male), and intervention condition. Three models assessed longitudinal relations between CU traits and each anxiety subtype, respectively. For each of these models, a companion model was run controlling for conduct problems. The final two models assessed relations between CU traits and all anxiety subtypes together, the first allowing rates of conduct problems for participants to vary and the second controlling for them. Race/ethnicity was not be included in the analyses as a covariate as the majority of students identified themselves as African American or Black (82%) and potential comparison groups – Hispanic/Latino, European American/White, students who endorsed more than one race/ethnicity, and student who identified as another racial/ethnic group were very small (i.e., ranging from 4 to 27 students in each group). Thus, sample sizes were too small to compare each group to the African American subsample. For each model, goodness of fit indices included the confirmatory fit index (CFI) and the root mean square error of approximation (RMSEA), with values of .95 and above for the CFI and values of 0.07 or below indicating that the model fits the data adequately (Hu & Bentler, 1999; Steiger, 2007)

Results

Descriptive Statistics

Descriptive statistics, including means, standard deviations, and correlations among study variables, are reported in Table 1. The subtypes of anxiety were positively associated with each other at both concurrently (*rs* ranged from .62 to .68) and prospectively (*rs* ranged from .71 to .72). CU traits at Time 1 were positively associated with CU traits at Time 2 ($r = .63$, $p < .001$),

conduct problems at Time 1 ($r = .17$, $p = .01$) and Time 2 ($r = .17$, $p = .01$), physiological anxiety at Time 1 ($r = .20$, $p = .001$) and Time 2 ($r = .21$, $p = .002$), and fear and concentration problems at Time 1 ($r = .14$, $p = .036$). Conduct problems at Time 1 were positively associated with conduct problems at Time 2 ($r = .64$, $p < .001$), physiological anxiety at Time 1 ($r = .14$, $p = .03$), and fear/concentration problems at Time 1 ($r = .15$, $p = .02$). CU traits at Time 2 were positively associated with physiological anxiety at Time 1 ($r = .20$, $p = .002$) and Time 2 ($r = .16$, $p = .015$), and fear and concentration problems at Time 2 ($r = .14$, $p = .046$). Finally, physiological anxiety at Time 1 was positively associated with conduct problems at Time 2 ($r = .17$, $p = .009$).

Table 1

Means, Standard Deviations, and Correlations for Callous Unemotional Traits, Anxiety Measures, and Conduct problems

	1	2	3	4	5	6	7	8	9	10
1. Physiological Anxiety (T1)	----									
2. Worry/Oversensitivity (T1)	.62***	----								
3. Fear/Concentration Problems (T1)	.67***	.68***	----							
4. Callous-Unemotional (CU) Traits (T1)	.20**	-.04	.14*	----						
5. Conduct problems (T1)	.14*	.01	.15*	.17**	----					
6. Physiological Anxiety (T2)	.68***	.53***	.54***	.21**	.08	----				
7. Worry/Oversensitivity (T2)	.57***	.68***	.56***	.01	.03	.71***	----			
8. Fear/Concentration Problems (T2)	.53***	.51***	.55***	.16*	.01	.72***	.71***	----		
9. Callous-Unemotional (CU) Traits (T2)	.20**	-.02	.13	.63***	.13*	.16*	-.04	.14*	----	
10. Conduct problems (T2)	.17**	.002	.09	.17**	.64***	.07	-.01	.01	.15*	----
M	2.68	3.31	2.02	27.80	20.52	2.47	2.95	2.07	27.12	21.55
SD	2.18	2.83	2.03	9.16	8.24	2.27	2.87	2.33	8.39	8.33

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

Relations Between Subtypes of Anxiety, CU traits, and Conduct problems

Eight autoregressive cross-lagged models were run using M-Plus 7.13 (Muthen & Muthen, 2013) to assess reciprocal associations between CU traits and anxiety from Time 1 to Time 2. Covariates in these models included age, sex, and intervention condition at Time 1. In each model, only age at Time 1 was related to CU traits at Time 2, with older youth reporting greater increases in CU traits as compared to younger youth. Three models assessed longitudinal relations between CU traits and each anxiety subtype, respectively. For each of these models, a companion model was run controlling for conduct problems. Finally, all subtypes of anxiety were included in the same model. Two separate models were run with one controlling for conduct problems and one allowing conduct problems to vary throughout groups.

Fear and concentration problems. Model 1 assessed the reciprocal association between fear and concentration problems and CU traits from Time 1 to Time 2. Model 2, in turn, assessed the reciprocal relations between fear and concentration problems and CU traits from Time 1 to Time 2, controlling for teacher-reported conduct problems.

