Predicting Antisocial Behavior: How Callous-Unemotional Traits Moderate Common Risk Factors

by

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Abstract

Callous-unemotional (CU) traits are associated with severe and aggressive youth antisocial behavior (ASB) and are under consideration as a potential specifier for the diagnosis of Conduct Disorder in *DSM-5* (Frick & Moffitt, 2010). This proposal demands more inquiry into the impact that CU traits have on behavioral subtypes of youth ASB. Normal-range personality traits, trait levels of anxiety, and hormonal stress reactivity (i.e., changes in the stress hormone, cortisol) are all factors that have been studied extensively in relation to ASB, but these relationships have not yet been considered in combination with CU traits. The purpose of the current set of studies was to examine the extent to which CU traits moderated links between these three factors and both overall and behavioral subtypes of ASB. In the first study, data were collected on children’s personality, CU traits, and three behavioral categories of ASB (physical aggression, relational aggression and non-violent rule-breaking behavior) for community (*N* = 742) and clinical (*N* = 183) samples of children. In the community sample, CU traits moderated links between Neuroticism, Extraversion, Agreeableness, Openness to Experience and ASB overall and externalizing behaviors, between Neuroticism, Extraversion and physical aggression and between Agreeableness, Extraversion and rule-breaking behaviors. In the clinical sample, CU traits moderated the
link between Agreeableness and externalizing behaviors. In the second study, data were collected on children’s trait anxiety, CU traits, and the same three behavioral categories of ASB in a follow-up adolescent community sample \((N = 145)\). Reactivity of cortisol in response to an unanticipated social stress test was also measured. Results revealed that CU traits moderated links between trait anxiety and ASB overall, externalizing behaviors and physical aggression. In females only, CU traits also moderated links between cortisol reactivity and ASB overall and externalizing behaviors. Combined, the results of these studies support the proposal that CU traits are a clinically useful diagnostic specifier with different implications for behavioral subtypes of ASB. Further, the present findings allow recommendations to be made for future research to further our understanding of the role CU traits play in CD, and to develop targeted interventions.
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Chapter 1
General Introduction

1.1 Present Goals

Callous-unemotional (CU) traits have been proposed by Frick and Moffitt (2010) to be included as a specifier for the diagnosis of Conduct Disorder (CD) in the upcoming edition of the *Diagnostic and Statistical Manual (DSM), DSM-5* (http://www.dsm5.org). In the *DSM*, a specifier is used to identify an important and clinically relevant subgroup within a particular diagnosis that share common features (American Psychiatric Association [APA], 2000). As a result, additional research is required to investigate the role CU traits play not only in the presentation of antisocial behavior (ASB), but also in the relationship that ASB has with other important factors. Past research has identified many different factors that are involved in the presentation of ASB, including normal-range personality traits (Miller & Lynam, 2001; Miller & Lynam, 2006), trait anxiety (Cunningham & Ollendick, 2010; Kotler & McMahon, 2005), and reactivity of the stress hormone, cortisol (McBurnett et al., 1991; van Goozen, Fairchild, Snoek, & Harold, 2007).

Though reliable relationships have been established between normal-range personality and ASB (Klimstra, Akse, Hale, Raaijmakers, & Meeus, 2010; Miller & Lynam, 2001; Miller, Lynam, & Jones, 2008), what has not been examined is whether these relationships are the same when considered at varying levels of CU traits. Given the heightened importance CU traits have been given in the diagnosis of CD, it is necessary to establish the relationship between personality and ASB in order to understand whether the risk and protective associations previously identified are consistent at varying levels of CU traits. The first goal of this thesis, therefore, was to answer this question by examining how CU traits and normal-range personality traits interact in the prediction of ASB in both a community and a clinical sample of youth.

Unlike the work on normal-range personality and ASB, there is no clear pattern of association between trait levels of anxiety and ASB and CD (Cunningham & Ollendick, 2010; Frick & Ellis, 1999; McBurnett et al., 1991). Instead, anxiety may act as a distinguishing factor for different types of individuals who engage in ASB (O’Brien & Frick,
1996) or show high levels of CU traits or psychopathy (Sevecke & Kosson, 2010). Despite these ideas, the relationship between trait anxiety and ASB has not yet been clearly defined (Frick & Ellis, 1999; Cunningham & Ollendick, 2010). The proposal of this thesis is that this relationship will be elucidated by considering anxiety at varying levels of CU traits. Examining the relationship between trait anxiety and ASB at varying levels of CU traits can provide critical information as to how this important risk factor influences the expression of ASB. This information, then, will be highly relevant to the subtypes of conduct-disordered youth that are defined by their level of CU traits and may provide useful insight into appropriate interventions. Therefore, the second goal of this thesis was to test the moderating effects of CU traits for trait anxiety in the prediction of ASB.

Similar expectations are held when considering the influence of cortisol reactivity on the expression of ASB. Though a blunted cortisol response has been commonly associated with ASB and CD, specific results suggest that the true relationship is more complex (Hawes, Brennan, & Dadds, 2009; Susman, 2006; Susman et al., 2010; van Goozen et al., 2007). Similar to trait anxiety, individuals with CD that do or do not demonstrate the diminished cortisol response have been identified as having different characteristics (van Goozen et al., 2007). As a result, measuring cortisol reactivity may be a useful indicator within conduct-disordered youth. This potential for useful subtyping for CD using cortisol reactivity must be considered in light of the proposal to include CU traits in this diagnosis. The limited research that has been conducted relating cortisol reactivity and CU traits has yielded inconsistent results (Glenn, Raine, Schug, Gao, & Granger, 2011; O’Leary, Loney, & Eckel, 2007; Stadler et al., 2010). The final goal of this thesis, then, was to combine CU traits and a measure of cortisol reactivity in response to a social stress task to examine how these factors moderate each other in predicting ASB. The hope is that in doing so, the role of this biological factor will be better understood based on the consideration of CU traits, and that this information can then be implemented in a clinical setting.

The overarching aim of this dissertation was to demonstrate that the relationships between ASB and commonly studied risk factors change when you consider them at varying levels of CU traits. By doing so, the included studies will provide strong support for the proposal to include CU traits into the diagnosis of CD. In pursuit of this goal, the initial
chapter will detail what CU traits are, the rationale behind the inclusion of CU traits in the
diagnosis of CD, the development of CU traits and the role CU traits play in the presentation
of ASB. It will also discuss instances in which interactions exist between CU traits and other
factors related to ASB. Finally, the research surrounding the relationship between normal-
range personality traits, trait anxiety and cortisol reactivity in ASB and CU traits, as well as
the hypotheses of the current thesis, will be briefly introduced. Following this, Chapter II
contains the first study in which the moderation between CU traits and normal-range
personality in the prediction of ASB and three subtypes (physical aggression, relational
agression, and non-violent rule-breaking behavior) is examined in a community and a
clinical sample of youth. Chapter III contains the second study, in which the moderating
effects of CU traits on trait anxiety and cortisol reactivity in the prediction of ASB and its
subtypes are examined in an adolescent community sample. The final chapter contains a
general discussion, including the overall implications and future directions of the present
studies.

1.2 CU Trait Characteristics

There are a number of factors that influence the expression of ASB such as
intelligence (Christian, Frick, Hill, Tyler, & Frazer, 1997) and impulsivity (Crpanzano,
Frick, & Terranova, 2010; Frick & Viding, 2009; Ostrov & Houston, 2008). CU traits, one
type of problematic personality, are yet another factor frequently studied in conjunction with
ASB (Frick & Moffitt, 2010). In youth, CU traits include a lack of concern about academic
performance, a tendency to break promises, hiding their emotions, being indifferent to the
feelings of others, a lack of empathy and remorse, and a general pattern of disregard for
others (Essau, Sasagawa, & Frick, 2006; Frick & Ellis, 1999; Moran et al., 2009). Individuals
with these traits also demonstrate narcissistic tendencies and manipulate others for their own
personal gain (Barry, Barry, Deming, & Lochman, 2008; Frick, Bodin & Barry, 2000;
Viding, Jones, Frick, Moffitt, & Plomin, 2008).

In regards to the ASB that they commit, youth with high levels of CU traits tend to
place more emphasis on the positive consequences of aggression and diminish the negative
(Frick, 2009; Frick & White, 2008; Pardini, Lochman, & Frick, 2003). In their study of coed
adjudicated youth, Pardini et al. (2003) found that CU traits were positively related to the
individual anticipating reward as a result of aggression, both in terms of tangible benefits and in the acquisition of dominance. Additionally, CU traits were negatively related to the anticipation of punishment as a result of aggression. A further interesting finding of this study was that the rationale for engaging in aggression for children with high levels of CU traits was focused on the expectations and values surrounding the immediate benefits of aggression, and was unrelated to a long-term goal of discouraging future conflict with an aggressive peer. The results of this study highlight important characteristics that predispose individuals with high levels of CU traits to engage in increased levels of aggression.

Besides differences in the expectations of various outcomes, CU traits were also positively related with the value these youth placed on the positive consequences of committing aggression and negatively related with the value placed on negative consequences, indicating they have two levels of bias towards reward versus punishment for antisocial acts (Pardini et al., 2003). Interestingly, Pardini et al. (2003) found that impulsivity was not related either to the expectations or values associated with aggression that CU traits were related to. These results represent a good example of the reward-dominant response style that individuals with CU traits typically exhibit. As a result of this style, their behavior is driven by the attainment of immediate-goals and is less sensitive to the deterring effects of punishment.

People with high levels of CU traits tend to lack empathy for their victims and do not feel remorse for their actions (Viding et al., 2008). Indeed, Pardini et al. (2003) also found in their study that CU traits were negatively related with empathic concern and perspective taking. In comparison, youth who commit ASB from an early age but have low levels of CU traits experience elevated levels of anxiety and remorse (Frick & Viding, 2009). They also experience empathy towards their targets and often feel distress at how their actions impact others (Frick & Viding, 2009). These associated characteristics exemplify why CU traits are of great interest in identifying important subgroups within individuals with ASB.
1.3 CU Traits as a Specifier for the Diagnosis of Conduct Disorder

Conduct Disorder (CD) is a behavioral disorder that afflicts multiple youth with serious potentially lifelong consequences (Moffitt, 1993). In the community, research has shown the prevalence of CD to be anywhere from 1.8 to 16% in boys and 0.8 to 9.2% in girls (Sevecke & Kosson, 2010). Unsurprisingly, the prevalence dramatically increases to between 31 and 100% when considering only delinquent adolescents (Sevecke & Kosson, 2010).

Recently, Frick and Moffitt (2010) put forth a proposal to include CU traits as a specifier for the diagnosis of CD in the fifth edition of the Diagnostic and Statistical Manual (DSM), DSM-5 (http://www.dsm5.org). The existing criteria included in the fourth edition text revision of the DSM (DSM-IV-TR; APA, 2000) of CD calls for the expression of at least three of 15 symptoms that fall within the following four categories of ASB in the past six months: (1) Aggression to people and animals; (2) Destruction of property; (3) Deceitfulness or theft; or (4) Serious violations of rules (Scheepers, Buitelaar, & Matthys, 2011). This current diagnosis also contains additional specification for age-of-onset (before or after the age of 10 years) and the severity of the diagnosis based on the number of symptoms present (Scheepers et al., 2011). The proposal put forth by Frick and Moffitt (2010) seeks to add an additional specifier to the CD diagnosis, requiring an indication of whether the child has exhibited at least two of the following four CU traits in the past 12 months: (1) Lack of remorse or guilt; (2) Callous-lack of empathy; (3) Unconcerned about performance; or (4) Shallow or deficient affect. The final criteria are set to be released with the DSM-5 in May 2013 (http://www.dsm5.org).

The rationale for this proposal included several key points. First, psychopathy, the theoretical origin of CU traits, has been used to reliably identify an important subgroup of antisocial adults that demonstrate more severe and violent ASB (Frick & Moffitt, 2010). Second, CU traits demonstrate a relative level of stability across multiple age groups (Frick & Moffitt, 2010). Finally, the high levels of heterogeneity in the CD population require clinically relevant subgroup identification (Frick & Moffitt, 2010). Each of these points will be discussed in turn.
1.4 Application of Psychopathy Construct to Youth

Psychopathy has been found to be one of the strongest risk factors for ASB (Czar, Dahlen, Bullock, & Nicholson, 2011). Indeed, psychopathy has been positively related not only to ASB in general in adults, but also to its subtypes of physical aggression and relational aggression (Czar et al., 2011; Ostrov & Houston, 2008). Physical aggression is defined as the physical harm or threatening of physical harm towards another. Relational aggression, in comparison, is the harm or threatened harm of an individual’s peer or social relationships. Examples of relational aggression include actions such as spreading rumors and excluding the individual from social groups.

To examine how psychopathy relates to different types of aggression, Czar et al. (2011) conducted a study examining the relationship between psychopathy and physical and relational aggression in a sample of introductory psychology students. They found that psychopathy levels significantly predicted relational aggression independently from both gender and physical aggression.

Ostrov and Houston (2008) also used introductory psychology students to examine the relationship between psychopathic personality traits and four categories of aggression – proactive (i.e., instrumental or goal-oriented) physical aggression, proactive relational aggression, reactive (i.e., provoked) physical aggression, and reactive relational aggression. In their study, psychopathic traits were uniquely related to proactive aggression in general. However, ASB subtype differences were identified at the factor level of psychopathic traits. Specifically, the factor associated with fearless dominance was uniquely positively related to proactive physical aggression, but uniquely negatively related to proactive relational aggression. In comparison, these authors found that proactive physical aggression, proactive relational aggression and reactive relational aggression were all uniquely positively associated with the impulsive antisociality factor. Such results suggest that the relationship between different subtypes of ASB relate to psychopathy differently depending on the specific traits of psychopathy that are being focused on. This is relevant to this thesis, as CU traits consist of only a subset of traits included in the construct of psychopathy.
Psychopathy has also been used reliably to identify an important subgroup of antisocial adults who exhibit a more pervasive and severe pattern of ASB (Essau et al., 2006; Frick & Moffitt, 2010; Sevecke & Kosson, 2010). Given the utility of psychopathy in adults to indicate a unique subgroup of individuals who commit ASB, many sought to determine whether the same distinction could be made in antisocial youth (Frick & Moffitt, 2010). Indeed, multiple studies have demonstrated a relationship between psychopathic traits and ASB and CD in youth (e.g., Barry et al., 2008; Marsee, Silverthorn, & Frick, 2005; Salekin, Lee, Schrum Dillard, & Kuback, 2010).

This line of research, however, raised concerns regarding the negative connotations that accompany the label of ‘psychopath’, such as psychopathy being an intractable condition with no hope of intervention (Frick & Ellis, 1999; Frick & Moffitt, 2010). These concerns included the consequences such a label can have in legal contexts (McMahon, Witkiewitz, Kotler, & Conduct Problems Prevention Research Group, 2010), an issue highly relevant to children with CD who often come into contact with the criminal justice system (Dolan, 2004). Another concern was that certain psychopathic characteristics may be somewhat normative in children, such as egocentrism and irresponsibility (Salekin & Frick, 2005). As a result, the serious implications of the label ‘psychopath’ could be inappropriately applied to youth who are only temporarily expressing these traits in a non-pathological manner (Salekin & Frick, 2005). Based on the issues raised, an alternative was needed that would allow the identification of important traits associated with more severe presentations of ASB that did not carry with it the negative connotations and consequences that accompanies the construct of psychopathy.

1.5 Development of CU Traits

In response to these concerns regarding applying the psychopathic construct to children, CU traits were defined to measure the personality-specific traits of psychopathy as they present in youth in an attempt to identify the most stable and developmentally relevant features of psychopathy. Specifically, CU traits represent the key personality and affective characteristics considered to be the most important and unique information that can be derived from the construct of psychopathy and applied to ASB in youth, while avoiding the
negative connotation that the label ‘psychopath’ carries (Frick, 2009; Frick & Ellis, 1999; Frick & Moffitt, 2010; Lochman, Powell, Boixmeyer, Young, & Baden, 2010).

When psychopathy was extended to apply to children, many tools were developed to measure psychopathy in youth, including the Antisocial Processing Screening Device (APSD; Frick & Hare, 2001), also known as the Psychopathy Screening Device (PSD; Frick & Hare, in press). The PSD and APSD were developed largely from bringing the Psychopathy Checklist – Revised (PCL-R; Hare, 1991) down to apply to children (Frick, O’Brien, Wooton, & McBurnett, 1994; Kotler & McMahon, 2005; McMahon et al., 2010). These scales assess all items of the PCL-R in children, unless they are developmentally inappropriate (Frick et al., 1994). In their study using the PSD, Frick et al. (1994) used factor analysis in two clinically referred samples of children aged 6 to 18 years that were predominantly male, and revealed that the scale consisted of a total score and two factors, akin to the two factors of the adult construct of psychopathy. The first scale, Impulsivity/Conduct Problems, represented behaviors such as risk tasking, becoming angry when corrected, and acting without thinking. The second scale represented CU traits and contained items such as lack of remorse and shallow emotions.

After determining the two factors of psychopathy the PSD measured, Frick et al. (1994) explored how these factors related to measures of ASB and conduct problems. They found that the impulsivity factor related strongly to the diagnosis and criteria of CD, the CU trait dimension did so less strongly and reliably, and though the CU trait dimension was related to the symptoms of CD, children with and without a CD diagnosis did not differ in their scores on this scale. These results reveal that unlike the measure of impulsivity and conduct problems, the CU trait dimension provides additional information separately from the diagnosis of CD. This was further confirmed when CD symptoms were entered in hierarchical regressions with the CU dimension. These analyses revealed that CU traits were uniquely associated with sensation seeking, demonstrating that CU traits are related to factors relevant to the commission of ASB above and beyond the diagnosis of CD. Frick et al. additionally showed that CD symptoms and CU traits were divergent in their association with anxiety such that CU traits were negatively related and CD symptoms positively related to anxiety. This result provides further support that while CU traits are related to the diagnosis
of CD, they are important to consider in addition to this condition and may be used to identify subgroups that differ in factors that have previously been inconsistently related to CD and ASB.

Christian et al. (1997) also conducted a study to determine how the factors of the PSD related to CD and ASB. They examined four groups of referred children aged 6 to 13 years who were predominantly male and who were separated based on their scores on the impulsivity/conduct problems and CU trait dimensions of the PSD. Their results demonstrated that the two groups who were high on impulsivity/conduct problems only or high on both impulsivity/conduct problems and CU traits accounted for all children in the sample who met criteria for CD. They also found that those high on both impulsivity/conduct problems and CU traits scored higher than those with only high impulsivity/conduct problems on measures of CD and ODD symptoms, physical aggression and non-violent rule-breaking behavior. In this paper, non-violent rule-breaking behavior refers to the commission of ASB that does not physically threaten or harm an individual, and includes behaviors such as vandalism and theft. The results of Christian et al. further support the importance of CU traits to the presentation of CD and demonstrates their utility in identifying individuals with heightened levels of ASB, even at the subtype level.

Additional research with the PSD and APSD in children identified three factors of psychopathy (Frick et al., 2000; McMahon et al., 2010). These three lower-level factors of psychopathy represented (1) Callous-Unemotional Traits; (2) Impulsivity/Conduct Problems; and (3) Narcissism (Barry et al., 2008; Dolan, 2004; McMahon et al., 2010). The additional factor of narcissism includes characteristics such as charm, excessive bragging, and manipulating or conning others (Frick et al., 2000). Among these three dimensions, again only CU traits were found to be useful in identifying a clinically-relevant subgroup of conduct-disordered youth (Frick & Dickens, 2006; Frick & Moffitt, 2010; Lawing, Frick, & Cruise, 2010).

CU traits have been demonstrated to be the subfactor of psychopathy in youth that has the least amount of overlap with the diagnostic criteria for CD, and therefore are the only traits to provide useful information above and beyond the diagnosis of CD itself (Frick et al.,
2000; Frick & Ellis, 1999; Frick & Moffitt, 2010). This was demonstrated in a study by Frick et al. (2000) in two samples, a coed community sample with an average age of 11 years and a predominately male clinic-referred sample between the ages of 6 to 13 years. In their study, they demonstrated that, after controlling for the other factors, CU traits were only weakly associated with the symptoms of CD in the community sample, and unrelated to the symptoms of CD in the clinical sample.

Given the clear superiority and utility of the CU trait dimension specifically to the general measurement of psychopathy in youth, a scale that targeted the measurement of CU traits specifically was developed from the APSD (Essau et al., 2006; Kimonis, Frick, Skeem, et al., 2008). The Inventory of Callous-Unemotional Traits (ICU; Frick, 2004a) was created by expanding each of the four items from the APSD that consistently represented the CU trait dimension into six items each, half of which were reverse coded, creating a 24-item scale (Essau et al., 2006). To examine the validity of the ICU, Essau et al. (2006) conducted a study using self-report in a sample of 13- to 18-year-old adolescents from a German community. They found that overall girls had lower scores on the ICU than boys, and that overall externalizing problems were related to CU trait scores in both genders, but this relationship was stronger in girls. The ICU has subsequently been used to study the relationship between CU traits and ASB in many studies (e.g., Dandreaux & Frick, 2009; Fanti, Frick, & Georgiou, 2009; Kimonis, Frick, Munoz, & Aucoin, 2007; Kimonis, Frick, Skeem, et al., 2008; Lawing et al., 2010; Marini & Stickle, 2010; Marsee & Frick, 2007; Viding, Simmonds, Petrides, & Frederickson, 2009) and has been suggested to be the tool used to measure CU traits when applying the CU traits specifier to CD (Barry, Golmaryami, Rivera-Hudson, & Frick, 2013).

Overall, CU traits are highly related not only to the presentation of ASB, but are also important for CD, providing clinically-relevant information above and beyond this diagnosis and its criteria. It is no surprise, then, that it is these traits that have been suggested to be included as a specifier for this disorder (Frick & Moffitt, 2010). Research has further demonstrated that the ICU is a valuable tool to measure and examine how CU traits may identify important subgroups within individuals who commit ASB. Beyond this, the
establishment of CU traits as a relevant and stable risk factor across development is necessary to support its use as a diagnostic specifier in children.

### 1.6 Stability of CU Traits Across Development

Other concerns surrounding the application of psychopathy to youth centered on whether psychopathic or CU traits identified in children demonstrate stability across development (Frick & Moffitt, 2010; McMahon et al., 2010). In addition to being a useful parallel to psychopathy in youth, CU traits have indeed demonstrated the desired stability in childhood and adolescence using multiple informants (Barry et al., 2008; Frick, Kimonis, Dandreaux, & Farell, 2003; Frick & Moffitt, 2010; Frick & Viding, 2009).

In their 3-year longitudinal study of children of both genders who are at a high risk for aggression, Barry et al. (2008) examined the stability of CU traits across three time points by collecting the APSD from parents and teachers. They found that CU traits as measured by parent report were stable across time, with intraclass coefficients ranging between 0.72 and 0.77 between time points with an overall 3-year stability score of 0.83. Importantly, CU traits measured by teacher report were also stable across time, with intraclass coefficients ranging between 0.57 and 0.82 between time points and with an overall 3-year stability score of 0.75. Importantly, it is understandable that the stability for teacher-report is lower given that the child’s teacher changed for each time point. Given that, the level of stability reported is still quite promising considering that it is consistent across individual raters in the same setting.

Frick, Kimonis, et al. (2003) measured stability in CU traits as measured by parental report using the APSD following children in grades 3, 4, 6, and 7 at yearly time points for 4 years. They found that parents’ report of the CU traits dimension demonstrated stability across time with intraclass coefficient values between the first time point and subsequent points ranging between 0.71 and 0.86, with an overall stability of 0.90. These authors also collected the APSD from teachers at the first time point and from self-report for the subsequent three time points. Cross-informant stability of the CU dimension using the parent report at the first time point and the youth report at all following was calculated to be 0.75. In comparison, cross informant stability of this factor using the teacher report at the first time point and the parent or youth report at all following was calculated to be 0.80 and 0.67,
respectively. Overall, the evidence exhibiting the stability of CU traits over time supports the utility of CU traits as a specifier for CD as it indicates that these traits are reliable at the individual level and not a transient characteristic.

Besides having demonstrated stability across adolescence, CU traits are also predictive of psychopathic trait levels in adulthood. In particular, CU traits have been shown to be able to predict adult psychopathy levels from CU trait levels measured in childhood (Burke, Loeber, & Lahey, 2007). This was demonstrated by Burke et al. (2007) who conducted a study following boys between the ages of 7 and 12 years at intake longitudinally to the age of 17 with follow-up interviews conducted at 18- or 19-years-old. The results demonstrated that interpersonal callousness measured via teacher report, but not parent report, was predictive of the interpersonal and affective factor and the antisocial and impulsive behavior factor of the PCL-R collected at the follow-up interviews. This finding suggests that CU traits are an important factor to consider in childhood, as they are indicative of future levels of psychopathy, but can be measured at an age when intervention is more viable and may even precede the individual’s engagement in severe ASB and the detrimental consequences that can accompany it.

Though these traits tend to be stable into adulthood (Salekin, Rosenbaum, & Lee, 2008), some research indicates that psychopathy is not as stable in youth as it is in adults (Salekin & Frick, 2005). Indeed, research has identified the presence of four different trajectories of CU trait stability across development, indicating there is some flexibility in these traits over the span of childhood that are differentially influenced by genetic and environmental factors (Fontaine, Rijsdijk, McCrory, & Viding, 2010). In their study, Fontaine et al. (2010) followed twin pairs over time, using teacher report measures of CU traits when the twins were 7-, 9-, and 12-years-old. The four stability patterns of CU traits identified included stable-high, stable-low (the most common), high-to-low, and low-to-high trajectories. This fluctuation allows for the potential of focused intervention in conduct-disordered children by reducing these traits if they are identified and implemented into diagnosis early, further highlighting the potential CU traits have for improving prognosis and treatment of CD if incorporated as a specifier.
1.7 Subgroup Identification within Conduct Disorder in the *DSM*

A reliable subgroup indicator for the diagnosis of CD is clinically relevant as the elevated levels of heterogeneity in the population of conduct-disordered youth complicate attempts to distinguish specific risk factors for CD, predict outcomes and focus interventions (Frick & Ellis, 1999; Frick, Kimonis, et al., 2003; Tackett, Krueger, Iacono, & McGue, 2005). Past attempts to apply categories to this population, however, have either been unsuccessful or still require additional specification (Frick & Moffitt, 2010).

In the third edition of the *DSM (DSM-III; APA, 1980)*, conduct-disordered youth were categorized into four groups based on two types of features: (1) socialized versus undersocialized; and (2) aggressive versus nonaggressive (Frick & Moffitt, 2010; Kotler & McMahon, 2005). This categorization was an initial attempt to include psychopathy in the diagnosis of CD, specifically the same key interpersonal and affective features CU traits represent (Frick & Moffitt, 2010; Kotler & McMahon, 2005). Unfortunately, the application was poorly conducted, causing more confusion than assistance (Frick & Moffitt, 2010; Kotler & McMahon, 2005).

The undersocialized-aggressive group was successful in capturing children who were more likely to continue committing ASB into adulthood and who demonstrated neuropsychological abnormalities connected with their ASB and decreased autonomic nervous system reactivity (Frick & Moffitt, 2010; Kotler & McMahon, 2005). The issues arose in that the term undersocialized was intended to represent the construct of psychopathy in children without the associated negative connotations, but this term was found to be inadequate in capturing the key affective and interpersonal characteristics of psychopathy (Frick & Moffitt, 2010). Instead this term suggested that the child had other social issues, such as not having friends (Frick & Moffitt, 2010). Additionally, the symptoms included in the *DSM-III* furthered the confusion, poorly representing the intended construct of psychopathy and focusing on issues such as a lack of peer relationships versus important features such as a lack of remorse (Frick & Moffitt, 2010). These categories were subsequently dropped in later versions of the *DSM* (Frick & Moffitt, 2010; Kotler & McMahon, 2005).
The only distinction within the diagnosis of CD that has survived to the current version of the *DSM* is whether the first symptom was experienced before (i.e. childhood-onset) or after (i.e. adolescent-onset) the age of 10 years (Frick & Moffitt, 2010). These categories have demonstrated clinical relevancy, as childhood-onset presentations are related to personality risk factors, issues in emotion regulation, ineffective parenting, and family instability (Dandreaux & Frick, 2009). In contrast, adolescent-onset is typically associated with adolescent rebellion and is considered to be more normative and to represent an attempt to establish autonomy and independence (Dandreaux & Frick, 2009; Moffitt, 1993).

Though such a distinction has been reliably and consistently identified in boys, this categorization is not as established for antisocial girls, as very few girls have an onset prior to the age of 10 years (Dandreaux & Frick, 2009; Frick & Dickens, 2006; Frick & Viding, 2009). Though recent research has identified a group of girls who exhibit an early-onset and persistent course of ASB (Brennan & Shaw, 2013), a subgroup within adolescent-onset girls can also be identified who demonstrate similar characteristics to boys with a childhood-onset (Dandreaux & Frick, 2009; Frick & Dickens, 2006; Frick & Viding, 2009). Despite the demonstrated utility of the age-of-onset categorization, additional distinction is necessary, especially for conduct-disordered girls. In response, CU traits have been suggested to be an important additional specifier for CD, identifying key subgroups, particularly within the childhood-onset group, that have not yet been distinguished (Dandreaux & Frick, 2009; Frick, 2009; Frick & Moffitt, 2010).

### 1.8 CU Traits as an Important Specifier for Conduct Disorder

The proposal put forth by Frick and Moffitt (2010) suggests that CU traits should be added to the diagnosis of CD such that they act as a specifier for CD in addition to the existing age-of-onset specifier. This will allow these traits to provide the additional specificity that is required within the subtypes of CD that have already been defined. Since the proposal has been put forward, research has been conducted to test the specific utility of CU traits to inform our understanding of ASB (McMahon et al., 2010; Rowe et al., 2010).

In one study, McMahon et al. (2010) examined the utility of the CU trait factor of the APSD in predicting ASB in a 15-year-longitudinal study beginning in kindergarten. Their
sample targeted both high risk and control children of both genders, with high risk children being identified via parent and teacher reports of their conduct at the beginning of the study. The results of this study revealed that CU traits were predictive of multiple ASB outcomes, including self-reported general delinquency, arrests as a juvenile and as an adult, a future diagnosis of Antisocial Personality Disorder (ASPD) and the number of ASPD criteria met. Importantly, CU traits were a stronger predictor of these outcomes than the other predictors included in the study, including criteria counts for CD, ODD, or ADHD, and whether the CD had a childhood-onset. These results demonstrate that CU traits provide information above and beyond the diagnosis of CD and the current age-of-onset specifier that is useful for providing a prognosis for children with CD. To further this argument, the study also assessed the utility of using CU traits as a specifier as outlined in Frick and Moffitt’s (2010) proposal, and found that including this specifier substantially increased the ability to predict future ASB (McMahon et al., 2010).

Rowe et al. (2010) also conducted a study to examine the impact CU traits would have as a subtype specifier for CD in a community sample of children between the ages of 5 and 16 years over the span of 3 years. In their sample they found the prevalence of CD and high levels of CU traits to be 2% and 3.8%, respectively. When combined, they found 0.9% to have both CD and high levels CU traits (with half of those with CD having high levels of CU traits), 1.1% to have CD without high levels of CU traits, and 2.9% to have high levels of CU traits but not CD. Further analyses revealed that 83% of the most persistent CD occurred in children who had high levels of CU traits, and that CU traits were significantly related to important factors such as greater psychosocial impairment and decreased prosocial behavior after controlling for level of conduct problems.

