Can Callous-Unemotional Traits Enhance the Understanding, Diagnosis, and Treatment of Serious Conduct Problems in Children and Adolescents? A Comprehensive Review

Paul J. Frick, James V. Ray, Laura C. Thornton, and Rachel E. Kahn University of New Orleans

This article provides a comprehensive review of the research on the use of callous and unemotional (CU) traits for designating an important subgroup of children and adolescents with severe conduct problems. It focuses on the etiological significance of recognizing this subgroup of youths with severe conduct problems, its implications for diagnostic classification, and the treatment implications of this research. The review highlights limitations in existing research and provides directions for future research. The available research suggests that children and adolescents with severe conduct problems and elevated CU traits show distinct genetic, cognitive, emotional, biological, environmental, and personality characteristics that seem to implicate different etiological factors underlying their behavior problems relative to other youths with severe conduct problems. Recognizing these subgroups could be critical for guiding future research on the causes of severe conduct problems in children and adolescents. Further, children and adolescents with both severe conduct problems and elevated CU traits appear to be at risk for more severe and persistent antisocial outcomes, even controlling for the severity of their conduct problems, the age of onset of their conduct problems, and common comorbid problems, which supports the clinical importance of designating this group in diagnostic classification systems. Finally, although children and adolescents with both severe conduct problems and elevated CU traits tend to respond less positively to typical interventions provided in mental health and juvenile justice settings, they show positive responses to certain intensive interventions tailored to their unique emotional and cognitive characteristics.

Keywords: conduct problems, callous-unemotional, diagnosis, children, adolescents

Serious conduct problems involving aggressive and antisocial behaviors that violate the rights of others or major societal norms are a serious mental health and public policy concern. Such conduct problems are highly related to criminal behavior (Frick, Stickle, Dandreaux, Farrell, & Kimonis, 2005) and are associated with a host of other social, emotional, and academic problems (Kimonis & Frick, 2011). In addition, serious conduct problems in childhood predict later impairments in the domains of mental health (e.g., substance abuse), legal (e.g., risk for arrest), educational (e.g., school dropout), social (e.g., poor marital adjustment), occupational (e.g., poor job performance), and physical health (e.g., poor respiratory function; Odgers et al., 2007, 2008). Even in a sample of children as young as ages 4 and 5, serious conduct problems predicted significant behavioral, emotional, social, and educational difficulties 5 years later (Kim-Cohen et al., 2009).

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Paul J. Frick, James V. Ray, Laura C. Thornton, and Rachel E. Kahn, Department of Psychology, University of New Orleans.

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Correspondence concerning this article should be addressed to Paul J. Frick, Department of Psychology, University of New Orleans, 2001 Geology and Psychology Building, New Orleans, LA 70148. E-mail: pfrick@uno.edu

As a result, there is a long and extensive history of research on the causes of serious conduct problems, their developmental trajectory, and their response to treatment (Moffitt et al., 2008). A consistent finding from this research is that within children and adolescents who display serious conduct problems, there is great variability in the types of conduct problems displayed, the level of impairment associated with their problem behavior, their risk for future impairment, and their response to treatment (Frick, 2012). Further, there also appears to be great variability in the social, emotional, cognitive, and biological characteristics of children and adolescents with serious conduct problems, suggesting a number of distinct causal pathways leading to their problem behavior (Frick & Viding, 2009). This variability has led to great interest in developing methods of classifying children and adolescents with serious conduct problems into meaningful subgroups, which can guide both etiological research and the development of innovative and effective approaches to treatment (Frick, 2012; Moffitt et al., 2008).

Most approaches to defining meaningful subgroups of children and adolescents with serious conduct problems have focused on variations in the behaviors displayed by the child, such as whether the behaviors are overt (i.e., involving direct confrontation of others) or covert in nature (Frick et al., 1993), whether they involve physical aggression (Tackett, Krueger, Iacono, & McGue, 2005), the frequency or diversity in types of conduct problems or aggression (Dodge & Pettit, 2003; Lahey & Loeber, 1994), or the age at which the serious conduct problems first emerge (Moffitt et

al., 2008). Another common method for defining meaningful subtypes of children and adolescent with serious conduct problems has focused on the presence of certain comorbid conditions, such as impulsivity or attention-deficit/hyperactivity disorder (ADHD; Lynam, 1996; Waschbusch, 2002).

Such approaches to subtyping have had some support for their utility for designating etiologically distinct subgroups of children with severe conduct problems or for designating subgroups showing differences in their course or response to treatment (see Frick & Marsee, 2006, for a more comprehensive review and evaluation of previous subtyping approaches). One notable example is the distinction between children whose serious conduct problems emerge prior to adolescence (i.e., childhood-onset) and children in whom the onset of serious conduct problems coincides with the onset of adolescence (i.e., adolescent-onset; Frick & Viding, 2009; Moffitt, 2006). To summarize the extensive research supporting this distinction (for comprehensive reviews, see Frick & Viding, 2009; Moffitt, 2006), the childhood-onset group is more likely to show aggressive behaviors in childhood and adolescents and is more likely to continue to show antisocial and criminal behavior into adulthood (Moffitt, Caspi, Harrington, & Milne, 2002; Odgers et al., 2008). Further, childhood-onset conduct problems appear related to neuropsychological deficits (e.g., deficits in executive functioning), cognitive deficits (e.g., low intelligence), and temperamental/personality risk factors (e.g., impulsivity and problems in emotional regulation; Frick & Viding, 2009; Moffitt, 2006). Children in this group are also more likely than the adolescentonset group to come from homes with greater family instability, more family conflict, and with parents who use less effective parenting strategies (Frick & Viding, 2009). However, despite these theoretically and clinically important differences between the two groups, there appear to be significant sources of heterogeneity even within the childhood-onset group in terms of both etiology (Viding, Blair, Moffitt, & Plomin, 2005) and outcomes (Odgers et

Developmental Extensions of the Construct of Psychopathy

A novel approach has been developed and tested over the past several decades focuses on the child's affective and interpersonal style and not on the conduct problems themselves. This approach attempts to provide a developmental extension to a large body of research on the construct of psychopathy. Specifically, there has been a long history of clinical research on incarcerated adults showing that certain personality traits, labeled as "psychopathic traits," designate an important subgroup of antisocial individuals (see Skeem, Polaschek, Patrick, & Lilienfeld, 2011, for a comprehensive review of this research). Psychopathic traits have historically not focused solely on the antisocial behavior of the individual but instead have focused on the affective (e.g., lack of empathy; lack of guilt; shallow emotions) and interpersonal (e.g., egocentricity; callous use of others for own gain) style of the person (Cleckley, 1976; Hare, 1993; Lykken, 1995). Importantly, research has indicated that only a minority of individuals who exhibit chronic antisocial and criminal behavior show elevated levels of psychopathic traits. However, the subgroup of antisocial individuals with psychopathic traits show a particularly severe and violent pattern of behavior (Leistico, Salekin, DeCoster, & Rogers, 2008),

and they show distinct cognitive and emotional deficits relative to other antisocial individuals that seem to implicate distinct causal factors underlying their antisocial behavior (Blair, Mitchell, & Blair, 2005; Patrick, 2007). Further, adults with significant levels of psychopathic traits often show childhood histories marked by severe conduct problems (Hare, Forth, & Strachan, 1992). Moreover, there has been a long history of research showing that many of the key features of psychopathy (e.g., low empathy) are highly related to conduct problems and aggression in children (Miller & Eisenberg, 1988).

This research has sparked many attempts to identify developmental precursors to psychopathy. Prior to 1980, there were several early efforts to extend the construct of psychopathy to children and adolescents to designate an important subgroup of youths with serious conduct problems or delinquent behavior (McCord & McCord, 1964; Quay, 1964). Such research led to the criteria included in the 3rd edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM–III*; American Psychiatric Association, 1980) that distinguished between children with a diagnosis of conduct disorder (CD) based on whether they were "socialized" or "undersocialized." The following quote from the *DSM–III* describes how the undersocialized type was conceptualized and illustrates its conceptual link to the construct of psychopathy:

The Undersocialized types [of CD] are characterized by a failure to establish a normal degree of affection, empathy, or bond with others. Peer relationships are generally lacking, although the youngster may have superficial relationships with other youngsters. Characteristically, the child does not extend himself or herself for others unless there is an obvious immediate advantage. Egocentrism is shown by readiness to manipulate others for favors without any effort to reciprocate. There is generally a lack of concern for the feelings, wishes, and well-being of others, as shown by callous behavior. Appropriate feelings of remorse are generally absent. Such a child may readily inform on his or her companions and try to place blame on them. (American Psychiatric Association, 1980, p. 45)

Subsequent research on the undersocialized subtype of conduct disorder was quite promising in showing that children with this subtype tended to have poorer adjustment in juvenile institutions, and they were more likely to continue to show antisocial behavior into adulthood, when compared to other antisocial adolescents (Frick & Loney, 1999; Quay, 1993). Also, the undersocializedaggressive group was more likely to show certain neuropsychological correlates of their antisocial behavior, such as low serotonin levels and autonomic irregularities (Lahey, Hart, Pliszka, Applegate, & McBurnett, 1993; Quay, 1993; Raine, 2002). However, there was also considerable confusion over the core features that should define the undersocialized subgroup and differentiate it from other subgroups of antisocial youths (Quay, 1993). This confusion was due to two main issues. First, in an attempt to avoid using the pejorative term "psychopathy," the term "undersocialized" was used. Unfortunately, this term did not clearly describe the affective or interpersonal features of psychopathy and led to other connotations (e.g., the child is not well socialized by parents; the child is unable to form peer groups). Second, the operational definition provided in the DSM-III for the undersocialized subgroup did not correspond well to traditional conceptualizations of psychopathy. Specifically, DSM-III listed only one symptom specific to the affective and interpersonal dimensions of psychopathy (i.e., does not "apparently feel guilt or remorse when such a reaction is appropriate not just when caught or in difficulty"). The other four symptoms focused on indicators of social attachment (e.g., does not have "one or more peer group friendships that have lasted over 6 months"), which have not proven to be highly indicative of the construct of psychopathy in samples of children and adolescents (Frick, 2009).

As a result of these definitional problems, the undersocialized distinction was not continued in later editions of the DSM. However, in the past two decades, a significant body of research has emerged refining how the key features associated with psychopathy may be expressed in children and adolescents (Frick, 2009; Salekin, 2006). These conceptualizations have focused largely on the presence of callous-unemotional (CU) traits (e.g., lack of empathy and guilt, failure to put for the effort on important tasks, shallow and deficient emotions), which correspond closely to the affective dimension of psychopathy—core to the construct in adult samples (Hare & Neumann, 2008). This research has proven to be quite promising for designating important subgroups of children and adolescents with severe conduct problems. As a result, the most recent revision of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013) has integrated these changes into the diagnostic criteria for conduct disorder and similar revisions are being considered by the International Classification of Diseases (Rutter, 2012).