Model 1. The model fit the data well, $\chi^2(4) = 1.90$, $p = 0.75$, CFI $= 1.00$, and RMSEA $= 0.00$ (90% CI $= 0.00$-0.06). Autoregressive paths between fear and concentration problems ($\beta = 0.53$, SE $= 0.05$, $p < .001$) and CU traits ($\beta = 0.63$, SE $= 0.04$, $p < .001$) were significant. Fear and concentration problems at Time 1 were not significantly associated with CU traits at Time 2 ($\beta = 0.05$, SE $= 0.06$, $p = .36$). CU traits at Time 1 were not significantly related to fear and concentration problems at Time 2 ($\beta = 0.10$, SE $= 0.06$, $p = .10$).

Model 2. The model fit the data well, $\chi^2(5) = 2.04$, $p = 0.84$, CFI $= 1.00$, and RMSEA $= 0.00$ (90% CI $= 0.00$-0.05). Autoregressive paths between fear and concentration problems ($\beta = 0.54$, SE $= 0.05$, $p < .001$), CU traits ($\beta = 0.63$, SE $= 0.04$, $p < .001$), and conduct problems ($\beta = $

0.63, SE = 0.04, $p < .001$) were significant. Neither fear and concentration problems ($\beta = 0.05$, SE = 0.06, $p = .34$) nor conduct problems ($\beta = 0.02$, SE = 0.06, $p = .76$) at Time 1 were significantly related to CU traits at Time 2. Conduct problems at Time 1 ($\beta = -0.09$, SE = 0.06, $p = .13$) were not significantly associated with fear and concentration problems at Time 2. Finally, neither CU traits ($\beta = 0.06$, SE = 0.05, $p = .22$) nor fear and concentration problems ($\beta = -0.01$, SE = 0.05, $p = .90$) at Time 1 were significantly related to conduct problems at Time 2.

Worry/oversensitivity. Model 3 assessed the reciprocal association between worry and oversensitivity and CU traits from Time 1 to Time 2. Model 4, in turn, assessed the reciprocal relations between worry and oversensitivity and CU traits from Time 1 to Time 2, controlling for teacher-reported conduct problems.

Model 3. The model fit the data well, $\chi^2(4) = 1.64$, $p = 0.80$, CFI = 1.00, and RMSEA = 0.00 (90% CI = 0.00-0.06). Autoregressive paths between worry and oversensitivity ($\beta = 0.67$, SE = 0.04, $p < .001$) and CU traits ($\beta = 0.64$, SE = 0.04, $p < .001$) were significant. Worry and oversensitivity at Time 1 was not significantly associated with CU traits at Time 2 ($\beta = 0.02$, SE = 0.06, $p = .66$). Similarly, CU traits at Time 1 were not significantly related to worry and oversensitivity at Time 2 ($\beta = 0.02$, SE = 0.05, $p = .66$).

Model 4. The model fit the data well, $\chi^2(5) = 1.77$, $p = 0.88$, CFI = 1.00, and RMSEA = 0.00 (90% CI = 0.00-0.04). Autoregressive paths between worry and oversensitivity ($\beta = 0.67$, SE = 0.04, $p < .001$), CU traits ($\beta = 0.63$, SE = 0.04, $p < .001$), and conduct problems ($\beta = 0.63$, SE = 0.04, $p < .001$) were significant. Neither worry and oversensitivity ($\beta = 0.03$, SE = 0.06, $p = .65$) nor conduct problems ($\beta = 0.02$, SE = 0.06, $p = .69$) at Time 1 were significantly associated with CU traits at Time 2. Neither CU traits ($\beta = 0.02$, SE = 0.06, $p = .71$) nor conduct

problems ($\beta = 0.03$, SE = 0.06, $p = .59$) at Time 1 were related to worry and oversensitivity at Time 2. Finally, neither CU traits ($\beta = 0.05$, SE = 0.05, $p = .21$) nor worry and oversensitivity ($\beta = 0.01$, SE = 0.05, $p = .85$) at Time 1 were related to conduct problems at Time 2.

Physiological anxiety. Model 5 assessed the reciprocal association between physiological anxiety and CU traits from Time 1 to Time 2. Model 6 in turn, assessed the reciprocal relations between physiological anxiety and CU traits from Time 1 to Time 2, controlling for conduct problems.

Model 5. The model fit the data well, $\chi^2(11) = 1.65$, $p = 0.80$, CFI = 1.00, and RMSEA = 0.00 (90% CI = 0.00-0.06). Autoregressive paths between physiological anxiety ($\beta = 0.67$, SE = 0.04, $p < .001$) and CU traits ($\beta = 0.62$, SE = 0.04, $p < .001$) were significant. Physiological anxiety at Time 1 was not significantly associated with CU traits at Time 2 ($\beta = 0.09$, SE = 0.06, $p = .13$). CU traits at Time 1, in turn, were not significantly related to physiological anxiety at Time 2 ($\beta = 0.07$, SE = 0.06, $p = .20$).