Recently, Kahn, Frick, Youngstrom, Findling, & Youngstrom (2012) conducted a study with students in grades 3 through 7 in the community and children aged 5 to 18 years from a community mental health center. They created groups based on CD diagnosis and the proposed CU trait specifier (measured using the APSD), and compared those groups on various antisocial measures. They found that those with CD and CU traits demonstrated more CD symptoms and more aggressive CD symptoms than those with only CD. In the clinical sample, those with CD and CU traits also demonstrated higher levels of cruelty than those
with CD only. Together these studies provide direct preliminary evidence of the utility of using a CU-trait specifier for the diagnosis of CD, and that CU traits do identify an important subtype within the CD population that has great prognostic relevance.

Beyond studying these characteristics as they relate directly to CD symptomology, the inclusion of CU traits into the diagnosis of CD highlights the need to examine the significance of CU traits to the general commission of ASB as well. By studying levels of ASB both in- and outside of the diagnosis of CD, we are allowed to examine how CU traits influence the expression of ASB in a more flexible capacity using samples with and without clinical levels of conduct problems. In doing so, we can determine whether the impact CU traits have on the expression of ASB is consistent across individuals with and without pathological levels of conduct problems, and explore whether risk factors can be identified prior to the diagnosis of CD in an attempt to prevent an at-risk child from developing more severe patterns of ASB.

1.9 CU Traits as an Important Factor in the Presentation of Antisocial Behavior

Individuals with high levels of CU traits have more severe and aggressive patterns of ASB, and this has been demonstrated in both clinical and community samples (Frick et al., 2000; Frick & Moffitt, 2010; Frick & White, 2008; Jones & Viding, 2007). For example, as part of their study Essau et al. (2006) examined the relationship between CU traits and ASB in boys and girls between the ages of 13 and 18 years. They found that CU traits were positively correlated with self-report measures of externalizing behaviors, general ASB, and level of CD symptoms (Essau et al., 2006).

Frick, Stickle, Dandreaux, Farrell, and Kimonis (2005) conducted a longitudinal study following male and female students from grades 3, 4, 6, and 7 at intake over 4 years. They divided these students into four groups based on the combinations of high and low intake scores of CU traits and CD symptoms. They found that those with high levels of both CU traits and CD symptoms demonstrated the most severe and chronic levels of ASB. Further, this group also had the highest levels of self-reported delinquency, parent-reported contact with the police, and CD symptoms over time. Interestingly, the group that
demonstrated high levels of CU traits without high levels of CD symptoms had the second highest level of delinquency.

CU traits are also associated with more severe patterns of ASB in juvenile sex offenders (Lawing et al., 2010). In their study, Lawing et al. (2010) examined CU trait levels in incarcerated adolescent males between the ages of 12 and 20 years who had a current sexual offense. They found that those participants who had a high level of CU traits had a larger number of victims, engaged in increased planning for their sexual offenses, and increased severity in violence for their sexual offenses.

In addition to being associated with more severe ASB, CU traits may actually be more important in predicting future delinquency than current conduct problems, especially in girls (Frick, Cornell, Barry, Bodin, & Dane, 2003). In their study, Frick, Cornell, Barry, et al. (2003) recruited children of both genders with an average age of 12 years into four groups based on high and low levels of CU traits and conduct problems with a 1-year follow-up. They found that CU traits at intake predicted level of conduct problems at follow-up, and that those children with both high levels of CU traits and conduct problems had the greatest number and variety of conduct problems. In terms of gender comparisons, they found that the greatest levels of general delinquency at follow-up were revealed for boys with high levels of CU traits and conduct problems at intake, but in girls with high levels of CU traits and low conduct problems at intake. Further, they found that general delinquency at follow-up was predicted by CU traits and not conduct problems at intake, and that this relationship was strongest for girls.

Expanding on these findings, researchers argue that it is the combination of high levels of CU traits and high levels of aggression that characterize a particularly problematic subgroup of antisocial youth, and that it is this group that most closely resembles the adult construct of psychopathy (Kimonis, Frick, Munoz, & Aucoin, 2008). For example, similar to psychopathy in adults (Blair, Peschardt, Budhani, Mitchell, & Pine, 2006), high levels of CU traits in conduct-disordered youth have been routinely related to more instrumental or proactive forms of aggression, in addition to high levels of reactive aggression (Crapanzano
et al., 2010; Fanti et al., 2009; Frick, 2004b; Jones & Viding, 2007; Kimonis et al., 2007; Kimonis, Frick, Skeem, et al., 2008; Kotler & McMahon, 2005; Marsee & Frick, 2007).

Crapanzano et al. (2010) conducted a study using a sample of community children between the ages of 9 and 14 years. They found that children who engaged in both proactive and reactive aggression, whether it was physical or relational, exhibited higher levels of CU traits than those who only engaged in reactive aggression. Further, those who engaged in only reactive aggression had the same level of CU traits as children who were non-aggressive.

Fanti et al. (2009) also looked at reactive versus proactive aggression but they used a sample of male and female adolescents from the community between the ages of 12 and 18 years. They found that CU traits were positively related to the commission of both proactive and reactive aggression. Further, higher CU traits predicted higher levels of proactive, but not reactive, aggression above and beyond the variance accounted for by demographic characteristics. Finally, children who engaged in proactive and reactive aggression were more likely to have high levels of CU traits.

CU traits are also related to the perpetration of a larger variety of ASB (Christian et al., 1997; Frick, Cornell, Barry, et al., 2003). As mentioned previously, Christian et al. (1997) examined CU trait levels and age-of-onset in a predominantly male sample of referred youth between the ages of 6 and 13 years. They found that the group that had high levels of both conduct problems and CU traits not only had a greater number of conduct problems, but also engaged in a larger variety of conduct problems than the group that had high levels of conduct problems but low levels of CU traits. Frick, Cornell, Barry, et al. (2003) found similar results when recruiting children with an average age of 12 years into four groups based on high and low levels of CU traits and conduct problems with a one-year follow-up. Their results also revealed that youth with high levels of CU traits and conduct problems committed the largest number and variety of conduct problems. Kruh, Frick, and Clements (2005) conducted an investigation with 14- to 21-year-old incarcerated male juvenile offenders and also found that the group who engaged in indiscriminant violence had higher levels of CU traits than the group who had a single provoked violent act.
In addition to studying ASB generally and looking at overall levels of conduct problems, it is important to examine ASB at its subtype levels. Three commonly studied subtypes of ASB are physical aggression, non-violent rule-breaking behavior, and relational aggression. By breaking ASB down into these types, we can examine whether ASB risk factors, in this case CU traits, have particular significance to violent versus non-violent behavior, for example. This is especially relevant to the proposal of Frick and Moffitt (2010), as the diagnosis of CD includes both aggressive and non-aggressive acts. Therefore it is clinically relevant to determine if the influence CU traits have on the expression of ASB is consistent across these criteria. An additional advantage to studying these subtypes is the inclusion of relational aggression as the current diagnostic criteria for CD do not encompass this type of behavior, potentially excluding a subset of antisocial youth who primarily engage in this type of aggression and would benefit from appropriate intervention (Crapanzano et al., 2010; Marsee & Frick, 2007). By studying the relationship CU traits have between these three subtypes of ASB, parallels and distinctions can be drawn between these categories and provide additional specificity to our understanding of ASB. In doing so, important and unique relationships can be revealed that would otherwise go undetected.

1.10 CU Traits as an Important Factor for Subtypes of Antisocial Behavior

CU traits are not only consistently associated with ASB at the general level (Christian et al., 1997), but also at the subtype level, being positively related to physical aggression, non-violent rule-breaking behavior, and relational aggression (Christian et al., 1997; Crapanzano et al., 2010; Frick, Cornell, Barry, et al., 2003; Kimonis, Frick, Skeem, et al., 2008; Marsee & Frick, 2007; Ostrov & Houston, 2008). Marsee et al. (2005) examined the relationship between CU traits and both relational and physical aggression in a coed sample of youth between the ages of 10 and 17 years. They found CU traits to be related to physical aggression across gender, but when looking at the genders separately, CU traits were only significantly related to both physical and relational aggression in girls. In this study, however, CU traits were also unrelated to either violent or non-violent self-reported delinquency.
In comparison to Marsee et al. (2005), Marsee and Frick (2007) conducted a study to look at the relationship between CU traits and physical and relational aggression in both proactive and reactive forms in preadjudicated girls between the ages of 12 and 18 years. Unsurprisingly, their results revealed that proactive physical aggression was uniquely related to CU traits. They also demonstrated this same effect for relational aggression and the relationship between CU traits and aggression was actually stronger for relational than it was for physical aggression.

Relational aggression is a particularly important subtype of ASB to examine for girls, as many girls who commit ASB do not perpetrate physical aggression, but do commit high levels of relational aggression (Crapanzano et al., 2010; Marsee & Frick, 2007). Indeed, these girls demonstrate high levels of CU traits and proactive and reactive relational aggression patterns similar to physical aggression in boys (Crapanzano et al., 2010). In their study, Crapanzano et al. (2010) studied how boys and girls use both physical and relational aggression in a community sample of children between the ages of 9 and 14 years. They found that in both genders, groups emerged for physical aggression that represented non-aggressors, aggressors who engaged in reactive aggression only, and aggressors who engaged in both reactive and proactive aggression. For relational aggression, however, these groups were only identified in girls, and in boys only aggressor and non-aggressor groups were identified. Taking these groupings further, Crapanzano et al. found that those who engaged in both proactive and reactive physical aggression exhibited elevated levels of CU traits in comparison to the groups who either did not engage in physical aggression or who only utilized the reactive form. This same pattern was seen for relational aggression in girls.

Despite this similarity between physical and relational aggression, antisocial girls who primarily commit relational aggression would currently be missed diagnostically as relational aggression is not typically included in the clinical definition of ASB, regardless of the fact that these types of aggression require similar intervention and are related to similar risk factors (Crapanzano et al., 2010; Frick & Dickens, 2006; Frick & Viding, 2009; Marsee & Frick, 2007). Additional research is necessary, therefore, to study relational aggression along with physical aggression and non-violent ASB in their relation to important risk factors
in order demonstrate the utility of considering relational aggression in the definition of ASB and the diagnosis of CD.

In comparison to the differences found in the CU trait literature between physical and relational aggression, such contrasts are not as established for physical aggression and non-violent rule-breaking behavior. Instead, youth with conduct problems and high levels of CU traits demonstrate heightened levels of both physical aggression and non-violent rule-breaking in comparison to youth with conduct problems and low levels of CU traits (Christian et al., 1997). For example, in their study of a predominantly male referred sample of youth between the ages of 6 and 13 years, Christian et al. (1997) demonstrated that those with high levels of CU traits and conduct problems engaged in more physical aggression and non-violent rule-breaking than those with only high levels of conduct problems.

Interestingly, one study did find a gender difference in the relation of CU traits to these subtypes of ASB. Kimonis, Frick, Skeem, et al. (2008) examined patterns of ASB and CU traits in a primarily male incarcerated sample of adolescents between the ages of 12 and 20 years. They found that CU traits were related to non-violent delinquency in both genders, but were related to violent delinquency only in girls (Kimonis, Frick, Skeem, et al., 2008). This finding is consistent with the previous finding of Marsee et al. (2005) who demonstrated that physical aggression was significantly related to CU traits in females and not males.

Despite these findings, both violent and non-violent ASB have been related to CU traits in male samples in the past. For example, Kimonis et al. (2007) conducted a study examining the relationship between CU traits and different types of ASB in detained boys between the ages of 13 and 18 years. They found that CU traits were significantly positively related to four different types of self-reported delinquency – violent offenses, property offenses, drug offenses, and status offenses (Kimonis et al., 2007).

Frick et al. (2005) also examined different types of ASB in children of both genders who were in grades 3, 4, 6, and 7 at intake in a longitudinal 4-year study. In this sample, children with high levels of both CU traits and conduct problems demonstrated the highest levels of both property related delinquency (a specific type of non-violent delinquency) and violent delinquency. Interestingly, for property related delinquency the second highest rates
were committed by youth with high levels of CU traits and low levels of conduct problems at intake. Together these results suggest that CU traits are likely positively related to both violent and non-violent ASB in both genders.

The distinction between physical aggression and non-violent rule-breaking behavior is relevant in this line of research as patterns in these behaviors have been related to age-of-onset of ASB, which is an important indicator for CD diagnosis (Burt & Donnellan, 2008; Moffitt, 1993). Indeed, similar to those with high levels of CU traits, individuals who demonstrate a childhood-onset pattern of ASB participate in a wider variety of ASB and are more likely to engage in aggressive and violent ASB than those who demonstrate an adolescent-onset pattern (Moffitt, 1993). In their study, Burt and Donnellan (2008) demonstrated additional distinct correlates between physical aggression and non-violent rule-breaking behavior in two samples of undergraduate introductory psychology course students, one with both genders and one with males only. They found that rule-breaking was distinctly related to having low levels of control, and that physical aggression was distinctly related to high stress reactivity. These findings also suggested that non-violent rule-breaking was related more to impulsivity and therefore adolescent-limited ASB, while physical aggression is more related to affective dysregulation, which is more related to life-course persistent ASB. Given that CU traits are proposed to be added as a specifier in conjunction with the current age-of-onset subtypes, the relationship CU traits have with these distinct types of ASB is important to examine, and may provide specific information that can be used when studying and treating ASB in both adolescent- and childhood-onset youth with CD.

Together, this body of research has highlighted the distinct relevance CU traits have to varying subtypes of ASB. By proposing to include CU traits in the diagnosis of CD, Frick and Moffitt (2010) have elevated the diagnostic relevance of CU traits for youth ASB, calling for additional research into the role CU traits play for these behavioral subtypes of youth ASB. Along that line, it is also necessary to consider how CU traits may influence the relationships between ASB, its subtypes, and other identified risk and/or resiliency factors that are involved in the expression of ASB.
1.11 Interaction of CU Traits with Other Factors Related to Antisocial Behavior

Though CU traits have been used to identify an important subgroup of conduct-disordered youth in the past, these traits do not solely account for variance in offending and CD development (Frick, 2004b; Kimonis et al., 2007). Research has begun to emerge demonstrating how the relationships between other factors and ASB are influenced by CU traits (Kotler & McMahon, 2005). For example, lower intelligence has been commonly associated with higher levels of ASB (Christian et al., 1997; Frick et al., 1994). However, this factor has been suggested to relate to ASB only when CU trait levels are low (Barry et al., 2000; Frick, 2004b; Frick et al., 1994; Kotler & McMahon, 2005).

In their study of predominantly male offenders between the ages of 11 and 18 years, Salekin, Lee, et al. (2010) demonstrated that their overall measure of psychopathy was positively related to verbal intelligence. This is consistent with the fact that generally psychopathy is related to normal levels of intelligence (Kotler & McMahon, 2005; Pardini et al., 2003). In their study, Christian et al. (1997) compared full scale IQ scores on the Wechsler Intelligence Scale for Children (WISC-R or WISC-III; Wechsler, 1974, 1991) between groups in a primarily male sample of referred youth between the ages of 6 and 13 years. They found that individuals with only high levels of conduct problems alone had lower intelligence than those with high levels of both conduct problems and CU traits or controls, who did not differ (Christian et al., 1997).

Loney, Frick, Ellis, and McCoy (1998) also compared full scale IQ levels using the WISC-R and WISC-III between groups in a predominantly male sample of referred youth between the ages of 6 and 13 years. Similar to the previous study, Loney et al. (1998) found that youth with an ODD or CD diagnosis and low levels of CU traits scored lower for intelligence than those with an ODD or CD diagnosis and high levels of CU traits. Additionally they found that the control group, who had no ODD or CD diagnosis and had low levels of CU traits, had higher intelligence than even the group with an ODD or CD diagnosis and high levels of CU traits. This collection of studies highlights the fact that although lower levels of intelligence have been routinely associated with higher levels of ASB in previous research, intelligence has been demonstrated to interact with psychopathic
tendencies in such a manner that it is likely not a typical risk factor for those with higher levels of CU traits.

High levels of impulsivity, specifically traits such as acting without thinking of the consequences, are also predictive of higher levels of ASB, but similar to intelligence, research suggests that this factor may be more important at lower levels of CU traits (Frick et al., 1994). Indeed, despite being related to each other (Crapanzano et al., 2010), CU traits and this branch of impulsivity have distinct individual characteristics associated with them. In one study, Pardini et al. (2003) compared scores of CU traits, impulsivity/conduct problems, and narcissism in adjudicated youth of both genders with an average age of 16 years. In this study, impulsivity captured such behaviors as acting without thinking and was grouped with conduct problems, such as blaming others for their mistakes (Frick et al., 1994; Pardini et al., 2003). Pardini et al. (2003) found that impulsivity/conduct problems were related to increased behavioral dysregulation while CU traits were not. In comparison, they found high levels of CU traits were related to expectations of reward and dominance as a result of committing aggression. Further, individuals with high levels of CU traits also placed a greater value on their expected positive outcomes of committing aggression and were less likely to expect punishment as a result of their actions. Such expectations and values associated with aggression were not seen in relation to impulsivity and conduct problems. The findings of this study further strengthen the theory that even commonly associated risk factors for ASB may not behave the same at higher levels of CU traits and that individuals with higher levels of CU traits may have their own distinct set of risk factors.

Along this line, motivation to change is another factor predicting offending that differs at varying levels of psychopathic traits (Salekin, Lee, et al., 2010). Salekin, Lee, et al. (2010) conducted a study to examine how these constructs interacted to predict recidivism (i.e., the commission of new crimes) in a sample of juvenile offenders of both genders between the ages of 11 and 18 years. In comparison to the previous findings regarding intelligence and impulsivity, in this study higher motivation to change predicted lower levels of repeated offending only at high levels of psychopathy, and was unrelated to offending at low levels. Additionally, individuals with high levels of psychopathy and low levels of
motivation to change were found to recidivate sooner than individuals who had either low levels of psychopathy or high levels of motivation to change.

1.12 CU Traits and Normal-Range Personality in Relation to Antisocial Behavior

Many other factors have been studied in relation to ASB, but the interaction between CU traits and these commonly studied factors has not been fully examined. Personality traits are a popular focus of research when studying ASB and have been routinely shown to be reliable factors associated with ASB and its subtypes in a variety of samples (e.g., Gaughan, Miller, Pryor, & Lynam, 2009; Lynam et al., 2010; Miller & Lynam, 2003; Skeem, Miller, Mulvey, Tiemann, & Monahan, 2005; Wilson, Miller, Zeichner, Lynam, & Widiger, 2011). Indeed, research has revealed that normal-range personality traits may be useful in understanding individual differences in the commission of ASB as well as the stability of ASB across development (Kruh et al., 2005; Miller & Lynam, 2001).

Personality traits have also been extensively studied in relation to psychopathy and CU traits with reliable results in both youth and adults (Lee, Salekin, & Iselin, 2010; Lynam et al., 2005; Salekin, Debus, & Barker, 2010). Some researchers have gone so far as to suggest that psychopathy could be represented solely by a combination of traits from the Five Factor Model (FFM; McCrae & Costa, 1990; Miller & Lynam, 2001) of personality (Gaughan et al., 2009; Lynam, 2010; Lynam et al., 2010; Miller, Lynam, Widiger, & Leukefeld, 2001). In particular, they suggest that the combination of low Agreeableness, low Conscientiousness, high or low Neuroticism, and high or low Extraversion creates a personality profile that captures a prototypical psychopath (Gaughan et al., 2009; Lynam et al., 2010; Miller & Lynam, 2003; Miller et al., 2001). Others have suggested that psychopathy is represented by high levels of Extraversion, in combination with low levels of the remaining FFM personality traits (Harpur, Hart, & Hare, 1994). This work has been primarily conducted in adult samples, but some research has demonstrated similar patterns for juvenile psychopathy (Lynam, 2010). In opposition to this theory, other research conducted with both adults and children has shown that CU traits/psychopathy predict unique variance in ASB above and beyond these five traits and vice versa (Essau et al., 2006; Skeem et al., 2005), suggesting that instead CU traits and normal-range personality are two distinct
but related factors that may work in concert to predict ASB. Despite the existence of many studies demonstrating the relationships between ASB, CU traits and normal-range personality, personality and CU traits have never been examined as a combined factor to predict ASB.

1.13 CU Traits and Trait Anxiety in Relation to Antisocial Behavior

Along a similar vein, researchers have suggested that using CU traits as a specifier for CD may explain the variable findings identified within the CD and anxiety literature (Frick & Ellis, 1999). Indeed, inconsistent results have been found when relating anxiety to both ASB and CU traits. For example, trait anxiety has been suggested by past findings to be a risk factor and a resiliency factor for ASB and conduct problems (Frick & Ellis, 1999; Frick et al., 1994; Garai, Forehand, Colletti, & Rakow, 2009; Kotler & McMahon, 2005; McBurnett et al., 1991; Rowe et al., 2010). Additionally, research has suggested that trait levels of anxiety may identify unique subgroups within antisocial individuals (McBurnett et al., 1991; O’Brien & Frick, 1996). Despite these variable findings, anxiety disorders are frequently found in conduct-disordered samples (Cunningham & Ollendick, 2010; Frick & Ellis, 1999) and children with conduct problems demonstrate higher levels of negative affectivity (Pardini & Fite, 2010), suggesting anxiety is an important factor in the presentation of CD, though the exact nature of this relationship is as yet undefined.

Trait anxiety has also been positively and negatively related to CU traits and psychopathy (Frick, Cornell, Bodin, et al., 2003; Frick et al., 1994; Harpur et al., 1994; Kubak & Salekin, 2009; Loney, Butler, Lima, Counts, & Eckel, 2006; Lynam et al., 2005), with some suggesting a unique comorbidity of internalizing disorders, and anxiety in particular, with psychopathy in youth versus adulthood (Kubak & Salekin, 2009; Salekin et al., 2008). Other research has demonstrated that psychopathy may mediate the relationship between anxiety and ASB, such that higher levels of anxiety lead to higher levels of psychopathy which in turn results in higher levels of offending (Kubak & Salekin, 2009). As mentioned, a potential solution to these inconsistencies may be the inclusion of CU traits into research examining the relationship between anxiety and ASB (Frick & Ellis, 1999). To date, however, it has not been examined how trait anxiety and CU traits might moderate each other
in their relationship to ASB. Research has, however, shown that high versus low levels of anxiety in combination with high levels of CU traits result in different behavioral patterns in conduct-disordered youth (O’Brien & Frick, 1996). As a result, the presence of higher or lower levels of CU traits may be an important variable in determining whether or not anxiety acts as a risk factor for the commission of ASB in conduct-disordered youth, which would have important implications for the development of targeted treatment (Kotler & McMahon, 2005).

1.14 CU Traits and Cortisol Reactivity in Relation to Antisocial Behavior

Similar to trait levels of anxiety inconsistent results have also been demonstrated in the cortisol reactivity and ASB literature. In particular, some research has shown no direct relationship between ASB and cortisol reactivity while others have demonstrated both positive and negative relationships (Hawes et al., 2009; Susman, 2006; Susman et al., 2010; van Goozen et al., 2007). However, some research suggests that this inconsistency may be due to the presence of clinically relevant subgroups that are related to whether the individual demonstrates an increase in cortisol in response to a stressor or not (van Goozen et al., 2007). This assertion suggests that other factors are at work in determining when and how cortisol reactivity relates to the expression of ASB, and research suggests that CU traits may be an ideal candidate.

Inconsistencies in the relationship with cortisol reactivity have also been found in the CU trait literature. In general, individuals with psychopathy are suggested to be only mildly reactive to stress (Lynam, 2010). However, research has been inconclusive in supporting this presumption, with some finding a depressed cortisol reactivity response in individuals high in CU traits or psychopathy, and others finding no difference (Glenn et al., 2011; O’Leary et al., 2007; Stadler et al., 2010). Similar to research examining normal-range personality and trait anxiety, cortisol reactivity has also not been combined with CU traits in the prediction of ASB. Pursuit of this line of research may help explain the inconsistent results that have been found relating cortisol reactivity to ASB and CU traits.
1.15 Current Studies

The goal of the current set of studies was to determine the extent to which CU traits modify the association between behavioral subtypes of ASB and other commonly studied factors. In particular, the present studies were designed to examine how CU traits moderated the relationships of personality, trait anxiety, and cortisol reactivity with ASB.

In Chapter II, the interaction between CU traits and normal-range personality traits was examined in the prediction of overall ASB and its behavioral subtypes, physical aggression, relational aggression and non-violent rule-breaking behavior. This was conducted using both a community and a clinical sample. Based on the data collected, significant interactions between personality and CU traits were identified. In the community sample, CU traits moderated links between Neuroticism, Extraversion, Agreeableness, Openness to Experience and ASB overall, externalizing behaviors, physical aggression and rule-breaking behavior. In comparison, CU traits were found to moderate the link between Agreeableness and externalizing behaviors in the clinical sample.

In Chapter III, the interactions between CU traits, trait anxiety and cortisol reactivity were examined in the prediction of overall ASB and its behavioral subtypes. These analyses were conducted in a follow-up community sample of adolescents. Significant interactions between CU traits and the current factors were also identified in this study. Specifically, CU traits moderated links between trait anxiety and ASB overall, externalizing behaviors and physical aggression. Further, CU traits also moderated links between cortisol reactivity and ASB overall and externalizing behaviors in female participants only.

Overall, the purpose of the present studies was to examine whether attention to CU traits would alter how the factors of normal-range personality traits, trait anxiety and cortisol reactivity influence the expression of ASB and its subtypes. The results of these studies support these hypotheses, and demonstrate the importance of considering CU traits in the study of ASB, and by extension, CD. Such findings should further elucidate potential gains that would be acquired from the inclusion of CU traits in *DSM-5*. 
Chapter 2
Callous-Unemotional Traits Moderate Links Between Personality and Antisocial Behavioral Subtypes in Youth Community and Clinical Samples

Because callous-unemotional (CU) traits have been proposed to be included in the diagnosis of Conduct Disorder (CD; Frick & Moffitt, 2010), it is necessary to consider how these traits may influence the relationships between antisocial behavior (ASB) and other identified risk and/or resiliency factors that are involved in the expression of ASB. By studying ASB generally, instead of CD directly, we can examine the relationship between CU traits, other factors, and ASB across multiple samples taken from both community and clinical settings, and potentially identify important relationships prior to the development of severe conduct problems. Further, we can examine these relationships for overall levels of ASB, as well as the different subtypes of ASB, one of which would be missed if we only used CD diagnostic criteria. Therefore, research is needed in both community and clinical samples to determine the impact CU traits have on the relationship between typically studied factors and ASB at the general and subtype levels. To address this, the purpose of the current study was to examine the extent to which CU traits modify the relationship between normal-range personality traits and behavioral subtypes of ASB.

Normal-range personality provides a rich psychological context for conceptualizing youth psychopathology (Tackett, 2006). The dominant model of normal-range personality traits is the Five Factor Model (FFM; McCrae & Costa, 1990; Miller & Lynam, 2001). The FFM traits include Neuroticism (emotional instability), Extraversion (positive emotion and sociability), Agreeableness (concern for others and interpersonal skills), Openness to Experience (curiosity and openness to novel experiences), and Conscientiousness (impulse control and morality; e.g., McCrae & Costa, 1990). Although studied extensively in adults, these traits can be measured reliably in childhood and adolescence (Deal, Halverson, Martin, Victor, & Baker, 2007; Halverson et al., 2003; Tackett et al., in press).
2.1.1 Normal-Range Personality and Antisocial Behavior

Research has repeatedly demonstrated that ASB is linked with low Agreeableness and low Conscientiousness (Klimstra et al., 2010; Miller & Lynam, 2001; Miller et al., 2008). In their meta-analysis, Miller and Lynam (2001) examined the relationship between the FFM and a broad definition of ASB. Overall they found Agreeableness and Conscientiousness to be negatively related to ASB. ASB has also been related to higher levels of Neuroticism, also demonstrated in Miller and Lynam’s (2001) meta-analysis, and possibly lower levels of Extraversion in youth (Klimstra et al., 2010; Tackett, 2006). Gaughan et al. (2009) found this relationship between Extraversion and ASB when they examined the relationship between ASB and the FFM in a coed sample of undergraduate introductory psychology students. Specifically, their results demonstrated that higher levels of ASB were related to lower levels of Agreeableness, Conscientiousness and Extraversion.

Miller et al. (2008) also studied the relationship between personality and ASB in a coed sample of undergraduate introductory psychology students. They found Conscientiousness to be negatively related to the variety of ASB committed and levels of aggression. They also found Agreeableness to be negatively related to substance use, the variety of ASB committed, engagement in riskier sexual behaviors, and levels of aggression. Agreeableness was also negatively related to the individual providing more aggressive responses to conflict situations and being more likely to choose to act on them.

In their study, Klimstra et al. (2010) examined the predictive relationship between aggression and the FFM annually over a period of 5 years in adolescents who were either an average age of 12 years or 17 years at intake. They found that high levels of aggression predicted low levels of Agreeableness and high levels of Neuroticism. Similarly, high levels of Agreeableness, Conscientiousness, and Openness to Experience predicted low levels of aggression. These results reveal not only an important relationship between different personality traits and ASB, but also that levels of current ASB can influence the expression of future personality traits, and vice versa.

John, Caspi, Robins, Moffitt, and Stouthamer-Loeber (1994) examined the relationship between the FFM and various measures of ASB in a community sample of 10-
year-old boys, with a follow-up between the ages of 12 and 13 years. They found that self-reported levels of delinquency were related to low levels of Agreeableness and Conscientiousness, but high levels of Extraversion. They also found that overall levels of externalizing problems based on teacher ratings were related to low levels of Agreeableness and Conscientiousness, and high levels of Extraversion.

This line of research has reliably demonstrated that normal-range personality, as measured by the FFM, has important correlates with ASB. Further, distinct relationships exist between the different traits of the FFM and ASB, with low levels of Agreeableness being the most robust correlate of high levels of ASB. However, besides overall levels of ASB, important relationships between the FFM and subtypes of ASB have also been identified in the literature.

### 2.1.2 Normal-Range Personality and Subtypes of Antisocial Behavior

A substantial literature has identified distinct correlates for behavioral subtypes of ASB (Tackett et al., 2005; Tackett, Krueger, Sawyer, & Graetz, 2003), including personality correlates, specifically (Burt & Donnellan, 2008; Burt, Donnellan, & Tackett, 2012; Burt & Larson, 2007; Tackett, 2010). In particular, physical aggression is strongly related to (low) Agreeableness and (high) Neuroticism, whereas rule-breaking behavior and relational aggression relate particularly to (low) Conscientiousness (Burt & Donnellan, 2008; Burt & Larson, 2007; Tackett, 2010).

In their study, Burt and Donnellan (2008) studied two samples of undergraduate introductory psychology students consisting of either both genders or males only. Their particular findings revealed low levels of control (related to the FFM trait of Conscientiousness) to be associated with non-violent rule-breaking, whereas high stress reactivity (related to the FFM trait of Neuroticism) was associated with physical aggression. Burt and Larson (2007), on the other hand, conducted a study using a sample of male undergraduates and examined the student’s level of negative affect, related to Neuroticism, following an aversive task. They found that physical aggression was specifically related to level of negative affect while non-violent rule-breaking behavior was not. Further,
differences in level of negative affect significantly varied across varying levels of physical aggression, but not rule-breaking.