In light of these recent and upcoming changes to major classification systems for mental disorders, the purpose of the current article is to provide a comprehensive and systematic review of the available research on CU traits in children and adolescents. The review focuses specifically on research relevant to the question of whether these traits can inform comprehensive causal models for severe conduct problems in children and adolescents by designating an etiologically distinct subgroup of youths with behavior problems. Further, we focus on whether these traits can help in classifying children and adolescents with severe behavior problems by adding information that predicts concurrent and future impairment, especially relative to other subtyping approaches that focus largely on the number, types, or onset of problem behavior or on the presence of comorbid conditions. Finally, we focus on the potential role of CU traits for designating children and adolescents with severe conduct problems who show a differential response to treatment and who may require more intensive treatments or distinct types of treatment.

There have been several published reviews of research on CU traits or psychopathic traits in children and adolescents. All have several notable limitations, which the current review was designed to overcome. First, some past reviews have focused solely on broad definitions of psychopathy, which include but are not limited to, CU traits (Edens, Campbell, & Weir, 2007; Leistico et al., 2008; Lynam & Gudonis, 2005). Two of these comprehensive reviews were limited to studies using only one method for assessing these traits (Edens et al., 2007; Leistico et al., 2008). Other reviews have focused more specifically on CU traits but were limited to focusing on only certain aspects of their validity, such as the association of CU traits with severe aggressive and antisocial behavior (Frick & Dickens, 2006) or their association with specific emotional and cognitive correlates (Frick & White, 2008) or their implications for diagnostic classification (Herpers, Rommelse, Bons, Buitelaar, & Scheepers, 2012). Furthermore, given the large

amount of research published in the past 5 years related to CU traits, a comprehensive and updated review is warranted. Of the 269 studies reviewed in the following sections, 191 (71%) were published in 2007 or later.

Finally, several reviews have focused on important theoretical questions related to how best to conceptualize the construct of psychopathy in children and adolescents but do not directly address their importance for understanding, classifying, and treating youths with severe conduct problems. For example, several past reviews have focused on research relevant to determining what dimension or dimensions are core to the construct of psychopathy in children and adolescents (Frick, 2009; Lynam & Gudonis, 2005). Research addressing the question of what dimension(s) are key to the construct of psychopathy may be different from research most relevant to the question of what dimension(s) may be most helpful for designating a distinct subgroup of youths with severe conduct problems. For example, within both a sample of serious adolescent offenders (Caputo, Frick, & Brodsky, 1999) and within a clinic-referred sample of preadolescent children (Christian, Frick, Hill, Tyler, & Frazer, 1997), the impulsivity and narcissistic dimensions of psychopathy were higher in youths with severe patterns of criminal offending or with childhood-onset conduct problems. However, it was the CU dimension, in addition to high levels of impulsivity and narcissism, which appeared to designate a particularly severe and aggressive subgroup within those with serious conduct problems. Similarly, several studies have demonstrated that it is the CU dimension (but not the other dimensions of psychopathy) that designate a subgroup of children among those with serious conduct problems showing distinct deficits in their emotional or cognitive response styles (Frick, O'Brien, Wootton, & McBurnett, 1994; Kimonis, Frick, Fazekas, & Loney, 2006; Loney, Frick, Clements, Ellis, & Kerlin, 2003).

Review Methods

To address these questions, we conducted an exhaustive search for studies investigating either CU traits or psychopathic traits in samples of children and adolescents (i.e., the majority of the sample and the mean age of the sample was below age 18) utilizing various electronic data bases, reviewing the reference lists of published studies, and contacting researchers directly. Only studies published or accepted for publication after 1990 were included. This inclusionary criterion was used for two reasons. First, it allowed the review to focus on only the most current research. Second, definitions of CU and psychopathic traits employed prior to 1990 often were largely guided by the definition of undersocialized conduct disorder discussed previously.

In this review, studies were included if they investigated psychopathic traits, which include but are not limited to CU traits. Such studies were judged to be relevant to the use of CU traits to designate an important subgroup of children with serious conduct problems because children and adolescents high on CU traits often score the highest on more global measures of psychopathy (Frick, Bodin, & Barry, 2000; Schrum & Salekin, 2006). However, we recognize that when using this methodology, it is not clear whether it is the CU traits or the other dimensions included in the measures of psychopathy (i.e., narcissism, impulsivity, antisocial behavior) that account for

the results. As a result, we have tried to be clear as to which studies used broader measures of psychopathy, which we describe using the term "psychopathic traits," and which studies used measures specific to CU traits. Further, if a study reported findings for both psychopathic traits more generally and CU traits more specifically, we focused only on the findings related to CU traits. As highlighted in the tables provided below, the vast majority of studies reviewed provided data on CU traits separate from other dimensions of psychopathy and, as a result, major interpretations and conclusions were largely based on studies that used measures specific to CU traits.

When different publications reported results using either partially or completely overlapping samples, a decision was made as to whether the different publications added significant incremental information to the review. If so, the multiple publications were included and the overlapping samples are noted in the tables. If the publications with overlapping samples were not judged to provide unique information, the study with the most complete sample or, for longitudinal studies, the study with the longest follow-up period was included in the review.

Finally, the review is organized into three primary sections. In the first section, research related to the utility of CU traits for designating distinct causal pathways to serious conduct problems is reviewed. This research includes behavioral genetic studies investigating the genetic and environmental influences on CU traits or their stability, studies investigating the cognitive or emotional correlates to CU traits, studies investigating biological markers to CU traits, studies investigating the temperamental and personality characteristics associated with CU traits, and studies investigating the family and peer correlates to CU traits. For each etiologically important correlate, the findings related to CU traits are reviewed with a particular focus on findings most relevant for whether CU traits might designate a more etiologically homogeneous subgroup of children and adolescents with serious conduct problems, such as whether the correlates to CU traits differ from those typically associated with conduct problems, whether the association between conduct problems and etiologically important variables differ depending on the presence of nonnormative levels of CU traits, or whether children with conduct problems and nonnormative levels of CU traits differ from children with conduct problems and normative levels of CU traits on these etiologically important variables.

In the second and third sections of the review, research related to the clinical utility of CU traits is reviewed. In the second section, studies testing the association between CU traits and the severity or stability of aggression, delinquency, and antisocial behavior are reviewed. This section specifically focuses on whether CU traits are associated with serious antisocial behavior, both concurrently and longitudinally, and whether this association remains even after controlling for the level and severity of conduct problems, level of aggression, level of impulsivity, or the onset of conduct problems. In the third section, the utility of CU traits for predicting variations in treatment outcome in samples of children and adolescents with severe conduct problems is reviewed, as well as the few studies testing treatments designed to reduce the level of CU traits themselves in children and adolescents.

Callous-Unemotional Traits and Distinct Causal Pathways to Serious Conduct Problems

Behavioral Genetic Research

Table 1 provides a summary of nine published behavioral genetic studies that used twin methodology to investigate the heritability of CU traits, as well as to examine differences in the genetic influences to CU traits and conduct problems. Several studies examined the heritability of CU traits, and these studies provided estimates of the amount of variation in CU traits accounted for by genetic effects ranging from 42% to 68% (Bezdjian, Raine, Baker, & Lynam, 2011; Blonigen, Hicks, Kruger, Patrick, & Iacono, 2006; Larsson, Andershed, & Lichtenstein, 2006; Taylor, Loney, Bobadilla, Iacono, & McGue, 2003; Viding et al., 2005). Also, several studies have shown that much of the stability in CU traits is due to genetic effects (Blonigen et al., 2006; Fontaine, Rijsdijsk, McCrory, & Viding, 2010; Forsman, Lichtenstein, Andershed, & Larsson, 2008). Further, although a large proportion of the correlation between CU traits and conduct problems has been reported to be due to shared genetic effects, studies have consistently found unique genetic influences to both constructs as well (Bezdjian, Raine, Tuvblad, & Baker, 2011; Larsson et al., 2006; Taylor et al., 2003; Viding, Frick, & Plomin, 2007; Waldman et al., 2011), supporting at least partially distinct etiological underpinnings.

Findings from one large twin study reported in Table 1 are particularly notable for suggesting that serious conduct problems may have different etiologies depending on the presence of CU traits and that this is not likely to be due to other characteristics, such as early onset of conduct problems, severity of conduct problems, or the presence of comorbid conditions. Specifically, in a large (n = 7,374) population-based study of 7-year-old twins, the genetic influences on childhood-onset conduct problems were reported to be considerably greater in those high on teacher-reported CU traits (81%) than for those who showed normative levels of CU traits (30%), although it is important to note that the confidence intervals for these genetic estimates overlapped (Viding et al., 2005). Further, Viding et al. (2005) also reported that the degree of genetic influence on conduct problems in those with elevated levels of CU traits was not related to the severity of conduct problems nor was it related to ADHD symptoms when the children were 9 years of age (Viding, Jones, Frick, Moffitt, & Plomin, 2008).

Another study from Table 1 is notable for testing potential neurological endophenotypes to account for the genetic contribution to CU traits. Specifically, one twin study reported that left posterior cingulate and right dorsal anterior cingulate gray matter concentrations showed significant heritability (0.46 and 0.37, respectively) and that common genes explained the phenotypic relationship between these regions and psychopathic traits in a sample of boys ages 10 to 13 (Rijsdijsk et al., 2010). These data suggest that the genetic contribution to CU traits might manifest through an impact on anterior and posterior cingulate cortex development. However, this study did not assess CU traits in isolation of other psychopathic traits. As a result, these findings need to be replicated in other studies before conclusive statements can be made concerning the biological endophenotypes that may account

Table 1
Summary of Genetic Research Investigating Callous-Unemotional (CU) Traits