Model 6. The model fit the data well, $\chi^2(5) = 1.79$, $p = 0.89$, CFI = 1.00, and RMSEA = 0.00 (90% CI = 0.00-0.04). Autoregressive paths between physiological anxiety ($\beta = 0.67$, SE = 0.04, $p < .001$), CU traits ($\beta = 0.61$, SE = 0.04, $p < .001$), and conduct problems ($\beta = 0.62$, SE = 0.04, $p < .001$) were significant. Neither physiological anxiety ($\beta = 0.08$, SE = 0.06, $p = .13$) nor conduct problems ($\beta = 0.02$, SE = 0.06, $p = .78$) at Time 1 were associated with CU traits at Time 2. Neither CU traits ($\beta = 0.08$, SE = 0.06, $p = .17$) nor conduct problems ($\beta = -0.04$, SE = 0.06, $p = .50$) at Time 1 were related to physiological anxiety at Time 2. Neither CU traits ($\beta = 0.05$, SE = 0.05, $p = .39$) nor physiological anxiety ($\beta = 0.07$, SE = 0.05, $p = .16$) at Time 1 were associated with conduct problems at Time 2.

Three subtypes of anxiety. Model 7 assessed the reciprocal associations between

physiological anxiety, worry/oversensitivity, and fear/concentration problems and CU traits from Time 1 to Time 2. Model 8, in turn, assessed the reciprocal relations between physiological anxiety, worry/oversensitivity, and fear/concentration problems and CU traits from Time 1 to Time 2, with conduct problems in the model.

Model 7. The model fit the data well, $\chi^2(6) = 2.52$, $p = 0.87$, CFI = 1.00, and RMSEA = 0.00 (90% CI = 0.00-0.04). Autoregressive paths between physiological anxiety ($\beta = 0.50$, SE = 0.07, $p < .001$), worry and oversensitivity ($\beta = 0.47$, SE = 0.07, $p < .001$), fear and concentration problems ($\beta = 0.26$, SE = 0.09, $p = .002$), and CU traits ($\beta = 0.61$, SE = 0.05, $p < .001$) were significant. Neither physiological anxiety ($\beta = 0.09$, SE = 0.08, $p = .23$), worry and oversensitivity ($\beta = -0.05$, SE = 0.08, $p = .52$), nor fear and concentration problems ($\beta = 0.02$, SE = 0.08, $p = .81$) at Time 1 were significantly associated with CU traits at Time 2. Alternatively, CU traits at Time 1 were not predictive of fear and concentration problems ($\beta = 0.10$, SE = 0.06, $p = .12$) nor worry and oversensitivity ($\beta = -0.04$, SE = 0.06, $p = .50$) at Time 2.

Model 8. The model fit the data well, $\chi^2(9) = 5.05$, $p = 0.83$, CFI = 1.00, and RMSEA = 0.00 (90% CI = 0.00-0.04). Autoregressive paths between physiological anxiety ($\beta = 0.51$, SE = 0.07, $p < .001$), worry and oversensitivity ($\beta = 0.46$, SE = 0.07, $p < .001$), fear and concentration problems ($\beta = 0.28$, SE = 0.09, $p = .001$), conduct problems ($\beta = 0.62$, SE = 0.04, $p < .001$), and CU traits ($\beta = 0.61$, SE = 0.05, $p < .001$) were significant. Neither physiological anxiety ($\beta = 0.09$, SE = 0.08, $p = .25$), worry and oversensitivity ($\beta = -0.05$, SE = 0.08, $p = .54$), fear and concentration problems ($\beta = 0.02$, SE = 0.08, $p = .79$), nor conduct problems ($\beta = -0.01$, SE = 0.06, $p = .87$) at Time 1 were significantly associated with CU traits at Time 2. Alternatively, CU traits at Time 1 were not predictive of worry and oversensitivity ($\beta = -0.04$, SE = 0.06, $p = $

.52) nor conduct problems (β = -0.04, SE = 0.05, p = .40) at Time 2. Neither physiological anxiety (β = 0.07, SE = 0.05, p = .16), worry and oversensitivity (β = - 0.03, SE = 0.08, p = .66), nor fear and concentration problems (β = -0.08, SE = 0.08, p = .28) at Time 1 were significantly associated with conduct problems at Time 2. Alternatively, conduct problems at Time 1 were not predictive of physiological anxiety (β = -0.02, SE = 0.06, p = .69), fear and concentration problems (β = -0.08, SE = 0.06, p = .21), nor worry and oversensitivity (β = -0.01, SE = 0.06, p = .87) at Time 2.

Analyses conducted with the African American subsample. The eight models were re-run with the subsample of African American youth (N = 196), which represented 76.6% of the full sample. Results indicated that age at Time 1 was no longer a significant predictor of CU traits at Time 2 in Models 1, 2, 4, 6, 7, and 8. Similar to the results with the whole sample, no significant prospective associations were found among study variables.