Thornton, Graham-Kevan, and Archer (2010) also conducted a study looking at different dimensions of ASB using an undergraduate sample from Britain that included males and females between the ages of 18 and 49 years. They found low Agreeableness to be related to high levels of general violence in females, while low Conscientiousness was related to high levels of non-violent offenses in males. Further, their results demonstrated that low Neuroticism was related to high levels of non-violent offenses in males but also to high levels of intimate partner violence in females.

Skeem et al. (2005) conducted a study looking at the relationship between the FFM and violent and non-violent ASB in a different manner. When looking at a civil psychiatric patient sample of adults, these authors demonstrated that the FFM could reliably distinguish between violent and non-violent patients. They additionally found that after controlling for psychopathy levels, low Agreeableness was the strongest trait that related to past violence in this sample, with Neuroticism also being positively related but at a weaker level.

In addition to violent versus non-violent ASB, differences have also been found when looking at all three subtypes of ASB, physical aggression, relational aggression, and non-violent rule-breaking behavior. Burt et al. (2012) conducted a study to examine the differences in the relationship between the FFM and these three subtypes of ASB in a coed sample of undergraduates. They found that relational aggression was uniquely related to (low) Conscientiousness, (high) Neuroticism and (low) Agreeableness, while rule-breaking behavior was only uniquely related to (low) Conscientiousness and (low) Agreeableness, and physical aggression to (high) Neuroticism and (low) Agreeableness.

Gleason, Jensen-Campbell, and Richardson (2004) examined the relationship between the FFM and physical and relational aggression in a coed sample of children from grades 7 and 8. In this sample, after controlling for gender, Agreeableness and Conscientiousness were significant negative predictors of relational aggression, but only Agreeableness was a significant negative predictor of physical aggression. They also found that the relationship
between Agreeableness and physical aggression was stronger than that between Agreeableness and relational aggression.

Taking this collection of studies together, these findings suggest a need to consider potential correlates separately by behavioral subtype. The results of these studies have identified significant differences in how normal-range personality relates to these subtypes of ASB. In addition to these distinctions, when considering the proposal to use CU traits as specifier for CD, it is also important to examine how CU traits and personality work together to influence the expression of ASB, an area which has not yet been explicated in the empirical literature.

2.1.3 Personality and CU Traits

In formulating hypotheses about how CU traits may interact with normal-range personality to predict youth ASB, it is important to examine the relationship between CU traits and normal-range personality. In particular, CU traits typically relate to low levels of Agreeableness and Conscientiousness (Essau et al., 2006; Lynam, 2010). For example, Essau et al. (2006) used a community sample of males and females in Germany and examined the relationship between CU traits and the FFM. They found CU traits to be negatively related to all traits within the FFM across gender. Interestingly, the relationship between emotional instability (i.e., Neuroticism) and CU traits was not significant in boys and significant but positive in girls. In their study, Gaughan et al. (2009) found that a dimension capturing callousness and manipulation was related to low levels of Agreeableness, Extraversion, Conscientiousness, and Openness to Experience in a coed sample of undergraduate introductory psychology students, consistent with the findings of Essau et al. (2006).

In a study using adult civil psychiatric patients, Skeem et al. (2005) also examined the relationship between the FFM and a measure of psychopathy. When that measure was broken down into factors, the interpersonal dimension, which includes characteristics such as being deceitful and arrogant, was negatively correlated with Agreeableness and positively related to Extraversion. In comparison, the affective dimension, which represents the experience of blunted affect, was also negatively related to Agreeableness but also negatively related to Openness to Experience.
In comparison, Salekin, Debus, et al. (2010) examined the relationship between CU traits and the FFM, but they used an adolescent sample from a detention centre that was two-thirds male and between the ages of 11 and 18 years. Their results revealed that CU traits were significantly negatively related to Agreeableness, Extraversion, Conscientiousness and Openness to Experience, but were not significantly related to Neuroticism.

Overall, CU traits have been reliably related to low levels of Agreeableness and Conscientiousness, but the remaining FFM traits have been less consistent. Despite the inconsistencies, we can use these results to determine expectations as to how CU traits and personality will interact in the prediction of ASB. Because of the parallels that exist between CU traits and ASB and their relationship with normal-range personality, we would expect that an individual who expresses higher levels of CU traits and lower levels of Agreeableness or Conscientiousness would exhibit the highest levels of overall ASB. As Conscientiousness is specifically related to rule-breaking behavior and relational aggression (Burt & Donnellan, 2008; Burt et al., 2012; Burt & Larson, 2007; Tackett, 2010), this moderation should be seen particularly for these sub-types. Lower levels of Agreeableness, on the other hand, are predictive of all three subtypes of ASB (Burt et al., 2012; Gleason et al., 2004; Skeem et al., 2005; Thornton et al., 2010) and so it is expected that this moderation will be seen for all subtypes.

The connections with Neuroticism and Extraversion, however, are more mixed, such that CU traits correlate with both high and low levels of each trait at the facet level (Lynam, 2010). For example, within Neuroticism, angry hostility and impulsivity have been positively related to CU traits and psychopathy, whereas anxiety and self-consciousness have been negatively related (Lynam, 2010). Overall, however, Neuroticism is generally thought to be negatively related to CU traits (Essau et al., 2006; Frick & Dickens, 2006). As CU traits and ASB may have divergent relationships with Neuroticism, the relationship between ASB and Neuroticism is likely different at varying levels of CU traits. Specifically, at lower levels of CU traits, Neuroticism would likely hold the same relationship seen with ASB in past research, namely that higher levels of Neuroticism are related to higher levels of ASB. However, higher levels of anxiety, an important facet of Neuroticism, have been suggested to be protective against detrimental behaviors in children with higher levels of CU traits.
Because of this, the aggravating affect of other facets, such as angry hostility, of Neuroticism for ASB will be counteracted by the beneficial effect of the anxiety facet at higher levels of CU traits, nullifying the overall impact of Neuroticism in this case. Therefore it is predicted that at higher levels of CU traits, Neuroticism may be unrelated to ASB, whereas at lower levels of CU traits, Neuroticism would predict higher ASB. As such, CU traits will represent a stronger risk factor for ASB at lower levels of Neuroticism. Similar to Conscientiousness, as Neuroticism is specifically related to physical and relational aggression (Burt & Donnellan, 2008; Burt et al., 2012; Burt & Larson, 2007; Tackett, 2010), one would expect to see this moderation particularly for these subtypes of ASB.

2.1.4 Current Study

Though past research has routinely demonstrated that CU traits, personality and ASB are integrally tied together, how normal-range personality and CU traits combine to predict ASB has not been tested. Further, it is important to replicate results across varying methods of measurement and samples to ensure we are assessing robust and meaningful relationships. With this in mind, the goal of the current study was to examine the extent to which CU traits moderated the relations among the FFM and behavioral subtypes of youth ASB using an innovative methodological approach. First, these relationships were examined in both community and clinical samples. Second, the present study combined more standard methods of measurement (i.e., paper-and-pencil questionnaires) with an innovative assessment of individual differences (i.e., thin-slice impressions). Until now, measuring youth personality has primarily depended upon the use of questionnaires completed by either the self or well-known informants, such as caregivers and peers. Multiple researchers (e.g., Borkenau & Liebler, 1992; Borkenau & Liebler, 1993; Fowler, Lilienfeld, & Patrick, 2009), however, have demonstrated that “thin slice” ratings of personality by unacquainted observers show surprising accuracy. In children, such methods may represent a particularly powerful tool that addresses existing limitations in measurement (Tackett et al., in press) and that rival more traditional forms of behavioral micro-coding (Prime, Tackett, Perlman, & Jenkins, 2011). In the present study, this methodology was used to assess CU traits and normal-range personality in archival video data for the clinical sample.
In both samples, it was hypothesized that CU traits would moderate the relationships between normal-range personality and different subtypes of ASB (i.e., physical aggression, relational aggression, and non-violent rule-breaking behavior). Specifically, it was predicted that CU traits would moderate the relationship between Agreeableness and all types of ASB such that CU traits would be the strongest risk factor for ASB at lower levels of Agreeableness. It was also hypothesized that the same pattern of moderation would be seen between CU traits and Conscientiousness in the prediction of ASB, but that this moderation would be specifically seen for non-violent rule-breaking behavior and relational aggression. Finally, it was expected that CU traits would moderate the relationship between Neuroticism and ASB, such that CU traits would be a stronger risk factor for ASB at lower levels of Neuroticism. This moderation pattern was particularly expected when looking at the physical and relational aggression subtypes of ASB.

2.2 Methods

2.2.1 Participants

Community Sample. Participants for this study included the parents of 742 children 6-to-18 years of age ($M = 11.25$, $SD = 3.64$) from 661 different families$^1$ who were recruited from a metropolitan area in Ontario, Canada. Participants were contacted via a database of families willing to participate in research studies maintained by the psychology department and through advertisements posted in the community ($n = 469$). Additional participants were recruited through a course assignment using student course participation, whereby students recruited the caregiver of a child aged 6-to-18 years ($n = 273$). Inclusion criteria included fluency in English; exclusion criteria included neurodevelopmental disorders, mental retardation and psychotic disorders in the child. Informed consent was collected from all participants. Data received from caregivers other than the mother or father were not included in the present analyses to reduce variability across informants. Sex of the target child was nearly evenly split (48% male, $n = 359$). Parents indicated ethnic status of the target child as 48% European/White, 14% Asian, 2% Black, 1% Latino, 11% other, and 23% not specified.

$^1$ Present results remained significant after including only one child per family in the analyses.
Clinical Sample. Participants had previously been involved in a study conducted by The Hospital for Sick Children in Toronto, Ontario. The current sample consisted of 183 children aged 7-to-18 years ($M = 9.79$, $SD = 1.90$) and their mothers. This sample included both a clinical and control group of children who were interviewed as part of a treatment study for behavioral problems at Sick Kids. The clinical group consisted of children referred to the Child Development Institute and the Kinark Child and Family Centre for aggressive behaviors ($n = 138; 75\%$). The non-aggressive control group ($n = 45$) was matched with the clinical group on age and ethnicity. Approximately $79\%$ of the clinical group was male ($n = 109$), while $67\%$ of the comparison group was male ($n = 30$). Mothers indicated ethnic status of the target child as $74\%$ European/White, $9\%$ Black, $3\%$ Asian, $3\%$ Latino, $1\%$ South Asian, less than $1\%$ Native-Canadian, $7\%$ other, and $3\%$ not specified.

2.2.2 Measures

**Inventory of Child Individual Differences-Short Form (ICID-S; Deal et al., 2007).** The ICID-S is a 51-item measure of child personality which uses a scale from 1 to 7, ranging from “much less than the average child or not at all” to “much more than the average child”. Parents in the community sample completed the ICID-S about their child. In the clinical sample, unacquainted individuals rated how well each item described the child after watching a short video of a mother-child interaction task (described further below). The ICID-S measures higher-order domains analogous to the adult FFM of personality, including Neuroticism (N), Conscientiousness (C), Extraversion (E), Agreeableness (A) and Openness to Experience (O). In the present study, for the community sample, the internal consistencies ranged from .86 (for E) to .92 (for A) with an average of .89. For the clinical sample, the internal consistencies ranged from .87 (for E) to .97 (for A) with an average of .92. The correlations between unacquainted raters’ domain scores in the clinical sample ranged from .42 (for O) and .59 (for A) with an average of .50.

**Inventory of Callous and Unemotional Traits (ICU; Frick, 2004a).** The ICU is a 24-item measure which uses a scale from 0 to 3, ranging from “not at all true” to “definitely true”. The items are summed into one total score for CU traits. Parents in the community sample completed the ICU about their child. In the clinical sample, unacquainted individuals rated how well each item described the child after watching a short video of a mother-child
interaction task. In the present study, the internal consistencies for the ICU as measured by Cronbach’s $\alpha$ were .84 for the community sample and .93 for the clinical sample. The correlation between unacquainted raters’ total scores in the clinical sample was .44.

**Child Behavior Checklist** (CBCL – 6-18; Achenbach & Rescorla, 2001). In both samples, parents completed the CBCL, which includes 118 items rated on a scale of 0 to 2, ranging from “not true (as far as you know)” to “very true or often true” regarding problems that may have been present over the past six months. Items were summed to provide scores for Internalizing Behaviors, Externalizing Behaviors, and a Total Problems Score. The current study utilized the two scales that measure Physical Aggression and Rule-Breaking Behavior which, together, make up the Externalizing Behaviors dimension. In the present study, for the community sample, the internal consistencies were calculated for Externalizing Behaviors ($\alpha = .89$), Physical Aggression ($\alpha = .87$) and Rule-Breaking Behavior ($\alpha = .75$). For the clinical sample, the internal consistencies were also calculated for Externalizing Behaviors ($\alpha = .96$), Physical Aggression ($\alpha = .96$) and Rule-Breaking Behavior ($\alpha = .85$).

**Children’s Social Behavior Scale** (CSBS; Crick, 1996). The CSBS is a 13-item measure which uses a scale from 1 to 5, ranging from “never true” to “almost always true”. Only the Relational Aggression subscale, made up of five items, was used in the present study. In the present study, the internal consistency of this subscale was .72. The CSBS was collected only in the community sample.

### 2.2.3 Procedure

**Community Sample.** To maximize the number of questionnaires that could be administered while simultaneously maintaining efficiency, a planned missing data design was used for the community sample (e.g., Graham, Hofer, & MacKinnon, 1996). All caregivers completed the CBCL and were randomly assigned three (out of six) additional questionnaires, some of which are not the focus of the present study. The remaining six questionnaires were paired, and decisions regarding which questionnaire would be administered to each participant were made with a coin toss. Missing data were thus considered completely missing at random. Participants were mailed compensation in the
form of a $10 Canadian gift voucher upon receipt of the completed questionnaires and signed consent form.

Students collected data from caregivers as partial fulfillment of course requirements in two courses. In the first course \((n = 128)\), all parents completed the ICID and CBCL among other questionnaires not relevant to the present study. In the second course \((n = 145)\), all parents completed the ICID, CBCL, ICU and CSBS as well as an additional questionnaire not relevant to the present study. Of the parents who completed questionnaires as part of the community sample, 579 reports (78%) were completed by the mother and the remaining reports \((n = 163)\) were completed by the father. Ethical approval was obtained from the relevant ethical review boards for all aspects of the community sample studies. Missing data was estimated via the maximum-likelihood based EM algorithm in SPSS.

**Clinical Sample.** Participants were interviewed by Sick Kids researchers either in their home or at Sick Kids Hospital. Consent was collected from participants who were given the option of having their data used for future research on similar topics. Only the data from those who consented to future research were included in the present study. Part of the interview at Sick Kids required the child and parent to engage in a conflict discussion for 6 minutes that centered on a current issue in their lives that was chosen by a research assistant from a list provided by the family. Parents were compensated CAD$30 for the visit and the child received a CAD$10 gift voucher.

In the present study, the video of the conflict discussion was used as a “thin slice” of the child’s behavior in order to assess the child’s personality and CU traits. In the present study, each child was rated twice for each questionnaire (ICID-S or ICU), such that each child was rated by four different research assistants. Each research assistant was trained to evaluate videos of children based on their overall impression using the scales provided and comparing the child to the average child. The scores were aggregated across raters to provide the scale scores for each child, consistent with thin-slice methodology (e.g., Borkenau, Mauer, Riemann, Spinath, & Angleitner, 2004). This method has never before been used in completing the ICU but has been found to be effective in rating other types of personality traits (Borkenau & Liebler, 1992; Borkenau & Liebler, 1993) and has been tested in the
rating of psychopathy (Fowler et al., 2009). Unfortunately this scale was not available for other raters for comparison purposes in the present study. However, as noted previously, the thin-slice scale scores demonstrated good internal consistency for both the ICID-S and the ICU, and reliability was comparable to parent-reported information on the same questionnaires in the community sample. Agreement between unacquainted raters was also satisfactory in the clinical sample, exhibiting correlations on par with informant agreement found in other studies with similar measures (Frick, Kimonis, et al., 2003; Frick et al., 2005; Halverson et al., 2003). Therefore, the scores provided by this method were deemed reliable for the purposes of the present study. Missing data was estimated via the maximum-likelihood based EM algorithm in SPSS.

2.3 Results

For descriptive information as well as an examination of the extent to which the thin-slice assessments converged with more traditional questionnaire assessments, Pearson correlations were calculated between CU traits, the higher-order domains from the ICID-S, and all ASB scales (see Table 1). In both the community and clinical samples, CU traits were positively related to N and negatively related to all other personality traits. When comparing the correlations between the two samples, the community and clinical sample correlations significantly differed only for O (Fisher’s $z = 2.47, p = .01$), such that CU traits were associated with lower levels of O in the clinical sample ($r = -.59, p < .001$) than in the community sample ($r = -.44, p < .001$). Finally, in both samples, CU traits were positively related to Externalizing and all measured subtypes of ASB: Physical Aggression, Rule-Breaking Behavior and Relational Aggression (see Table 1). Given the presence of shared method variance in the community sample, it was unsurprising that these correlations were higher in the community sample than in the clinical sample. Regression analyses were next performed within each sample.²

² To test the veracity of the assumption of differences between samples the three-way interactions between the source sample, CU traits and the ICID-S trait domains were tested in a multivariate model. Sample was found to moderate the interactions between CU traits and N, Pillai's $λ = .02, p = .004$, E, Pillai's $λ = .01, p = .01$, O, Pillai's $λ = .01, p = .04$, and A, Pillai's $λ = .01, p = .02$, in the prediction of ASB overall.
2.3.1 Regressions Predicting Antisocial Behavior in the Community Sample

A multivariate regression was performed in the community sample to account for the increase in Type I error including Externalizing Behaviors, Physical Aggression, Rule-Breaking Behavior, and Relational Aggression as dependent variables. Age and sex were entered as covariates with age being centered to the mean and sex being effect coded (-1 = male, 1 = female). The ICU total score and all ICID-S trait domains were also included centered to the mean. Finally interaction terms were included between the ICU total score and all ICID-S trait domains. CU traits significantly interacted with N, Pillai's $\lambda = .03$, $p < .001$, E, Pillai's $\lambda = .03$, $p < .001$, and A, Pillai's $\lambda = .02$, $p = .002$, in the prediction of overall ASB. CU traits did not interact with O, Pillai's $\lambda = .01$, $p = .13$, or C, Pillai's $\lambda = .003$, $p = .49$, in the prediction of ASB overall.

Hierarchical linear regressions were next used to examine CU traits as a potential moderator of each dependent variable in turn starting with Externalizing Behaviors. For all regressions, the ICU total score, the ICID-S trait domains, and all covariates were centered to the mean, with sex being effect-coded. Sex and age were entered as covariates along with all five ICID-S trait domains and the ICU total score to account for main effects. Interaction terms were calculated for CU traits with each of the ICID-S trait domains (see Table 2). CU traits significantly interacted with N, E, A, and O in the prediction of overall externalizing problems.

Using a corrected alpha of .0125 based on the a priori intention to probe each interaction, simple effects testing demonstrated that CU traits were a significant predictor of overall externalizing problems at higher ($t(728) = 8.26, p = <.001$) but not lower ($t(728) = 1.84, p = .07$) levels of N, suggesting CU traits became a more powerful positive predictor of overall externalizing problems at higher levels of N (see Figure 1). CU traits were also a significant predictor of overall externalizing problems at higher ($t(728) = 8.80, p < .001$) and lower ($t(728) = 2.86, p = .004$) levels of E, with CU traits becoming a more powerful positive predictor of overall externalizing problems at higher levels of E (see Figure 1). Further, N was a significant predictor of overall externalizing problems at higher levels of CU traits ($t(728) = 7.48, p < .001$) but not at lower levels ($t(728) = 1.45, p = .15$). Similarly, E was also
a significant predictor of overall externalizing problems at higher levels of CU traits ($t(728) = 9.51, p < .001$) but not at lower levels ($t(728) = 1.88, p = .06$).

Simple effects testing also demonstrated that CU traits were a significant predictor of overall externalizing problems at higher ($t(728) = 3.85, p < .001$) and lower ($t(728) = 7.03, p < .001$) levels of A, with CU traits becoming a stronger positive predictor of overall externalizing problems at lower levels of A (see Figure 1). Similarly, CU traits were a significant predictor of overall externalizing problems at higher ($t(728) = 6.89, p < .001$) and lower ($t(728) = 3.78, p < .001$) levels of O, with CU traits becoming a stronger positive predictor of overall externalizing problems at lower levels of O (see Figure 1). Further, A was a significant negative predictor of overall externalizing problems at higher levels of CU traits ($t(728) = -5.03, p < .001$) but not at lower levels ($t(728) = -2.13, p = .03$). O was not a significant predictor of overall externalizing problems either at higher ($t(728) = -2.42, p = .02$) or lower ($t(728) = 0.94, p = .35$) levels of CU traits.

Parallel analyses were conducted to examine CU traits as a potential moderator for the ASB behavioral subtypes. In these analyses, the alternate ASB subtype scores (Physical Aggression, Rule-Breaking Behavior or Relational Aggression) were additionally entered as covariates. Significant interactions were found in predicting Physical Aggression and Rule-Breaking Behavior, but not Relational Aggression (see Table 2). Specifically, CU traits significantly interacted with N and E in the prediction of Physical Aggression and with E and A in the prediction of Rule-Breaking Behavior.

Simple effects testing demonstrated that CU traits were a significant predictor of Physical Aggression at higher ($t(726) = 3.64, p = .001$) and lower ($t(726) = -3.41, p = .001$) levels of N, with CU traits being a positive predictor of Physical Aggression at higher levels of N and a negative predictor at lower levels (see Figure 2). In contrast, CU traits were not a significant predictor of Physical Aggression at higher ($t(726) = 1.71, p = .09$) or lower ($t(726) = -1.67, p = .10$) levels of E. Further, N was a significant positive predictor of Physical Aggression at higher levels of CU traits ($t(726) = 7.99, p < .001$) but not at lower levels ($t(726) = 2.29, p = .20$). Similarly, E was also a significant predictor of Physical Aggression at higher levels of CU traits ($t(726) = 5.00, p < .001$) but not at lower levels.
with E becoming a stronger positive predictor of Physical Aggression at higher levels of CU traits (see Figure 2).

Simple effects testing also demonstrated that CU traits were a significant predictor of Rule-Breaking at higher \((t(726) = 6.98, p < .001)\) and lower \((t(726) = 4.43, p < .001)\) levels of E, with CU traits becoming a stronger positive predictor of Rule-Breaking at higher levels of E (see Figure 3). CU traits were also a significant predictor of Rule-Breaking at higher \((t(726) = 2.54, p = .01)\) and lower \((t(726) = 8.15, p < .001)\) levels of A, with CU traits becoming a stronger positive predictor of Rule-Breaking at lower levels of A (see Figure 3).

Further, E was a significant positive predictor of Rule-Breaking at higher levels of CU traits \((t(726) = 3.68, p < .001)\) but not at lower levels \((t(726) = 0.19, p = .85)\). In comparison, A was not a significant predictor of Rule-Breaking at higher levels of CU traits \((t(726) = -1.82, p = .07)\) but was a significant positive predictor at lower levels \((t(726) = 2.85, p = .004)\).

### 2.3.2 Regressions Predicting Antisocial Behavior in the Clinical Sample

A multivariate regression was performed in the clinical sample to account for the increase in Type I error including Externalizing Behaviors, Physical Aggression and Rule-Breaking Behavior as dependent variables. Age and sex were entered as covariates with age being centered to the mean and sex being effect coded (-1 = male, 1 = female). Six cases were removed from the clinical group for these analyses as their age was unknown. The ICU total score and all ICID-S trait domains were also included centered to the mean. Finally, interaction terms were included between the ICU total score and all ICID-S trait domains. CU traits did not interact with N, Pillai's \(\lambda = .03, p = .21\), E, Pillai's \(\lambda = .02, p = .38\), O, Pillai's \(\lambda = .01, p = .56\), A, Pillai's \(\lambda = .03, p = .15\), or C, Pillai's \(\lambda = .01, p = .78\), in the prediction of ASB overall.

Follow-up univariate regression analyses were next performed in the clinical sample paralleling those conducted in the community sample (see Table 3). CU traits interacted with N and A in predicting Externalizing Behaviors at marginally significant levels (see Table 3).
domains, and a new variable that indicated which sample each case originated from was included. Once the data were combined, a moderated regression predicting Externalizing Behaviors was run. For this regression, the ICU total score, the ICID-S trait domains and all covariates were centered to the mean. Sex and age were entered as covariates along with all five ICID-S trait domains, the ICU total score and the source sample variable to account for main effects. All possible two-way and three-way interaction terms were calculated for CU traits, the ICID-S trait domains and the source sample variable and entered into the regression. Between the two interactions between N, A, CU traits and Externalizing Behaviors for the clinical sample, only the interaction including A was significant in this additional regression \((B = -1.90, 95\% CI [-2.98, -0.82], p = .001)\), therefore only this interaction is interpreted for the clinical sample. Consistent with the community sample, simple effects testing revealed that CU traits were not a significant predictor of externalizing problems at higher \((t(163) = 0.42, p = .68)\) but were at lower \((t(163) = 3.63, p < .001)\) levels of A, with CU traits becoming a strong positive predictor of overall externalizing problems at lower levels of A (see Figure 4). Further, A was not a significant predictor of externalizing problems at higher levels of CU traits \((t(163) = 0.73, p = .47)\) but was a significant positive predictor at lower levels \((t(163) = 3.20, p = .002)\). In regards to the additional regressions, no significant interaction was found in the prediction of Physical Aggression or Rule-Breaking Behavior (see Table 3).

### 2.4 Discussion

Normal-range personality traits as measured by the FFM have demonstrated important relationships with both overall levels of ASB and its subtypes. In addition, the FFM has been extensively studied in relation to CU traits, and both personality and CU traits have been shown to be associated with unique variance in the exhibition of ASB in youth (Essau et al., 2006). Given the newfound importance of CU traits for CD, due to the proposal to include these characteristics as a specifier in the CD diagnosis (Frick & Moffitt, 2010), research is required into the impact CU traits have on previously identified risk factors of ASB, personality being one of them. In response to this demand, the current study sought to test whether CU traits moderate the relationship between normal-range personality traits and ASB. The present findings revealed that CU traits did indeed alter the relationship between
FFM personality traits and ASB in both a community and a clinical sample, and using a novel methodology.

2.4.1 Neuroticism, CU Traits, and Antisocial Behavior

In the community sample CU traits moderated the relationship between Neuroticism and ASB overall. It was specifically found that higher levels of externalizing behaviors and physical aggression were predicted by higher levels of CU traits in combination with higher levels of Neuroticism. These findings support the original hypothesis that CU traits would moderate the relationship between Neuroticism and ASB, and are consistent with past research that has shown Neuroticism to be uniquely related to physical aggression (Burt & Donnellan, 2008; Burt et al., 2012; Burt & Larson, 2007; Tackett, 2010). However, this interaction was not replicated in the clinical sample. This may be the result of the much smaller sample size of the clinical sample as the interaction between CU traits, Neuroticism and externalizing behaviors was marginally significant.

It is important to note that the way CU traits interacted with Neuroticism in the community sample was unexpected, as was the positive correlation found between these two constructs. This may be a result that is unique to using a younger sample. Some research has suggested that anxiety (an important facet of Neuroticism; Miller et al., 2001; Miller & Lynam, 2003) is less comorbid with psychopathy in later adolescence than it is in younger children, and that the correlation between these two constructs decreases as individuals age (Kubak & Salekin, 2009). As such, the protective effect one would expect to see Neuroticism have for individuals who have higher levels of CU traits may be unique to adults, while the opposite occurs in younger individuals, where Neuroticism may be more positively related to CU traits. Additionally, the relationship between angry hostility and measures of psychopathy has been shown in some research to be the strongest facet association in youth, a finding unique to this age group (Lynam, 2010). Further research should be conducted to replicate this finding using different age groups ranging from childhood to adulthood in order to determine if there is an important developmental trend to the relationship between CU traits and Neuroticism that influences the expression of ASB, and whether it is dependent on the specific associations between the facets of Neuroticism and CU traits.
Examinations conducted at the facet level may also reveal important and specific relationships between Neuroticism and CU traits that may be driving this relationship. For example, the angry hostility facet may have a much stronger association with CU traits than the anxiety facet in the present sample, resulting in the overall positive relationship between Neuroticism and CU traits. This bias in association has been found in a meta-analysis of youth research examining the correlation between the facets of the FFM and juvenile psychopathy (Lynam, 2010). The results demonstrated that the strongest association was a positive one between angry hostility and youth measures of psychopathy (Lynam, 2010). This finding, however, was unique to the youth research, as the similar meta-analysis for adult research demonstrated that the correlation between the anxiety facet of Neuroticism and adult psychopathy was the strongest (Lynam, 2010). Further research must be conducted to further examine the developmental implications of this possibility.

The impulsivity facet of Neuroticism has also been positively associated with measures of psychopathy in the past (Lynam, 2010). This facet represents the engagement in impulse driven behaviors, resulting from submitting to temptation and being highly motivated by one’s desires (McCrae & Costa, 1987). Though research has demonstrated that CU traits and impulsivity are separate categories of traits, they have been shown to be highly correlated constructs (Crpanzano et al., 2010; Frick et al., 1994). In the case of this particular facet, the description of behavior is highly related to the reward-dominant response style often found in association with high levels of CU traits (Barry et al., 2000; Frick, Cornell, Bodin, et al., 2003). It is therefore likely that this is another facet that is driving the positive association between Neuroticism and CU traits found in the present study. Additional research examining the specific relationships seen between facets of Neuroticism and CU traits is required, especially given that research has demonstrated that the interaction of these facets may provide different behavioral outcomes in individuals with high levels of CU traits (O’Brien & Frick, 1996).

2.4.2 Extraversion, CU Traits, and Antisocial Behavior

The results from the community sample also revealed that CU traits moderated the relationship between Extraversion and ASB overall, which is a finding not originally predicted. Similar to Neuroticism, the highest levels of externalizing behaviors as well as
rule-breaking in particular were predicted by higher levels of CU traits and Extraversion combined. When predicting physical aggression, Extraversion was a significant risk factor only at higher levels of CU traits. These results were not replicated in the clinical sample. This again may be explained by the much smaller sample size for the clinical sample in comparison to the community sample.

Though this interaction was unexpected, it may be explained by looking at Extraversion at the facet level. Indeed, certain characteristics of individuals with CU traits, such as excitement seeking, fall under the personality category of Extraversion and have been associated with ASB in past research (Kotler & McMahon, 2005; Lynam, 2010; Miller et al., 2001). As such, these traits may be important in individuals with higher levels of CU traits who also have higher levels of Extraversion. Individuals such as these would therefore be more likely to engage in risky behavior (Barry et al., 2000; Crapanzano et al., 2010). Future research should attempt to tease apart the present findings by studying the facet level associations to reveal what particular relationship is driving this result and to replicate it in a larger clinical sample.

2.4.3 Openness to Experience, CU Traits, and Antisocial Behavior

CU traits were also found to moderate the relationship between Openness to Experience and ASB overall. Specifically they moderated the relationship between Openness to Experience and externalizing behaviors in the community sample, another result that was unexpected. In the present study, CU traits became a more powerful risk factor for overall externalizing problems at lower levels of Openness to Experience.