Study	Sample	Key methods	Summary of results
Bezdjian, Raine, Baker, & Lynam (2011) ^a	N = 1,219; age = 9–10; 48.7% male; community sample.	Cross-sectional; parent report of psychopathic traits.	Significant genetic influences on psychopathic traits were found for both boys and girls.
Bezdjian, Raine, Tuvblad, & Baker (2011) ^a	N = 1,219; age = 9–10; 48.7% male; community sample.	Cross-sectional; parent and self- reports of psychopathic traits including CU traits; parent and self-reports of aggression.	Both common and specific genetic influences were found for psychopathic traits and aggression. The common influences were stronger for proactive aggression, but this was for child self-report only.
Blonigen et al. (2006) ^b	N = 1,252; age = 17; population-based mixed-sex community sample.	Cross-sectional; twin methodology; self-report of CU traits.	Substantial additive genetic effects on CU traits at both age 17 and 24; stable variance in CU traits were largely due to genetic effects.
Fontaine et al. (2010) ^c	N = 9,461; age = 7; 47.3% male; population-based mixed-sex community sample.	Longitudinal; teacher report of CU traits.	Highest heritability estimates were found for boys in a stable-high trajectory of CU traits; membership in stable-high trajectory for girls was largely accounted for by shared environmental factors.
Forsman et al. (2008) ^d	N = 1,480; age = 16; population-based mixed-sex community sample.	Cross-sectional; twin methodology; self-report of CU traits.	Genetic factors contributed substantially to the stability of CU traits from 16 to 19. There was evidence for genetic effects on the stability of CU traits, which were unique from the genetic effects on the stability of impulsive and antisocial behavior.
Larsson et al. (2006) ^d	N = 2,198; age = 16– 17; population-based mixed-sex community sample.	Cross-sectional; twin methodology; self-report of CU traits.	Substantial genetic influence on CU traits; correlation between CU traits and impulsivity/antisocial behavior show substantial shared genetic influences but some significant independent influences.
Rijsdijsk et al. (2010)	N = 123; age = 10–13; 100% male; community sample.	Cross-sectional; twin methodology; parent and teacher reports of CU traits; use of structural magnetic resonance imaging with voxel-based morphometry analyses.	Left posterior cingulate and right dorsal anterior cingulate gray matter concentrations showed significant heritability and common genes explained the phenotypic relationship between these regions and CU traits.
Taylor et al. (2003) ^b	N = 1,126; age = 11– 18; 100% male; community sample.	Cross-sectional; twin methodology; self-report of CU traits.	Sizeable additive genetic influence on CU traits; shared genetic influences account for a large proportion of the correlation between CU traits and antisocial behavior, although some independent effects were found; independent non-shared environmental factors associated with CU traits and antisocial behaviors.
Viding et al. (2005) ^e	N = 7,374; age = 7; population-based mixed-sex community sample.	Cross-sectional; twin methodology using group hereditability estimates; teacher report of CU traits.	Conduct problems in children high on CU traits showed stronger genetic influence than those low on CU traits, even controlling for severity of conduct problems.
Viding et al. (2007) ^c	N = 6,868; age = 7; population-based mixed-sex community sample.	Cross-sectional; twin methodology; teacher report of CU traits.	Both CU traits and conduct problems were highly hereditable in both boys and girls. Shared genetic influences account for a large proportion, but not all, of the correlation between CU traits and conduct problems.
Viding et al. (2008) ^c	N = 3,730; age = 9; population-based mixed-sex community sample.	Cross-sectional; twin methodology using group hereditability estimates; teacher report of CU traits.	Conduct problems in children high on CU traits showed stronger genetic influence than those low on CU traits, even controlling for presence of attention-deficit/hyperactivity disorder symptoms.
Waldman et al. (2011)	N = 1,981; age = 16– 18; population-based mixed-sex community sample.	Cross-sectional; twin methodology; parent report of prosocial behaviors (inverse of CU traits).	Prosocial behaviors showed moderate additive genetic influences; prosocial behaviors had both shared and unique genetic influences with conduct disorder.

for the genetic risk to CU traits. Additional biological markers to CU traits are reviewed in a later section of this review.

Cognitive Characteristics

Table 2 summarizes 33 studies investigating the cognitive characteristics associated with psychopathic (n = 8) or CU traits (n = 8)24) in children and adolescents. One consistent finding from these studies is that CU traits are associated with abnormalities in the processing of punishment cues. Such abnormalities have been found using a number of different learning paradigms. Specifically, CU traits have been associated with an insensitivity to punishment cues using tasks in which a reward dominant response set is primed and the youth has to respond to an increasing ratio of punished to rewarded responses (Fisher & Blair, 1998; Frick, Cornell, Bodin, et al., 2003). Also, when different punishment schedules are compared, youths with behavior problems and high levels of psychopathic traits have been reported as responding more poorly to gradual punishment compared to youths with behavior problems but normative levels of psychopathic traits (Blair, Colledge, & Mitchell, 2001). In addition, boys with elevated CU traits were less sensitive to potential punishment when peers were present compared to boys with normative levels of CU traits (Centifanti & Modecki, 2013). Finally, youths with a CU presentation have been reported to underestimate the likelihood that they will be punished for misbehavior (Pardini, Lochman, & Frick, 2003). Importantly, several studies directly compared children with conduct problems and elevated CU traits to children with conduct problems and normative levels of CU traits and the punishment abnormalities were only found in those with a CU presentation (Fisher & Blair, 1998; Frick, Cornell, Bodin, et al., 2003).

Other studies examining cognitive characteristics associated with CU traits in children and adolescents have documented differences in how those elevated on psychopathic traits evaluate situations involving moral transgressions (i.e., actions defined by the consequences to others, such as hurting someone else) and conventional transgressions (i.e., actions defined by breaking social rules, such as talking in class). Compared to other youths with conduct problems, youths showing elevated psychopathic traits make less clear distinctions between moral and conventional transgressions and make fewer references to the welfare of others when making these distinctions (Blair, 1997; Blair, Monson, & Frederickson, 2001; Dolan & Fullam, 2010b). Importantly, no study has tested these differences in evaluating moral and conventional transgressions with measures specific to CU traits, although adolescent sex offenders with elevated levels of CU traits demonstrated less mature moral judgments related to their victims (van Vugt et al., 2012).

Also, several studies reported that children and adolescents with severe conduct problems and elevated CU traits endorse more deviant values and goals in social situations, such as viewing aggression as a more acceptable means for obtaining goals, blaming others for their misbehavior, and emphasizing the importance of dominance and revenge in social conflicts (Chabrol, van Leeuwen, Rodgers, & Gibbs, 2011; Pardini, 2011; Pardini et al., 2003; Stickle, Kirkpatrick, & Brush, 2009). Further, on a laboratory task measuring altruistic behavior, adolescents high on both CU traits and conduct problems were more likely to make decisions that

benefitted themselves while harming others compared to normal controls, and this association between task performance and CU traits remained after controlling for level of externalizing behaviors, suggesting that the association was not due to the presence of more severe conduct problems or impulsivity (Sakai, Dalwani, Gelhorn, Mikulich-Gilbertson, & Crowley, 2012).

It is not surprising from these findings, and because CU traits are defined in part by a lack of concern for the feelings of others, that studies have consistently reported a negative association between CU traits and measures of empathy. However, there appears to be some variation in findings when different types of empathy are considered. Specifically, studies have consistently reported that CU traits are associated with deficits in affective empathy (i.e., experiencing negative emotions due to the harm caused to others; Chabrol et al., 2011; Dadds, Cauchi, Wimalaweera, Hawes, & Brennan, 2012; Dadds et al., 2009; A. P. Jones, Happe, Gilbert, Burnett, & Viding, 2010; Pardini & Byrd, 2012; Pardini et al., 2003), and this association remains significant after controlling for level of impulsivity and conduct problems (Pardini et al., 2003) and level of aggression (Pardini & Byrd, 2012). However, the association between CU traits and deficits in cognitive empathy (i.e., the ability to take the perspective of others) has been reported in some studies (Chabrol et al., 2011; Dadds et al., 2009; Pardini et al., 2003; Stellwagen & Kerig, 2013) but not others (Anastassiou-Hadjicharalambous & Warden, 2008a; Dadds, Cauchi, et al., 2012; A. P. Jones et al., 2010; Schwenck et al., 2012). The results of a study by Dadds et al. (2009) suggest that this discrepancy may be age-related. Specifically, Dadds et al. (2009) reported that parent-reports of CU traits were related to lower levels of cognitive empathy in boys prior to age 9 but were not related to deficits in cognitive empathy after this age, whereas the deficits in emotional empathy persisted throughout childhood. These authors suggested, based on these findings, that children with CU traits have deficits in both affective and cognitive empathy early in development but may learn to take others perspective later in childhood and adolescence. However, the deficits in affective empathy remain.

Of particular relevance to whether the cognitive deficits related to CU traits might help designate an important subgroup of children and adolescents with severe conduct problems, A. P. Jones et al. (2010) directly compared boys (ages 9–16) with conduct problems and high levels of teacher-reported CU traits (n = 21) to boys with conduct problems and normative levels of CU traits (n = 23), boys with autism spectrum disorder (ASD; n = 21), and normal control boys (n = 31). Boys with conduct problems and elevated levels of CU traits showed less affective empathy for victims of aggression compared to boys in the other three groups. However, they did not differ from normal controls on cognitive perspective taking or Theory of Mind tasks (e.g., tasks requiring the child to recognize the thoughts and feelings of others), whereas boys with ASD showed poorer performance on these cognitive tasks. Importantly, boys with conduct problems and normative levels of CU traits did not differ from normal controls on any of the empathy or perspective-taking measures, suggesting that the problems in affective empathy were specific to those with significant levels of CU traits. These results showing distinct profiles of empathy deficits for boys with CU traits and conduct problems, boys with ASD, and boys with conduct problems without elevated CU traits were replicated using the Diagnostic and Statistical Manual of

Table 2
Cognitive Characteristics Associated With Callous-Unemotional (CU) Traits

Study	Sample	Key methods	Summary of results
Anastassiou-Hadjicharalambous & Warden (2008a)	N = 122; age = 10; 96% male; high-risk community and clinical sample.	Cross-sectional; primary caregiver and teacher reports of CU traits; cognitive and affective perspective taking vignettes.	Children with conduct disorder (CD) with normative levels of CU traits demonstrated deficits in both cognitive and affective perspective taking, whereas those with CD and elevated CU traits demonstrated deficits in affective perspective taking only.
Blair (1997)	N = 42; mean age = 13.20 (CU) and 12.79 (controls); 100% male; residential treatment sample.	Cross-sectional; teacher report of psychopathic traits including CU traits; moral/conventional dilemma vignettes.	Children with psychopathic traits made less moral/conventional distinctions and attributed less moral emotions to story protagonists than children with disruptive behavior problems only.
Blair, Colledge, & Mitchell (2001)	N = 51; age = 9–17; 100% male; clinical sample.	Cross-sectional; teacher report of psychopathic traits including CU traits; laboratory tasks of gambling and response reversal.	Boys with behavior problems and high levels of psychopathic traits were less able to change stimulus responses and responded more poorly to gradual punishment compared to boys with behavioral problems who were low on psychopathic traits.
Blair, Monson, & Frederickson (2001)	N = 102; age = 8–16; 100% male; clinical sample.	Cross-sectional; teacher report of psychopathic traits including CU traits; moral/conventional dilemma vignettes.	Boys with behavior problems and high levels of psychopathic traits performed more poorly when asked to make distinctions between moral and conventional social rules and made fewer references to the welfare of others when making determinations between moral and conventional rules compared to boys with behavioral problems who were low on psychopathic traits.
Chabrol et al. (2011)	N = 972; age = 14–21; 61% male; community sample.	Cross-sectional; self-report of CU traits; self-report of empathy and cognitive distortions.	CU traits were negatively associated with cognitive empathy, and positively associated with self-serving cognitive distortions such as blaming others, minimizing/mislabeling, and using self-centered thoughts. Higher levels of self-serving cognitive distortions were associated with more extensive antisocial behavior among participants with a CU presentation.
Dadds et al. (2009)	N = 2,760; age = 3–13; 50% male; community sample.	Cross-sectional; maternal report of CU traits; maternal report of empathy.	For boys across all ages, CU traits were associated with deficits in affective empathy; CU traits were associated with deficits in cognitive empathy for both sexes in young children, but boys with high CU traits did not show lower cognitive empathy in adolescence.
Dadds, Cauchi, et al. (2012)	N = 195; age = 6–16; mean age = 10.52; 76% male; clinic-referred sample.	Cross-sectional; parent, teacher, and self-reports of CU traits; maternal ratings of empathy.	Children high on CU traits had substantially lower scores on the measure of affective empathy but not cognitive empathy.
DeLisi et al. (2011)	N = 432; Grades 7–8; 57% male; community sample.	Cross-sectional; teacher report of CU traits; individually administered intelligence and achievement tests.	Consider empathy. Children high on CU traits had lower scores on achievement tests but showed no differences on intelligence tests compared to normal controls and controls with attention-deficit/ hyperactivity disorder (ADHD). (table continues)