Discussion

The current study examined bi-directional longitudinal relations between three subtypes of anxiety (worry/oversensitivity, fear and concentration problems, and physiological) and CU traits in early- to mid-adolescence. These associations were tested in a middle school sample of predominantly African American youth living in an inner-city, low-income community. For each subtype of anxiety, two models were run. Each model examined bi-directional longitudinal relations between the focal anxiety subtype and CU traits. One model controlled for conduct problems while the other did not. The final two models included paths between all anxiety subtypes and CU traits, with one model excluding and the other including conduct problems. It was hypothesized that there would be a negative, predictive bi-directional relation between both CU traits and worry and oversensitivity, and CU traits and fear and concentration problems. The

hypotheses exploring the association between CU traits and physiological anxiety, however, remained exploratory, as this relation has remained largely unexplored. Across all models no significant cross-lagged paths were found for relations between the three anxiety subtypes and CU traits.

The present study contributed to the existing literature on relations between CU traits and anxiety in several ways. Although CU traits are theoretically and empirically linked to anxiety, studies exploring these relations have revealed mixed findings. Some studies showed that lower levels of anxiety led to increased CU traits (e.g., Barker et al., 2011; Kochanska, 1995; Pardini, Lochman, & Powell, 2007) while others found positive relations between physiological anxiety and CU traits (e.g. Waller et al., 2016b). Most studies have assessed anxiety using more global or composite measures and did not consider subtypes of this construct (Derefinko, 2015). Furthermore, the majority of literature in this area has focused on clinical samples or youth who were incarcerated (e.g. Frick, 1999; Dolan & Rennie, 2007; Herpers et al., 2016). Few researchers have explored the prospective association between CU traits and the subtypes of anxiety (see Waller et al., 2016b for an exception) and, to date, this relation has not been explored among a community sample. Finally, even though early- to mid-adolescence is an important developmental period characterized by transitions and increased academic and social stressors, little research has examined associations between these constructs in early- to mid-adolescence.

Descriptive Analyses

According to teacher-report, approximately 81 to 84% of adolescents in the current study engaged in at least one act of externalizing behavior in the past 2 months at both Time 1 and Time 2. While it is difficult to compare prevalence rates of externalizing behavior due to

differing sample characteristic and context, as well as the varying item severity, the prevalence rates in the current sample are higher than those observed in studies focusing on adolescents living in inner-city urban settings (Branson & Cornell, 2009). Additionally, the present study found higher average scores for CU traits compared to scores of community adolescents in Cyprus and Germany (Essau et al., 2006; Fanti et al., 2013) but similar to that of detained male adolescents in the U.S. This highlights the need to explore risk factors and consequences of CU traits in community samples of urban youth, as well as the impact that poverty and psychosocial stressors may have on the development of CU traits.

Consistent with prior research, CU traits were relatively stable from Time 1 to Time 2. Additionally, CU traits at Time 1 and Time 2 were positively correlated with conduct problems at Time 1 and Time 2. Similar to Waller and colleagues (2016b), CU traits at Time 1 and Time 2 were positively associated with physiological anxiety at Time 1 and Time 2. However, contrary to expectations, CU traits at Time 1 and Time 2 were also positively associated with fear and concentration problems at Time 1 and Time 2. Waller and colleagues (2016b) provide one explanation for these findings by suggesting that, as their sample consists of high risk adolescent males, they may belong to the secondary psychopathy subgroup, which is characterized by high levels of trauma and physiological anxiety. As mentioned previously, researchers have made theoretical distinctions between primary and secondary psychopathy. Consistent with this distinction, previous findings indicate that youth with CU traits differ in terms of emotion dysregulation, levels of distress, and internalizing symptoms according to whether they have a history of trauma (Fanti, Demetriou, & Kimonis, 2013; Kimonis et al., 2012; Vaughn, Edens, Howard, & Smith, 2009). While the present study used a community sample, participants lived in an urban setting with high crime rates and the majority (88%) were eligible for the federally

subsidized school lunch program. Previous findings have indicated that lower socioeconomic status puts youth at a higher risk for exposure to trauma (Breslau, Kessler, Chilcoat, Schultz, Davis, & Andreski, 1998); however, as exposure to trauma was not measured in the current study, this relation was not able to be established.