This moderation was unexpected as only a weak relationship between this trait and CU traits has been demonstrated in the past. Some research has indeed associated low Openness to Experience with callousness (Gaughan et al., 2009; Salekin, Debus, et al., 2010). Similarly, there is a limited amount of research that has found an association between Openness to Experience and ASB. In one study, Klimstra et al. (2010) found that high levels of this trait predicted low levels of future aggression. However, the lack of a consistent association between Openness to Experience and either CU traits or ASB being present in the literature suggests that the investigation of the interaction between personality and CU traits
may have revealed an important association between these three constructs that has gone undetected. The results of the present study must be interpreted with caution, however, as the significance level of the interaction between CU traits and Openness to Experience in the prediction of overall externalizing problems was only significant at the $\alpha = .05$ level and was not supported in the multivariate regression. Future research is necessary to replicate this interaction in an attempt to determine whether it is a reliable finding or not.

### 2.4.4 Agreeableness, CU Traits, and Antisocial Behavior

The only significant interaction seen in both samples was the moderation of the relationship between Agreeableness and ASB. This finding supports the original hypothesis and is consistent with past research indicating Agreeableness is the strongest of the FFM traits in its relation to both ASB and psychopathy (Lynam, 2010; Lynam et al., 2005; Wilson et al., 2011). The pattern of interaction also supported the original hypothesis that CU traits would be the strongest risk factor for overall externalizing behaviors at lower levels of Agreeableness, and this result was demonstrated in both the community and the clinical sample. In the community sample, CU traits also moderated the relationship between Agreeableness and ASB overall and non-violent rule-breaking behavior. Interestingly, Agreeableness actually acted as a resiliency factor for non-violent rule-breaking behavior at higher levels of CU traits and as a risk factor at lower levels, a finding not seen for overall externalizing problems in the community sample.

The negative association between Agreeableness and ASB is one of the most robust and consistent findings in the literature regarding the relationship between personality and ASB, and indeed the present results demonstrated this in the prediction of overall externalizing behaviors in the community sample. However, this relationship may only hold true at higher levels of CU traits for a specific type of ASB, namely non-violent rule-breaking behavior. This finding is consistent with Moffitt’s (1993) theories regarding the development of ASB. Individuals who do not have CU traits are more likely to exhibit ASB that began in their adolescence (Dandreaux & Frick, 2009), and therefore their ASB is considered to be the unfortunate result of seeking independence and rebellion in combination with imitating the behaviors of antisocial peers in that search (Moffitt, 1993). Higher levels of Agreeableness may therefore make it more likely that individuals in this group will have a
more submissive role in their engagement of ASB in an attempt to imitate and fit in more with these antisocial peers. This explanation is further strengthened by the fact that this result was found specifically for rule-breaking behavior, as those in the adolescent-onset group typically commit non-violent ASB (Moffitt, 1993). It is also important to highlight that this relationship only existed in the present results at lower levels of CU traits. This is also consistent with past research that has demonstrated that typically individuals with adolescent-onset or adolescence-limited ASB have lower levels of CU traits than youth with childhood-onset or life-course-persistent ASB (Dandreaux & Frick, 2009; Rowe et al., 2010).

Some researchers have argued that CU traits and psychopathy can be reliably understood and measured as a combination of certain levels of the FFM traits (Gaughan et al., 2009; Lynam, 2010; Lynam et al., 2010; Miller et al., 2001). In particular, low levels of Agreeableness has been a very robust correlate with higher levels of CU traits and psychopathy (Essau et al., 2006; Lynam, 2010), including in the present study, suggesting that these traits may be redundant and therefore that the present interaction is immaterial. However, past research has been conducted that demonstrates that despite the high level of association between CU traits and the FFM, CU traits/psychopathy predict unique variance in ASB above and beyond these five traits and vice versa (Essau et al., 2006; Skeem et al., 2005). This suggests that instead CU traits and the FFM are two distinct but related factors that may work in concert to predict ASB. The present findings have elucidated the particular relationship between CU traits and Agreeableness. In particular, these results suggest that these traits may be somewhat redundant at higher levels of CU traits as demonstrated by the non-significant association between Agreeableness and rule-breaking in the community sample and externalizing problems in the clinical sample. However, at lower levels of CU traits, Agreeableness is revealed to be a significant risk factor for these same two measures of ASB, suggesting that CU traits and Agreeableness do have unique and important relationships with ASB that are not accounted for by the other trait.

2.4.5 Conscientiousness, CU Traits, and Antisocial Behavior

CU traits did not moderate the relationship between Conscientiousness and ASB or any of its subtypes, contrary to the original hypotheses. It is possible that important moderations may be revealed by future research at the facet level of Conscientiousness. For
example, one would anticipate facets of Conscientiousness such as compliance and the reverse of impulsivity to be negatively associated with CU traits, but others, such as intellect, to be positively associated (Frick et al., 1994; Kotler & McMahon, 2005). Pursuing these relationships at the facet level would therefore be an attractive avenue for future research.

2.4.6 Personality, CU Traits, and Relational Aggression

Finally, CU traits did not moderate the relationship between relational aggression and normal-range personality. This was unexpected given the relationships that have been demonstrated between relational aggression, CU traits and personality in the past (Czar et al., 2011; Tackett, 2010). However, the relationship between CU traits and relational aggression has been shown to be more important for females than males (Crpanzano et al., 2010; Marsee & Frick, 2007). It is therefore possible that the present results might be different had the results been analyzed separately for both genders. An important endeavor for future research then would be to examine whether CU traits moderate the relationship between normal-range personality and ASB differently between males and females. This was not feasible in the current analyses due to insufficient power resulting from the small effect size.

2.4.7 Limitations

The conclusions of the present study must be considered within the context of its limitations. First, although a strength of these studies is the inclusion of both a community sample and a clinical sample, the clinical sample was small both in size and in proportion of girls. These limitations may have resulted in the inability to detect significant interactions between personality and CU traits for the clinical sample in the present study.

Another potential limitation is the use of unacquainted individuals for the measurement of normal-range personality and CU traits in the clinical sample. Though this method of measuring personality has been reliably used in other research (Borkenau et al., 2004), it has not been used previously with the ICU. The validity of its use in this manner, therefore, has not yet been established given the novelty of this approach. However, one may reasonably believe that the results found were reliable given the similarity in findings between the community sample and the clinical sample, primarily as represented by the level of agreement found between raters as well as the measures of internal consistency and the
near identical pattern of correlations found between CU traits and normal-range personality traits. This suggests that the novel use of “thin slice” ratings for these traits was successful in the current study.

Finally, all of the measures were collected via questionnaire from either an individual parent or an unacquainted rater. This may have resulted in the inflation of the relationships measured due to shared method variance. However, support for the reliability of the present results is demonstrated in the consistency of findings between the community and clinical samples. This was particularly demonstrated by the interaction between Agreeableness, CU traits and externalizing behaviors identified in both samples. This consistency is especially relevant to the present limitation, as the predictors and dependent variables within the clinical sample were collected from different informants limiting the susceptibility of those results to shared method variance.

2.4.8 Implications

Despite these limitations, the present study provides an important step in the development of our understanding of CD and ASB. Taking these findings together, it is clear that CU traits play an important role in the exhibition of ASB. Particularly, the present study has shown that when we consider levels of CU traits, we can reveal significant and varying relationships between established risk factors and ASB.

These results have important implications for the study and treatment of conditions such as CD. Previous research has already shown that conduct-disordered individuals with higher levels of CU traits respond better to different styles of intervention than those who have lower levels of CU traits (e.g., Hawes & Dadds, 2005). The present findings can further aid in the development of appropriate treatment strategies by identifying the appropriate risk factors for sub-groups that exist within the diagnosis of CD. For example, children with higher levels of CU traits should be encouraged to engage in and express agreeable attitudes and behaviors, while these same attitudes and behaviors would be a target for redirection towards pro-social endeavors in children with lower levels of CU traits. However, the present findings are based on correlation only, and future longitudinal research needs to be conducted to determine the causal relationship between CU traits, personality, and ASB.
The current study also provides additional support for the use of CU traits as a specifier for the diagnosis of CD (Frick & Moffitt, 2010). Indeed, these results demonstrate how significantly varying levels of CU traits affects the associations between risk and resiliency factors for the presentation of ASB, and therefore why CU traits must be included whenever ASB is targeted either in research, diagnosis or intervention.

Overall, this is the first study to directly test the impact CU traits have on the relationship between normal-range personality and ASB. The present findings show how important a role CU traits play in predicting aggression and ASB from normal-range personality and how varying levels of CU traits change the picture from what was previously considered a consistent association between these two constructs. Finally, this study demonstrates that CU traits are a factor that cannot be disregarded when characterizing the relationship between any given risk and/or resiliency factor and ASB.

2.4.9 Future Directions

Despite the promising results found in the present study, additional research must be conducted to confirm and further explicate the influence CU traits have on the relationship between normal-range personality and ASB. Indeed, there are a number of different areas that can be targeted for future work that arise from the present findings.

One necessary avenue for future research is to investigate how CU traits impact the relationship between the facets of the FFM and ASB. It was previously mentioned that different facets of Neuroticism and Extraversion have been distinctly related to levels of CU traits. Indeed, within Neuroticism, traits such as high levels of anxiety would be expected to be negatively related to CU traits, whereas traits such as angry hostility and impulsiveness should be positively related (Lynam, 2010). Similarly, within Extraversion, excitement-seeking should be positively related to CU traits, while traits such as warmth should be negatively related (Lynam, 2010). Due to these expected disparate associations between personality facets and CU traits, the current results need to be investigated at the facet level to determine how CU traits impact the relationship between facets of personality and ASB.
Besides Neuroticism and Extraversion, the present results suggest that both Openness to Experience and Conscientiousness should be investigated at the facet level as well. The interaction found between Openness to Experience and CU traits in the prediction of externalizing behaviors was unexpected. If we consider Openness to Experience at the facet level, one study demonstrated that a single facet of Openness to Experience, openness to actions, was significantly negatively related to reactive aggression and positively related to proactive aggression (Miller & Lynam, 2006). Otherwise, this trait has not been reliably related to ASB in past research. However, the fact that a relationship has not previously been demonstrated does not mean that this trait does not impact the expression of ASB. Indeed, the current results indicate that the relationship between ASB and this trait may be dependent on the level of CU traits present, potentially revealing an important association between this trait and ASB that has previously gone undetected. Future research should therefore be conducted to examine this interaction both at the domain and facet level in order to determine whether the interaction between CU traits and Openness to Experience is reliable, and whether facet level associations can inform what is driving this finding.

Similarly, the lack of interaction between CU traits and Conscientiousness may be informed by studying the facets of this trait. In their study Miller et al. (2008) found that the variety of ASB committed and level of aggression was related to low levels of Conscientiousness in their coed sample of undergraduate introductory psychology students. However, associations at the facet level suggested that this relationship may be primarily due to the facet of dutifulness (Miller et al., 2008). Another facet, intelligence, is often considered to be part of Conscientiousness in children (Deal et al., 2007). In comparison to other facets of Conscientiousness, such as achievement striving and the reverse of impulsivity which should be negatively related, intelligence is suggested to be positively associated with CU traits (Christian et al., 1997). Overall, this suggests that although no interaction was found between Conscientiousness and CU traits in the prediction of ASB, significant findings may still be identified at the facet level, an area of investigation which should be taken up in future endeavors. By conducting additional research at the facet level for all FFM traits we can obtain higher levels of specificity in determining the combined influence of CU traits and personality on the expression of ASB, and possibly reveal important and distinct relationships for different facets that would otherwise be unknown.
Impulsivity is a component of personality that is highly related to the domains of Conscientiousness and Neuroticism (Deal et al., 2007; Lynam, 2010). The facet level trait of distractibility is built into both of these factors in the current measure, though in opposing ways, and is strongly positively related to other measures of impulsivity (Deal et al., 2007). Further, facets of other traits have been found to be positively associated with impulsivity, such as sensation-seeking behaviors from the domain of Extraversion and antagonism and strong-will from the domain of Agreeableness (Deal et al., 2007; Halverson et al., 2003). As such, the impact impulsivity has on the commission of ASB may be strongly influencing the association between these facets and ASB, adding another layer of complexity as to how CU traits may moderate those specific relationships, given that CU traits and impulsivity are correlated but unique factors that are influenced by separate processes (Frick et al., 1994; Pardini et al., 2003). Research has begun to address the construct of impulsivity more specifically in an attempt to tease apart the different traits that reflect different components of impulsivity (Miller, Flory, Lynam, & Leukefeld, 2003; Whiteside & Lynam, 2001). The recent UPPS model suggests that impulsivity is constructed of four distinct factors: (1) urgency (associated with Neuroticism); (2) (lack of) premeditation (associated with Conscientiousness); (3) (lack of) perseverance (associated with Conscientiousness); and (4) sensation seeking (associated with Extraversion; Miller et al., 2003; Whiteside & Lynam, 2001). These traits, then, all lead to the commission of impulsive behavior but in different ways (Miller et al., 2003). An additional five-factor model has also been suggested (the UPPS-P) model that includes two factors for positive and negative urgency instead of a single urgency factor (Derefinko, DeWall, Metze, Walsh, & Lynam, 2011).

Research has suggested that these models of impulsivity have significance for our understanding of ASB. For example, one study examined the relationship between the UPPS model and measures of ASB and psychopathy (Miller et al., 2003). The results revealed that of the four factors a lack of premeditation, followed by sensation seeking, had the greatest correlation with delinquency, Antisocial Personality Disorder (ASPD), and psychopathy, while urgency had the largest, though not significantly different, correlation with aggression (Miller et al., 2003). Additionally, a lack of perseverance was a predictor only of psychopathy and urgency was the only significant predictor of aggression (Miller et al., 2003). Similarly, Derefinko et al. (2011) conducted a study looking at the relationship
between the UPPS-P and different types of aggression in male undergraduates. They found that lack of premeditation and sensation seeking were related to general violent behaviors while intimate partner violence was specifically related to urgency. Overall, this research demonstrates that impulsivity likely has a significant influence on the relationship between the FFM and ASB, and that the various factors of impulsivity would be influenced by CU traits differently. A goal of additional research, therefore, would be to determine the exact role impulsivity, as conceptualized by the UPPS and/or UPPS-P models, plays in how CU traits moderate the FFM to influence ASB.

Another avenue for future research would be to attempt to replicate these results in additional appropriate samples and using a longitudinal design. Specifically, it is important to examine these constructs with more clinical participants and with consistently even gender distributions. The present clinical sample provided no significant interactions as the community sample did. One potential reason for this may be the small sample size. Thus, replication in a larger clinical sample is necessary, as it is unclear whether the interactions found are appropriate in a clinical sample but presently undetectable, or whether they in fact do not apply to this group. A longitudinal design should also be employed to establish the causal associations between CU traits, personality, and ASB.

Future research should examine whether the moderation of CU traits differs between genders, as past research has demonstrated different associations between ASB, CU traits and personality in males versus females (Marsee et al., 2005; Ostrov & Houston, 2008). In particular, the association between relational aggression and CU traits has been demonstrated to be either stronger in girls versus boys or non-existent in boys (Crapanzano et al., 2010; Marsee et al., 2005). Because of this, it is important for future research to investigate if meaningful interactions between normal-range personality and CU traits in the prediction of overall ASB and its subtypes can be identified between genders.

Besides gender, differences in the relationship between CU traits, ASB and normal-range personality may also exist across ages. As mentioned previously, an important facet of Neuroticism is anxiety, and anxiety has been suggested to relate differently to psychopathy across development in youth, with a positive association between psychopathy and anxiety in
young children potentially culminating in no association between psychopathy and anxiety in adults (Kubak & Salekin, 2009). Along these lines, some research studying the FFM in children of various ages has suggested that Neuroticism and Extraversion may look different in younger adolescents than they do in older children and adults (John et al., 1994). In particular, John et al. (1994) have suggested that for early adolescents, Neuroticism and Extraversion may be better conceptualized as four separate factors, with Neuroticism being represented by an anxious/distress factor and an irritability factor, and Extraversion being represented by a sociability factor and an activity factor. As the individual ages into adulthood, then, these four factors eventually develop into the two major traits of Neuroticism and Extraversion that are commonly assessed and recognized (John et al., 1994). This theory provides important context for studying how CU traits and personality interact, as these two major factors of Neuroticism would be expected to relate to CU traits in opposing manners. However, the influence of these factors may diminish as an individual ages, therefore changing the influence CU traits have on outcome measures through the impact they have on these traits. Future research must be conducted to study whether there do exist developmental trends in how CU traits interact with personality to predict ASB using both the higher-order factors and lower-level facets of the FFM. In doing so, we will be better able to inform prognosis and intervention for CD from early childhood to adulthood by being able to target the specific and dynamic risk factors that influence ASB across development.

Another point on which future research can build centers on the novel methodology, i.e., the coding of “thin slices” of behavior, used in the present study to measure personality and CU traits in the clinical sample. Despite the consistent results found between the community and clinical samples, this is the first time CU traits have been collected in this manner. As such, the reliability of this method for this particular scale has not been fully investigated. Future research should therefore attempt to replicate these findings in additional clinical samples using typical collection methods of CU traits. Importantly, research should also be conducted to directly compare measures of CU traits completed by unacquainted individuals to self and parent reports for the same targets in order to assess the ability of individuals to accurately rate CU traits based on “thin slices” of their behavior. Though the results of the present study demonstrated adequate reliability between stranger ratings, the
agreement between acquainted and unacquainted ratings was not available. This type of comparison will become highly relevant to the study of CU traits in the presence of a CD diagnosis, as demonstrating that CU traits can be reliably determined based on “thin slices” of behavior may allow clinicians with only brief contact with children to appropriately gauge a child’s level of CU traits and properly apply the proposed specifier when diagnosing CD. This would then limit the dependence on well-known informants that is suggested in the proposal to include CU traits as a specifier for CD (Frick & Moffitt, 2010).

Finally, normal-range personality traits are only one factor that has been commonly related to ASB and CD. Indeed, many other risk factors for ASB have been identified, including additional individual characteristics, such as trait levels of anxiety (Frick & Ellis, 1999; McBurnett et al., 1991), as well as biological factors, such as baseline and hormonal stress reactivity levels (Susman et al., 2010; van Goozen et al., 2007). These same variables have also been found to relate to psychopathy and CU traits in past research, though not always in consistent ways (e.g., Dolan & Rennie, 2007; Frick, Lilienfeld, Ellis, Loney, & Silverthorn, 1999; Sevecke & Kosson, 2010). Given the promising findings of the present study showing that CU traits do influence the relationship between normal-range personality traits and ASB, additional research must be conducted to examine how CU traits may also alter the way in which other factors relate to ASB. Overall this line of research is providing further support for the use of CU traits as a specifier in the diagnosis of CD, and it informs our understanding of the role CU traits and other risk factors play in the description, prognosis, and intervention of ASB.
Chapter 3
Callous-Unemotional Traits Moderate Links Between Trait Anxiety, Cortisol Reactivity, and Antisocial Behavioral Subtypes in an Adolescent Community Sample

Incorporating callous-unemotional (CU) traits into the diagnosis of Conduct Disorder (CD) will provide greater specificity in the understanding of this condition (Frick & Moffitt, 2010). Such a proposal requires the search for insight into how commonly-studied variables, such as trait anxiety and the physiological stress response, relate to antisocial behavior (ASB) at varying levels of CU traits. Specifically, research examining general levels of ASB can provide insight that studying CD directly cannot. For example, studying the associations between CU traits, ASB and these types of factors in community samples that may not meet diagnostic criteria may provide important insight into these relationships prior to the development of severe conduct problems. Additionally, as mentioned previously, studying ASB more generally allows the consideration of behaviors that are not typically associated with CD but are an important and relevant type of ASB, namely relational aggression. Because of this, research is needed to examine the role CU traits play in the exhibition of ASB at this level. In particular, research must be conducted to determine if factors such as trait anxiety and the physiological stress response demonstrate the same risk and resiliency patterns for ASB and its behavioral subtypes at varying levels of CU traits.

Trait anxiety has been extensively studied in relation to ASB and CU traits (Garai et al., 2009; Loeber, Russo, Stouthamer-Loeber, & Lahey, 1994; McBurnett et al., 1991; Walker et al., 1991). Typically, the concept of trait anxiety refers to a constant level of anxiety or distress an individual feels due to the belief that danger or detrimental outcomes are everywhere and inescapable (Frick, Cornell, Bodin, et al., 2003). In other words, trait anxiety refers to the overall or baseline level of anxiety that a person feels consistently that is not associated with a particular stressor.

Though the relationship between anxiety and ASB has been examined at length, inconsistencies in the literature still remain and the exact nature of this association remains in question (Cunningham & Ollendick, 2010; Garai et al., 2009; Loeber et al., 1994; McBurnett
et al., 1991; Walker et al., 1991). Research has also demonstrated that a clear relationship between CU traits and anxiety is unlikely (Frick, Cornell, Bodin, et al., 2003; Frick et al., 1994; Harpur et al., 1994; Kubak & Salekin, 2009; Loney et al., 2006; Lynam et al., 2005). Indeed, some have suggested that anxiety may identify subtypes within individuals with high levels of CU traits (Lee & Salekin, 2010; Lee et al., 2010). Taking this idea a step further, the proposal of the current study was that the relationship between ASB and anxiety is dependent upon the level of CU traits possessed by the youth, and therefore studying how CU traits and anxiety interact will provide better specificity in the examination of ASB.

Salivary cortisol levels have been highly correlated with levels of anxiety (McBurnett et al., 1991) and baseline levels of cortisol are considered to be a biological marker for trait anxiety (Loney et al., 2006). Cortisol is a glucocorticoid that is important in the functioning of the hypothalamic-pituitary-adrenal (HPA) axis (Kalatsas & Chrousos, 2007). It is therefore also a significant player in an individual’s biological response to stress (Kalatsas & Chrousos, 2007). Cortisol reactivity represents an individual’s increase in cortisol levels from baseline in response to a specific stressor and is a factor that has been extensively studied in relation to ASB with inconsistent results suggesting a potential risk and resiliency relationship between these variables (Deming, 2009; Lochman et al., 2010; Rudolph, Troop-Gordon, & Granger, 2010; van Goozen et al., 2007). Despite this, the importance of biological factors and cortisol reactivity in particular for the development and persistence of ASB has been established, though the exact relationship remains unclear (Susman, 2006; van Goozen et al., 2007). Research into the association between cortisol reactivity and CU traits has also been unreliable (O’Leary et al., 2007; Stadler et al., 2010). Given this inconsistency, similar to trait anxiety, the goal of the current study is to demonstrate that the relationship between cortisol reactivity and CU traits may be better considered in combination when examining ASB. As a result, the study of the interaction between CU traits and cortisol reactivity should enhance our understanding of ASB as well.

The proposal to use CU traits as a specifier for CD and the literature supporting it suggests that individuals high or low in these traits have different behavioral patterns and etiologies (Frick & Moffitt, 2010). In this vein, and considering the unreliable associations established in the literature, the purpose of the present study was to test CU traits as a
moderator of the relationships between trait anxiety, cortisol reactivity and ASB, potentially providing an important platform that will allow us to better understand the nature of these associations.

3.1.1 Trait Anxiety and Antisocial Behavior

Anxiety disorders and CD have often been found to be comorbid at rates higher than expected by chance, suggesting an underlying link between these two conditions (Cunningham & Ollendick, 2010; Lochman et al., 2010). Indeed, in their meta-analysis, Angold, Costello and Erkanli (1999) reported a diagnosis of CD or Oppositional Defiant Disorder (ODD) to be comorbid for 5.9 to 69.2% of individuals with an anxiety disorder over the collection of studies using samples of various ages between 7 and 18 years. They further reported that across these same studies a comorbid anxiety disorder was present in 4.8 to 40.9% of youth with a CD or ODD diagnosis. In their study, Newcomer, Barenbaum, and Pearson (1995) showed higher self and teacher ratings of anxiety in children with CD versus children with a learning disability or no disability. The children in this sample were between the ages of 6 and 19 years.

A high level of comorbidity has also been found in adults. Goodwin and Hamilton (2003) demonstrated in their study of over 5000 community individuals between the ages of 15 and 54 years, that within those who had Antisocial Personality Disorder (ASPD), 54% had a co-occurring anxiety disorder. Further, of those with a past diagnosis of CD but who did not have ASPD, 42% had a lifetime diagnosis of an anxiety disorder. In the same study, these authors also examined the rates of specific anxiety disorders, measuring generalized anxiety disorder, agoraphobia, social phobia, specific phobia, post-traumatic stress disorder and panic attacks individually. Though all types of anxiety disorders were present in those with CD and ASPD, some differences were noted. After conducting odds ratios controlling for demographics, they found that individuals with a lifetime diagnosis of agoraphobia, post-traumatic stress disorder, specific phobia or social phobia were more likely to have a past diagnosis of CD but never to be diagnosed with ASPD. Similarly, they found that individuals with a lifetime diagnosis of a panic attack, agoraphobia, specific phobia or social phobia were more likely to have a lifetime diagnosis of ASPD.
Previous research has also shown that children with conduct problems with varying levels of anxiety can have distinct characteristics. In their study, O’Brien and Frick (1996) found that children between the ages of 6 and 13 years with demonstrated conduct problems engaged in a reward-dominant response style only if they also had low levels of anxiety. Overall, however, research into the nature of the relationship between anxiety and ASB has yielded inconsistent results.

On the protective side, Walker et al. (1991) conducted a longitudinal study in which they found that boys between the ages of 7 and 12 years with both CD and either overanxious disorder, separation anxiety disorder, or both demonstrated lower levels of ASB than individuals with CD alone as measured by the number of police contacts and school suspensions the individual had accrued. Similarly, McBurnett et al. (1991) conducted a study of conduct-disordered boys between 9- and 10-years-old that did or did not have a comorbid anxiety disorder, which included either separation anxiety disorder or overanxious disorder based on DSM-III-R (APA, 1987) criteria. They also found that boys with CD and an anxiety disorder had decreased levels of school suspensions and police contacts, and were rated as less aggressive by their peers in comparison to boys with CD and no anxiety disorder.

In contrast, there is evidence that anxiety is a particularly strong risk factor for conduct problems in adolescence (Deming, 2009; Russo & Beidel, 1994). In their study of children with a mean age of 12 years from African-American single-mother families, Garai et al. (2009) demonstrated that youth with high levels of anxiety or depression in combination with high levels of externalizing problems engaged in more high risk behavior in the future. Loeber et al. (1994) found 75% of their adolescent male sample who had the most severe externalizing behavior to have stable high levels of anxiety representing nervous, phobic and anxious behaviors over time whereas only 35% and 19% of those with only moderate or mild cases of externalizing behavior had this as well. In their study of community boys and girls aged 6 to 16 years, Eaves, Darch, and Williams (2004) found that children with high levels of fear and anxiety scored higher for conduct problems, CD and socialized aggression than children with low levels of fear and anxiety.
In addition to evidence for and against anxiety being a risk factor for ASB, some research has found no relationship between anxiety and more severe ASB. In their study, Ollendick, Seligman, and Butcher (1999) examined the impact of anxiety on behavioral outcomes in incarcerated conduct-disordered youth of both genders between the ages of 12 and 19 years. They found that 22% qualified for a co-morbid diagnosis of an anxiety disorder, but that those with and without a comorbid anxiety diagnosis did not differ in terms of gender, age at first offense, number of offenses, or offense severity for their first and most recent offenses.

Based on this body of research, no clear conclusion as to the relationship between CD or ASB and anxiety can be drawn. Some interesting patterns can be seen, however, in the literature presented here. Specifically, anxiety has a greater tendency to be a risk factor for ASB when measured in a community sample without measuring actual disorders. In comparison, when examining clinical samples and measuring anxiety disorders, anxiety has a greater tendency to be a protective factor for ASB. It is unclear as to why this particular relationship may be developing. A viable possibility is that another factor may be at work that dictates when and how anxiety relates to ASB levels. In particular, CU traits may be a likely factor, given that higher levels of CU traits are associated with more severe levels of ASB (Frick et al., 2000; Frick & Moffitt, 2010; Frick & White, 2008; Jones & Viding, 2007). Therefore, anxiety may act as a protective factor in individuals with higher levels of CU traits, but as a risk factor in those with lower levels of these traits. Besides the overall level of ASB, an inconsistent relationship has also been found in the limited research examining the relationship between trait anxiety and the subtypes of ASB.

### 3.1.2 Trait Anxiety and Subtypes of Antisocial Behavior

Anxiety has been examined in relation to the subtypes of ASB, specifically physical aggression, relational aggression, and non-violent ASB. Storch, Bagner, Geffken, and Baumeister (2004) examined the relationship of social anxiety with physical and relational aggression in a coed sample of undergraduate students between the ages of 17 and 41 years. They found that social anxiety was significantly positively related to both physical and relational aggression, but that this was only seen in females after separating the genders.
Craig (1998) looked at different types of aggression in children from the community with an average age of 11 years. She found that relational aggression predicted social anxiety levels in these children, while physical aggression did not, regardless of whether the children were identified as bullies or victims. Importantly, relational aggression was a significant positive predictor of social anxiety in this study. Craig also included a measure of purely verbal aggression (including behaviors such as insulting the other or threatening another) that was negatively related to social anxiety. Overall, these findings suggest that anxiety may exhibit different relationships with ASB depending on the subtype being examined, and they also suggest that even within the broader categories of physical and relational aggression, differences may exist. These findings are, however, limited to social anxiety specifically.

Marsee, Weems, and Taylor (2008) examined reactive versus proactive and relational versus physical aggression in relation to anxiety in children of both genders between the ages of 6 and 17 years from the community. In this study, a measure of total anxiety was used which included items based on the *DSM-IV* (APA, 1994) symptoms of all anxiety disorders except post-traumatic stress disorder and the specific phobias. This scale was significantly positively related to proactive and reactive relational aggression but only reactive physical aggression, suggesting anxiety may be more important for relational aggression than physical aggression.

Together, this collection of studies has demonstrated that though anxiety is commonly positively associated with physical and relational aggression, differences do exist in how anxiety relates to these subtypes of ASB. Unfortunately, limited research is available in studying the relationship between relational aggression and anxiety, and the majority that does exist measures social anxiety versus trait or overall levels. Additional research must be conducted comparing physical aggression and relational aggression in how they relate to trait anxiety. Besides these two subtypes, research has also touched on whether anxiety relates differently to non-violent behavior in comparison to aggression.

One study by Hodgins, Barbareschi, and Larrson (2011) investigated the impact of co-morbid diagnoses of CD and an anxiety disorder in the exhibition of violent and non-violent ASB in adolescents of both genders seeking treatment for substance use. In this study,
the anxiety disorders identified based on *DSM-IV-TR* (APA, 2000) criteria included social phobia, specific phobia, panic disorder, separation anxiety disorder, obsessive compulsive disorder, post-traumatic stress disorder, substance related anxiety disorder, and anxiety disorder not otherwise specified, and the distribution of the specific types did not differ between the groups with and without a CD diagnosis. In their sample, 78% of the sample had at least CD or an anxiety disorder and approximately one quarter of the sample had both. To investigate the differences between subtypes of ASB, Hodgins et al. (2011) examined the levels of violent and non-violent ASB between adolescents with CD only and adolescents with CD and an anxiety disorder. They did not find any differences, however, as these two groups did not differ in their levels of both violent and non-violent ASB, whether it was measured via self-report or from the CD diagnostic criteria.