Table 2 (continued)

Study	Sample	Key methods	Summary of results
Dolan & Fullam (2010b)	N = 115; age = 13–18; 100% male; forensic sample.	Cross-sectional; clinician rating of psychopathic traits including CU traits; moral/conventional vignettes.	Youths high on psychopathic traits viewed both moral and conventional transgressions as more permissible and conventional transgressions as less serious than offenders low on psychopathic traits. Further, youths high on psychopathic traits made fewer distinctions between moral and conventional transgressions than offenders low on psychopathic traits.
Fisher & Blair (1998)	N = 39; age = 9–16; 100% male; clinical sample.	Cross-sectional; multiple teacher reports of psychopathic traits including CU traits; laboratory measure of response modulation, moral/conventional vignettes.	Boys with behavior problems and high levels of psychopathic traits showed deficient responses to punishment when a reward oriented response was primed. These youth also showed poorer ability to make moral versus conventional distinctions about social rules than boys with emotional and behavioral problems who were low on psychopathic traits.
Fontaine et al. (2008)	N = 4,713; age = 9; 46% male; twin birth cohort sample.	Cross-sectional; teacher report of CU traits; teacher report of hyperactivity and conduct problems; individually administered intelligence tests.	CU traits were initially negatively related to verbal and nonverbal abilities. However, after accounting for conduct problems and hyperactivity, these associations were no longer significant.
Frick, Cornell, Bodin, et al. (2003)	N = 98; mean age = 12.36; 53% male; community sample.	Cross-sectional; parent and teacher report of CU traits; computer task of reward dominance; vignette procedure to assess hostile attributions.	Youths with conduct problems and elevated CU traits showed poorer response to punishment when a reward-oriented response was primed, but boys with conduct problems only did not. For boys only, those with conduct problems without high levels of CU traits were more likely to show a hostile attributional bias.
A. P. Jones et al. (2010)	N = 102; age = 9-16; 100% male; high-risk, community and clinical sample.	Cross-sectional; teacher report of CU traits; vignettes to assess values on outcomes of aggression; self-report of attributions of emotions to self; multiple Theory of Mind tasks.	Boys with conduct problems and elevated CU traits reported experiencing less fear and less empathy for victims of aggression compared to normal control boys, boys with autism spectrum disorder (ASD), or boys with conduct problems only. However, boys with elevated CU traits did not differ from normal boys on cognitive perspective taking or Theory of Mind tasks, whereas those with ASD did show deficits on these tasks. Boys with conduct problems but normative levels of CU traits did not differ from normal controls on any of the emotional or cognitive tasks.
Kimonis, Frick, Skeem, et al. (2008)	N = 248; age = 12–20; 76% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of socioemotional competence; skin	Higher levels of CU traits were associated with less empathy, less positive affect, and less skin conductance reactivity to provocations
Loney et al. (1998) ^a	N = 117, age = 6–13; 78% male; clinical sample.	conductance reactivity. Cross-sectional; parent and teacher reports of CU traits; individually administered intelligence test.	from peers. Children with conduct problems and normative levels of CU traits showed lower levels of verbal intelligence compared to children with conduct problems and elevated CU traits.
Lorber et al. (2011)	N = 76; age = 10–19; 75% male; high-risk community sample.	Cross-sectional; self-report of CU traits; vignettes assessing outcome expectations.	CU traits were not significantly associated with positive expectations for outcomes of the youth's behavior such as receiving a tangible reward, reducing aversive treatment, or demonstrating dominance. (table continues)

Table 2 (continued)

forensic sample. forensic sample. staff report, and self-reports of CU traits; gender, sensa impulsivity. Muñoz Centifanti & Modecki (2013) $N = 675$; age = 16–20 (mean age community sample. $N = 675$; age = 16–20 (mean age community sample. $N = 675$; age = 16–20 (mean age community self-report demonstrated community sample. $N = 13.2$; age = 6–13; 78% male; Cross-sectional; teacher clinical sample. $N = 132$; age = 6–13; 78% male; Cross-sectional; teacher clinical sample. $N = 132$; age = 6–13; 78% male; Cross-sectional; teacher report of CU traits; elevated CU to the compared to the clinical sample.	f CU traits predicted less nsivity controlling for tition seeking, and
Muñoz Centifanti & Modecki (2013) $N = 675$; age $= 16-20$ (mean age (2013) $= 16.9$); 48% male; high-risk of CU traits; computer of CU traits; computer measure of risk taking. $N = 132$; age $= 6-13$; 78% male; Cross-sectional; teacher clinical sample. $N = 132$; age $= 6-13$; 78% male; Cross-sectional; teacher report of CU traits; elevated CU traits; $N = 132$; age $= 6-13$; 78% male; $N = 132$; age $= 6-13$; ; age	
O'Brien & Frick (1996) ^a $N = 132$; age = 6–13; 78% male; Cross-sectional; teacher clinical sample. Cross-sectional; teacher report of CU traits; elevated CU traits;	less sensitivity to when with same age peers
dominance. punishment w response set v youths with c	onduct problems with traits and low anxiety responsiveness to when a reward-oriented was primed compared to conduct problems who native levels of CU traits.
forensic sample. of CU traits; self-report of empathy; vignette procedure for assessment of expectations and values of social outcomes. of CU traits; self-report conduct proble conduct proble values of social outcomes. aggression (i. dominance), a expectations a of deviant bel	related to deficits in I emotional empathy or level of impulsivity and lems. CU traits were also reased expectations and e positive consequences of e., tangible rewards and and decreased and values for punishment havior controlling for illsivity and conduct
forensic sample. of CU traits; social goals assessed using a vignette procedure. revenge, dom and reported about victim controlling fo	uths with elevated CU od more deviant social peer conflicts (e.g., ninance, forced respect) lower levels of concern suffering, while or prior history of elligence, and demographic
Pardini & Byrd (2012) N = 96; mean age = 10.31; 48%	associated with less aggression would result in less concern over victim less remorse, controlling ggression. CU traits were ed with less empathic less sadness in response to ss controlling for level of
male; residential treatment center sample. male; residential treatment center report of CU traits; levels of CU laboratory tasks of executive functioning, set shifting, and social shifting task, situations. However, chi CU traits performed to the conventional recognition of the convention of the c	SD diagnosis and high traits did not differ from SD and low CU traits in functioning task, set or a social situations task. ildren with ASD and high formed poorer on moral- distinctions and f sadness than their low-
clinic-referred and community of CU traits; laboratory related to task sample. task of altruistic participants we behavior. elevated CU make decision while harming with CU traits.	conduct problems were not k performance. However, with conduct problems and traits were more likely to ns that benefit themselves g others. The association is remained after or externalizing behaviors.
	positively correlated with

(table continues)

Table 2 (continued)

Study	Sample	Key methods	Summary of results
Salekin et al. (2012)	N = 36; age = 12–18; 67% male; forensic sample.	Cross-sectional; self-report of psychopathic traits including CU traits; performance test of cognitive abilities.	Youths with conduct problems and psychopathic traits showed improved cognitive performance following a motivational message.
Schwenck et al. (2012)	N = 192; age = 6–17; 100% male; clinic-referred sample.	Cross-sectional; parent report of CU traits; computerized tasks assessing emotional and cognitive empathy.	Boys with CD and elevated CU traits showed deficits in emotional empathy but not cognitive empathy, whereas boys with ASD showed deficits in cognitive empathy but not emotional empathy. Boys with CD and normative levels of CU traits did not differ from control boys on the measures of empathy.
Stellwagen & Kerig (2013)	N = 146; Grades 6–8; 42% male; community sample.	Cross-sectional; teacher report of CU traits; Theory of Mind narratives.	Teacher report of CU traits were negatively associated with performance on a Theory of Mind task.
Stickle et al. (2009) ^b	N = 150; age = 11–17; 60% male; forensic sample.	Cross-sectional; detention staff and self-reports of CU traits; vignettes to assess response to ambiguous social situations.	CU traits were associated with positive beliefs about the acceptability of aggressive response during social situations controlling for impulsivity and aggression.
van Vugt et al. (2012)	N = 85; age = 13–23; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; structured interview of moral judgment; self-report measures of cognitive and affective empathy.	Within a sample of young sex offenders, higher levels of CU traits were associated with less mature moral judgment for the youth's abuse victim. Negative associations were found between cognitive and affective empathy and CU traits, for general life situations and sexual situations. Although higher rates of CU traits were not associated with lower cognitive or affective empathy for victims generally, lower affective empathy was found for victims who were unfamiliar to the offender.
Vaughn et al. (2011)	N = 432; Grades 7–8; 57% male; community sample.	Cross-sectional; teacher and self-reports of CU traits; group and individually administered tests of reading abilities; individually administered test of intelligence; teacher report of ADHD behaviors.	CU traits were negatively associated with intelligence test scores. CU traits predicted poor reading comprehension controlling for ADHD and intelligence.
Vitale et al. (2005)	N = 329; age = 16; 53% male; community sample.	Cross-sectional; self-report of psychopathic traits including CU traits; Stroop task.	Youths with high levels of psychopathic traits and low levels of anxiety showed reduced interference on a Stroop task compared to youths low on anxiety and psychopathic traits. Boys with high levels of psychopathic traits and low on anxiety made more passive avoidance errors than boys low on psychopathic traits and anxiety.
Waschbusch, Walsh, et al. (2007)	N = 53; age = 7–12; 75% male; clinic-referred sample.	Cross-sectional; parent and teacher reports of CU traits; social problem solving task.	Youths with conduct problems and elevated CU traits showed greater flexibility in solutions to a social problem-solving task. Youths with conduct problems and normative levels of CU traits demonstrated lower solution relevance, less flexible use of prosocial solutions, and more overtly antisocial outcomes.

Mental Disorders (4th ed., text rev.; American Psychiatric Association, 2000) definition of CD as the measure of conduct problems and using different laboratory measures of empathy (Schwenck et al., 2012).