Longitudinal Relations Between Anxiety and CU Traits

Hypotheses that lower rates of anxiety (i.e., fear and concentration problems and worry/oversensitivity) at Time 1 would predict higher levels of CU traits at Time 2 were not supported. The non-significant findings were consistent whether or not conduct problems were included in the model, for analyses run separately for each subtype of anxiety, and when all anxiety subtypes were included in one model. It is important to consider that low rates of anxiety in early- to mid-adolescence could have a variety of implications, including being precursors of adaptive functioning in social, behavioral, and academic domains, and, thus, when considering anxiety alone, could be one possible explanation for the lack of significant findings. Perhaps more surprising was the finding that low anxiety did not function as a risk factor for higher levels of CU traits when accounting for conduct problems. Instead of controlling for rates of conduct problems, some studies have used latent profile analyses (LPA) to identify profiles of youth with varying characteristics (e.g., the presence of high levels of conduct problems and CU traits; Eisenbarth et al., 2016). Research suggests that it is the co-occurrence of conduct problems and CU traits which reflects traits in youth that are similar to the temperamental style of adults with psychopathy. Thus, low anxiety may be more strongly linked to specific subgroups of adolescents who exhibit both high levels of conduct problems and CU traits, and using analyses such as LCA may be useful in future research to test these relations.

A significant predictive association between physiological anxiety and CU traits was not found after a period of six months, regardless of whether or not conduct problems were accounted for. These findings were not consistent with Waller et al. (2016b), as their results indicated that increased physiological anxiety differentiated youth with high stable CU traits. One explanation for this difference may be that while both the present study and Waller et al. (2016b) accounted for conduct problems between groups, there were differences in the operationalization of conduct problems. Specifically, Waller et al. (2016b) used self-reported violent offending as a covariate while the present study used teacher-reported externalizing behavior. Although there are some benefits to teacher-report, it is restricted to the school context while self-report takes into account different settings. Additionally, violent offending measures exclusively assess violent crimes and physical aggression, while externalizing behavior includes non-aggressive items such as "fidgets or moves around too much" and "acts without thinking." Thus, it may be that the different conceptualizations of conduct problems may have contributed to the differential findings. Further, while Waller et al. (2016b) examined the prospective relations between CU traits and anxiety subtypes over a period of five years, the present study explored these associations over a period of six months. Thus, it may be that six months is too short of a time period to observe significant changes in physiological anxiety.

Further, neither fear and concentration problems nor worry and oversensitivity at Time 1 were found to be associated with CU traits at Time 2. These results contradict previous findings indicating a negative predictive relation between temperamental fearlessness and CU traits (e.g., Barker et al., 2011; Fanti et al., 2016, Kochanska, 1995). Specifically, Kochanska (1995) found that low anxiety and fearfulness in toddlerhood contributed to the development of CU traits. Barker et al. (2011), in turn, found that mother-reported fearlessness at age 2 predicted both

mother-reported conduct problems and CU traits at age 13, controlling for prenatal risks and parenting factors. One explanation for these differential findings may be that while fearlessness, as well as worry and oversensitivity, predicts changes in CU traits in infancy and toddlerhood, CU traits may have stabilized by early- to mid-adolescence and, thus, fearlessness does not bring about changes in CU traits throughout this developmental period. Alternatively, six months may be too short a time period to observe significant changes in CU traits. Indeed, the present study found that there was high stability between CU traits at Times 1 and 2 fear and concentration problems at Times 1 and 2 , and worry and oversensitivity at Times 1 and 2 when controlling for each other, physiological anxiety, and conduct problems. Finally, these differential findings may be attributable to contextual and environmental differences given that this is the first study to explore this prospective relation among a community sample of middle school students in the U.S.

Longitudinal Relations Between CU Traits and Anxiety

Expected relations between higher levels of CU traits at Time 1 and lower levels of anxiety across subtypes at Time 2 were not found. In fact, no predictive relations between CU traits and physiological anxiety, worry and oversensitivity, or fear and concentration problems were found over six months, regardless of whether or not conduct problems where accounted for. As this is the first study to examine the prospective relation between CU traits and subtypes of anxiety, it is difficult to directly compare these findings to the current literature. However, the present results are inconsistent with research demonstrating a negative relation between anxiety measured as a composite score and CU traits (e.g., Barker et al., 2011; Kochanska, 1995; Pardini, Lochman, & Powell, 2007). Additionally, these results contradict theoretical models which posit that youth with high levels of CU traits may react differently than youth with low levels of CU

traits to external stressors (e.g., in peer relationships) due in part to low activation of the

autonomic nervous system and, thus, have less resulting anxiety.

One potential reason for these unexpected findings is that, as mentioned previously, six

months may be too short of a time period to examine change in CU traits, especially given the

stability of this construct. Another explanation for these unexpected findings may be that the

prospective relation between anxiety subtypes and CU traits may be less pronounced among

community versus clinical samples. However, as this is the first U.S. study to examine these

relations in an early- to mid-adolescent community sample, future research is needed to arrive at

this conclusion. A third explanation could be that, as mentioned previously, trauma and adverse

childhood experiences, such as child abuse, may have influenced the directionality and/or

strength of the relation between the constructs, but these were not measured in the present study.