The amount of research available to detail the relationship that trait anxiety holds with the three subtypes of ASB is extremely limited and often not directly applicable to the current question. Despite this absence of studies, current literature does demonstrate that physical aggression, relational aggression and non-violent rule-breaking behavior do relate differently with common risk factors for ASB, including CU traits and the personality trait Neuroticism, of which a key component is anxiety (Miller & Lynam, 2001, 2003, 2006). As a result, important and clinically relevant distinctions in the influence of trait anxiety on these subtypes can be expected and additional research specifically looking at both overall and subtype levels of ASB is required.

What is clear from the collection of research dictating the relationship between anxiety and ASB is that this association is not consistent. Even at the subtype level, however, the pattern of clinical levels of anxiety acting as a protective factor in clinical samples while general levels of anxiety act as a risk factor in community samples is maintained. The proposal of the current study is that the discrepancies in this body of literature may be elucidated by considering these associations as dependent upon an additional factor. By proposing to include CU traits in the diagnosis of CD, Frick and Moffitt (2010) have highlighted the need to determine how CU traits influence the relationship between other relevant factors to CD and the expression of ASB. What’s more, examination of the
association between CU traits and trait anxiety in past research suggests that CU traits may be an ideal candidate for explaining the inconsistencies between trait anxiety and ASB.

3.1.3 Trait Anxiety and CU Traits

Historically, psychopathy has been assumed to incorporate low levels of trait anxiety, whether in relation to blunted emotional responses or general fearlessness (Lynam et al., 2005; Sevecke & Kosson, 2010). However, the relationship has not been clearly established in the literature. Frick et al. (1999) found in a mostly male sample of clinical youth aged 6 to 13 years that trait anxiety and CU traits were negatively associated. They further demonstrated that this relationship becomes even more marked when controlling for conduct problems (Frick et al., 1999). In their study, Dolan and Rennie (2007) examined the relationship between psychopathy, its sub-factors, and trait anxiety in incarcerated male adolescent offenders who had varying levels of CD but were excluded if they had a comorbid disorder. Though they found no correlation between overall psychopathy and trait anxiety, trait anxiety was significantly negatively correlated with the affective component of psychopathy, the sub-factor that most closely resembles those characteristics captured by CU traits (Dolan & Rennie, 2007). Similar to Frick et al. (1999), this correlation remained significant even after controlling for the ASB sub-factor of psychopathy (Dolan & Rennie, 2007).

However, Lee et al. (2010) demonstrated in their study of male adolescent offenders aged 12 to 18 years that the groups with high and moderate levels of psychopathy had significantly higher levels of trait anxiety than the group with a low level of psychopathy. In another sample of juvenile offenders that were predominantly male and aged 9 to 18 years, Kubak and Salekin (2009) also found measures of psychopathy to be positively related to trait anxiety. Further, these authors found that the correlation between psychopathy and anxiety decreased as the individual ages. However, though the total psychopathy score was positively related to trait anxiety, the callous-unemotional factor was negatively related.

In comparison to the above research, some studies have found no relationship between CU traits or psychopathy and anxiety. O’Leary, Taylor, and Eckel (2010) compared coed adult groups of high versus low levels of psychopathic personality traits in an
undergraduate psychology class on their level of trait anxiety and found no difference. Hale, Goldstein, Abramowitz, Calamari, and Kosson (2004) conducted a study relating trait anxiety levels with psychopathy scores in adult males who were incarcerated and found no correlation between the psychopathy affective factor and trait anxiety. They did find, however, that the antisocial lifestyle was significantly positively correlated with trait anxiety, even after controlling for the affective factor. They additionally found a significant group difference between the psychopathic and non-psychopathic inmates, with psychopaths scoring higher on their measure of trait anxiety. Another study by Hodgins et al. (2011) demonstrated a lack of relationship between anxiety and psychopathy levels by looking at this relationship among adolescents of both genders seeking treatment for substance misuse. These authors found no difference in overall psychopathy levels or its three sub-factors between a group that had CD and an anxiety disorder versus a group that had CD alone.

In light of the inconsistent results contained in the literature, the nature of the relationship between anxiety and CU traits must be considered using a different approach. In this vein, some researchers have suggested that rather than being a defining feature, the level of anxiety could instead distinguish between two types of individuals with higher levels of CU traits (Sevecke & Kosson, 2010). For example, among adults with high levels of psychopathic characteristics, subtypes of psychopathy can be identified based on levels of trait anxiety (Lee et al., 2010). Specifically, those who express low levels of trait anxiety tend to be those who also exhibit deficits in emotional processing, decreased stress reactivity, and higher levels of ASB (Lee & Salekin, 2010; Lee et al., 2010; Lorenz & Newman, 2002). Further, O’Brien and Frick (1996) found that in youth between the ages of 6 and 13 years, those with high levels of CU traits and no anxiety symptoms demonstrated a more reward-dominant response style on a behavioral task than children with high levels of CU traits and anxiety symptoms, regardless of level of conduct problems.

In comparison, psychopaths with high levels of anxiety tend to have higher levels of traits of borderline personality disorder, social withdrawal and higher levels of psychopathology (Lee et al., 2010). Further, this type of psychopathy is suggested to be more related to environmental factors in terms of its etiology (Lee & Salekin, 2010). However, similar to psychopaths with low levels of anxiety, those with high levels of anxiety also
engage in high levels of aggression (Lee & Salekin, 2010). On the positive side, they also tend to exhibit better treatment responsiveness (Lee et al., 2010).

This collection of research provides strong support for the consideration of subtypes within individuals with higher levels of CU traits based on level of trait anxiety. Taking this idea further, by combining CU traits and anxiety fully as two factors related to ASB, we may be able to explain the inconsistencies both in the CU trait literature and the ASB literature in terms of how they relate to anxiety. To do so, we must examine how CU traits and trait anxiety work together to influence the expression of ASB. Based on this idea, the first goal of the present study was to determine whether CU traits and trait anxiety interact to predict ASB and its three subtypes.

Thus far, the literature suggests that anxiety may pose as a risk or protective factor for ASB, and that which relationship occurs is dependent upon additional factors. For example, in general research conducted examining anxiety disorders in clinical samples has found anxiety to be protective against the commission of ASB (O’Brien & Frick, 1996; McBurnett et al., 1991; Walker et al., 1991). In comparison, research examining anxiety generally in community samples tends to find it to act as a risk factor for ASB (Eaves et al., 2004; Garai et al., 2009; Loeber et al., 1994). Given this inconsistency, an additional factor may be dictating when anxiety is beneficial and when it is detrimental for ASB. The proposal of the current study is that CU traits are this factor. Based on the evidence that higher levels of CU traits are associated with more severe manifestations of ASB, it is likely that in this case anxiety is involved as a protective influence. This is strengthened by the previous research demonstrating higher levels of ASB in individuals with psychopathy and lower levels of anxiety (Lee & Salekin, 2010). In comparison, lower levels of CU traits are associated with less severe ASB and more reactive aggression, a type of aggression commonly associated with higher levels of anxiety (Crapanzano et al., 2010; Frick, Cornell, Barry, et al., 2003; Jones & Viding, 2007; Miller & Lynam, 2006). This suggests that at lower levels of CU traits, anxiety likely acts as a risk factor for additional ASB. In regards to the results of the present study, it is therefore expected that the association between anxiety and ASB is distinct at different levels of CU traits, with anxiety acting as a risk factor at lower levels of
CU traits and as a resiliency factor at higher levels of CU traits. As such, CU traits should represent a stronger positive predictor of ASB at lower levels of trait anxiety.

3.1.4 Cortisol Reactivity and Antisocial Behavior

Besides personality and trait factors, such as anxiety, biological factors have been proven to be important for the development and study of ASB, with the HPA axis being a target of particular interest (Hawes et al., 2009; van Goozen et al., 2007). This axis is part of the overall system that is involved in an individual’s response to stress, with activation resulting in an increase in glucocorticoid levels (Kaltsas & Chrousos, 2007). Underactivation of this system has been suggested to be a risk factor for the commission of ASB (van Goozen et al., 2007). Specifically, researchers theorize that a blunted biological response to stress may predispose individuals to engage in risky and thrill seeking behavior, resulting in ASB in individuals so inclined (van Goozen et al., 2007). The importance of studying biological factors for ASB in addition to individual characteristics cannot be understated. Examining this type of factor provides us with information as to the potential etiology behind certain types of ASB and therefore to predisposing factors that can be identified early allowing steps to be taken to prevent the development of persistent ASB and subsequently CD in youth.

Cortisol is a glucocorticoid integral in the functioning of the HPA axis (Kaltsas & Chrousos, 2007) and has been related to an individual’s level of anxiety (Loney et al., 2006). In a relevant clinic-referred sample of boys between the ages of 8 and 13 years, higher salivary cortisol levels were observed in children with comorbid CD and anxiety compared to children with CD alone (McBurnett et al., 1991). As with research on the relationship between trait anxiety and ASB, research on baseline cortisol measures has yielded inconsistent associations with ASB (van Goozen et al., 2007). Rudolph et al. (2010) demonstrated in their study using a coed sample of children with a mean age of 9 years that high levels of baseline levels of salivary cortisol were related to higher levels of aggression. However, this was only true when the individual experienced high levels of victimization. In comparison, Sondeijker et al. (2007) found no relationship between questionnaire measures of ASB and baseline levels of salivary cortisol in their 10- to 12-year-old community sample. However, higher levels of youth self-reported ODD symptoms demonstrated an association with higher levels of morning cortisol levels.
Aside from baseline cortisol levels, stress reactivity levels of cortisol have also been suggested to be important for ASB. Similar to baseline levels, stress reactivity measures have demonstrated some inconsistent relationships with ASB (Rudolph et al., 2010; Susman, 2006; van Goozen et al., 2007). For example, Fairchild et al. (2008) conducted a study comparing salivary cortisol reactivity in response to a frustration stressor involving competition in males between the ages of 14 and 18 who either had childhood-onset CD, adolescent-onset CD or no CD. In comparison to the controls who showed an increase in cortisol following the application of the stressor, both CD groups demonstrated decreases in their cortisol levels and did not differ from each other. Even after only looking at participants who qualified as a responder by reaching a threshold in cortisol increase in response to the stressor, participants with childhood-onset CD still had a significantly blunted cortisol response versus controls, while the adolescent-onset CD group did not significantly differ from either group.

Popma et al. (2006) examined salivary cortisol reactivity levels in response to a public speaking task in boys between the ages of 12 and 17 years in the Netherlands. Specifically, they compared cortisol reactivity between a control group of boys and two groups of boys in a delinquency diversion program who were distinguished by presently meeting criteria for a diagnosis of ODD/CD or not. These authors found that boys in the diversion program who met criteria for ODD or CD had a significantly lower cortisol response to the stressor than the control group, whereas the boys in the diversion program who did not meet criteria did not differ.

van Goozen, Matthys, Cohen-Kettenis, Buitelaar, and van Engeland (2000) also conducted a study looking at salivary cortisol reactivity in response to a provocation and frustration task in children of both genders between the ages of 8 and 12 years who either had a disruptive behavioral disorder (ODD or CD) or were controls. The stressor used involved general competition and lasted for 80 minutes. The task was designed to elicit feelings of provocation, frustration and aggression in response to a videotaped opponent who was in a performance competition with the participant. In this study, the controls demonstrated an increase in cortisol in the samples following the application of the stressor while the behavioral disorder group overall demonstrated a continual decrease across the experiment.
Interestingly, when classifying the participants as responders versus non-responders, responders within the behavioral disorder group had significantly higher scores of anxiety/depression than their non-responder counterparts. Thus, although overall the group with behavioral disorders displayed a blunted cortisol reactivity response there remains variability within this group such that subtypes based on reactivity responses may be distinguished that could have clinical relevance.

van Goozen et al. (1998) conducted another study in which they utilized a sample of 8- to 11-year-old boys who did or did not have ODD or CD. The purpose of this experiment was to study salivary cortisol reactivity in response to the 75-minute application of stress using the same paradigm as the previously described study by van Goozen et al. (2000). van Goozen et al. (1998) found that the ODD group had a slightly stronger increase in cortisol in response to the stressor in comparison to the control group. Interestingly, these researchers also divided their participants into four groups classified by high or low externalizing behaviors and high or low anxiousness based on teacher ratings. These analyses revealed that the highest cortisol reactivity in response to the stressor was found in the high anxious and high externalizing group, while the low anxious high externalizing group actually had a decrease in their cortisol in response to the stressor. These results suggest that anxiety may actually act as a useful specifier for ASB, suggesting that important subtypes of individuals with CD or who engage in ASB may be identified based on their trait levels of anxiety and potentially their biological reactivity to stress.

The suggestion that cortisol reactivity may be a useful method of distinguishing important differences within individuals who commit ASB is supported by researchers’ suggestion that hyporeactivity of the stress system may be a condition unique to individuals who engage in only the most severe forms of aggression (van Goozen et al., 2007). In comparison, heightened levels of reactivity in response to a stressor have been suggested to predispose individuals to engage in aggression as a result of provocation (i.e., reactive aggression; van Goozen et al., 2007). The potential for cortisol reactivity, then, to be an important and dynamic factor for ASB must be investigated to elucidate the relationship between this biological risk factor and ASB. Similar to typologies that have been suggested for trait levels of anxiety, subtypes defined by an individual’s biological response to stress
may be related to patterns of ASB and differential risk factors. In order to pursue this avenue, we must look at how cortisol reactivity influences the exhibition of ASB in various forms and in concert with other factors that may dictate the nature of that relationship.

3.1.5 Cortisol Reactivity and Subtypes of Antisocial Behavior

In contrast to overall levels of ASB, additional inconsistencies have been demonstrated when looking at its subtypes (physical aggression, relational aggression, and non-violent rule-breaking), but the literature is sparse. In one study, Susman et al. (2010) examined overall ASB, physical aggression and non-violent rule-breaking behavior in their relation with stress-induced salivary cortisol reactivity, gender and puberty in girls aged 8, 10 and 12 years and boys aged 9, 11 and 13 years from the community using a social stress test involving the completion of a story and a math task in front of confederate judges. In this case they assessed girls between day five and nine of their menstrual cycle. They found that puberty interacted with cortisol reactivity to predict ASB overall and non-violent rule-breaking in particular in boys. In contrast, they found no relationship between cortisol reactivity and physical aggression or a measure of CD symptoms.

The results of this study support the notion that differences do exist between subtypes of ASB in their relation to cortisol reactivity. Despite this, the research available to further defend this position is lacking, and to date this comparison has not been examined in relational aggression. This dearth of studies is clearly a limitation of the present literature given the significant differences found in how physical aggression, relational aggression, and non-violent rule-breaking behavior distinctly relate to a number of different factors (e.g., Burt & Donnellan, 2008; Burt et al., 2012; Marsee et al., 2005; Moffitt, 1993). As such, research must be conducted in order to investigate how cortisol reactivity may differentially relate to these subtypes of ASB.

Given the complex relationship that has been demonstrated between overall ASB and cortisol reactivity, we can expect that the association between the subtypes of ASB and cortisol reactivity is similarly complex. As such, additional factors must be considered when studying this association in order to determine the exact nature of this relationship. Again,
CU traits may be an ideal candidate for this role, as the specific relationship between CU traits and cortisol reactivity has proven to be equally elusive.

3.1.6 Cortisol Reactivity and CU Traits

Physiological factors have proven to be highly relevant to CU traits and can distinguish individuals with high levels of psychopathic traits versus controls. For example, Blair (1999) found that individuals with psychopathic personality traits have heightened baseline levels of skin conductance in comparison to controls, and have a diminished skin conductance response to distress cues in comparison to controls.

Similar to ASB, research has been conducted to examine the relationship between CU traits and cortisol reactivity levels (Loney et al., 2006; O’Leary et al., 2007; Stadler et al., 2010). Stadler et al. (2010) examined the relationship between CU traits and salivary cortisol reactivity, but they used a sample of clinically referred males between the ages of 8 and 14 years who all had an ADHD diagnosis. They demonstrated that boys with high levels of CU traits had a blunted cortisol response to a lab social stressor involving a speech and math task 35 minutes after the stressor in comparison to those with low levels of CU traits.

Similarly, in their study, O’Leary et al. (2007) measured salivary cortisol reactivity in response to a lab social stressor involving public speaking and math tasks in adults, ensuring that female participants came in during the luteal phase of their menstrual cycle and were not taking birth control. Though they found no difference in baseline cortisol levels, males with low levels of CU traits showed a significant increase in cortisol levels in response to induced stress, whereas males with high levels of CU traits did not show this stress response. In comparison, they found no relationship between CU trait level and stress induced cortisol reactivity in females; in fact, females exhibited no significant increases in cortisol in response to the stressor.

A lack of findings in females has occurred in past research in which women have demonstrated a blunted cortisol response to a stress task (Childs, Dlugos, & De Wit, 2010). For example, Childs et al. (2010) examined cortisol reactivity using both salivary and plasma collection methods in adult males and females, excluding females who used oral
contraceptives or had irregular menstrual cycles. They demonstrated that only men demonstrated a significant increase in salivary cortisol levels in response to the social stressor involving a speech task and a math task, and that women in either the follicular or the luteal phases of the menstrual cycle did not. In their study, Walter et al. (2008) actually found a decrease in salivary cortisol levels across the study in their control female sample which included a specific stressor in the form of a conflict discussion with their mother. This study used young adults with a mean age of 19 years and the investigators did not control for menstrual cycle or the use of birth control pills in their female participants.

One study, however, found a significant relationship between stress response in salivary cortisol levels and psychopathic traits in both genders. O’Leary et al. (2010) studied the differences in stress reactivity in undergraduate psychology students in response to two types of stressors, a social stress test and a social rejection task. In their study, they included both genders but included females only if they were not taking oral contraceptives and were in the luteal phase of their menstrual cycle, which they confirmed using salivary progesterone levels. They found that both male and female students who exhibited high levels of psychopathic personality traits exhibited a blunted salivary cortisol level in response to the social stress test, which involved speech and math tasks, in comparison to controls, but only when looking at the cortisol levels measured at 20 minutes following the removal of the stressor. A different pattern of results was found for the social rejection stressor, where participants were not chosen by the confederates to finish a task and would have to work alone. In this case, only males with high psychopathic traits demonstrated a blunted cortisol response seen when measured immediately following the stressor and 20 minutes later; female participants had no significant increase in cortisol in response to the social rejection stressor.

Another study conducted by Glenn et al. (2011), however, found no relationship between psychopathy and salivary cortisol reactivity in adults. In this study, both genders were used and the authors did not control for menstrual cycle status in females. Importantly, this study only controlled for sex in their analyses and did not conduct any analyses for the two genders separately. Further, the stressors used involved an uncontrollable stressor involving the presentation of loud white noise followed by a short speech task focusing on
the worst thing the participant had ever done. Given the disparate results found in previous studies by examining the sexes individually, a different pattern of findings may have been identified in this study had the analyses been conducted in each gender independently.

Despite the overall finding of this collection of results that psychopathy and CU traits are related to blunted cortisol reactivity, researchers have suggested that the true relationship is likely not as simple as it may first appear, i.e. high levels of CU traits does not necessarily equal low levels of cortisol (Shirtcliff, Vitacco, et al., 2009). The limited amount of research that has studied the relationship between cortisol reactivity and CU traits does not allow us to determine whether the same subtypes of individuals with CU traits as suggested for high and low levels of trait anxiety can be identified using cortisol reactivity. That being said, a potential relationship between anxiety and cortisol reactivity has been identified when studying ASB (van Goozen et al., 2000; van Goozen et al., 1998), and suggests that we may expect the same CU-trait moderation of the relationship between cortisol reactivity and ASB as is expected for trait anxiety and ASB.

There is also evidence that cortisol reactivity may be able to identify subtypes within individuals who commit ASB. Particularly, individuals who do demonstrate an increase in cortisol in response to a stressor and have a behavioral disorder have been shown to have higher levels of anxiety and depression than those with a behavioral disorder who do not show this reactivity (van Goozen et al., 2000). Similarly, high levels of anxiety in combination with high levels of externalizing behaviors has been related to higher cortisol responses, whereas lower levels of anxiety in combination with higher levels of externalizing behaviors has been related to a blunted cortisol response (van Goozen et al., 1998). These findings suggest that there are important subgroups within those who commit ASB that can be identified based on their levels of anxiety and their cortisol response to stress, and that these two things are integrally related.

By extension of the anxiety literature, CU traits are a strong potential candidate in defining these important groups. Given that important subgroups in the ASB literature can be defined by a combination of anxiety and cortisol reactivity that appear to fluctuate together in individuals with conduct issues, it is likely that CU traits would interact similarly with both
to influence the expression of ASB. Based on the literature reviewed, we can expect that at higher levels of CU traits, a higher cortisol response will be protective against the commission of ASB. This expectation arises from the idea that individuals with heightened levels of CU traits and blunted cortisol reactivity are more likely to engage in ASB due to a resulting lack of fear of punishment, as well as the greater need for stimulation as exhibited by greater risk-taking and sensation-seeking behavior, both of which have been related to greater levels of ASB (van Goozen et al., 2007). Based on this, a typical or heightened cortisol response would be protective for these individuals against the commission of ASB. In comparison, as mentioned previously, individuals with lower levels of CU traits engage in more reactive aggression, which, similarly to anxiety, is associated with heightened cortisol responses (Frick, 2004b; Jones & Viding, 2007; Hawes et al., 2009; van Goozen et al., 2007). Because of this, greater cortisol reactivity is expected to be a risk factor for ASB in individuals with lower levels of CU traits.

Overall, then, CU traits and cortisol reactivity may be examined concurrently to bring consistency to the literature and explicate the influence of these two factors on the commission of ASB. Based on this supposition, the second goal of the present study was to determine whether CU traits and cortisol reactivity interact to predict ASB and its three subtypes, physical aggression, rule-breaking behavior, and relational aggression. As with trait anxiety, it is expected that the association between cortisol reactivity and ASB is distinct at different levels of CU traits, such that cortisol reactivity acts as a risk factor at lower levels of CU traits and as a resiliency factor at higher levels. As such, CU traits should represent a stronger positive predictor of ASB at lower levels of cortisol reactivity.

3.1.7 Current Study

In examining the literature relating trait anxiety and cortisol reactivity with ASB, the findings are inconsistent and require additional research into factors that will elucidate these associations. Evidence is growing that CU traits may be an ideal candidate, as they are a crucial set of characteristics when studying ASB and have been proposed to be included in the diagnosis of CD as a specifier (Frick & Moffitt, 2010). Considering CU traits when measuring the relationship between these constructs and ASB may therefore explain the complicated nature of these associations. This research will also shed light on how CU traits
may influence the relationship between ASB and other factors, providing support for incorporating CU traits into CD by demonstrating that different risk factors are associated with ASB depending on whether higher versus lower levels of CU traits are present. In this specific study, the goal is to demonstrate that the relationships between ASB and trait anxiety and between ASB and cortisol reactivity are different at varying levels of CU traits, thus accounting for the variable findings in the previous literature.

Past research has also been unable to further elucidate the relationship between physical aggression, relational aggression, and non-violent rule-breaking behavior and trait anxiety, and there is a paucity of research examining the relationship between cortisol reactivity and these subtypes. As yet, CU traits have not been included as a key factor when examining these associations. By addressing this missing link, it may be possible to define these relationships and utilize that information to address prognosis and treatment of ASB, and apply that knowledge to CD.

The aim of the present study was therefore to explain the inconsistencies in the relationships between ASB, its subtypes, trait anxiety and cortisol reactivity levels by examining them at varying levels of CU traits. In particular, a questionnaire measure of trait anxiety and cortisol reactivity in response to a laboratory social stressor were used to predict ASB in the presence of CU traits in order to examine how these factors interact with CU traits. It was hypothesized that at higher levels of both trait anxiety and cortisol reactivity, CU traits would not represent a strong risk factor in the prediction of ASB, and therefore higher levels of trait anxiety and cortisol reactivity would be protective for the expression of ASB in individuals with higher levels of CU traits. In contrast, at lower levels of the present factors it was expected that CU traits would represent a stronger risk factor in the prediction of ASB, and therefore lower levels of trait anxiety and cortisol reactivity would also represent strong risk factors for ASB for individuals with higher levels of CU traits. Given that past research has been regularly unsuccessful in finding a stress response in females, the present analyses for cortisol reactivity were conducted separately for boys and girls. It was therefore also expected that CU traits and cortisol reactivity would significantly interact to predict ASB specifically in males.
The previous research examining ASB subtypes in relation to these factors is limited. However, what studies have been conducted indicate that the same inconsistencies found between ASB and trait anxiety likely exist at the subtype level as well. In particular, CU traits are predicted to moderate the relationship between trait anxiety and relational aggression specifically in the same manner as for overall ASB, as research suggests trait anxiety may be more related to relational aggression than it is to physical aggression (Marsee et al., 2008). Further, given the close relationship between anxiety and cortisol, and the preliminary findings suggesting cortisol reactivity interacts with physical aggression and non-violent rule-breaking differently (Susman et al., 2010), it is likely that results will vary across subtype for cortisol reactivity as well. Specifically, the limited research available suggests that cortisol reactivity may be more related to non-violent behavior than violent (Susman et al., 2010). Therefore, it was hypothesized that the same moderation of CU traits for cortisol reactivity predicted for overall ASB would be seen for non-aggressive rule-breaking behavior specifically.

3.2 Methods

3.2.1 Participants

Participants for this study were a subsample of the individuals from the community sample in Chapter II. To recruit participants, a research assistant identified children between the ages of 12 and 17 years at the time of the first study and added them to the current target sample (N = 184). If the child had turned 19 years old or older since the initial study they were deemed ineligible for the follow-up. Only one child was selected from each family that had participated to ensure that the details of the study were not known to the participant prior to their lab visit. Participants were also not included if they originally participated via the course assignment, as no contact information was collected for these individuals.

Participants included in the follow-up were contacted primarily via phone (email or mail was used if phone contact was unsuccessful or unavailable) and asked if they would like to participate in a follow-up study. The participants were brought into the lab no less than one year after that initial participation and were compensated with CAD$50 cash for the family and a CAD$25 gift voucher for the youth. Transportation expenses were also covered.
Additional families who were unable to visit the lab were recruited to participate by mail only. These participants were compensated with a CAD$15 gift voucher for each of the parent or child who completed questionnaires.

The present sample consisted of 105 youth and their caregivers who participated in the lab. An additional 38 youth and 40 caregivers from 40 different families participated by mail only. This resulted in an overall positive response rate of 79%. In total, the sample was nearly evenly split by gender (45% male, \( n = 65 \)). All youth were currently between the ages of 13 and 18 years (\( M = 16.10, SD = 1.29 \)). Of the variables used in the present study, participants in the lab and mail-only conditions significantly differed only on the measures of overall externalizing problems and physical aggression (see Table 4) with the lab participants having higher mean scores than the mail-only participants.

3.2.2 Measures

**Inventory of Callous and Unemotional Traits** (ICU; Frick, 2004a). The ICU is a 24-item measure which uses a scale from 0 to 3, ranging from “not at all true” to “definitely true”. The items are summed into one total score for CU traits. Both parents and youth completed the ICU about their child or themselves, respectively. In the present study, the internal consistencies for the ICU as measured by Cronbach’s \( \alpha \) were .89 for the parents and .84 for the youth.

**Child Behavior Checklist** (CBCL – 6-18; Achenbach & Rescorla, 2001). Parents completed the CBCL, which includes 118 items rated on a scale of 0 to 2, ranging from “not true (as far as you know)” to “very true or often true” regarding problems that may have been present over the past six months. Items were summed to provide scores for Internalizing Behaviors, Externalizing Behaviors, and a Total Problems Score. The current study utilized two scales that measure Physical Aggression and Rule-Breaking Behavior which, together, make up the Externalizing Behaviors dimension. Norms for referred versus non-referred boys in the present age range for these scales include raw score means of 14.3 (\( SD = 8.5 \)) versus 4.9 (\( SD = 4.9 \)) for Physical Aggression, 8.6 (\( SD = 5.6 \)) versus 2.9 (\( SD = 3.0 \)) for Rule-Breaking, and 22.9 (\( SD = 13.0 \)) versus 7.8 (\( SD = 7.3 \)) for Externalizing Behaviors, respectively. Norms for referred versus non-referred girls in the present age range for these
scales include raw score means of 12.8 (SD = 8.6) versus 4.5 (SD = 4.7) for Physical Aggression, 8.0 (SD = 5.8) versus 2.5 (SD = 2.7) for Rule-Breaking, and 20.8 (SD = 13.3) versus 7.0 (SD = 6.8) for Externalizing Behaviors, respectively. In the present study the internal consistencies for parents were calculated for Externalizing Behaviors (α = .90), Physical Aggression (α = .88) and Rule-Breaking Behavior (α = .79).

The Youth Self Report (YSR – 11-18; Achenbach & Rescorla, 2001) was also used as it is the self-report version of the CBCL (6-18) and provides the same scores. Norms for referred versus non-referred boys for these scales include raw score means of 10.7 (SD = 6.3) versus 5.9 (SD = 4.1) for Physical Aggression, 7.0 (SD = 4.4) versus 3.7 (SD = 3.2) for Rule-Breaking, and 17.7 (SD = 9.7) versus 9.7 (SD = 6.6) for Externalizing Behaviors, respectively. Norms for referred versus non-referred girls for these scales include raw score means of 10.2 (SD = 6.4) versus 6.5 (SD = 4.7) for Physical Aggression, 6.3 (SD = 5.0) versus 3.5 (SD = 3.3) for Rule-Breaking, and 16.5 (SD = 10.3) versus 9.9 (SD = 7.3) for Externalizing Behaviors, respectively. In the present study, the internal consistencies for youth were calculated for Externalizing Behaviors (α = .90), Physical Aggression (α = .84) and Rule-Breaking Behavior (α = .85).

Children’s Social Behavior Scale (CSBS; Crick, 1996). The CSBS is a 13-item measure, completed by both parents and youth. It uses a scale from 1 to 5, ranging from “never true” to “almost always true”. Only the Relational Aggression subscale, made up of five items, was used in the present study. In the present study, the internal consistency for RAgg was .73 for parents and .70 for youth.

Dimensional Personality Symptom Item Pool (DIPSI; De Clercq, De Fruyt, Van Leeuwen, & Mervielde, 2006). The DIPSI is a measure of maladaptive personality traits. This questionnaire was completed about the child by both the parent and youth. This scale includes 172 items scored on a scale of 1 to 5, ranging from “not characteristic” to “highly characteristic”. Subscale scores can be calculated for multiple traits, including Impulsivity, Risk Taking, Lack of Empathy, Anxious Traits, and Extreme Achievement Striving and four higher order factors identified as Disagreeableness, Emotional Instability, Compulsivity and Introversion. Only the Anxious Traits subscale was used in the present study as a measure of
trait anxiety representing a general pattern of worry, excessive fear and the tendency to panic. This subscale is made up of seven items, and includes statements such as “panics very easily” and “worries all the time”. The internal consistency for this subscale was .91 for parents and .86 for youth.

**Pubertal Development Scale** (PDS; Petersen, Crockett, Richards, & Boxer, 1988). The PDS is an eight-item self-report scale that assesses the stage of pubertal development. A separate questionnaire is used for boys and girls with items referring specifically to developmental markers for each gender (e.g., facial hair growth and voice change versus breast development and menstruation). The stage of puberty was used in the present study to control for developmental differences in hormone levels and was calculated separately for males and females based on a previously developed scoring system (Shirtcliff, Dahl, & Pollak, 2009). The internal consistency for this measure was .71 for males and .68 for females.