Taken together, the available research strongly suggests that children and adolescents with conduct problems and nonnormative levels of CU traits differ from other youths with conduct problems by showing abnormalities in the processing of punishment cues, by endorsing more deviant social goals, and by showing deficits in affective empathy. In contrast, deficits in cognitive empathy and cognitive perspective taking have not been as consistently documented in those with elevated levels of CU traits, especially in samples of older children and adolescents. Consistent with these mixed findings related to cognitive perspective taking, some studies reviewed in Table 2 reported that adolescents with both conduct problems and elevated levels of CU traits were less impaired in their verbal abilities (Loney, Frick, Ellis, & McCoy, 1998; Salekin, Neumann, Leistico, & Zalot, 2004), were less likely to show a hostile attribution bias (Frick, Cornell, Bodin, et al., 2003), and showed greater flexibility in developing solutions in socialproblem-solving tasks (Waschbusch, Walsh, Andrade, King, & Carrey, 2007) than other adolescents with conduct problems. However, such evidence for less impaired cognitive abilities in youths with elevated CU traits has not been found in all studies (DeLisi et al., 2011; Vaughn et al., 2011) and requires further testing.

Emotional Characteristics

In Table 3, we summarize 26 studies investigating the emotional characteristics associated with psychopathic (n = 6) or CU (n =20) traits in children and adolescents. The studies are quite consistent in suggesting that children and adolescents high on CU traits are impaired in their responsiveness to and recognition of cues to fear and sadness in others. The consistency of findings is remarkable given the wide age ranges used in the studies and the diverse methods for assessing emotional responsiveness. Of particular relevance to whether CU traits may be important for designating an etiologically distinct subgroup of children and adolescents with severe conduct problems is that several studies reported that children or adolescents with severe conduct problems but normative levels of CU traits show no deficits in their recognition of emotions in others (Blair, Colledge, Murray, & Mitchell, 2001; Dadds, El Masry, Wimalaweera, & Guastella, 2008; Dadds, Perry, et al., 2006; Fairchild, Stobbe, Van Goozen, Calder, & Gooyer, 2010; Stevens, Charman, & Blair, 2001) and show an enhanced emotional responsiveness to distress cues in others (Kimonis et al., 2006; Kimonis, Frick, Muñoz, & Aucoin, 2008; Loney et al., 2003). Such findings suggest that CU traits distinguish among subgroups of children and adolescents with severe conduct problems who show very different emotional characteristics. A study by Willoughby, Waschbusch, Moore, and Propper (2011) suggests that these differences in emotional processing between groups of children with conduct problems may be evident very early in life. Specifically, 5-year-old children (n = 178) with high levels of parent-reported CU traits and symptoms of oppositional defiant disorder (ODD), which often precedes CD, were rated as less soothable and showed less negative reactivity to the still-face paradigm (i.e., parental face showing no emotion or interaction

with infant) as infants (6 months) compared to those with symptoms of ODD but with normative levels of CU traits.

Another study reviewed in Table 3 could be informative as to the factors that may lead to the deficits in emotional responding in children and adolescents with significant CU traits. Specifically, Dadds et al. (2008) reported on a community sample (n = 100) of boys ages 8 to 15 years and found that boys high on CU traits demonstrated poorer recognition of fearful faces, consistent with a large number of other studies reported in Table 3. Importantly, these authors also demonstrated that boys with high levels of CU traits exhibited deficits in their attention to the eye region compared to boys low on CU traits, even controlling for level of conduct problems and hyperactivity. However, these deficits disappeared under conditions in which the boys were explicitly instructed to focus on the eyes of others. Thus, this study suggests that the deficits in the recognition of distress cues in others exhibited by boys with a CU presentation may be related to a failure to focus on the eye region in the faces of others, and this deficit could potentially be overcome with specific instruction and training.

Biological Markers

Table 4 summarizes 32 studies investigating various biological correlates to psychopathic (n = 14) or CU (n = 18) traits. Most of these studies show psychophysiological correlates to CU traits supporting the results reported previously that children and adolescents with nonnormative levels of CU traits show blunted emotional reactivity to certain types of stimuli. For example, both Anastassiou-Hadjicharalambous and Warren (2008b) and de Wied, van Boxtel, Matthys, and Meeus (2012) reported that youths with both CD and elevated CU traits showed a lower magnitude of heart rate change to emotionally evocative films compared to youths with CD but normative levels of CU traits. In addition, adolescents with psychopathic traits demonstrate reduced skin conductance reactivity when anticipating aversive stimuli (Fung et al., 2005; Isen et al., 2010) and abnormal event-related potentials to stimuli showing others in pain (Cheng, Hung, & Decety, 2012). Further, CU traits were negatively related to skin conductance reactivity when responding to peer provocation in a sample of detained adolescent boys (Kimonis, Frick, Skeem, et al., 2008). Finally, children with CU traits have shown blunted cortisol reactivity to experimentally induced stress (Stadler et al., 2011).

Functional imaging studies of children and adolescents have consistently found youths with both conduct problems and either psychopathic (White, Marsh, et al., 2012) or CU (A. P. Jones, Laurens, Herba, Barker, & Viding, 2009; Marsh et al., 2008) traits exhibit lower right amygdala activity in response to fearful faces in comparison to normal controls or they exhibit lower right amygdala activity during an affective theory of mind task (Sebastian et al., 2012). Importantly, Sebastian et al. (2012) demonstrated that the association between CU traits and lower amygdala activity could not be accounted for by conduct problem severity or hyperactivity and, consistent with the findings reviewed on laboratory tasks of emotional processing, children with severe conduct problems with normative levels of CU traits showed the opposite pattern of amygdala activity (i.e., increased right amygdala activity). Another imaging study showed that youths with CD or ODD and high levels of psychopathic traits showed disruptions in

Table 3
Emotional Characteristics Associated With Callous-Unemotional (CU) Traits

Study	Sample	Key methods	Summary of results
Blair (1999)	N = 42; age = 8–17; 100% male; clinical sample.	Cross-sectional; self-report of psychopathic traits including CU traits; slides with distressing, threatening, and neutral images; skin conductance.	Boys with behavior problems and high levels of psychopathic traits had lower initial levels of skin conductance and were less responsive to distress cues compared to children with emotion and behavior problems who were low on psychopathic traits as well as normal controls.
Blair & Coles (2000)	N = 55; age = 11–14; 56% male; community sample.	Cross-sectional; teacher report of psychopathic traits including CU traits; laboratory measure of labeling facial expressions.	Psychopathic traits were inversely related to ability to recognize sad and fearful facial expressions.
Blair, Colledge, Murray, & Mitchell (2001)	N = 51; age = 9–17; 100% male; clinical sample.	Cross-sectional; self-report of psychopathic traits including CU traits; laboratory task labeling changing facial expressions.	Boys with behavior problems and psychopathic traits made more errors recognizing fearful facial expressions and were less responsive to sad expressions compared to boys with behavior problems only.
Blair, Budhani, et al. (2005)	N = 43; age = 11–15; 100% male; clinical sample.	Cross-sectional; self-report of CU traits; vocal affect recognition task.	Boys with behavior problems and high levels of psychopathic traits showed impaired recognition of fearful vocal tones compared to boys with behavior problems but normative levels of psychopathic traits.
Dadds, Perry, et al. (2006) ^a	N = 98; age = 8–17; 100% male; community sample.	Cross-sectional; self-report of CU traits; laboratory facial expression recognition task.	CU traits were negatively associated with accuracy in identifying fearful faces while controlling for antisocial behavior. This poorer fear expression recognition existed for high CU boys except when instructed to attend to the eyes, whereas boys low on CU traits did not show a fear recognition deficit.
Dadds et al. (2008) ^a	N = 100; age = 8–15; 100% male; community sample.	Cross-sectional; parent and self-reports of CU traits; measurement of multiple indices of eye-gaze.	Boys high on CU traits demonstrated poorer recognition of fear, as well as deficits in attention to the eye region, compared to boys low on CU traits, controlling for level of antisocial behavior and hyperactivity. When instructed to "look at the eyes," the deficit in eye gaze was reduced in boys high on CU traits.
Dolan & Fullam (2010a)	N = 84; age = 14–18; 100% male; forensic sample.	Cross-sectional; clinician rating of psychopathic traits including CU traits; laboratory task of emotional memory.	A negative association was found between CU traits and emotional memory when controlling for impulsivity and antisocial behavior.
Fairchild et al. (2009)	N = 81; age = 14–18; 100% male; high-risk community sample.	Cross-sectional; self-report of psychopathic traits including CU traits; laboratory facial expression recognition task.	Boys high on psychopathic traits demonstrated deficits in recognizing fearful, sad, and surprised faces compared to boys with conduct disorder (CD) and normative levels of psychopathic traits.
Fairchild et al. (2010)	N = 55; age = 14–18; 0% male; high-risk community sample.	Cross-sectional; self-report of CU traits; skin conductance; startle response.	Girls with CD and a CU presentation demonstrated impaired recognition of sad faces compared to girls with CD only. (table continues)

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Table 3 (continued)

Study	Sample	Key methods	Summary of results
Kimonis et al. (2006)	N = 50; age = 6–13; 54% male; community sample.	Cross-sectional; parent and self-reports of CU traits; emotional pictures dot-probe task to assess attentional orienting.	High rates of both CU traits and conduct problems were associated with reduced attentional orienting responses to distressing pictorial stimuli, whereas high rates of conduct problems without CU traits were associated with increased attentional orienting.
Kimonis, Frick, Muñoz, & Aucoin (2008)	N = 88; age = 13–18; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; emotional pictures dot-probe task to assess attentional orienting.	High rates of both CU traits and aggression were associated with reduced attentional orienting response, whereas high rates of aggression without CU traits were associated with increased attentional orienting.
Leist & Dadds (2009)	N = 23; age = 16–18; 74% male; inpatient clinical sample.	Cross-sectional; clinician and self-reports of CU traits; laboratory task of labeling emotional faces.	When controlling for antisocial behavior, CU traits were associated with impairments in recognizing fearful faces, whereas antisocial behavior was associated with impaired anger recognition when controlling for CU traits.
Loney et al. (2003)	N = 60; age = 12–18; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; reaction time to recognition of emotional and neutral words.	CU traits were associated with diminished reactivity to negative emotional words, controlling for impulsivity and conduct problems.
Loney et al. (2006)	N = 108; age = 12–18; 49% male; community sample.	Cross-sectional; parent report of CU traits; salivary cortisol.	Boys with conduct problems and elevated CU traits showed lower resting levels of cortisol compared to boys with only conduct problems or normal controls.
Lotze et al. (2010)	N = 50; age = 6–12; 38% male; high-risk sample.	Cross-sectional; mentor and self-reports of CU traits; self-report of emotional regulation and guilt.	Children's self-report of guilt was negatively associated with CU traits whereas problems in emotional regulation were associated with externalizing behaviors.
Marsh et al. (2011)	N = 42; age = 10–17; 57% male; community sample.	Cross-sectional; self-report and clinician rating of psychopathic traits including CU traits.	Children with psychopathic traits reported less subjective experiences of fear relative to other emotions during recent emotionally evocative life events compared to healthy controls. Moreover, children with psychopathic traits reported fewer symptoms associated with sympathetic nervous system arousal during fear-evoking experiences compared to healthy controls.
Muñoz (2009)	N = 55; age = 8–16; 100% male; community sample.	Cross-sectional; self-report of CU traits; labeling task of facial expressions and postures.	CU traits were related to deficits in labeling many facial expressions, specifically poorer accuracy when labeling afraid faces. CU traits were also related to deficits in labeling certain body postures related to fear.
Muñoz, Pakalniskiene, & Frick (2011)	N = 201; age = 11–12; 50% male; community sample.	Cross-sectional; self-report of CU traits; self-report of empathy.	Youths with high levels of CU traits reported lower levels of affective and cognitive empathy compared to controls low on CU traits.
Sharp et al. (2006)	N = 659; age = 7-11; 48% male; community sample.	Cross-sectional; parent and teacher reports of psychopathic traits including CU traits; self-report ratings of arousal and pleasure to pictorial stimuli.	Psychopathic traits were associated with low ratings of arousal to unpleasant pictorial stimuli controlling for oppositional defiant disorder (ODD) and CD symptoms (table continues)