Previous findings have indicated a differential association between the relation of CU traits and

anxiety according to participants' traumatic backgrounds (Vaughn et al., 2009). Specifically,

results demonstrate that among youth without traumatic histories, CU traits were negatively

related to anxiety while among youth with histories of trauma, CU traits were positively related

to anxiety (Vaughn et al., 2009). Thus, future research would benefit from considering traumatic

experiences when exploring relations between CU traits, anxiety, and conduct problems. Finally,

there may be other environmental and contextual factors, such as exposure to community

violence or school climate, that moderate, and may influence, the directionality of relations

between CU traits and anxiety.

Relations Between CU Traits and Conduct Problems

While previous findings have demonstrated a relation between CU traits and conduct

problems (see Frick et al., 2014 for a review), this relation was not established in the present

study. One reason for these findings may be that conduct problems symptoms were assessed using teacher-reported of externalizing behavior. Some of the items on this measure (e.g., "fidgets or moves around too much," and "acts without thinking") may not be representative of conduct problems as assessed in the DSM-5 which are characterized by deceitful, destructive, and aggressive behavior (Nock, Kazdin, Hiripi, & Kessler, 2006). Moreover, teacher-report of externalizing behaviors is restricted to the school context which, therefore, does not represent behaviors occurring at home or in the community.

Additionally, the present study did not examine specific conduct problem symptomatology or distinguish between overt and covert behavior or between reactive and proactive aggression. The terms 'conduct problems' or 'externalizing behaviors' are composite variables that may include a cluster of behaviors such as covert aggression, overt aggression, proactive aggression, and reactive aggression, among others. While there has been no study to date that explored covert and overt aggression among youth with CU traits, researchers have theorized that youth with CU traits are less likely to perform reactive aggression as compared to proactive aggression, which is characterized by calculated planning, is motivated by a goal, and anticipates a reward (Frick & Ellis, 1999). Yet studies have yielded mixed results and, while some studies have indicated that CU traits are associated with proactive aggression alone (e.g. Fanti et al., 2009; Stellwagen & Kerig, 2010; Marsee & Frick, 2007), the majority of studies have found that CU traits are related to both reactive and proactive aggression (Barry, Thompson, Barry, Lochman, Adler, & Hill, 2007, Kimonis et al., 2008, Stickle, Marini, & Thomas, 2012). Distinguishing between and accounting for subtypes of aggression, therefore, may yield meaningful results when examining the relation between CU traits and anxiety. Taken together, this may explain why, unlike in Pardini and colleagues' (2007) study, accounting for

conduct problems did not strengthen the relation between CU traits and the three subtypes of anxiety.

Limitations

While the present study had several strengths, its limitations should be acknowledged. First, as the majority of students identified themselves as African American or Black and potential comparison groups (e.g., Hispanic/Latino, European American/White, and students who endorsed more than one race/ethnicity) were very small, examination of differences in the findings based on race/ethnicity could not be considered. Future studies should consider race/ethnicity in the model as it may account for differences in the strength of relations among the study variables.

Second, conduct problems symptoms were assessed as externalizing behavior for the current study, and did not include all symptoms of ODD and conduct disorder based on the current version of the Diagnostic and Statistical Manual of Mental Health Disorders (DSM-5). While there has been no consistent measure of conduct problems in studies exploring associations between conduct problems and CU traits, many have included symptoms of ODD and conduct disorder in their definition of conduct problems. For example, studies have used the *Diagnostic Interview Schedule for Children* (e.g., Christian et al., 1997; Frick et al., 1999; Frick, 2003; Hawes & Dadds, 2005), the *Checkmate plus Youth Inventory* (Eisenbarth et al., 2016; Fanti et al., 2013), and the *Behavior Assessment System for Children* (e.g. Pardini et al., 2007). In other words, despite a lack of consistent measurement, most researchers have used questionnaires that assess youth's conduct disorder and ODD symptoms when investigating relations between conduct problems and CU traits. Further, while findings have indicated that teacher-report of externalizing behavior is a more valid assessment than self-report (Stanger &

Lewis, 2010) teacher-report is restricted to the school context. Thus, the present study did not assess conduct problems that may happen in the home or neighborhood.

Another limitation of the present study is that the data was collected over six months, which may be too short of a time period to observe changes in the study variables. While early-to mid-adolescence is a developmental period characterized by change, CU traits have demonstrated moderate to high stability and, thus, it may be that a longer period of time is necessary to detect change in relations between CU traits and anxiety. Thus, studies are needed that examine prospective relations between CU traits and subtypes of anxiety over a longer period of time. Further, the present study did not account for developmental differences between sixth, seventh, and eighth graders. Research is needed to follow a cohort of sixth graders throughout middle school to explore how relations between CU traits and subtypes of anxiety may change during this timeframe.