**State Questionnaire** (Schimmack & Grob, 2000). The State Questionnaire is an 18-item measure, completed by the youth before and after the social stress test. This scale measures the current mood state of the youth. Each item is scored on a scale of 1 to 4, ranging from “DO NOT FEEL it” to “I feel it STRONGLY”. Scale scores are calculated for feelings of pleasure, tension and wakefulness at both time points. The internal consistencies for these scales were $\alpha = .82$ for pleasure, $\alpha = .65$ for tension, and $\alpha = .85$ for awake at time one, and $\alpha = .87$ for pleasure, $\alpha = .80$ for tension, and $\alpha = .77$ for awake at time two. This measure was used in the present study to measure change in the participants’ mood as a result of the stressor.

### 3.2.3 Procedure

The youth participants were mailed a set of questionnaires to complete at home that they brought to the lab during their visit. This set included the YSR, ICU, CSBS and DIPSI. Prior to the lab visit, the child was requested to not floss the morning of the session, to drink two 8-oz. glasses of water upon waking the morning of the session, to not eat any dairy products prior to their session, to not eat or drink anything for 2 hours prior to the session, and to not smoke cigarettes for 4 hours prior to the session. In addition, lab visits were
scheduled such that all saliva samples were collected between noon and sunset to account for daily fluctuations in cortisol levels. These steps were taken in an effort to ensure the consistency of the hormonal measures. To increase the sensitivity of the hormonal analyses, female participants were targeted to be scheduled during the follicular phase of their menstrual cycle (Childs et al., 2010).

During the lab visit, a brief interview was conducted with the parent by a research assistant. This interview consisted of obtaining informed consent from the parent and asking a series of standardized questions to control for external sources of variability in salivary hormonal levels, including the last time their child ate or drank, if they had brushed or flossed their teeth, and what they had eaten that day. Additional inquiries included but were not limited to questions regarding wake and sleep cycle and menstrual status of their child. Following this brief interview, the parent completed a set of questionnaires about their child including a brief demographics questionnaire, the CBCL, ICU, CSBS and DIPSI.

The lab visit for the child began with obtaining informed consent. After being taken to rinse their mouth and consume approximately 4 oz. of water, the main research assistant (the tester) working with the child asked the child the same series of standardized control questions that were asked of the parent. The child then proceeded to complete questionnaires. The first saliva sample (approximately 2 mL) was collected 30 minutes after the family entered the lab to allow time for the child to habituate to the surroundings and therefore for the baseline saliva sample to be standardized.

Immediately following the first saliva sample collection the participant underwent the Trier Social Stress Test (TSST; Kirschbaum, Pirke, & Hellhammer, 1993). To administer this task, the tester brought the participant to a second room where two research assistants (the judges) were waiting. The judges were introduced to the participant as experts in communication who were trained to evaluate effective speech. The participant was told that they were to give a 4-minute speech as though they were interviewing for their dream job. For this speech, they were asked to describe why they wanted to have that job and to describe their strengths and weaknesses. This task was video recorded where consent was provided. Following the speech task, the participant was required to complete an unanticipated 5-
minute serial subtraction task. During the completion of this task, the difficulty level was 
adjusted based on the participant’s skill as necessary following standardized thresholds. A 
manipulation check was conducted using mood ratings on the State Questionnaire. Overall, 
participants reported a decrease in pleasure \([F(1,101) = 120.57, p < .001]\) and an increase in 
both tension \([F(1,103) = 202.70, p < .001]\) and wakefulness \([F(1,99) = 32.93, p < .001]\) 
following the TSST.

The second saliva sample (approximately 1 mL) was taken 20 minutes from the 
beginning of the participant’s speech. This sample represented the individual’s reaction to the 
stressor as it takes approximately 20 minutes for the cortisol that is released as a result of the 
stressor to be secreted into the saliva (Dickerson & Kemeny, 2004). The third saliva sample 
(approximately 1 mL) was collected 15 minutes following the completion of the second 
saliva sample as a recovery measure. The remaining portion of the lab visit involved the 
administration of a collection of questionnaires and tasks. Though some of the tasks included 
neuropsychological tests, these tasks were scheduled to occur such that they would not 
interfere with the cortisol levels in the saliva samples of interest for the present study.

All three saliva samples were collected via the participant drooling through a straw 
into a 2 mL cryovial. Samples were stored in a lab freezer until they were shipped to an 
independent lab in Germany for analysis. All samples were analyzed for levels of cortisol. 
All intra- and interassay coefficients of variation were below 8%. Stress reactivity scores for 
cortisol were used in the present study and were calculated by subtracting the cortisol level 
for the first saliva sample from the cortisol level for the second saliva sample (Page-Gould, 
Mendoza-Denton, & Tropp, 2008). One female participant’s cortisol values were deemed to 
be an outlier as they were more than two standard deviations greater than the average value at 
each time point and were therefore voided. No other outlier was identified and therefore all 
other cortisol scores were retained. Of the remaining 59 female participants who participated 
in the lab, 43 were in the target phase of their menstrual cycle, one had not yet begun to 
menstruate, and 15 were not in the target phase. No statistical difference was found between 
these groups of individuals in their levels of cortisol across the experiment and therefore no 
additional values were removed.
Of the parent reports, 132 (91%) were completed by the mother and the remaining reports were completed by the father ($n = 12$) or stepfather ($n = 1$). Parents indicated ethnic status of the target child as 72% European/White, 6% Asian, 3% Black, 1% Latino, 1% Pacific Islander, 11% other, and 6% not specified. Ethical approval was obtained from the institutional review board for all aspects of the study. Missing data were estimated via the maximum-likelihood based EM algorithm in SPSS for all measures.

### 3.3 Results

Pearson correlations were calculated between each predictor (trait anxiety and cortisol reactivity), CU traits and the measures of ASB to demonstrate the simple patterns of relationship between these constructs in the present sample (see Table 5). Based on the parent completed measures, CU traits were positively related to trait anxiety, Externalizing Behaviors, Physical Aggression, Rule-Breaking Behavior, and Relational Aggression. CU traits were not significantly correlated with cortisol reactivity in either boys or girls. The same pattern of significance was found when examining the measures collected from the youth (see Table 5). Trait anxiety and cortisol reactivity were found to be significantly correlated for females based on the parent data ($r = .24$, $p = .03$) but not the youth data. These two constructs were also not correlated for males when using either the parent or youth data.

#### 3.3.1 Regressions Predicting Antisocial Behavior from Trait Anxiety and CU Traits

A multivariate regression was performed using the parent and youth data to account for the increase in Type I error including Externalizing Behaviors, Physical Aggression, Rule-Breaking Behavior, and Relational Aggression as dependent variables. Age and sex were entered as covariates with age being centered to the mean and sex being effect coded (-1 = male, 1 = female). The ICU total and trait anxiety scores were also included centered to the mean. Finally interaction terms were included between the ICU total score and trait anxiety. CU traits significantly interacted with trait anxiety in the prediction of ASB overall in the parent, Pillai’s $\lambda = .15$, $p < .001$, but not the youth data, Pillai’s $\lambda = .02$, $p = .55$.

Hierarchical linear regressions were next used to examine CU traits as a potential moderator of Externalizing Behaviors predicted from trait anxiety using the parent data.
Again, sex and age were entered as covariates along with trait anxiety and the ICU total score to account for main effects, and an interaction term was calculated for CU traits with trait anxiety (see Table 6). CU traits significantly interacted with trait anxiety to predict overall externalizing problems when using the parent data. Using a corrected alpha of .0125 based on the a priori intention to probe each interaction, simple effects testing revealed that CU traits were a significant predictor of overall externalizing problems at higher ($t(139) = 8.54, p < .001$) and lower ($t(139) = 3.70, p < .001$) levels of trait anxiety, with CU traits becoming a more powerful positive predictor of overall externalizing problems at higher levels of trait anxiety (see Figure 5). Further, trait anxiety was a significant positive predictor of overall externalizing problems at higher levels of CU traits ($t(139) = 4.88, p < .001$) but not at lower levels ($t(139) = -0.04, p = .97$). This result was not replicated using the youth data (see Table 7).

Parallel analyses were conducted to examine CU traits as a potential moderator for ASB behavioral subtypes using the parent data. In these analyses, the alternate ASB subtype scores (Physical Aggression, Rule-Breaking Behavior or Relational Aggression) were additionally entered as covariates. A significant interaction was found in predicting Physical Aggression, but not Rule-Breaking Behavior or Relational Aggression (see Table 6). Simple effects testing revealed that CU traits were a significant predictor of Physical Aggression at higher levels of trait anxiety ($t(137) = 4.38, p < .001$), but were not a significant predictor at lower levels ($t(137) = -1.23, p = .22$), such that CU traits were a stronger positive predictor of Physical Aggression at higher levels of trait anxiety (see Figure 6). Further, trait anxiety was a significant positive predictor of Physical Aggression at higher levels of CU traits ($t(137) = 7.81, p < .001$) but not at lower levels ($t(137) = 0.70, p = .48$). No significant interactions were found using the youth data (see Table 7).
3.3.2 Regressions Predicting Antisocial Behavior from Cortisol Reactivity Levels and CU Traits

A multivariate regression was performed within each sex separately\(^3\) using both the parent and youth data to account for the increase in Type I error including Externalizing Behaviors, Physical Aggression, Rule-Breaking Behavior, and Relational Aggression as dependent variables. Age and pubertal development were entered as covariates centered to the mean separately for each sex. The ICU total score and cortisol reactivity were also included centered to the mean separately for each sex. Finally interaction terms were included between the ICU total score and cortisol reactivity. CU traits significantly interacted with cortisol reactivity in the prediction of overall ASB in the youth for females, Pillai's $\lambda = .11, p = .03$, but not for males, Pillai's $\lambda = .01, p = .91$. CU traits did not significantly interact with cortisol reactivity in the prediction of ASB overall for males, Pillai's $\lambda = .01, p = .83$, or females, Pillai's $\lambda = .06, p = .20$, in the parent data.

Hierarchical linear regressions were next used to examine CU traits as a potential moderator of Externalizing Behaviors predicted from cortisol reactivity using the parent data for males and females individually. Again, age and pubertal development were entered as covariates along with cortisol reactivity and the ICU total score to account for main effects. An interaction term was calculated for CU traits with cortisol reactivity for both genders. The interaction between CU traits, cortisol reactivity and Externalizing Behaviors was not significant for males (see Table 8) but was for females (see Table 9). Using a corrected alpha of .0125 based on the a priori intention to probe each interaction, simple effects testing confirmed that CU traits were not a significant predictor of externalizing problems at higher levels of cortisol reactivity ($t(74) = 2.41, p = .02$) but were at lower levels ($t(74) = 6.87, p < .001$), such that CU traits became a stronger positive predictor of overall externalizing problems at lower levels of cortisol reactivity in females (see Figure 7). Further, cortisol reactivity

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\(^3\)To test the veracity of the assumption of differences between sexes the three-way interaction between sex, CU traits and cortisol reactivity was tested in both the parent and youth data. Sex was not found to moderate the interaction between CU traits and cortisol reactivity in the prediction of ASB overall when using the parent, Pillai's $\lambda = .01, p = .70$, or the youth data, Pillai's $\lambda = .04, p = .12$. At the univariate level sex moderated the interaction between CU traits and cortisol reactivity in the prediction of Externalizing Behaviors, $t(133) = 2.44, p = .02$, in the youth data.
reactivity was a significant predictor of externalizing problems at higher levels of CU traits ($t(74) = -3.64, p < .001$) but not at lower levels ($t(74) = -0.14, p = .89$). Similar to the parent data, the interaction between CU traits, cortisol reactivity and Externalizing Behaviors was not significant for males (see Table 10) but was for females (see Table 11) when using the youth data. Simple effects testing revealed that CU traits were a significant predictor of externalizing problems at higher levels of cortisol reactivity ($t(73) = 4.73, p < .001$), but were not a significant predictor at lower levels ($t(73) = 0.93, p = .35$), such that CU traits became a stronger positive predictor of overall externalizing problems at higher levels of cortisol reactivity in females (see Figure 7). Further, cortisol reactivity was not a significant predictor of externalizing problems at higher levels of CU traits ($t(73) = 1.33, p = .19$), but was a significant predictor at lower levels ($t(73) = -3.04, p = .003$).

Parallel analyses were again conducted to examine CU traits as a potential moderator for ASB behavioral subtypes using the parent data for males and females individually. In these analyses, the alternate ASB subtype scores (Physical Aggression, Rule-Breaking Behavior or Relational Aggression) were additionally entered as covariates. No interaction between CU traits, cortisol reactivity, and the ASB subtypes was significant for males (see Table 8) or females (see Table 9). This result was the same when using the youth data (see Table 10 and Table 11).

3.4 Discussion

In past research, the relationships between trait anxiety, cortisol reactivity and ASB have been inconsistent. However, support has been increasing for the idea that an individual’s level of trait anxiety and an individual’s cortisol response to stress may not have a linear relationship with ASB, but that they may identify important groups within children who commit ASB. These groups, then, should be relevant to and identifiable in youth with CD as well. The question is what other factors may be involved in determining who falls into each group.

The proposal of Frick and Moffitt (2010) argues that CU traits identify important subsets of antisocial youth within the diagnosis of CD and should therefore be included as a specifier. There is evidence that trait anxiety and cortisol reactivity may also identify relevant
subgroups within individuals with high levels of CU traits. Based on this collection of research, it is suggested that by combining CU traits with trait anxiety and CU traits with cortisol reactivity, we can demonstrate that these factors work in concert in their association with ASB, and that by studying them jointly we can add specificity to our understanding and prediction of ASB. In doing so, we can also increase our understanding of CD and its prognosis and will provide support for Frick and Moffitt’s (2010) proposal to use CU traits in the upcoming edition of the *Diagnostic and Statistical Manual (DSM), DSM-5* (http://www.dsm5.org).

To achieve this goal, the present study was conducted to investigate whether trait anxiety and cortisol reactivity relate to ASB differently depending on the level of CU traits. The aim was also to determine whether this relationship differed for various subtypes of ASB. It was found that CU traits did alter the relationship between ASB and trait anxiety across gender. Further, results revealed that CU traits significantly interacted with cortisol reactivity in the prediction of ASB in females.

### 3.4.1 Trait Anxiety, CU Traits, and Antisocial Behavior

CU traits interacted with trait anxiety in predicting ASB overall, and in predicting externalizing problems and physical aggression in particular. In both cases, CU traits became a more powerful positive predictor of externalizing behaviors and physical aggression at higher versus lower levels of trait anxiety. The fact that the significant interaction was only found for the physical aggression subtype supports the supposition that anxiety and CU traits relate distinctly to different forms of ASB.

Individuals with CU traits are prone to engage in both violent and non-violent ASB (Kimonis, Frick, Skeem, et al., 2008; Marsee et al., 2005). Research has demonstrated that individuals high in CU traits who feel high levels of anxiety experience enhanced sensitivity to punishment cues in comparison to individuals high in CU traits but low in anxiety (O’Brien & Frick, 1996). Therefore, these individuals may be less likely to act on antisocial impulses. This concept was exemplified by O’Brien and Frick (1996) when they demonstrated that youth with psychopathic traits who also had high levels of anxiety would forgo immediate reward when cued for punishment. As a result, we would expect that
individuals with higher CU traits and higher levels of anxiety would be less likely to engage in ASB as they would be more sensitive to the indicators of potential punishment. This was not supported by the present findings however, as higher levels of trait anxiety in combination with higher levels of CU traits actually predicted the highest levels of both overall externalizing behaviors and physical aggression.

This discrepant result does not necessarily contradict the above theory. Instead, this theory simply may not apply for physical aggression. The consequences for engaging in physical violence may not be readily apparent and may not necessarily be negative. Indeed, research has shown that youth with higher levels of CU traits associate positive consequences (such as social dominance and reward) and not negative consequences (such as punishment) with violence (Pardini et al., 2003). Therefore, evidence that heightened levels of anxiety increase sensitivity for the expected negative consequences of a behavior may not be relevant to physical aggression, specifically, and therefore anxiety may not be a protective influence in this case. Instead, anxiety acts as a risk factor, which may be explained by the association anxiety has with emotional instability (Miller & Lynam, 2001) and reactive aggression (Miller & Lynam, 2006). An individual who is prone to this kind of emotional experience will likely respond poorly to confrontational situations with others, and their concurrent high levels of CU traits would predispose them to respond aggressively (Frick, Cornell, Bodin, et al., 2003).

As the negative consequences of non-violent rule-breaking behavior would be more definitive and tangible, we would expect that heightened levels of anxiety should inhibit an individual with higher levels of CU traits from committing this type of ASB. This, however, was not supported by the present results, as no significant interaction was found between trait anxiety and CU traits for non-violent rule-breaking behavior. This may be explained by the consideration of the type of ASB and the age of the present participants. The prevalence of ASB in youth changes at different times in development. Moffitt (1993) discussed two types of patterns of ASB commission, life-course persistent, and adolescence-limited. The adolescence-limited subtype is of particular relevance to the current discussion as Moffitt (1993) established that those who commit ASB as part of this subtype typically commit only non-violent ASB. As a result, our adolescent sample may be distinct in terms of how factors
relate to non-violent rule-breaking behavior, given that the majority of adolescents committing ASB engage in this subtype, regardless of whether they are life-course persistent or adolescence-limited (Moffitt, 1993). As such, any factor that would typically distinguish these groups of antisocial youth, such as CU traits (Frick & Moffitt, 2010) would not apply to this type of ASB at this time. This would then explain why the interaction between CU traits and anxiety is not significant in this particular age group for this type of ASB.

In addition to rule-breaking, no significant interaction between CU traits and trait anxiety was found for relational aggression. This result was unexpected as research has demonstrated that the relationship between overall anxiety symptoms and aggression may be stronger for relational aggression rather than physical aggression (Marsee et al., 2008). This finding used a measure of clinical anxiety symptoms, however, and therefore may relate to ASB and CU traits differently than trait anxiety. In some research, however, the association between relational aggression and anxiety was found only in female participants, suggesting that this association may be stronger in females than in males (Storch et al., 2004). The present findings may therefore be different had the analyses been conducted separately for each gender. This result was also demonstrated using social anxiety, and also may not extend to other types or measures of anxiety (Storch et al., 2004).

Overall, these findings support the proposal that CU traits moderate the relationship between trait anxiety and ASB. In doing so, they also provide support for the importance of CU traits in the examination of ASB. Demonstrating how CU traits and anxiety interact to predict ASB provides additional insight into how these two factors may influence the expression of ASB which may be used in the future to enhance the treatment of CD. However, the levels of ASB in the present sample were consistent with non-referred samples based on CBCL and YSR norms (Achenbach & Rescorla, 2001). As such the current results must be tested in clinical samples, particularly in children with CD, in order to be able to apply the present conclusions to this population.

The present findings also highlight the distinction between physical aggression, relational aggression and non-violent rule-breaking behavior that has also been demonstrated in the previous results of Chapter II and past research (Burt & Donnellan, 2008; Burt et al.,
By showing how CU traits and trait anxiety interact differently in the prediction of the various subtypes of ASB, we have provided detailed insight into the understanding of specific types of CD symptoms.

### 3.4.2 Cortisol Reactivity, CU Traits, and Antisocial Behavior

Consistent with the original predictions, CU traits and cortisol reactivity did significantly interact to predict ASB overall in the youth data and externalizing problems in both the parent and youth data. However, the results were not consistent between informants. Supporting the original hypothesis, based on the parent data CU traits became a more powerful positive predictor at lower levels of cortisol reactivity. This finding provides support for the theory that higher levels of cortisol reactivity act as a protective factor for individuals with higher levels of CU traits.

The same pattern, however, was not found when using the youth data. Instead, CU traits became a stronger positive predictor of overall externalizing behaviors when cortisol reactivity was higher. Though this result contradicts the original hypothesis, it is consistent with the results regarding the interaction of trait anxiety and CU traits in the prediction of externalizing problems. In this case, the results may be explained similarly. Specifically, individuals with higher levels of CU traits who experience increased levels of cortisol following a social stressor may be more likely to act out following a confrontational situation. This theory is supported by the fact that hyperreactivity of cortisol in response to stress is more related to reactive aggression (van Goozen et al., 2007). As this result was only found for overall levels of externalizing behaviors, it is not possible to determine whether this interaction is being driven by a particular subtype of ASB.

It is unknown as to why the results diverge between the parent and youth data, or which informant is the most accurate in their rating of the child’s behaviors and characteristics. As there is no objective rating source included in the present data for these measures, the reliability of these two informants cannot be verified. Some researchers argue that the adolescents’ self report becomes more reliable and relevant as the child gets older, as demonstrated by increases in test-retest reliability for youth with age and decreases in reliability for parents (Kamphaus & Frick, 1996). In regards to the present study, we may
believe that the youth report may be more reliable than the parent report for specific measures. Specifically, when looking at the means across measures between the parent and youth report, there is a high level of consistency, even in measures of trait anxiety and CU traits, but not for ASB as measured by the CBCL versus the YSR. In this case, the youth reported higher levels of ASB than their parents. This is not surprising, given that in adolescence it is unlikely that parents know the extent to which their child engages in ASB as they would be limited to information they either observe or that is reported to them. As a result, the youth report is likely to be more reliable for this particular type of behavior and therefore for the present study. We must also consider that the interaction between CU traits and cortisol reactivity in the parent data was not maintained when conducting the multivariate regression, and may therefore be an unreliable finding. That being said, overall both sets of data provided interesting findings that demonstrate both converging and contradicting results.

If the relationships found in the present study are reliable, interesting information may be revealed for our understanding of ASB and its relationship to cortisol reactivity and CU traits. The completely opposing interactions found between CU traits and cortisol reactivity may be representing the difference in how these constructs relate to varying types of ASB. In particular, the combination of higher levels of CU traits and lower levels of cortisol reactivity, as seen in the parent data, may be driving youth to commit higher levels of ASB in an attempt to feel excitement and satisfy their sensation-seeking desires given their higher threshold for arousal (van Goozen et al., 2007) and their inclination for ASB (Frick et al., 2000; Frick & Moffitt, 2010; Frick & White, 2008; Jones & Viding, 2007). This likely applies to non-violent ASB behavior in particular, as cortisol reactivity has been suggested to be particularly associated with this form (Susman et al., 2010). Low cortisol reactivity may also be involved in the moment of committing ASB, as the stress of the situation and the resulting increase in cortisol would not act as an inhibiting factor for the behavior. These possible explanations become highly likely when we consider that cortisol reactivity was unrelated to ASB at lower levels of CU traits. This suggests, then, that an individual needs both the desire to commit ASB and either a lack of inhibitory response or a lower threshold for arousal to commit ASB.
In comparison, in the youth data, cortisol reactivity was unrelated to externalizing problems at higher levels of CU traits. However, at lower levels of CU traits, cortisol reactivity acted as a protective factor against committing ASB. Such a finding may be explained by individuals with lower levels of CU traits being more likely to shut down and internalize their negative emotions in the face of a stressful situation. Indeed, individuals with low levels of CU traits often feel distress at how their actions impact others, potentially deterring future acts of violence (Frick & Viding, 2009). In contrast, at higher levels of cortisol reactivity, those with higher levels of CU traits would be more likely to externalize their negative emotions based on their tendency to engage in ASB (Frick et al., 2000; Frick & Moffitt, 2010; Frick & White, 2008; Jones & Viding, 2007). This is supported by the positive association that has been identified between reactive physical aggression and cortisol reactivity (van Goozen et al., 2007). These disparate findings of the present data, then, may be tapping into nuances that exist between the subtypes of ASB and the situations in which they occur. Future research will need to be conducted to establish the reliability of the present results and determine the source of this variability to understand the true relationship that exists between these factors.

Though the present results are promising and provide new insight into the relationship between cortisol reactivity, CU traits, and ASB, significant interactions were found only in females. This was unexpected, as previous studies in adults have been unreliable in establishing an association between CU traits and cortisol reactivity, especially in females (Glenn et al., 2011; O’Leary et al., 2007). However, some studies have found a relationship between ASB and cortisol reactivity across genders (van Goozen et al., 2000). In interpreting these findings it is important to note that the present non-significant results do not mean that males did not demonstrate the stress response, but that their stress response did not interact with CU traits to predict ASB. This discrepancy between males and females may represent true differences between the sexes in terms of how their stress responses relate to CU traits and ASB. As research has suggested that CU traits may be more important in their relationship with ASB in girls than in boys (Essau et al., 2006; Marsee et al., 2005), the moderation effect of these traits on factors that are integrally related to sex may be dependent on whether you are studying males or females.
Another unexpected finding was that there were no significant interactions for cortisol reactivity and CU traits in the prediction of any subtype of ASB. This may be due to the ability of the current study parameters to detect significant findings for individual differences in physiological measures. Further, though the range was not restricted to non-clinical levels, the acquired range of scores that exist for the subtypes of ASB in the present sample due to the use of community participants may provide less variability thereby again limiting the ability to detect significant interactions. This is supported by the fact that the means of the CBCL and YSR reports of the present study are consistent with those of the norms for a non-referred sample (Achenbach & Rescorla, 2001). Therefore a larger sample size and the use of a clinical sample would benefit the examination of these associations and potentially allow for the identification of important relationships at this level.

3.4.3 Limitations

The findings of the present study must be considered in light of its limitations. First, the sample size may be too small to allow sufficient power in the detection of interactions in individual differences, particularly those involving hormonal levels. Small effect sizes were found in the present study at the multivariate level for the interactions between CU traits and cortisol reactivity that were insignificant. Power analyses suggest that a sample size between around 250 and almost 700 would be required to achieve adequate power for these analyses. This may explain why no significant results were found when examining the interaction between cortisol reactivity and CU traits in males or in the prediction of the subtypes of ASB.

The present study was also limited to using a community sample, thus restricting the range of ASB levels in the current sample, as indicated by the CBCL and YSR norms (Achenbach & Rescorla, 2001), though the mean levels of CU traits in the present study are consistent with past research looking at both community and clinical samples (e.g., Dandreaux & Frick, 2009; Essau et al., 1996; Fanti et al., 2009; Marsee & Frick, 2007; Viding et al., 2009). As a result, the present findings may not generalize to clinical populations of youth with CD. Additionally, norms are not available for the trait measure of anxiety used so the present means cannot be compared to clinical levels. The potential
implications of these results, however, are clear and future studies may highly benefit this group of troubled youth by replicating these findings in clinical samples.

The current sample was also restricted in terms of the ages targeted, as only adolescents were included. Research has shown that the relationship between anxiety and psychopathy changes across development, with psychopathy being less related to anxiety in older versus younger individuals (Kubak & Salekin, 2009). As such, these findings should not be generalized to apply to younger children or adults. Finally, as many measures were collected from both parents and youth, the possibility of shared method variance must be considered. The present results, however, are likely reliable as significant results were found in analyses combining questionnaire data with objective physiological measures.

A large portion of research studying the relationship between anxiety and conduct problems has examined the relationship between anxiety disorders and anxiety disorder symptoms with conduct disorder (e.g., O’Brien & Frick, 1996; McBurnett et al., 1991; Walker et al., 1991). The present study focused on trait anxiety defined by issues such as panicking easily and worrying often. Future research should be conducted to address whether the current results also apply to clinical levels of anxiety symptoms. Further, certain anxiety disorders have been demonstrated to have stronger relationships with CD and ASPD, such as agoraphobia, specific phobia and social phobia (Goodwin & Hamilton, 2003). Future work should therefore also distinguish between different anxiety disorders to see if they interact with CU traits differently in their role in the exhibition of ASB and CD.

An additional limitation of the present study regards the menstrual status of the female participants. In particular, despite females being targeted to be tested during the follicular phase of their cycle, 15 were not. Though preliminary analyses indicated that their cortisol scores were not different from those females who were in the correct phase, additional research should be conducted with a larger sample of females and the impact of menstrual status on the results should be examined. Developmentally, research should also be conducted to determine whether the onset of menses may have an impact on the presently studied relationships. In boys, research has suggested that timing for puberty onset significantly interacts with cortisol reactivity levels in determining their influence on ASB
presentation (Susman et al., 2010). Additional research is needed to determine if there are important pubertal characteristics that may influence how cortisol reactivity relates to ASB and CU traits in girls as well.

3.4.4 Implications

Despite these noted limitations, the present study significantly contributes to the understanding of the relationships between ASB, trait anxiety and cortisol reactivity. In particular, these findings have demonstrated that the relationships between these risk factors and ASB that have been studied in detail in the past are integrally dependent on the present level of CU traits. Given this evidence, it would be imprudent to further study ASB and in turn CD without including CU traits.

The current study lends additional support to Frick and Moffitt’s (2010) proposal to include CU traits as a specifier in the diagnosis of CD. By demonstrating that the influence of trait anxiety and cortisol reactivity may be dependent on the present level of CU traits, the current results provide preliminary evidence for using CU traits to identify potentially clinically relevant subgroups within the CD population. It also reveals ways in which the CU trait specifier may be able to enhance our understanding of the presentation and treatment of CD.

Based on the present findings, potential recommendations can be developed regarding intervention for individuals who engage in ASB. For example, for conduct-disordered youth who have high levels of CU traits, anxiety may be targeted and reduced in order to remove a risk factor for physical aggression that was shown to be integrally related to CU traits in youth. Comparatively, the present results suggest that targeting anxiety in conduct-disordered youth who display low levels of CU traits may not be an appropriate intervention. Based on the youth data, coping strategies may also be an attractive avenue for the development of targeted treatment plans for CD youth with high levels of CU traits who demonstrate heightened cortisol responses to stressful situations and engage in high levels of reactive aggression. By teaching them coping strategies to reduce the amount of stress they feel in a given situation, we may potentially reduce their risk for ASB. Additionally, because subtypes of ASB were examined in addition to overall levels, specific recommendations could be
made depending on the type of CD symptoms the child presents with, allowing for the development of highly tailored and individualized treatment plans. For example, if they largely commit violent and aggressive behaviors in addition to having higher levels of CU traits, targeting and reducing the child’s anxiety might be a good strategy. However, should the child be exhibiting primarily non-violent behaviors, this approach would likely be inappropriate.

Overall, the present results demonstrate that the nature of the relationship between anxiety and ASB depends both on the level of CU traits as well as the subtype of ASB being studied. These findings, though promising, are only preliminary. These suggested recommendations need to be supported by additional longitudinal studies that also utilize a conduct-disordered sample in order to demonstrate a causal relationship between the present factors and ASB as this is not possible based on the design of the current study. These results do, however, provide a starting step for the pursuit of multiples avenues of future research.

3.4.5 Future Directions

Future research should attempt to examine the moderation of CU traits for the relationship between trait anxiety and ASB across developmental periods, from childhood to adulthood, to identify whether developmental trends exist. Indeed, as mentioned, the findings of the present study may not hold across different age groups. In particular, the prevalent level of non-violent rule-breaking behavior that is characteristic of adolescents (Moffitt, 1993), suggests that the associations between the present factors and this type of ASB may differ outside of this age period. The same question may also be studied by examining the relationship of ASB with the current factors between those who commit life-course-persistent ASB and those who are adolescence-limited. This line of research would further assist the creation of targeted intervention strategies, as different treatment approaches may be required depending on the age of the individual as well as the type of ASB being exhibited.