Table 3 (continued)

Study	Sample	Key methods	Summary of results
Stadler et al. (2011)	N = 36; age = 8–14; 100% male; clinical sample.	Cross-sectional; parent report of CU traits; salivary cortisol.	Although attention-deficit/hyperactivity disorder (ADHD) boys high and low on CU traits did not differ in their self-report of emotional reactivity, boys high on CU traits demonstrated a blunted cortisol reactivity to stress when controlling for comorbid symptoms, which included delinquent and aggressive behavior.
Stevens et al. (2001)	N = 37; age = 9–15; 100% male; clinical sample.	Cross-sectional; teacher report of psychopathic traits including CU traits; laboratory task of labeling facial and vocal emotions.	Boys with behavior problems and high levels of psychopathic traits were less able to accurately recognize sad and fearful faces and sad vocal tones compared to boys with behavior problems only.
Sylvers et al. (2011)	N = 88; age = 7-11; 100% male; community sample.	Cross-sectional; parent and self-reports of CU traits; measured response to preconscious emotional visual stimuli.	CU traits were associated with automatic preconscious fear- recognition deficits and disgust- recognition deficits, controlling for impulsivity and conduct problems.
Thijssen et al. (2012)	N = 42; age = 8–12; 57% male; community sample.	Cross-sectional; parent report of CU traits; laboratory task of memory for neutral and negative pictures.	Children with elevated CU traits did not demonstrate a deficit in the ability to remember negative emotional pictures.
van Baardewijk et al. (2008)	N = 360; age = 9–12; 52% male; community sample.	Cross-sectional; self-report of CU traits; video vignettes to evoke empathy reactions; self and peer nominations of empathy.	CU traits were negatively associated with empathetic reactions to sad situational videos, as well as self-reported and peer-nominated empathy.
Willoughby et al. (2011)	N = 178; age = 5; 51% male; high-risk community sample.	Longitudinal; parent report of CU traits; parent report of temperament, ADHD, and ODD; behavioral and physiological reactivity to Still-Face Paradigm.	Children (60 months) with symptoms of ODD and elevated CU traits were rated as less soothable as infants (6 months) than non-ODD children. They also showed less negative reactivity to the still-face paradigm as infants than either non-ODD or ODD-only children, and showed greater recovery in positive affect during the reunion period than either non-ODD or ODD-only groups.
Woodworth & Waschbusch (2008)	N = 73; age = 7–12; 81% male; clinic-referred sample.	Cross-sectional; parent and teacher reports of CU traits; task of labeling emotions from pictures of faces.	Youths with elevated CU traits were less accurate in identifying sad facial expressions controlling for level of conduct problems. In contrast, there was a trend for youths with elevated CU traits to more accurately identify fear expressions compared to youths with conduct problems only.

amygdala-prefrontal functional connectivity (Finger et al., 2012). The same research group reported that youths with both conduct problems and elevated CU traits demonstrated abnormal responses within the ventromedial prefrontal cortex during punished reversal errors compared to normal controls (Finger et al., 2008). Finally, White, Brislin, Meffert, Sinclair, and Blair (2013) reported that the association between increases in punishments and increases in activity in dorsal anterior cingulate cortex and anterior insula activity was weaker for adolescents with higher levels of CU traits. Although more imaging studies are needed, especially directly comparing children and adolescents with conduct problems

with and without elevated levels of CU traits, these studies are quite promising for potentially clarifying the neurological markers for some of the emotional and cognitive characteristics of children and adolescents with severe conduct problems and elevated CU traits.

Research on structural brain differences in children and adolescents with elevated levels of CU traits is more limited. One structural imaging study reported that, compared to normal developing boys, boys with both conduct problems and elevated CU traits showed increased grey matter concentration in the medial orbitofrontal and anterior cingulate cortex, in addition to increased

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Table 4
Biological Markers of Callous-Unemotional (CU) Traits

Study	Sample	Key methods	Summary of results
Anastassiou-Hadjicharalambous & Warden (2008b)	N = 95; age = 7–11; 95% male; high-risk community sample and clinical sample.	Cross-sectional; combined parent and teacher reports of CU traits; resting and reactive heart rate using electrocardiogram.	Youths with conduct disorder (CD) and elevated CU traits exhibited lower magnitude of heart rate change while watching an emotionally evocative film compared to youths with CD only and non-conduct disorder controls.
Beitchman et al. (2012)	N = 162; age = 6–16; 65% male; clinic-referred sample.	Cross-sectional; self-report of CU traits; DNA extraction from both whole blood and saliva.	CU traits were associated with two polymorphisms on the oxytocin receptor (OXTR) gene. Specifically, the haplotype consisting of the OXTR_rs237885 A allele and OXTR_rs2268493es A allele was associated with CU traits.
Cheng et al. (2012)	N = 28; age = 15–18; 100% male; forensic sample.	Cross-sectional; clinician ratings of psychopathic traits including CU traits; event related potential (ERP) for empathy eliciting stimuli; pressure pain threshold measured by pressure algometer.	Compared to control subjects, offenders both low and high on psychopathic traits demonstrated higher pain thresholds. Youths high on psychopathic traits showed impairment in both early and late processing of empathy, evidenced by decreased frontal N120, central P3, and late positive potential (LPP) when responding to stimuli showing others in pain.
De Brito et al. (2009)	N = 48; mean age = 11.7; 100% male; community sample.	Cross-sectional; combined parent and teacher reports of CU traits; structural magnetic resonance imaging (MRI) analyzed using optimized voxel-based morphometry.	Compared to typically developing boys, boys with conduct problems and elevated CU traits showed increased grey matter concentration in the medial orbitofrontal and anterior cingulate cortices in addition to increased grey matter volume and concentration in the temporal lobes bilaterally.
de Wied et al. (2012)	N = 63; age = 12–15; 100% male; high-risk community sample.	Cross-sectional; combined parent and teacher report of CU traits; resting heart rate and respiratory sinus arrhythmia (RSA) using electrocardiogram.	Resting RSA was significantly lower in youths with conduct problems and elevated CU traits compared to other conduct problem youths and age-matched normal controls. Youths with conduct problems and elevated CU traits also demonstrated less change in heart rate response to empathy inducing film clips involving sadness compared to other youths with conduct problems and normal controls.
Fairchild et al. (2013)	N = 42; age = 14–20; 0% male; mixed clinical and community sample.	Cross-sectional; self-report of CU traits; gray- matter volume collected using MRI.	CU traits were positively associated with bilateral middle/ superior orbitofrontal (OFC) volume controlling for lifetime history of CD and attention-deficit/hyperactivity disorder (ADHD). Girls with CD and CU traits had reduced right anterior insula volume compared girls with CD and normative levels of CU traits. (table continues)

Table 4 (continued)

Study	Sample	Key methods	Summary of results
Finger et al. (2008)	N = 42; age = 10–17; 67% male; community sample.	Cross-sectional; clinician ratings and parent report of psychopathic traits including CU traits; blood-oxygen-level-dependent (BOLD) signal measured during functional magnetic resonance imaging (fMRI).	Youths with psychopathic traits demonstrated abnormal responses within the ventromedial prefrontal cortex during punished reversal errors compared to youths with ADHD and normal controls.
Finger et al. (2012)	N = 31; mean age = 14.8 (CD/ oppositional defiant disorder [ODD]) and 13.8 (control); 68% male; community sample.	Cross-sectional; clinician ratings and parent report of psychopathic traits including CU traits; diffusion tensor scans and BOLD signal measured during fMRI.	Youths with CD/ODD and high levels of psychopathic traits had disruptions in amygdala-prefrontal functional connectivity but no disruption in structural connections of the uncinate fasiculus or white matter tracts.
Fowler et al. (2009)	N = 147; age = 12–19; 93% male; clinical sample.	Cross-sectional; clinician ratings of psychopathic traits including CU traits; genotyping of Monoamine oxidase A (MAOA), 5HTT, and Catechol Omethyltransferase (COMT) variants.	Among adolescents with childhood ADHD, those possessing a low activity MAOA allele, those who were homozygous for the low activity 5HTT allele, and those with the high activity COMT Val/Val genotype demonstrated significantly higher CU traits even after controlling for CD.
Fung et al. (2005)	N = 130; age = 16; 100% male; community sample.	Cross-sectional; self-report of psychopathic traits, including CU traits; skin conductance recording during rest and countdown stressor task.	Youths who scored high on psychopathic traits exhibited reduced skin conductance activity when anticipating and responding to aversive stimuli compared to control youths with normative levels of psychopathic traits.
Glenn et al. (2007)	N = 335; age = 3; 61% male; community sample.	Longitudinal; self-report of psychopathic traits, including CU traits; electrocardiogram measuring skin conductance at resting and reactivity to orienting and aversive auditory stimuli; clinician ratings of child temperament.	Adults (age 28) who scored higher on psychopathic traits were more likely to have a fearless and disinhibited temperament at age 3. These adults also demonstrated longer skin conductance half-recovery times to aversive stimuli at age 3 compared those scoring lower on psychopathic traits as adults.
Hirata et al. (2013)	N = 144; age = 6–16; 72% male; clinic-referred sample.	Cross-sectional; clinician ratings of CU traits; genomic DNA from blood and saliva for genotyping of four COMT single-nucleotide polymorphisms (SNPs).	Within a sample of children and adolescents high on conduct problems, CU traits were associated with two COMT polymorphisms.
Holi et al. (2006)	N = 20; age = 16–22; 100% male; forensic sample.	Cross-sectional; clinician ratings of psychopathic traits including CU traits; serum cortisol levels.	Higher levels of CU traits among young adult male offenders were associated with lower levels of serum cortisol levels.
Isen et al. (2010)	N = 791; age = 9–10; 47.9% male; community sample.	Cross-sectional; parent report of psychopathic traits including CU traits; skin conductance reactivity on an attention orienting task.	Boys with higher levels of psychopathic traits showed lower skin conductance reactivity (SCR) to unsignaled and nonaversive auditory stimuli. There was no relationship between psychopathic traits and SCR hyporeactivity in girls. (table continues)