Furthermore, while the Inventory of Callous Unemotional Traits (ICU; Frick et al., 2004) has been normed with both youth in juvenile justice (Kimonis, Cross, Howard, & Donoghue, 2013; Muñoz, Frick, Kimonis, & Aucoin, 2008; Pechorro, Ray, Barroso, Maroco, & Goncalves, 2014) and community samples (Byrd, Kahn, & Pardini, 2013; Ezpeleta et al., 2013; Roose et al., 2010), this measure has not been normed among a community sample of primarily African American youth in the U.S. Many studies exploring the psychometric properties of the ICU among community samples have been conducted internationally. Specifically, the ICU has been assessed in samples of Dutch adolescents (Roose et al., 2010), German adolescents (Essau et al., 2006), Spanish preschoolers (Ezpeleta et al., 2013), and Greek adolescents (Fanti et al., 2009). Of those studies conducted in the U.S., two had adult samples (Byrd, Kahn, & Pardini, 2013; Neal & Sellbom, 2012) and one had an undergraduate sample (Kimonis, Branch, Hagman,

Graham, & Miller). Among these, only one sample was racially diverse (i.e., including 56% African American participants), but this sample was exclusively male (Byrd, Kahn, & Pardini, 2013).

Thus, the validity of the ICU in a primarily African American community sample of adolescents in the U.S. has not been established. Further, while the ICU has demonstrated validity for use internationally, it may be that some items are ethnocentric (e.g. "does not care about being on time") and may not be suggestive of CU behaviors across different races and ethnicities (McDonald et al., 2017). For example, McDonald et al. (2017) argued that some items on the ICU may not be indicative of callous or uncaring behavior among Latino/a individuals and lack of endorsement of items such as "I care about how well I do at school" may not be considered deviant when youth are undergoing financial pressures or given the responsibility to take care of their siblings. Accordingly, this item did not fit in McDonald and colleagues' (2017) multidimensional item-response theory (MIRT) analysis. However, as the present sample was primarily African American, not Latino/a, these assertions are hypothetical.

Finally, the present study did not take into account histories of trauma, adverse events, and/or exposure to community violence. As previous findings have indicated a positive relation between anxiety and CU traits among individuals with histories of trauma but a negative relation between anxiety and CU traits among individuals without histories of trauma, it may be that there is a differential association between anxiety and CU traits according to experience of trauma or adverse childhood events. Therefore, considering histories of trauma and adverse events within the model is important to understand if having a history of trauma or adverse childhood experiences may moderate relations between CU traits and subtypes of anxiety. In addition, as trauma and exposure to community violence may lead to changes in behavioral

responses and anxiety over time, the relation between CU traits and anxiety may be informed by models of trauma-informed care.

Future Directions and Implications

CU traits are an important risk factor for delinquency and antisocial behavior. Thus, efforts to establish risk factors and outcomes of youth with CU traits have been prevalent. While the present study did not find a longitudinal association between CU traits and subtypes of anxiety over six months, there is theoretical and empirical evidence that suggests longitudinal relations between these constructs (e.g., Frick et al., 1999; Derefinko, 2015; Pardini et al., 2007;). Thus, the lack of significant results in the present study may be attributable to differences in sample characteristics and/or the length of time examined. For example, there may be cultural and societal differences that may influence associations between anxiety and CU traits. Understanding how environmental, contextual, and cultural factors influence the relation between CU traits and anxiety has important implications for intervention, particularly during early- to mid-adolescence and, thus, should continue to be explored.

Future research should explore the prospective bidirectional relations between CU traits and subtypes of anxiety over a period of one year or longer. As CU traits have demonstrated moderate to high stability (e.g. Fontaine et al., 2011; Fontaine et al., 2012), it may be that six months is too short of a time period to observe significant change. Alternatively, studies that follow a cohort of sixth graders throughout middle school may be informative to better understand trajectories of CU traits and anxiety as well as their interactions across this timeframe. Additionally, examining longitudinal relations between study variables in samples representing other races/ethnicities would add to the literature in this area. Future research could also incorporate multi-informant ratings of conduct problem symptoms from both parent- and

teacher-reported conduct problems, as parents and teachers observe adolescents' behavior in different contexts. Measures of conduct problem should, in turn, more specifically address conduct disorder and ODD symptoms. Distinguishing between subtypes of aggressive behavior (i.e. covert, overt, proactive, or reactive aggression) when accounting for conduct problems is also an important future direction. Finally, when exploring the bidirectional relation between CU traits and subtypes of anxiety, researchers should consider accounting for trauma and/or adverse childhood events, as previous findings have indicated a differential association between CU traits and anxiety according to whether or not study participants had been exposed to these experiences. Alternatively, researchers should explore the effects that contextual and environmental factors, such as SES, exposure to violence, and/or trauma, have on the prospective relation between CU traits and the subtypes of anxiety among a community sample.