Another target for future research would be to replicate the study in a larger sample of both genders. In doing so, additional interactions may be revealed by the current factors, providing additional insight into the presentation of CD and ASB. By including larger numbers of both males and females, future studies will be able to fully explore any gender
differences that might be influencing how CU traits moderate the relationships between trait anxiety, cortisol reactivity and ASB, and will be able to determine if the present pattern of findings is reliable.

Though interesting findings were obtained in the present study regarding cortisol reactivity and its relationship with CU traits and ASB, the conclusions that can be made are limited to the present study parameters. The stressor used in the current experiment was an unexpected public speaking task followed by a math task. In order to be able to fully understand the role that cortisol reactivity plays in the expression of ASB, additional research must be conducted to determine whether the same pattern of findings holds across different types of stressors, such as those used by van Goozen et al. (2000) and Fairchild et al. (2008). In those studies, the stressor used consisted of a setting of general competition involving provocation and the inducement of frustration and aggression in the participant in response to a videotaped confederate competitor (Fairchild et al., 2008; van Goozen et al., 2008). In this case, the social aspect of the current stressor used is not present, and this type of stressor may allow for greater understanding of the behavior of individuals with varying levels of CU traits in different interpersonal scenarios and importantly in one designed to elicit aggressive tendencies.

Research using the competition stressor has typically found that individuals with CD, ODD or high levels of externalizing behaviors as a group demonstrate blunted cortisol reactivity, but that important differences can be identified between responders and non-responders (Fairchild et al., 2008; van Goozen et al., 1998; van Goozen et al., 2000). In particular, those who have a combination of high levels of anxiety and externalizing behaviors or a behavioral disorder exhibit typical cortisol responses, but those without the additional high levels of anxiety exhibit the blunted response (van Goozen et al., 1998; van Goozen et al., 2000). The relationship between these factors, however, has not yet been studied in combination with varying levels of CU traits using this stressor. Given the relationship demonstrated here between anxiety and cortisol reactivity, it is likely that CU traits will moderate the relationship between cortisol reactivity and provoked aggression consistent with the current findings. In particular, it would be expected that heightened cortisol reactivity would be protective for individuals with lower levels of CU traits and a
risk factor for individuals with higher levels of CU traits, particularly because the task is
designed to elicit aggression specifically versus another type of ASB. Regardless of whether
future studies find that the same pattern of relationship between the present factors is
consistent or divergent across types of stressors, this information will be highly important for
the development of appropriate intervention strategies.

In order for the present results to be fully applicable to clinical populations and
intervention, the present associations must be examined in a clinical sample of conduct-
disordered youth and using a longitudinal design. By replicating these findings within the
target population using an approach that can establish directionality of the relationship,
reliable knowledge can be gained about how these factors influence the presentation of CD,
and recommendations can be made and implemented in their treatment. The use of a clinical
sample would also provide greater variance in ASB levels, and possibly cortisol and anxiety
levels, allowing for additional significant relationships to be identified should they exist but
be undetectable in the present sample.

Besides the sample characteristics, another important avenue for future research is the
incorporation of additional factors into the association between CU traits, ASB and cortisol
reactivity. Indeed, other variables have been shown to interact with cortisol in their
relationship with ASB (Glenn et al., 2011; Morgan et al., 2004; Susman et al., 2010). One
potential factor focuses on pubertal development. Past research has suggested that whether
the youth had an early or late pubertal onset is important for the relationship between ASB
and cortisol reactivity (Susman et al., 2010). In their study of boys and girls from the
community, Susman et al. (2010) found that early puberty in combination with a decreased
cortisol response predicted higher levels of non-violent rule-breaking behavior. In addition,
however, later puberty in combination with a heightened cortisol response also predicted
higher levels of rule-breaking behavior. Future research would greatly benefit from
investigating how CU traits may interact with pubertal development and cortisol levels
together to predict ASB.

Additionally, research suggests that it may not be cortisol reactivity alone that is
important for the presentation of ASB and CU traits, but the ratio between cortisol reactivity
and other hormones. Testosterone is one such hormone. Glenn et al. (2011) conducted a study examining the interaction between testosterone and cortisol reactivity in a predominantly male sample of adults with no controlling for menstrual cycle in females. Their results demonstrated that psychopathy was related not to cortisol reactivity, but to the ratio between baseline testosterone levels and cortisol reactivity. Importantly, this finding was mostly due to the relationship between this ratio and the antisocial lifestyle factor of psychopathy, suggesting that this ratio likely has important implications for ASB as well.

Dehydroepiandrosterone (DHEA) and its sulfate form (DHEA-S) are other popular candidates for the role they may play in the relationship between ASB and cortisol. For example, Pajer et al. (2006) conducted a study looking at both DHEA and cortisol levels in plasma in 15- to 17-year old girls who were tested within the first 72 hours of the onset of menstruation. They found that the ratio between cortisol to DHEA was significantly lower in girls with CD. Additionally, girls who exhibited primarily aggressive ASB had a lower cortisol/DHEA ratio in comparison to girls who had non-violent CD. Other research has suggested that the ratio between DHEA-S and cortisol is more important when studying stress responsivity than either hormone alone (Morgan et al., 2004). In their study, Morgan et al. (2004) examined baseline and post-interrogation saliva and plasma levels of cortisol and DHEA-S in 25 military personnel in active duty. Their results demonstrated that there were significant increases in plasma levels of both cortisol and DHEA-S and salivary levels of cortisol following the interrogation. However, in terms of predicted outcomes, they found that the participants who exhibited higher DHEA-S to cortisol ratios during the stressor had less reported symptoms of dissociation and better military performance. The results of this study suggest that this ratio may be important in determining whether the individual’s stress response is healthy or will lead to detrimental outcomes. Future research is required to tease apart these relationships by measuring multiple hormones in conjunction with CU traits and ASB in coed clinical as well as community samples. In doing so, our understanding of the etiology of ASB will be greatly enhanced and individualized, targeted treatment can be developed that incorporates both personality and biological factors.
Chapter 4
General Discussion

Callous-unemotional (CU) traits have been distinguished in the literature as an important set of characteristics that identify a particularly severe and aggressive subgroup of antisocial youth who are more likely to persist in committing antisocial behavior (ASB) into adulthood (Essau et al., 2006; Frick et al., 2000; Frick & Moffitt, 2010; Frick et al., 2005; Frick & White, 2008; Jones & Viding, 2007). Based on this, CU traits have been proposed to be included as a specifier for the diagnosis of Conduct Disorder (CD) in the upcoming edition of the Diagnostic and Statistical Manual (DSM), DSM-5 (Frick & Moffitt, 2010). In doing so, the diagnostic relevance of CU traits has been heightened and additional research is required to examine the intricacies of the relationship between CU traits and ASB. In response, the purpose of the current set of studies was to determine if the presence of high levels of CU traits modifies how commonly studied factors relate to ASB in youth.

4.1 Present Findings

4.1.1 Normal-Range Personality, CU Traits, and Antisocial Behavior

The first study was conducted to determine whether CU traits interact with normal-range personality in the prediction of ASB in children and adolescents, in both a community and a clinical sample. In particular, the Five Factor Model (FFM) of personality was combined with CU traits to predict overall ASB and its three subtypes – physical aggression, non-violent rule-breaking behavior, and relational aggression. The findings demonstrated that CU traits do interact with four of these five core personality traits, but how they combined to predict ASB was dependent on the sample and the type of ASB being measured.

In the community sample, CU traits significantly interacted with Neuroticism, Extraversion, and Agreeableness to predict ASB overall and externalizing problems, and with Openness to Experience to predict externalizing problems. Specifically, CU traits became a more powerful positive predictor of externalizing behavior at higher levels of Neuroticism and Extraversion. In comparison, CU traits became a more powerful positive predictor of externalizing behavior at lower levels of Agreeableness and Openness to
Experience. In this sample, at the subtype level, CU traits also significantly interacted with Neuroticism and Extraversion in the prediction of physical aggression, and with Extraversion and Agreeableness to predict rule-breaking behavior. Specifically, CU traits were a negative predictor of physical aggression at lower levels of Neuroticism, and a positive predictor at higher levels. Further, Extraversion was a stronger positive predictor of physical aggression at higher levels of CU traits. In comparison, CU traits became a more powerful positive predictor of non-violent rule-breaking behavior at higher levels of Extraversion and lower levels of Agreeableness. No interaction was significant, however, in the prediction of relational aggression in this study.

In the clinical sample, the only interpretable interaction found was between CU traits and Agreeableness in the prediction of overall externalizing problems. In this case, as in the community sample, CU traits became a more powerful positive predictor of externalizing behaviors at lower levels of Agreeableness. Together these results demonstrated how important CU traits are in predicting aggression and ASB from normal-range personality and how varying levels of CU traits alters what was previously considered a consistent association between these constructs.

4.1.2 Trait Anxiety, Cortisol Reactivity, CU Traits, and Antisocial Behavior

The purpose of the second study was to examine the impact CU traits have on the relationships between trait anxiety, cortisol reactivity and ASB. In this study, measures of trait anxiety and cortisol reactivity levels were collected in a follow-up community sample of adolescents. These variables were used as interacting factors with CU traits in predicting overall ASB and the same three subtypes as the previous study.

CU traits significantly interacted with trait anxiety to predict ASB overall, externalizing problems and physical aggression using the parent data. In both cases, CU traits became a more powerful positive predictor at higher levels of trait anxiety. CU traits also significantly interacted with cortisol reactivity to predict externalizing behaviors, but this was found in females only. This result was significant using both parent and youth data, but the pattern of interaction differed. CU traits became a more powerful positive predictor of
externalizing behavior at lower levels of cortisol reactivity in the parent data but at higher levels of cortisol reactivity in the youth data. Overall this study demonstrated that the relationships between trait anxiety, cortisol reactivity and ASB depend both on the individual’s level of CU traits as well as the subtype of ASB being studied.

4.2 Implications for Proposal to use CU Traits as a Specifier in Conduct Disorder

The primary purpose of the present set of studies was to examine the impact CU traits have on typically studied factors as they relate to ASB, and in doing so provide support for the inclusion of CU traits as a specifier in the diagnosis of CD (Frick & Moffitt, 2010). The current results from both studies have accomplished this goal and have provided insight into the important role CU traits play in the commission of ASB.

Together, these studies demonstrated that a given factor for ASB can be protective, detrimental, or insignificant depending on the child’s level of CU traits. For example, in terms of personality, lower levels of Agreeableness and Openness to Experience and higher levels of Neuroticism and Extraversion were stronger risk factors for overall ASB for individuals with higher levels of CU traits. Higher levels of trait anxiety were also a stronger risk factor for overall ASB for individuals with higher levels of CU traits. As a result, the level of CU traits present may be important diagnostically when attempting to determine the factors that are the most relevant in understanding the manifestation of a particular child’s conduct problems.

The evidence supporting the proposal to use CU traits as a specifier for the CD diagnosis is further strengthened by the consistency of the present findings across studies, samples, methods and informants. In the first study, an interaction between CU traits and Agreeableness was found in the prediction of externalizing behaviors in both the clinical and community samples when using parent reported measures of personality and CU traits in the community sample, as well as the novel “thin-slice” method using unacquainted ratings in the clinical sample. Importantly, these factors did interact in the same manner in both samples, with CU traits becoming a stronger positive predictor of externalizing behaviors at lower levels of Agreeableness, suggesting that a lower level of Agreeableness is a stronger
risk factor for those with higher levels of CU traits. Not only was this finding consistent across samples and methodologies, but it was consistent with the hypothesis of the study.

Besides being an illustration of the consistency of the present results across samples, the interaction between Agreeableness and CU traits is also a prime example of the importance of considering factors as they relate to ASB at varying levels of CU traits and therefore the necessity of considering CU traits when diagnosing and treating CD. The relationship between lower levels of Agreeableness and higher levels of ASB is one of the most consistent findings in the literature between the FFM and ASB or conduct problems (Gaughan et al., 2009; Gleason et al., 2004; John et al., 1994; Lynam et al., 2010; Miller & Lynam, 2001; Miller et al., 2008; Wilson et al., 2011). However, the present results demonstrate that the impact low levels of Agreeableness have on the expression of ASB is dependent on the present level of CU traits such that higher levels of Agreeableness are a risk factor for individuals with lower levels of CU traits. This result highlights the necessity of considering risk factor relationships in combination with CU traits if we are looking at either ASB or CD.

In addition to the present findings being replicated across samples, the results were also consistent across studies. An important facet of the FFM factor Neuroticism is anxiety (Lynam, 2010; Miller et al., 2001). Though the opposite was predicted, in the current studies, both Neuroticism and trait levels of anxiety interacted with CU traits such that both acted as stronger risk factors for overall externalizing problems and physical aggression for individuals with higher levels of CU traits. For those with lower levels of CU traits, these factors were not significant predictors of either overall externalizing problems or physical aggression.

Unlike Agreeableness, the relationship between anxiety and ASB or CD has been undefined in the literature (Cunningham & Ollendick, 2010; Garai et al., 2009; Loeber et al., 1994; McBurnett et al., 1991; Walker et al., 1991). By using the suggestion to include CU traits as a specifier in the diagnosis of CD as a launching platform, the present studies proposed that this relationship could be explicated by considering it in this context. Indeed, the findings of the present study supported this hypothesis by demonstrating that higher
levels of CU traits were a stronger risk factor for ASB at higher levels of trait anxiety and Neuroticism. Though the direction of the interaction was in opposition to the original hypothesis, these findings provide reliable evidence that CU traits are highly important when studying the relationship between anxiety and ASB and enlighten our understanding of this association.

The collection of results found in the present studies suggests that the present findings may be used to improve our understanding of ASB and CD, as well as to suggest potential targets for appropriate intervention strategies for antisocial children. It is important to note, however, that the majority of the present results have been identified in the prediction of overall externalizing behaviors, and that the results at the subtype level have been more inconsistent. From a methodological standpoint, this is somewhat to be expected, given that this measure subsumes the two subtypes of physical aggression and rule-breaking. As such, the measure of externalizing behaviors benefits from the added range and variability provided by the combination of these two scores, making it more likely for significant results to be identified. Aside from this, it also makes theoretical sense for CU traits to be more integrally involved with a measure that includes both violent and non-violent behavior, as higher levels of these traits have consistently been related to higher rates of both types of ASB (Christian et al., 1997; Kimonis, Frick, Skeem, et al., 2008; Marsee et al., 2005), while lower levels of CU traits are more associated with non-violent behavior and any aggression committed is often reactive in nature (Kotler & McMahon, 2005; Moffitt, 1993). Therefore, CU traits would understandably be more related to a measure that encompassed both types of ASB versus one. That being said, this does not negate the importance of studying ASB at the subtype level. Indeed, besides providing support for the inclusion of CU traits in the study of ASB and the diagnosis of CD in general, the present findings also demonstrate that in order to fully comprehend the relationship between any factor and ASB we must consider its behavioral subtypes as well.

4.3 Importance of Considering ASB Subtypes

The present findings show that by examining the associations between different factors with ASB at the subtype level we can reveal added levels of specificity to our understanding. Importantly, different risk and protective factors are at work depending on the
type of ASB being considered. Neither Neuroticism nor trait anxiety interacted with CU traits to predict relational aggression or non-violent rule-breaking behavior. However, both interacted with CU traits to predict physical aggression. Specifically, for physical aggression CU traits became a more powerful risk factor at higher levels of trait anxiety and Neuroticism.

Distinct interactions were also found between CU traits and personality in the prediction of non-violent rule-breaking behavior. Specifically, CU traits became a stronger positive predictor of non-violent rule-breaking behavior at higher levels of Extraversion and lower levels of Agreeableness. These results provide further differentiation between the subtypes of ASB, as Extraversion did not interact with CU traits to predict either physical aggression or relational aggression, suggesting that this particular moderation may be unique to non-violent ASB. This result was not, however, replicated in the clinical sample, requiring replication in future research.

Together these results indicate that in the diagnosis and treatment of CD, clinicians must consider not only whether the child has conduct problems and whether or not they have high levels of CU traits, but also what type of ASB the child primarily commits. By considering these factors all together, the practitioner would be able to know whether or not various factors would be more or less relevant to the child’s likely behavioral outcomes and proceed accordingly. Besides the subtypes of ASB, the present results also suggest that important differences may be revealed in subgroups of individuals with higher levels of CU traits.

4.4 Subtypes within High Levels of CU Traits

High levels of CU traits have been consistently related to poor ASB outcomes in past research (Frick et al., 2005; McMahon et al., 2010; Rowe et al., 2010). However, not all individuals with psychopathy and CU traits are alike, and variation within this unique subsample of antisocial individuals exists (Lee & Salekin, 2010). Anxiety is one feature that has been associated with two subtypes of psychopathy (Lee et al., 2010). Particularly, psychopaths with high levels of anxiety tend to be more impulsive in their behavior and more remorseful for their actions (Frick, 2004b). In comparison psychopaths with low levels of
anxiety have more severe ASB and care little about the consequences of their behavior (Kotler & McMahon, 2005). The present findings support this distinction, as significant interactions between trait anxiety and CU traits revealed varying patterns of predicted ASB between individuals with higher levels of CU traits but with differing levels of anxiety. In particular, individuals with higher levels of both CU traits and anxiety actually had higher predicted levels of overall externalizing problems and physical aggression than those with lower levels of anxiety.

Besides their antisocial presentation and characteristics, there is also variability within psychopaths and those with high CU traits in terms of prognosis and intervention (Lee & Salekin, 2010). Individuals with psychopathy and anxiety tend to be more responsive to treatment and have better outcomes (Lee et al., 2010). This may, however, be due to the fact that individuals with CU traits and anxiety do not demonstrate all of the same detrimental characteristics as individuals with CU traits and no anxiety do (O’Brien & Frick, 1996). Additionally, limited intervention programs have been developed for individuals with high levels of CU traits who do have typical psychopathic characteristics, such as a reward-dominant response style (Frick, 2004b; Frick, Cornell, Bodin, et al., 2003; Jones & Viding, 2007; O’Brien & Frick, 1996). Given this gap in appropriate treatment, the present results could be combined with past research to aid in the development of targeted intervention that will focus not only on the child’s CU traits and conduct problems directly, but also on additional factors that may be working in concert with CU traits in the exhibition of ASB.

The results of the present studies suggest that the use of CU traits as a specifier for the diagnosis of CD is an important addition to the current diagnostic process. All of the present studies have demonstrated that multiple factors that are commonly associated with ASB have different and occasionally opposing relationships with ASB depending on how they interact with CU traits. This information has the potential to be used to make recommendations for the development of targeted intervention based on these findings.

4.5 Implications for Intervention

If Frick and Moffitt’s (2010) proposal succeeds and CU traits are used as a specifier in the diagnosis of CD, this has important implications for the development and application
of treatment strategies. In fact, research has already indicated that these two groups of youth likely require different intervention strategies based on their inherent characteristics, such as the ability to learn from punishment (Frick, 2004b; Frick, 2009; Jones & Viding, 2007; Salekin et al., 2008). Further, individuals with higher levels of psychopathy or CU traits have poorer responses to treatment and discipline than individuals who also exhibit ASB but have lower levels of these traits (Frick & Dickens, 2006; Frick & White, 2008; Jones & Viding, 2007). Again, some suggest that this is primarily due to the fact that interventions have been tailored to individuals who commit ASB with low CU traits and that treatments designed to address the features associated with those who have high levels of CU traits are sorely absent (Frick, 2004b; Jones & Viding, 2007). Based on this gap, the current results can be used to provide preliminary insight into and recommendations for the development of targeted intervention for those with either higher or lower levels of CU traits.

An important interaction that was identified in the current results occurred between trait anxiety and CU traits. This finding can be particularly useful to inform constructive targets for reducing ASB. In this case, higher levels of trait anxiety were a stronger risk factor for the commission of both overall ASB and physical aggression particularly for individuals with higher levels of CU traits. Based on this, clinicians may be able to target the reduction of anxiety in youth with higher levels of CU traits in an attempt to reduce future conduct problems. Further, the present findings suggest that such a focus would be less suitable for children with lower levels of these traits, and therefore other target areas should be identified.

Cortisol reactivity also interacted with CU traits in the prediction of overall externalizing problems in girls which suggests that this biological factor may also present as a useful target for intervention. Unfortunately, the present findings were inconsistent in whether higher or lower levels of reactivity are a stronger risk factor in individuals with higher levels of CU traits. As a result, we can only preliminarily conclude that cortisol reactivity is an important risk factor for the commission of overall ASB in girls with higher levels of CU traits, and additional research must be conducted in order to determine the true nature of this relationship and therefore how this information can be used to reduce ASB.
Other factors that were collected in the present studies provide insight into risk factors for individuals with lower levels of CU traits. For example, in the community sample Agreeableness acted as a stronger risk factor for non-violent rule-breaking behavior in individuals with lower levels of CU traits, with higher levels predicting higher levels of rule-breaking. Similarly, in the clinical sample, Agreeableness acted as a stronger positive risk factor for overall externalizing behavior at lower levels of CU traits. We can hypothesize that this relationship may be particularly relevant for youth who are in the adolescence-limited subgroup identified by Moffitt (1993). In this case, higher levels of Agreeableness is likely associated with the child engaging in more attempts to fit in with antisocial peers in a misguided attempt to establish autonomy and independence in adolescence, resulting in the commission of primarily non-aggressive ASB (Moffitt, 1993). Based on this information and the findings of this study, recommendations could be made such that agreeable behavior in youth with lower levels of CU traits should be targeted and redirected towards prosocial behavior.

Knowledge of these kinds of interactions provides the clinician with a more detailed picture of the individual characteristics of the child and allows insight into predicting their behavior, and developing targeted intervention. Though the stability of some of these factors, such as personality traits, may make them a difficult focus for intervention and change, the accurate measurement and understanding of appropriate risk factors still allows the development of specific and individualized treatment that will enhance overall efficacy (Frick, 2004b; Miller & Lynam, 2001).

4.6 Future Directions

Though the present results are helpful in informing the creation of appropriate treatment, the current sampling of factors only skims the surface of all of the variables that could be at play for conduct-disordered youth. Future research is needed to address the impact CU traits have on other factors that relate to ASB that can also be incorporated into more efficacious interventions.
4.6.1 Gender Differences

Gender is an important factor that could play a critical role in how CU traits relate to psychopathology. Past research has demonstrated that the relationship between CU traits and ASB is stronger in girls than it is in boys (Essau et al., 2006). Therefore, before the present findings can be applied to a clinical setting, differences in how CU traits are involved in ASB in the two genders needs to be defined.

Relational aggression has been shown to be an important subtype of ASB for girls. In particular, relational aggression is expressed and relates to CU traits and psychopathy in girls as physical aggression does in boys (Crapanzano et al., 2010; Frick & Viding, 2009). Further, the addition of relational aggression in measuring ASB in children may explain the discrepancy in childhood-onset frequency differences between girls and boys (Frick & Dickens, 2006; Frick & Viding, 2009).

Because of the established gender differences, future research needs to be conducted regarding the incorporation of relational aggression into the measurement of ASB and therefore the diagnosis of CD (Frick & Dickens, 2006; Frick & Viding, 2009), as well as how CU traits impact factors that relate to ASB differently between the genders. This area of research is highly clinically relevant, as the interactions between CU traits and other factors that have been demonstrated in the present research may not hold for both genders, and additional relationships may be revealed when examining the genders separately. As a result, the application of these findings to the development of interventions requires the precise knowledge of how these factors affect the sexes individually so they can be appropriately implemented. Further, research into the relevance of relational aggression to our understanding of ASB and the diagnosis of CD is necessary, as the inclusion of this subtype of ASB may be used to identify groups of children, primarily girls, that commit high levels of ASB but use only relational aggression (Crapanzano et al., 2010; Marsee & Frick, 2007). This group, then, would benefit from clinical attention, but would currently be missed diagnostically (Crapanzano et al., 2010; Frick & Dickens, 2006; Frick & Viding, 2009; Marsee & Frick, 2007).
One conclusion that is becoming increasingly apparent is that CU traits may be especially important in understanding patterns of ASB in girls (Kroneman, Hipwell, Loeber, Koot, & Pardini, 2011). Indeed, researchers have suggested that these traits could be used to identify girls who are at a heightened level of risk for developing ASB but who have not yet exhibited significant conduct problems (Frick, Cornell, Barry, et al., 2003). For example, Marsee et al. (2005) compared genders in a community sample of adolescents aged 10 to 17 years. The results revealed that CU traits as reported by teachers were related to physical and relational aggression in girls only, and were unrelated in boys. They additionally found that when no conduct problems were present, CU traits were a stronger predictor of delinquency in girls than in boys. These findings highlight the potential for using CU traits as an identifiable risk factor for youth who have not yet developed conduct problems, especially in girls (Dolan, 2004; Kotler & McMahon, 2005). As CU traits have been shown to be reliably measured at a very early age (even as young as 3 or 4 years; Frick & Dickens, 2006), the use of CU traits as a pre-morbid risk factor may allow earlier intervention, improving the chances of success as individuals with these and psychopathic traits are more malleable and more likely to profit from treatment at younger ages (Dolan, 2004).

In addition to how gender impacts the expression of specific types of ASB, research is also lacking in defining how hormones play a role in the expression of ASB in girls (Garai et al., 2009; Susman et al., 2010). Past research that has demonstrated a relationship between CU traits and cortisol has produced significant results in male but not female samples (Burke et al., 2007). Some researchers have also suggested that the current literature has failed to properly examine the relationship between hypothalamic-pituitary axis functioning and troubled girls (Sondeijker et al., 2007). Though one goal of the present study was to examine the relationship between CU traits and relevant biological factors for ASB in a coed sample, the findings were unexpected as significant interactions between cortisol reactivity and CU traits were found only in females. As such, future research must attempt to examine these relationships both across and within the different genders in order to fully understand the nature of these associations. This is an area of much needed research, as biological risk factors are potentially life-long influences (Shirtcliff, Vitacco, et al., 2009) that are highly relevant to the expression of both ASB and CU traits (Hawes et al., 2009; O’Leary et al.,
4.6.2 Developmental Trends

In addition to studying the impact of CU traits between genders, it is also important to examine how CU traits impact ASB and its factors for different age groups. Besides CU traits, other factors have been shown to have differential relationships to ASB as a child ages. For example, depression is commonly associated with externalizing problems at younger ages, but anxiety becomes more commonly associated with externalizing at older ages (Loeber et al., 1994). Future research is needed to determine whether the interactions demonstrated in the present results hold for all age groups, or whether developmental trends exist. By doing so, the most appropriate intervention strategies can be developed and implemented for specific ages.

Both studies demonstrated significant interactions between CU traits and factors that research has suggested alter in either their presentation or relationship with CU traits over time. For example, anxiety has been shown to be more comorbid with psychopathy at younger ages, and the relationship between anxiety and psychopathy decreases with age (Kubak & Salekin, 2009). In the present research, trait anxiety was shown to significantly interact with CU traits in the prediction of overall ASB as well as physical aggression specifically, but this study only used an adolescent sample. Given the evidence that the relationship between anxiety and CU traits may change across development, additional research must be conducted with younger children and adults to determine whether the pattern of interaction seen currently is consistent at all ages.

The interaction between CU traits and Neuroticism in the prediction of ASB overall and externalizing behaviors and physical aggression in particular is another instance in which developmental trends likely exist. Specifically, Neuroticism has been suggested to be different in its presentation at different ages (John et al., 1994). In particular, John et al. (1994) suggest that in younger children Neuroticism is better represented by two separate factors representing anxious/distress versus irritability, and that these two factors evolve into a single trait as a child ages into adulthood. Given the differential relationship between
anxiety and CU traits across development previously mentioned, it is likely that the relationship between CU traits and Neuroticism also fluctuates with age. Additional research should examine this association in children of all age groups and adults.

### 4.6.3 Additional CU Trait Moderation

Although the present findings have revealed the impact CU traits can have on the relationships between different variables and ASB, additional research must be pursued to identify and incorporate other risk factors into the broader picture. One such factor that has distinguished between youth high in CU traits in past research is the individual’s ability to detect distress (Kimonis et al., 2007). Specifically, in one study researchers found that CU traits were unrelated to violence in youth who were able to detect distress in others (Kimonis et al., 2007). Research has also demonstrated that exposure to community violence is related to CU traits and a poorer ability to detect distress (Kimonis, Frick, Munoz, et al., 2008). In comparison, experiencing abuse is also related to higher levels of CU traits, but a better ability to detect distress (Kimonis, Frick, Munoz, et al., 2008).

These findings highlight the importance of studying multiple factors, both in the development of ASB and the presentation of CU traits. As such, future research should build upon the present results by combining additional factors in the prediction of ASB for individuals with high and low levels of CU traits. This is especially critical for the development of successful intervention, as treatments focusing on a single risk factor have proven ineffective (Frick, 2004b).

Along this line, future research should measure the influence of a combination of the present factors when examining the impact CU traits have on the presentation of ASB. Specifically, though promising results have already been identified by studying the interactions between personality, trait anxiety, and CU traits, additional information may be gleaned if these three factors were investigated together. In past research in undergraduate students, unique relationships between psychopathy and normal-range personality have been identified between primary and secondary psychopaths, which are largely distinguished by their levels of anxiety (Lee & Salekin, 2010). Particularly, in males, primary psychopaths demonstrated lower levels of Neuroticism and higher levels of Extraversion than secondary
psychopaths (Lee & Salekin, 2010). Future research should therefore be conducted to determine if and how normal-range personality, trait anxiety, and CU traits all interact together to influence ASB.

Another avenue for additional study would be to investigate how CU traits moderate the current factors in the prediction of other subtypes of ASB, such as reactive and proactive aggression. Past research has demonstrated that CU traits and psychopathy are more related to proactive than reactive aggression (e.g., Miller & Lynam, 2003). Indeed, personality has also been differentially related to these subtypes of aggression (Wilson et al., 2010). For example, in a study of coed undergraduates, reactive aggression was related to high levels of Neuroticism and low levels of Agreeableness, while proactive aggression was related to low levels of Agreeableness and Conscientiousness (Wilson et al., 2010). In comparison, in another study of coed undergraduate introductory psychology students, low levels of Neuroticism were related to reactive aggression and were unrelated to proactive (Miller & Lynam, 2006).

Reactive aggression has also been suggested to specifically relate to hyperreactivity of the cortisol response to stress (van Goozen et al., 2007) and anxiety (Miller & Lynam, 2006). Further, this is the typical type of aggression that is committed by individuals with conduct problems but lower levels of CU traits (Crpanzano et al., 2010; Fanti et al., 2009; Frick, Cornell, Barry, et al., 2003; Marsee & Frick, 2007). As significant and distinct interactions between the current factors and CU traits have been identified in the present results, additional research should be conducted examining these associations between reactive and proactive aggression. Such further specificity in the division of ASB into categories will allow us to better understand its expression and develop better and more focused intervention.

4.6.4 Beneficial Potential of CU Traits

Despite the influence of CU traits on factors that impact the expression of ASB, and the increase in risk the presence of higher levels of CU traits can cause (Frick, Cornell, Barry, et al., 2003; Kimonis et al., 2007; Marsee et al., 2005), CU traits may also have beneficial influences for children. For example, research has demonstrated that children with
CU traits are less often victimized by bullying (Fanti et al., 2009). Specifically, Fanti et al. (2009) studied the relationship between bullying and victimization patterns in adolescents of both genders from the community in Greece between the ages of 12 and 18 years. They found that higher levels of CU traits predicted lower amounts of victimization experienced by the individual (Fanti et al., 2009).