Table 4 (continued)

Study	Sample	Key methods	Summary of results
A. P. Jones et al. (2009)	N = 30; age = 10–12; 100% male; community twin sample.	Cross-sectional; combined parent and teacher reports of CU traits; functional image volumes acquired using BOLD contrasts.	Boys with conduct problems and elevated CU traits demonstrated lower right amygdala activity in response to fearful faces compared to an IQ matched normal control group.
Kimonis, Frick, Skeem, et al. (2008)	N = 248; age = 12–20; 76% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of socioemotional competence; skin conductance reactivity.	Higher levels of CU traits were associated with less empathy, less positive affect, and less skin conductance reactivity to provocations from peers.
Marsh et al. (2008)	N = 36; age = 10–17; 58% male; community sample.	Cross-sectional; clinician, parent and self-reports of CU traits; comparison of fMRI BOLD signals.	Youths with elevated CU traits showed reduced amygdala activation while processing fearful expressions compared to youths with ADHD and normal controls.
Racer et al. (2011)	N = 54; age = 9-14; 40% male; community sample.	Cross-sectional; self-report of CU traits; reaction time and ERP for three attention networks.	Youths with elevated CU traits demonstrated weaker P1 amplitude ERP responses on indices of alerting on an attention task, but not on indices of orienting or conflict. This reduced P1 amplitude was only present during the central cue condition, which provided temporal but not spatial information about an upcoming target.
Raine et al. (1990)	N = 40; age = 13–18; 100% male; forensic sample.	Cross-sectional; self-report of psychopathic traits including CU traits; verbal stimuli consisting of pairs of consonants and yowels.	Youths high on psychopathic traits demonstrated reduced ear asymmetries compared to those low on psychopathic traits, indicating reduced lateralization for verbal materials.
Sadeh et al. (2010)	Study 1: N = 118; mean age = 14.3; 42% male; community sample. Study 2: N = 178; mean age = 10.8; 55% male; community sample.	Study 1: Cross-sectional; self-report of CU traits; molecular genetics with genomic DNA collected via buccal swabs. Study 2: Cross-sectional; self- report of CU traits; genomic DNA collected via buccal swabs.	Youths with the I/I 5-HTT genotype living in low-socioeconomic-status (SES) homes showed higher levels of CU traits than youths living in high-SES homes.
Sebastian et al. (2012)	N = 47; age = 10–16; 100% male; community sample.	Cross-sectional; parent and teacher reports of CU traits; BOLD signal measured using fMRI; affective and cognitive Theory of Mind cartoon scenarios.	CU traits demonstrated a negative association with activity in the right amygdala in response to affective Theory of Mind scenarios after controlling for conduct problems. In contrast, conduct problems demonstrated a positive association with activity in the right amygdala in response to affective Theory of Mind scenarios after controlling for CU traits. These findings could not be explained by hyperactivity, depression/anxiety, or alcohol use.
Stadler et al. (2011)	N = 36; age = 8–14; 100% male; clinical sample.	Cross-sectional; parent report of CU traits; salivary cortisol collections before and after experimentally induced stress.	Youths with ADHD, conduct problems, and high levels of CU traits exhibited blunted cortisol reactivity to experimentally induced stress compared to youths with normative levels of CU traits. (table continues)

Table 4 (continued)

Study	Sample	Key methods	Summary of results
Sumich et al. (2012)	N = 77; age = 10–18; 100% male; community sample.	Cross-sectional; self-report of psychopathic traits including CU traits; ERP for a visual continuous performance task.	CU traits were positively associated with N200 amplitude at frontal and temporal brain regions during a visual continuous performance task after controlling for age, indicative of delay in maturational changes.
Syngelaki et al. (2013)	N = 92; age = 12–18; 100% male; forensic sample.	Cross-sectional; self-report of psychopathic traits including CU traits; startle reflex acquired through electromyography (EMG) measurements during response to aversive tones.	Youths with conduct problems and high levels of psychopathic traits had reduced startle amplitude compared to those without conduct problems and psychopathic traits. This difference was more pronounced during the viewing of negatively valenced slides. However, psychopathic traits did not significantly predict fear potentiated startle responses when controlling for CD symptoms.
Viding et al. (2010)	N = 8,374; age = 7; population- based mixed sex community sample.	Cross-sectional; teacher report of CU traits; screened allele frequency differences in 642,432 autosomal SNPs.	Identified 30 SNPs associated with conduct problems and elevated CU traits.
Wang et al. (2012)	N = 843; age = 9–10; 48.83% male; community sample.	Cross-sectional; parent report of CU traits; recording of heart rate (HR) and non-specific skin conductance responses (NS-SCRS) to aversive stimuli.	Increased HR acceleration was associated with CU traits in both boys and girls.
White et al. (2013)	N = 20; age = 11–17; 65% male; community sample.	Cross-sectional; self-report of CU traits; social exchange game; BOLD signal measured during event-related fMRI.	When playing a social exchange game, participants with higher levels of CU traits demonstrated a weaker relationship between increases in punishment of unfair offers and increased dorsal anterior cingulate cortex (dACC) and anterior insula activity.
White, Brislin, et al. (2012)	N = 59; mean age = 14.90 (conduct problem) and 14.38 (control); 75% male; community sample.	Cross-sectional; self-report of psychopathic traits including CU traits; cavum septum pellucidum (CSP) measurement using structural MRI; self-report of proactive and reactive aggression; parent semi-structured interviews of ADHD, ODD, and CD.	Compared to controls, youths with ODD/CD had a larger CSP. However, the size of the CSP did not differ among those with CD or ODD diagnoses. In addition, youths with ODD/CD who had a larger CSP did not exhibit higher levels of aggression or psychopathic traits.
White, Marsh, et al. (2012)	N = 32; age = 10–17; 66% male; community sample.	Cross-sectional; parent report of CU traits; BOLD signal measured during event-related fMRI; parent semi-structured interviews of ADHD, ODD, and CD.	Compared to youths with ODD/CD diagnoses and elevated CU traits, control youths showed a greater increase in amygdala response to fearful facial expressions under low versus high attentional loads. CU traits were uniquely and significantly correlated with amygdala response to fearful facial expressions under low attention load conditions. (table continues)

Table 4 (continued)

Study	Sample	Key methods	Summary of results
White, Williams, et al. (2012)	N = 36; age = 10–17; 61% male; community sample.	Cross-sectional; parent report of psychopathic traits including CU traits; BOLD signal measured during event-related fMRI; parent semi-structured interviews of ADHD, ODD, and CD.	Compared to controls, youths with ODD/CD and elevated psychopathic traits had reduced recruitment of the dorsal endogeneous attention orienting network in response to fearful faces. However, there were no differences between controls and ODD/CD with elevated psychopathic traits on eye gaze.
Wright et al. (2009)	N = 250; age = 3–6 months, 49% male; high-risk community sample.	Longitudinal; self-report of psychopathic traits including CU traits; blood specimens obtained in childhood analyzed for lead.	Higher levels of lead concentration in blood in early childhood was associated with higher levels of psychopathic traits in adulthood, after controlling for gender, race, maternal IQ, child IQ, and quality of home environment.

grey matter volume and concentration in the temporal lobes bilaterally (De Brito, Mechelli, Wilke, Laurens, & Jones, 2009). Importantly, the comparison group for this study was normal developing boys and not boys with conduct problems without a CU presentation. However, this finding is consistent with the findings of the twin study reported previously showing that common genes seemed to explain the association between right dorsal anterior cingulate gray matter concentrations and psychopathic traits (Rijsdijsk et al., 2010).

Several studies have investigated potential genetic polymorphisms associated with CU traits. Specifically, Viding et al. (2010) documented several potential autosomal single-nucleotide polymorphisms that could play a role in the development of CU traits. Further, Hirata, Zai, Nowrouzi, Beitchman, and Kennedy (2013) reported that among children and adolescents (ages 6-16) with severe conduct problems, CU traits were associated with two Catechol O-methyltransferase (COMT) polymorphisms. COMT is an enzyme that metabolizes catecholamines including dopamine and norepinephrine and polymorphisms in dopaminergic genes have been associated with serious conduct problems in past research (Moffitt et al., 2008). Fowler et al. (2009) also found evidence to suggest that COMT polymorphisms may be related to CU traits. Specifically, among adolescents (ages 12-19) with childhood ADHD, those with a) the high activity COMT Val/Val genotype, b) a low activity monoamine oxidase-a receptor (MAOA) allele, and c) who were homozygous for the low activity serotonin transporter (5HTT) allele demonstrated significantly higher clinician-rated CU traits. Importantly, this group difference remained even after controlling for the presence of CD. Finally, in a study of 162 children and adolescents (ages 6-16), CU traits were associated with two polymorphisms on the oxytocin receptor (OSTR) gene (Beitchman et al., 2012). Given the relatively few molecular genetic studies conducted to date, conclusions about potential genetic polymorphisms that may be related to the development of CU traits should be made cautiously. However, COMT polymorphisms deserve further study, given their associations with conduct problems in past research (Moffitt et al., 2008), as well as the findings on OSTR polymorphisms, given oxytocin's role in

affiliation and recognition of emotions in others (A. Campbell, 2010).

In summary, the available research has documented several psychophysiological correlates to CU traits that may provide the biological markers for many of the emotional and cognitive characteristics of youths with elevated CU traits reviewed previously. Generally, research has suggested that, like the emotional and cognitive characteristics themselves, the biological markers are also specific to CU traits and not related to severe conduct problems in general. The findings from functional imaging studies are also promising in suggesting that deficits in the amygdala and its connections to the prefrontal cortex may also be related to CU traits. However, this research has been less clear in disentangling the effects of severe conduct problems and CU traits more specifically. Finally, there have been too few molecular genetic studies to make firm conclusions but several promising polymorphisms have been found, including COMT and OSTR polymorphisms.