Conclusion

Overall, this study highlights the need to conduct additional research to further understand the risk factors and consequences of high levels of CU traits among early- to mid-adolescents. Prospective relations between CU traits and anxiety are not well understood, and research is needed over longer periods of time with community samples of early- to mid-adolescents. Better understanding the directionality and strength of longitudinal relations between CU traits and anxiety could inform the timing and content of clinical interventions. Further, this study underscores the need to identify and assess the influence of environmental and contextual factors on intrapsychic processes like CU traits and anxiety such as exposure to community violence, trauma, and distress. For example, taking these factors into account may reveal relations between CU traits and specific subtypes of anxiety (e.g., physiological) and intervention approaches such as trauma-informed care that may impact both levels of CU traits

and anxiety. Although the current findings were not anticipated based on prior literature and theory, they emphasize the need to continue exploring longitudinal relations between CU traits and anxiety, considering the influence of environment and context.

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Inventory of Callous Unemotional Traits (Youth Version)

Name: _____

Date Completed: _____

Instructions: Please read each statement and decide how well it describes you. Mark your answer by circling the appropriate number (0-3) for each statement. Do not leave any statement unrated.

	Not at all true	Somewhat true	Very true	Definitely true
1. I express my feelings openly.	0	1	2	3
3. I care about how well I do at school or work.	0	1	2	3
4. I do not care who I hurt to get what I want.	0	1	2	3
5. I feel bad or guilty when I do something wrong.	0	1	2	3
6. I do not show my emotions to others.	0	1	2	3
7. I do not care about being on time.	0	1	2	3
8. I am concerned about the feelings of others.	0	1	2	3
9. I do not care if I get into trouble	0	1	2	3
10. I do not let my feelings control me.	0	1	2	3
11. I do not care about doing things well.	0	1	2	3
12. I seem very cold and uncaring to others	0	1	2	3
13. I easily admit to being wrong.	0	1	2	3
14. It is easy for others to tell how I am feeling.	0	1	2	3
15. I always try my best.	0	1	2	3
16. I apologize ("say I am sorry") to persons I hurt.	0	1	2	3
17. I try not to hurt others' feelings.	0	1	2	3

18. I do not feel remorseful when I do something wrong.	0	1	2	3
19. I am very expressive and emotional.	0	1	2	3
20. I do not like to put the time into doing things well.	0	1	2	3
22. I hide my feelings from others.	0	1	2	3
23. I work hard on everything I do.	0	1	2	3
24. I do things to make others feel good.	0	1	2	3

Appendix B

Revised Children's Manifest Anxiety Scale

Read each question carefully. Put a circle around the word YES if you think it is true about you.
Put a circle around the word NO if you think it is not true about you

1.	I have trouble making up my mind.	Yes / No
2.	I get nervous when things do not go the right way for me.	Yes / No
3.	Others seem to do things easier than I can.	Yes / No
4.	Often I have trouble getting my breath.	Yes / No
5.	I worry a lot of the time.	Yes / No
6.	I am afraid of a lot of things.	Yes / No
7.	I get mad easily.	Yes / No
8.	I worry about what my parents will say to me.	Yes / No
9.	I feel that others do not like the way I do things.	Yes / No
10.	It is hard for me to get to sleep at night.	Yes / No
11.	I worry about what other people think about me.	Yes / No
12.	I feel alone even when there are people with me.	Yes / No
13.	Often I feel sick in the stomach.	Yes / No
14.	My feelings get hurt easily.	Yes / No
15.	My hands feel sweaty.	Yes / No
16.	I am tired a lot.	Yes / No
17.	I worry about what is going to happen.	Yes / No
18.	Other children are happier than I am.	Yes / No

19.	I have bad dreams.	Yes / No
20.	My feelings get hurt easily when I am fussed at.	Yes / No
21.	I feel someone will tell me I do things the wrong way.	Yes / No
22.	I wake up scared some of the time.	Yes / No
23.	I worry when I go to bed at night.	Yes / No
24.	It is hard for me to keep my mind on my schoolwork.	Yes / No
25.	I wriggle in my seat a lot.	Yes / No
26.	I am nervous.	Yes / No
27.	A lot of people are against me.	Yes / No
28.	I often worry about something bad happening to me.	Yes / No

Appendix C

Social-Skills Improvement System – Teacher Report (SSIT)

Externalizing Problems Subscale

Think about this student's behavior **during the past two months**. Then, decide **how often** this

student displays the behavior…

    1 = Never
    2 = Seldom
    3 = Often
    4 = Almost Always

    Examples of items for the Externalizing Problems subscales included:

	Never	Seldom	Often	Almost always
Acts without thinking.	1	2	3	4
Is aggressive toward people or objects.	1	2	3	4
Fights with others.	1	2	3	4
Disobeys rules or requests.	1	2	3	4
Talks back to adults.	1	2	3	4