Additionally, CU traits have been shown to have an inverse relationship with some internalizing conditions such as depression (Pardini & Fite, 2010). In their longitudinal sample of boys with an average age of 11 years at intake, Pardini and Fite (2010) found that higher levels of CU traits were related to the participants having lower levels of anxiety and depression over the course of the study. Some researchers also suggest that CU traits may protect youth who grow up experiencing high amounts of stress or trauma from developing psychopathology in the future (Hawes et al., 2009). Similarly, at the biological level there may be genetic variants that are related to CU traits that may also be protective against extreme levels of anxiety (Frick & Viding, 2009).

Despite the potential for protective influences, some contradictory research has also related CU traits to the development of future psychopathology, including emotional issues (Moran et al., 2009). Moran et al. (2009) conducted a study examining CU traits and psychiatric issues in 5- to 16-year-old children in Britain from the community across 3 years. They found that CU traits were related to overall levels of psychopathology over time and were particularly related to conduct and emotional problems (Moran et al., 2009). Other research has also demonstrated positive or inconsistent associations between CU traits and anxiety (Hale et al., 2004; Kubak & Salekin, 2009; Lee et al., 2010).

Given the discrepancy in the literature regarding internalizing problems, and the extensive past and present research demonstrating that CU traits are a strong risk factor for externalizing problems, CU traits are likely protective only for specific types of issues. Future research should explore the potential for CU traits in preventing psychopathology, and how this may be relevant to developing interventions for youth with higher levels of these traits. This is especially relevant to a conduct-disordered sample, as childhood adversity is a known risk factor for ASB (van Goozen et al., 2007), and conduct problems have often been
associated with other forms of internalizing psychopathology including negative emotionality and depression (Pardini & Fite, 2010; Rowe et al., 2010).

4.6.5 CU Trait Stability

CU traits are also considered to be a particular risk factor for life-course persistent ASB (Jones & Viding, 2007). Given the significant risk relationship CU traits have with ASB, future research investigating the stability of CU traits over time is important. By determining what factors influence this stability, additional interventions can be designed to reduce CU trait levels over time, hopefully counteracting the negative impact these traits can have on behavioral outcomes. Previous research has determined that four trajectories across development exist for CU traits – stable high, stable low, increase from low to high and decrease from high to low (Fontaine et al., 2010). Of these four, the stable-low trajectory was the most common, with few children demonstrating stable high levels of CU traits (Fontaine et al., 2010). In addition, research has established that CU traits may not be as stable in children as they are in adults (Salekin & Frick, 2005). This fluctuating stability suggests that childhood is a prime target for intervention, further highlighting the significance of incorporating CU traits into the diagnostic and treatment process for troubled youth (Frick et al., 2005).

Other research has determined a variety of factors that have been related to decreases in CU traits over time. Higher socioeconomic status and higher quality parenting are reported to lead to a decrease in CU traits over time (Frick & Dickens, 2006; Frick & Viding, 2009; Frick & White, 2008). Some research has also suggested that high levels of parental warmth may prevent the development of CU traits in children who demonstrate low fearfulness (Kroneman et al., 2011). Finally, having a friend can be protective against committing ASB for psychopathic youth, especially if that friend is committed to school (Salekin et al., 2008). All of these factors can be used in conjunction with those from the present studies to inform both prevention and intervention for CU traits and ASB. Future research may also seek to establish whether these findings are consistent across youth with high levels of CU traits, such as between those with and without high levels of anxiety.
In contrast to these protective factors, having high levels of conduct problems predicts higher stability in CU traits over time (Frick, Kimonis, et al., 2003). Issues with communication between parent and child have also been associated with increases in CU traits across adolescence (Salekin et al., 2008). Future research needs to investigate and identify factors that increase, decrease and maintain high levels of CU traits across development in order to identify new intervention and prevention strategies that could reduce ASB and its negative consequences indirectly (Salekin, Rosenbaum, Lee, & Lester, 2009). This is relevant to the presently studied factors, as these constructs may not only interact with CU traits to predict ASB, but may also influence the stability of CU traits across development. Some preliminary research has been conducted that support this as a potential avenue for effective intervention. Hawes and Dadds (2007) examined the stability of CU traits in boys between the ages of 4 and 8 years with Oppositional Defiant Disorder (ODD) whose parents received training as a form of intervention for their child’s conduct problems. They found that posttreatment CU trait scores were predictive of antisocial scores at follow-up and those children with stable-high levels of CU traits demonstrated the most severe conduct problems at follow-up (Hawes & Dadds, 2007). In their study, McDonald, Dodson, Rosenfield, and Jouriles (2011) examined the impact of a parenting intervention for conduct problems on level of psychopathy in children between the ages of 4 and 9 years with either ODD or CD. They found that the level of psychopathic features decreased for children whose parents received the intervention versus the control group and this decrease was maintained at follow-up (McDonald et al., 2011). Based on these early findings, targeting the stability of CU traits as a method of intervention for ASB is an attractive avenue for future research.

4.6.6 Multiple Informants, Samples and Study Designs

Finally, in order to fully understand the relationships examined in the present research, future work must be conducted to replicate these findings using additional informants, samples and study designs. First, most of the data collected in the present studies were from community samples. However, the overarching goal of this research is to support the proposal of Frick and Moffitt (2010) to include CU traits in the diagnosis of CD, as well as to inform the understanding and treatment of CD. As such, the present relationships must be examined in clinical samples of children. In particular, research should be conducted
using conduct-disordered youth and controls who have been distinguished based on their level of CU traits as defined by the proposed specifier (Frick & Moffitt, 2010). Then, within these groups, the associations between the present findings and antisocial outcomes should be measured. By conducting this examination, the results of the present study could be replicated in a sample that has direct implications for clinical practice.

Additional replication must also be completed using a longitudinal design that examines the interaction of CU traits and normal-range personality, trait anxiety and cortisol reactivity in the prediction of future levels of ASB. Without conducting studies that examine the relationship between the present factors and ASB with established directionality, we cannot make causal conclusions about the impact CU traits and other factors have on the expression of ASB. Therefore, future research must address this by examining the predictive ability of these factors across multiple follow-up periods.

The present studies also relied heavily on parent report. Additional data collection methods were used, however, and the results across informants were largely consistent. In particular, the results collected in the first study between parent report in the community and the combination of parent report and unacquainted ratings in the clinical sample demonstrated high levels of agreement. In comparison the results found for the parent and youth report in the second study had varying levels of agreement and diversion. Additional research must be conducted to establish the reliability of the present findings across informants and attempt to determine the source of any discrepancies.

Of particular importance to the present studies is the comparison of unacquainted raters for CU traits with other informants, such as parent, teacher and self report. Indeed, the present results suggest that using unacquainted raters who scored an individual’s level of CU traits based on “thin-slices” of behavior is reliable, as they demonstrated satisfactory levels of inter-rater reliability, the same level of internal consistency, and a similar pattern of association with normal-range personality. Despite this, future research should investigate the consistency between CU traits scored by unacquainted individuals and other informants to fully establish the accuracy of these ratings.
In demonstrating the reliability of ratings for CU traits by unacquainted individuals, research can increase the applicability and utility of CU traits in a clinical setting. Specifically, if studies show that this type of informant is as reliable as parent report or potentially more so based on having a higher level of objectivity, we can use this information to develop parameters under which clinicians can reliably rate a patient’s level of CU traits for themselves. In doing so, the clinician would not be reliant upon the parent or child’s ratings, and will be able to independently determine if the child exhibits CU traits, and therefore can accurately decide whether the specifier proposed by Frick and Moffitt (2010) for CD is appropriate. To make this potential a reality, research must be conducted establishing the reliability of unacquainted individuals’ scoring of CU traits in both clinical and non-clinical settings and using a variety of instances of “thin-slices” of behavior to determine the ideal factors for providing the clinician with the most accurate ratings of CU traits.

4.7 Conclusion

Research has demonstrated that CU traits play a significant role in the exhibition of ASB (Frick & Moffitt, 2010). Combined, the present set of studies adds to the current literature by providing additional evidence of the importance of CU traits in the examination of ASB. Specifically, they have shown that not only are CU traits significantly related to ASB, but their presence determines how other relevant factors relate to ASB as well. Because of this, these traits cannot be overlooked in the diagnosis of CD, a childhood disorder centered on the commission of ASB.

In the first study, the results revealed that normal-range personality traits interact with CU traits to predict ASB. Even further, these findings demonstrated that the relationship of these traits with ASB and how they interact with CU traits differs depending on the type of ASB that is being considered. Based on these results, our knowledge of the role personality plays in the expression of ASB has been advanced, and additional questions have been raised as to the impact other factors would have on this relationship. In the second study, trait anxiety was found to interact with CU traits in the prediction of overall ASB and physical aggression but not the remaining subtypes. Further, cortisol reactivity in response to a social stressor interacted with CU traits to predict overall ASB, but this was only found in females.
Together these findings demonstrate that CU traits play an important role in the expression of ASB as they impact the relationship both trait and biological factors have with ASB. However, many questions remain unanswered and additional research is required to fully explore these complex relationships.

Together, the present results strongly support Frick and Moffitt’s (2010) proposal to include CU traits as a specifier for the diagnosis of CD, and highlight the unique impact these traits have on the prediction of ASB. They also provide insight into the development of more targeted intervention approaches that can be taken in the treatment of CD and ASB. Despite these promising findings, many other factors that influence ASB must be investigated to determine how CU traits impact their relationship with ASB, further supporting the clinical relevance of CU traits to the exhibition of ASB and the diagnosis of CD.
References


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Figure 1. Externalizing Behaviors score predicted from the Five Factor Model (FFM) of personality and CU traits in the community sample. Scores represent the combinations of centered scores for the FFM traits and CU traits as calculated for one standard deviation above and below the centered mean.
Figure 2. Physical Aggression score predicted from the Five Factor Model (FFM) of personality and CU traits in the community sample. Scores represent the combinations of centered scores for the FFM traits and CU traits as calculated for one standard deviation above and below the centered mean.
Figure 3. Rule-Breaking Behavior score predicted from the Five Factor Model (FFM) of personality and CU traits in the community sample. Scores represent the combinations of centered scores for the FFM traits and CU traits as calculated for one standard deviation above and below the centered mean.
Figure 4. Externalizing Behaviors score predicted from Agreeableness and CU traits in the clinical sample. Scores represent the combinations of centered scores for Agreeableness and CU traits as calculated for one standard deviation above and below the centered mean.
Figure 5. Externalizing Behaviors score predicted from trait anxiety and CU traits. Scores represent the combinations of centered scores for trait anxiety and CU traits as calculated for one standard deviation above and below the centered mean using parent data.
Figure 6. Physical Aggression score predicted from trait anxiety and CU traits. Scores represent the combinations of centered scores for trait anxiety and CU traits as calculated for one standard deviation above and below the centered mean using parent data.
Figure 7. Externalizing Behaviors score predicted from cortisol reactivity and CU traits in females only. Scores represent the combinations of centered scores for cortisol reactivity and CU traits as calculated for one standard deviation above and below the centered mean using parent and youth data.
Table 1

**Means, Standard Deviations and Pearson r Correlations with Callous-Unemotional Traits with the Five Factor Model of Personality and Antisocial Behavior Scores in the Community and Clinical Samples**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Community Mean (SD)</th>
<th>Clinical Mean (SD)</th>
<th>Community Correlation</th>
<th>Clinical Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroticism</td>
<td>3.23 (0.76)</td>
<td>4.09 (0.80)</td>
<td>.62</td>
<td>.57</td>
</tr>
<tr>
<td>Extraversion</td>
<td>4.89 (0.54)</td>
<td>3.87 (0.63)</td>
<td>-.49</td>
<td>-.43</td>
</tr>
<tr>
<td>Openness</td>
<td>5.14 (0.70)</td>
<td>3.43 (0.91)</td>
<td>-.44</td>
<td>-.59</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>4.95 (0.81)</td>
<td>3.40 (1.12)</td>
<td>-.68</td>
<td>-.61</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>4.57 (0.84)</td>
<td>3.15 (1.03)</td>
<td>-.55</td>
<td>-.52</td>
</tr>
<tr>
<td>Externalizing Behaviors</td>
<td>5.37 (6.19)</td>
<td>24.21 (14.34)</td>
<td>.59</td>
<td>.28</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>3.66 (4.27)</td>
<td>16.80 (9.74)</td>
<td>.54</td>
<td>.29</td>
</tr>
<tr>
<td>Rule-Breaking Behavior</td>
<td>1.71 (2.43)</td>
<td>7.23 (4.75)</td>
<td>.57</td>
<td>.24</td>
</tr>
<tr>
<td>Relational Aggression</td>
<td>8.54 (2.20)</td>
<td>N/A</td>
<td>.40</td>
<td>-</td>
</tr>
<tr>
<td>CU Traits</td>
<td>19.96 (7.58)</td>
<td>40.25 (11.35)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note: CU = Callous-Unemotional. All correlations significant at \( p \leq .001 \).*
Table 2

Multiple Regression Analyses Predicting Externalizing Behaviors, Physical Aggression, Relational Aggression and Rule-Breaking Behavior From Personality Traits Moderated by CU Traits in the Community Sample Using Standardized Scores

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Externalizing Behaviors</th>
<th>Physical Aggression</th>
<th>Rule-Breaking</th>
<th>Relational Aggression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \Delta R^2 )</td>
<td>B</td>
<td>( \Delta R^2 )</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>[95% CI]</td>
<td>[95% CI]</td>
<td>[95% CI]</td>
<td>[95% CI]</td>
</tr>
<tr>
<td>Step 1</td>
<td>.54***</td>
<td>.67***</td>
<td>.57***</td>
<td>.33***</td>
</tr>
<tr>
<td>Control variables&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>.07***</td>
<td>.03***</td>
<td>.01***</td>
<td>.003</td>
</tr>
<tr>
<td>N x CU Traits</td>
<td>0.20***</td>
<td>0.14***</td>
<td>-.02</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>[0.10, 0.30]</td>
<td>[0.08, 0.20]</td>
<td>[-0.06, 0.02]</td>
<td>[-0.03, 0.06]</td>
</tr>
<tr>
<td>E x CU Traits</td>
<td>0.24***</td>
<td>0.08**</td>
<td>0.05*</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td>[0.15, 0.34]</td>
<td>[0.02, 0.14]</td>
<td>[0.01, 0.09]</td>
<td>[-0.05, 0.04]</td>
</tr>
<tr>
<td>O x CU Traits</td>
<td>-.11*</td>
<td>-.03</td>
<td>-.02</td>
<td>-.002</td>
</tr>
<tr>
<td></td>
<td>[-0.20, -0.02]</td>
<td>[-0.09, 0.02]</td>
<td>[-0.06, 0.01]</td>
<td>[-0.04, 0.04]</td>
</tr>
<tr>
<td>A x CU Traits</td>
<td>-.08*</td>
<td>0.03</td>
<td>-.06***</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>[-0.16, -0.002]</td>
<td>[-0.02, 0.08]</td>
<td>[-0.09, -0.03]</td>
<td>[-0.03, 0.04]</td>
</tr>
<tr>
<td>C x CU Traits</td>
<td>0.05</td>
<td>0.01</td>
<td>0.02</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>[-0.02, 0.13]</td>
<td>[-0.04, 0.05]</td>
<td>[-0.01, 0.05]</td>
<td>[-0.03, 0.04]</td>
</tr>
<tr>
<td>Total ( R^2 )</td>
<td>.61***</td>
<td>.69***</td>
<td>.59***</td>
<td>.33***</td>
</tr>
</tbody>
</table>

Note: N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, CU = Callous-Unemotional.

<sup>a</sup>Control variables included gender, age, Five Factor Model traits, CU traits, and opposing subtypes of antisocial behavior.

<sup>†</sup> \( p < .10 \). <sup>∗</sup> \( p < .05 \). <sup>**</sup> \( p < .01 \). <sup>***</sup> \( p < .001 \).
Table 3
Multiple Regression Analyses Predicting Externalizing Behaviors, Physical Aggression, and Rule-Breaking Behavior From Personality Traits Moderated by CU Traits in the Clinical Sample Using Standardized Scores

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Externalizing Behaviors</th>
<th>Physical Aggression</th>
<th>Rule-Breaking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \Delta R^2 )</td>
<td>( B )</td>
<td>[95% CI]</td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control variables^a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>.02</td>
<td>.01</td>
<td>.01</td>
</tr>
<tr>
<td>N \times CU Traits</td>
<td>-0.52†</td>
<td>-0.09</td>
<td>-0.03</td>
</tr>
<tr>
<td>E \times CU Traits</td>
<td>-0.13</td>
<td>0.05</td>
<td>-0.05</td>
</tr>
<tr>
<td>O \times CU Traits</td>
<td>-0.11</td>
<td>0.03</td>
<td>-0.03</td>
</tr>
<tr>
<td>A \times CU Traits</td>
<td>-0.29†</td>
<td>-0.06</td>
<td>-0.02</td>
</tr>
<tr>
<td>C \times CU Traits</td>
<td>0.06</td>
<td>-0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Total ( R^2 )</td>
<td>.28***</td>
<td>.71***</td>
<td>.68***</td>
</tr>
</tbody>
</table>

Note: N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, CU = Callous-Unemotional. 
^aControl variables included gender, age, Five Factor Model traits, CU traits, and opposing subtypes of antisocial behavior. 
†p < .10. * p < .05. ** p < .01. *** p < .001.
Table 4

Means, Standard Deviations and t-test Results Comparing Mail-Only versus Lab Participants for Callous-Unemotional Traits, Trait Anxiety, Cortisol Reactivity Scores, and Antisocial Behavior Scores using Parent and Youth Data

<table>
<thead>
<tr>
<th>Construct</th>
<th>Mail-Only (Mean, SD)</th>
<th>Lab (Mean, SD)</th>
<th>t (df)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent Data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>1.46 (0.64)</td>
<td>1.52 (0.72)</td>
<td>t(143) = 0.49</td>
</tr>
<tr>
<td>Cortisol Reactivity - Males</td>
<td>5.07 (4.35)</td>
<td>3.63 (4.30)</td>
<td>t(63) = -1.22</td>
</tr>
<tr>
<td>Cortisol Reactivity - Females</td>
<td>4.61 (5.79)</td>
<td>3.39 (4.72)</td>
<td>t(78) = -0.96</td>
</tr>
<tr>
<td>Externalizing Behaviors</td>
<td>3.83 (4.87)</td>
<td>6.61 (7.26)</td>
<td>t(143) = 2.24*</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>2.35 (3.04)</td>
<td>4.17 (4.63)</td>
<td>t(143) = 2.30*</td>
</tr>
<tr>
<td>Rule-Breaking Behavior</td>
<td>1.48 (2.04)</td>
<td>2.44 (3.40)</td>
<td>t(143) = 1.68</td>
</tr>
<tr>
<td>Relational Aggression</td>
<td>7.82 (2.11)</td>
<td>7.93 (2.61)</td>
<td>t(143) = 0.24</td>
</tr>
<tr>
<td>CU Traits</td>
<td>20.51 (8.90)</td>
<td>21.57 (9.92)</td>
<td>t(143) = 0.59</td>
</tr>
<tr>
<td><strong>Youth Data</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>2.05 (0.83)</td>
<td>2.21 (0.85)</td>
<td>t(141) = 1.04</td>
</tr>
<tr>
<td>Cortisol Reactivity - Males</td>
<td>3.46 (3.78)</td>
<td>3.63 (4.30)</td>
<td>t(62) = 0.15</td>
</tr>
<tr>
<td>Cortisol Reactivity - Females</td>
<td>4.00 (4.48)</td>
<td>3.23 (4.59)</td>
<td>t(77) = -0.65</td>
</tr>
<tr>
<td>Externalizing Behaviors</td>
<td>10.79 (8.01)</td>
<td>12.04 (8.94)</td>
<td>t(141) = 0.76</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>5.71 (4.71)</td>
<td>6.50 (4.90)</td>
<td>t(141) = 0.86</td>
</tr>
<tr>
<td>Rule-Breaking Behavior</td>
<td>5.08 (4.31)</td>
<td>5.54 (4.94)</td>
<td>t(141) = 0.51</td>
</tr>
<tr>
<td>Relational Aggression</td>
<td>8.41 (2.84)</td>
<td>8.60 (2.81)</td>
<td>t(141) = 0.35</td>
</tr>
<tr>
<td>CU Traits</td>
<td>20.16 (6.81)</td>
<td>21.76 (8.24)</td>
<td>t(141) = 1.07</td>
</tr>
</tbody>
</table>

*Note: CU = Callous-Unemotional.*

† p < .10. * p < .05. ** p < .01. *** p < .001.
Table 5

Means, Standard Deviations and Pearson r Correlations with Callous-Unemotional Traits with Trait Anxiety, Cortisol Reactivity Scores, and Antisocial Behavior Scores using Parent and Youth Data.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Mean (SD)</th>
<th>Correlation with CU traits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parent Data</td>
<td>Youth Data</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>1.51 (0.70)</td>
<td>2.17 (0.85)</td>
</tr>
<tr>
<td>Cortisol Reactivity - Males</td>
<td>4.05 (4.33)</td>
<td>3.58 (4.13)</td>
</tr>
<tr>
<td>Cortisol Reactivity - Females</td>
<td>3.71 (5.01)</td>
<td>3.43 (4.54)</td>
</tr>
<tr>
<td>Externalizing Behaviors</td>
<td>5.84 (6.79)</td>
<td>11.71 (8.70)</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>3.67 (4.32)</td>
<td>6.29 (4.84)</td>
</tr>
<tr>
<td>Rule-Breaking Behavior</td>
<td>2.17 (3.11)</td>
<td>5.42 (4.77)</td>
</tr>
<tr>
<td>Relational Aggression</td>
<td>7.90 (2.47)</td>
<td>8.55 (2.81)</td>
</tr>
<tr>
<td>CU Traits</td>
<td>21.27 (9.63)</td>
<td>21.33 (7.89)</td>
</tr>
</tbody>
</table>

Note: CU = Callous-Unemotional.

† p < .10. * p < .05. ** p < .01. *** p < .001.
Table 6

**Multiple Regression Analyses Predicting Externalizing Behaviors, Physical Aggression, Rule-Breaking Behavior and Relational Aggression From Trait Anxiety Moderated by CU Traits with Parent Data Using Standardized Scores**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Externalizing Behaviors</th>
<th>Physical Aggression</th>
<th>Rule-Breaking</th>
<th>Relational Aggression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta R^2$</td>
<td>$B$ [95% CI]</td>
<td>$\Delta R^2$</td>
<td>$B$ [95% CI]</td>
</tr>
<tr>
<td>Step 1</td>
<td><strong>.43</strong>*</td>
<td>.60***</td>
<td>.57***</td>
<td>.22***</td>
</tr>
<tr>
<td>Control variables$^a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td><strong>.04</strong></td>
<td>.06***</td>
<td>.01†</td>
<td>.00</td>
</tr>
<tr>
<td>Trait Anxiety x CU Traits</td>
<td>0.20**</td>
<td>0.15***</td>
<td>-0.05†</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>[0.08, 0.31]</td>
<td>[0.09, 0.21]</td>
<td>[-0.10, 0.002]</td>
<td>[-0.05, 0.06]</td>
</tr>
<tr>
<td>Total $R^2$</td>
<td><strong>.47</strong>*</td>
<td><strong>.66</strong>*</td>
<td><strong>.58</strong>*</td>
<td><strong>.22</strong>*</td>
</tr>
</tbody>
</table>

*Note: CU = Callous-Unemotional.*

$^a$Control variables included gender, age, trait anxiety, CU traits, and opposing subtypes of antisocial behavior.

$^\dagger p < .10.$ * $p < .05.$ ** $p < .01.$ *** $p < .001.$
Table 7

*Multiple Regression Analyses Predicting Externalizing Behaviors, Physical Aggression, Rule-Breaking Behavior and Relational Aggression From Trait Anxiety Moderated by CU Traits with Youth Data Using Standardized Scores*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Externalizing Behaviors</th>
<th>Physical Aggression</th>
<th>Rule-Breaking</th>
<th>Relational Aggression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta R^2$ $B$</td>
<td>$\Delta R^2$ $B$</td>
<td>$\Delta R^2$ $B$</td>
<td>$\Delta R^2$ $B$</td>
</tr>
<tr>
<td></td>
<td>[95% CI]</td>
<td>[95% CI]</td>
<td>[95% CI]</td>
<td>[95% CI]</td>
</tr>
<tr>
<td>Step 1</td>
<td>.38***</td>
<td>.59***</td>
<td>.51***</td>
<td>.26***</td>
</tr>
<tr>
<td>Control variables$^a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>.01</td>
<td>.002</td>
<td>.001</td>
<td>.00</td>
</tr>
<tr>
<td>Trait Anxiety x CU Traits</td>
<td>0.14</td>
<td>0.04</td>
<td>0.02</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td>[-0.06, 0.34]</td>
<td>[-0.05, 0.13]</td>
<td>[-0.08, 0.12]</td>
<td>[-0.08, 0.06]</td>
</tr>
<tr>
<td>Total $R^2$</td>
<td>.39***</td>
<td>.59***</td>
<td>.51***</td>
<td>.26***</td>
</tr>
</tbody>
</table>

*Note:* CU = Callous-Unemotional.

$^a$Control variables included gender, age, trait anxiety, CU traits, and opposing subtypes of antisocial behavior.

$^\dagger p < .10. \ast p < .05. \ast\ast p < .01. \ast\ast\ast p < .001.
Table 8

Multiple Regression Analyses Predicting Externalizing Behaviors, Physical Aggression, Rule-Breaking Behavior and Relational Aggression From Cortisol Reactivity Scores Moderated by CU Traits for Males with Parent Data Using Standardized Scores

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Externalizing Behaviors</th>
<th>Physical Aggression</th>
<th>Rule-Breaking</th>
<th>Relational Aggression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta R^2$</td>
<td>$B$   [95% CI]</td>
<td>$\Delta R^2$</td>
<td>$B$ [95% CI]</td>
</tr>
<tr>
<td>Control variables$^a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td>.43***</td>
<td>.49*** [95% CI]</td>
<td>.47***</td>
<td>.22*</td>
</tr>
<tr>
<td>Cort Reactivity x CU Traits</td>
<td>-0.002</td>
<td>[-0.05, 0.05]</td>
<td>-0.004</td>
<td>[0.0, 0.01]</td>
</tr>
<tr>
<td>Step 2</td>
<td>.00</td>
<td>.001 [95% CI]</td>
<td>.00</td>
<td>.01</td>
</tr>
<tr>
<td>Total $R^2$</td>
<td>.43***</td>
<td>.49*** [95% CI]</td>
<td>.47***</td>
<td>.23*</td>
</tr>
</tbody>
</table>

Note: Cort = Cortisol, CU = Callous-Unemotional.
$^a$Control variables included age, pubertal development, cortisol reactivity, CU traits, and opposing subtypes of antisocial behavior.
$^\dagger p < .10. * p < .05. ** p < .01. *** p < .001.$
Table 9

Multiple Regression Analyses Predicting Externalizing Behaviors, Physical Aggression, Rule-Breaking Behavior and Relational Aggression From Cortisol Reactivity Scores Moderated by CU Traits for Females with Parent Data Using Standardized Scores

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Externalizing Behaviors</th>
<th>Physical Aggression</th>
<th>Rule-Breaking</th>
<th>Relational Aggression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control variables</td>
<td>.41***</td>
<td>.61***</td>
<td>.65***</td>
<td>.37***</td>
</tr>
<tr>
<td>Cort Reactivity x CU Traits</td>
<td>-0.02*</td>
<td>-0.01</td>
<td>-0.003</td>
<td>0.001</td>
</tr>
<tr>
<td>Step 2</td>
<td>.04*</td>
<td>.01</td>
<td>.004</td>
<td>.001</td>
</tr>
<tr>
<td>Cort Reactivity x CU Traits</td>
<td>[-0.04, -0.002]</td>
<td>[-0.02, 0.01]</td>
<td>[-0.01, 0.004]</td>
<td>[-0.01, 0.01]</td>
</tr>
<tr>
<td>Total R²</td>
<td>.44***</td>
<td>.62***</td>
<td>.66***</td>
<td>.37***</td>
</tr>
</tbody>
</table>

Note: Cort = Cortisol, CU = Callous-Unemotional.

*aControl variables included age, pubertal development, cortisol reactivity, CU traits, and opposing subtypes of antisocial behavior.

†p < .10. *p < .05. **p < .01. ***p < .001.
Table 10

*Multiple Regression Analyses Predicting Externalizing Behaviors, Physical Aggression, Rule-Breaking Behavior and Relational Aggression From Cortisol Reactivity Scores Moderated by CU Traits for Males with Youth Data Using Standardized Scores*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Externalizing Behaviors</th>
<th>Physical Aggression</th>
<th>Rule-Breaking</th>
<th>Relational Aggression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta R^2$</td>
<td>$B$ [95% CI]</td>
<td>$\Delta R^2$</td>
<td>$B$ [95% CI]</td>
</tr>
<tr>
<td>Control variables$^a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>.003</td>
<td>.002</td>
<td>.00</td>
<td>.003</td>
</tr>
<tr>
<td>Cort Reactivity x CU Traits</td>
<td>-0.02</td>
<td>[-0.08, 0.05]</td>
<td>-0.01</td>
<td>[0.01]</td>
</tr>
<tr>
<td>Step 1</td>
<td>.40***</td>
<td>.62***</td>
<td>.52***</td>
<td>.30**</td>
</tr>
<tr>
<td>Total $R^2$</td>
<td>.40***</td>
<td>.63***</td>
<td>.52***</td>
<td>.31**</td>
</tr>
</tbody>
</table>

*Note:* Cort = Cortisol, CU = Callous-Unemotional.

$^a$Control variables included age, pubertal development, cortisol reactivity, CU traits, and opposing subtypes of antisocial behavior.

$^\dagger p < .10$.  * $p < .05$.  ** $p < .01$.  *** $p < .001$. 
Table 11

*Multiple Regression Analyses Predicting Externalizing Behaviors, Physical Aggression, Rule-Breaking Behavior and Relational Aggression From Cortisol Reactivity Scores Moderated by CU Traits for Females with Youth Data Using Standardized Scores*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Externalizing Behaviors</th>
<th>Physical Aggression</th>
<th>Rule-Breaking</th>
<th>Relational Aggression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta R^2$</td>
<td>$B$ [95% CI]</td>
<td>$\Delta R^2$</td>
<td>$B$ [95% CI]</td>
</tr>
<tr>
<td>Step 1</td>
<td>.19**</td>
<td>.48***</td>
<td>.52***</td>
<td>.36***</td>
</tr>
<tr>
<td>Control variables$^a$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>.09**</td>
<td>.01</td>
<td>.01</td>
<td>.002</td>
</tr>
<tr>
<td>Cort Reactivity x CU Traits</td>
<td>0.09**</td>
<td>0.02</td>
<td>0.02</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>[0.03, 0.15]</td>
<td>[-0.01, 0.05]</td>
<td>[-0.01, 0.04]</td>
<td>[-0.02, 0.03]</td>
</tr>
<tr>
<td>Total $R^2$</td>
<td>.28***</td>
<td>.49***</td>
<td>.53***</td>
<td>.36***</td>
</tr>
</tbody>
</table>

*Note: Cort = Cortisol, CU = Callous-Unemotional.  
$^a$Control variables included age, pubertal development, cortisol reactivity, CU traits, and opposing subtypes of antisocial behavior.  
$^\dagger p < .10. * p < .05. ** p < .01. *** p < .001.*