Temperament and Personality

Table 5 summarizes 20 studies investigating the temperament and personality correlates to either psychopathic (n = 5) or CU (n = 15) traits in children and adolescents. The most consistent finding is that CU traits are associated with lower levels of fear and lower levels of anxiety (or neuroticism), especially when controlling for either impulsivity or conduct problems. These findings are particularly relevant for understanding different correlates to severe conduct problems in those with and without CU traits because conduct problems in the absence of CU traits tend to be positively correlated with anxiety (Frick, Lilienfeld, Ellis, Loney, & Silverthorn, 1999). As a result, these findings provide further support for the contention that children and adolescents with severe conduct problems show different emotional characteristics depending on the presence of CU traits. This contention was most directly tested in a longitudinal study of 1,862 girls who were ages 5 to 8 at the initial assessment (Pardini, Stepp, Hipwell, Stouthamer-Loeber, & Loeber, 2012). Specifically, girls with CD who showed elevated CU traits exhibited fewer anxiety problems 6 years later compared

Table 5 Temperament and Personality Characteristics Associated With Callous-Unemotional (CU) Traits

Study	Sample	Key methods	Summary of results
Andershed et al. (2002)	N = 1,077; mean age = 14.41; mixed sex community sample.	Cross-sectional; self-report of psychopathic traits including CU traits; self- report of personality traits.	Boys with high levels of psychopathic traits showed lower levels of anxiety than boys who were high on impulsivity and conduct problems but normative on psychopathic traits.
Barker et al. (2011)	N = 7,000; age = 13; 50% male; population-based sample.	Longitudinal; parent report of CU traits; mother report of fearless temperament.	Fearless temperament at age 2 predicted both CU traits and conduct problems at age 13. In follow-back analyses, children (age 13) with both conduct problems and elevated CU traits showed higher rates of fearless temperament at age 2 compared to normal controls and lower fear response to punishment cues at age 2 compared to those high on conduct problems but with normative levels of CU traits.
C. T. Barry et al. (2003)	N = 98; mean age = 11.9; 52% male; high-risk community sample.	Cross-sectional; parent and teacher reports of CU traits; self-report of narcissistic traits.	CU traits were positively associated with maladaptive narcissistic traits, whereas CU traits were not associated with an adaptive narcissism composite or total narcissism scale in high-risk children.
Das et al. (2008)	N = 67; age = 11–19; 0% male; forensic sample.	Cross-sectional; clinician ratings of psychopathic traits including CU traits; self-report of psychopathology and personality traits.	Psychopathic traits were negatively associated with somatic complaints, sensitivity in reaction to others, social avoidance, and social imperturbability as measured by the Minnesota Multiphasic Personality Inventory (MMPI).
Decuyper et al. (2013)	N = 342; mean age = 15.85; 50% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of psychopathology and Big Five personality traits.	CU traits did not distinguish between three groups of juvenile offenders: an emotionally labile, close-minded and organized group; an undercontrolled group; or an emotionally labile and careless group.
Dolan & Rennie (2007)	N = 110; mean age = 16.27; 100% male; forensic sample.	Cross-sectional; clinician ratings of CU traits; self-report of trait anxiety.	When controlling for antisocial behavior, CU traits were negatively associated with trait anxiety but were not associated with a measure of fearlessness.
Essau et al. (2006)	N = 1443; age = 13–18; 54% male; community sample.	Cross-sectional; self-report of CU traits; self-report of personality.	CU traits were negatively correlated with agreeableness and conscientiousness; they were positively associated with sensation seeking.
Frick et al. (1999)	N = 143; age = 6–13; 77% male; clinical sample.	Cross-sectional; parent and teacher reports of CU traits; computerized structured interview of trait anxiety; self-report of fearlessness.	When controlling for level of conduct problems, CU traits were negatively related to trait anxiety and positively related to fearlessness.
Kerig & Stellwagen (2010)	N = 252; 6th-8th graders; 56% male; community sample.	Cross-sectional; teacher report of CU traits, narcissism, and Machiavellianism.	CU traits were positively associated with narcissism and Machiavellianism.
Lau & Marsee (2013)	N = 141; age = 11-17; 100% male; community sample.	Cross-sectional; self-report of CU traits; self-report of narcissism and Machiavellianism.	CU traits were positively associated with narcissism and Machiavellianism.
Lee et al. (2010)	N = 94; age = 12–18; 100% male; forensic sample.	Cross-sectional; clinician rated psychopathic traits including CU traits; self- report of personality traits.	Psychopathic traits were negatively associated with extraversion, agreeableness, and conscientiousness but positively associated with neuroticism.
Lynam et al. (2005)	N = 746; age = 13–16; 100% male; high-risk community sample.	Cross-sectional; parent and self-reports of psychopathic traits including CU traits; parent report of personality traits.	Psychopathic traits were negatively related to neuroticism and agreeableness when controlling for level of conduct problems.
			(table continues)

Table 5 (continued)

Study	Sample	Key methods	Summary of results
Pardini (2006)	N = 169; age = 11–18; 58% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of temperament and expectations for outcomes of aggression.	CU traits were associated with fearlessness, which was mediated by lower levels of punishment concern.
Pardini et al. (2007)	N = 120; age = 9–12; 59% male; high-risk community sample.	Cross-sectional; parent and teacher reports of CU traits; parent report of anxiety.	CU traits were negatively related to trait anxiety, controlling for level of conduct problems.
Roose et al. (2010) ^a	N = 455; age = 14–20; 56% male; community sample.	Cross-sectional; parent, teacher, and self-reports of CU traits; self-report of Big Five personality factors.	CU traits were negatively associated with agreeableness, conscientiousness, neuroticism, openness, and extraversion.
Roose et al. (2011) ^a	N = 830; age = 14–21; 73% male; community sample.	Cross-sectional; self-report of CU traits; self-report of impulsivity and personality traits.	CU traits were negatively associated with fear, anxiety, and reward-responsiveness, when controlling for impulsivity.
Sadeh et al. (2009)	N = 229; age = 11–17; 42% male; clinical and community sample.	Cross-sectional; parent and self-reports of CU traits; self-report of personality traits.	CU traits were negatively associated with a measure of stress reactivity after controlling for other personality dimensions.
Salekin et al. (2005) ^b	N = 114; age = 11–18; 70% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of personality traits.	CU traits were negatively related to agreeableness, conscientiousness, and openness for boys; but were only negatively associated with extraversion for girls.
Salekin et al. (2010) ^b	N = 145; age = 11–18; 69% male; forensic sample.	Cross-sectional; self-report of psychopathic traits including CU traits; self- report of personality traits.	Psychopathic traits were negatively associated with agreeableness, conscientiousness, extraversion, and openness.
Stellwagen & Kerig (2013)	N = 146; Grades 6–8; 42% male; community sample.	Cross-sectional; teacher report of CU traits; teacher report of Machiavellianism; self-report of maladaptive narcissism.	CU traits were positively associated with teacher report of Machiavellianism for both boys and girls. However, CU traits were not associated with self-reported maladaptive narcissism.

to girls with CD but with normative levels of CU traits. In another notable study that used a population-based sample (n=7,000), fearless temperament at age 2 predicted both CU traits and conduct problems at age 13 (Barker, Oliver, Viding, Salekin, & Maughan, 2011). However, in follow-back analyses, children at age 13 who were high on both conduct problems and CU traits showed lower fearful responses to punishment cues at age 2 compared to those high on conduct problems but without a CU presentation. This finding provides an important link between temperamental (i.e., low fear) and cognitive (e.g., punishment insensitivity) characteristics of children and adolescents with elevated CU traits.

Several studies summarized in Table 5 examined the association between CU traits and various deviant and normative personality traits. In terms of deviant traits, CU traits have been positively associated with narcissistic traits, although the strength of this correlation has varied widely across studies with correlations ranging from .19 to .62 (C. T. Barry, Frick, & Killian, 2003; Kerig & Stellwagen, 2010; Lau & Marsee, 2013). C. T. Barry et al. (2003) suggested that these widely varying correlations may depend on the content of the measure of narcissism, with more adaptive aspects of narcissism (e.g., self-sufficiency, authority) showing less strong correlations with CU traits than maladaptive aspects

(e.g., exploitiveness, entitlement). In terms of normative personality traits, studies have consistently reported that CU traits are negatively correlated with agreeableness and conscientiousness (*r*s ranging from –.38 to –.57), whereas correlations with other personality dimensions (e.g., extraversion) have been less consistent across studies (Essau, Sasagawa, & Frick, 2006; Lee, Salekin, & Iselin, 2010; Lynam et al., 2005; Roose, Bijttebier, Decoene, Claes, & Frick, 2010; Salekin, Debus, & Barker, 2010; Salekin, Leistico, Trobst, Schrum, & Lochman, 2005).

In summary, the most consistent finding from existing research is that CU traits are associated with lower levels of fear and anxiety, whereas severe conduct problems tend to be positively associated with anxiety. This differential association with anxiety, combined with the positive correlation between CU traits and conduct problems, often leads to a suppressor effect when all three variables are studied together. Specifically, the positive correlation between conduct problems and anxiety often increases in magnitude when controlling for CU traits and the negative association between anxiety and CU traits often becomes more strongly negative when controlling for conduct problems (Frick, Cornell, Bodin, et al., 2003; Frick et al., 1999; Loney et al., 2003; Lynam et al., 2005; Pardini, Lochman, & Powell, 2007). Frick et al. (1999)

interpreted this pattern of relations as suggesting that children with conduct problems, with or without CU traits, display elevated levels of anxiety that may be secondary to their behavioral problems and a result of the many psychosocial impairments associated with their conduct problems. However, when controlling for the level of conduct problem severity, children high on CU traits show lower levels of anxiety, suggesting that they are less distressed by the effects of their behavior on themselves and others, given a similar level of impairment.

Parenting and Peer Risk Factors

Studies that have investigated parenting and peer risk factors for CU traits in children and adolescents are summarized in Table 6. This table summarizes 30 studies using either a global measure of psychopathic traits (n = 7) or measures specific to CU traits (n = 7)23). The most consistent finding from these studies is that parenting factors tend to have different associations with conduct problems depending on whether it is accompanied by high levels of CU traits. Specifically, harsh, inconsistent, and coercive discipline has consistently been shown to be more highly associated with conduct problems in youths with normative levels of CU traits (Edens, Skopp, & Cahill, 2008; Hipwell et al., 2007; Oxford, Cavell, & Hughes, 2003; Pasalich, Dadds, Hawes, & Brennan, 2011; Wootton, Frick, Shelton, & Silverthorn, 1997; Yeh, Chen, Raine, Baker, & Jacobson, 2011). In contrast, low warmth in parenting appears to be more highly associated with conduct problems in youths with elevated CU traits in some studies (Kroneman, Hipwell, Loeber, Koot, & Pardini, 2011; Pasalich et al., 2011) but not others (Falk & Lee, 2012; Hipwell et al., 2007).

In some studies, dysfunctional parenting practices have been related directly to CU traits themselves (Barker et al., 2011; Waller et al., 2012), although this has not been a consistent finding across studies (Viding, Fontaine, Oliver, & Plomin, 2009). For example, in a prospective longitudinal study of a population-based sample (n = 7,000), harsh parenting at age 4 significantly predicted CU traits at age 13, accounting for 10% and 14% of the variance in these traits in boys and girls, respectively (Barker et al., 2011). However, the direction of influence is not clear between parenting practices and CU traits. In the few longitudinal studies that have tested potential bidirectional effects of parenting and child characteristics, CU traits have been more predictive of changes in parenting over time than parenting has been predictive of changes in CU traits over time (Hawes, Dadds, Frost, & Hasking, 2011; Muñoz, Pakalniskiene, & Frick, 2011). Unfortunately, too few studies have tested such bidirectional effects to make firm conclusions regarding the direction of effects between dysfunctional parenting and CU traits.

Several studies reported that CU traits are associated with disorganized attachment styles (*r*s ranging from .22 to .50), and this association remains significant when controlling for level of conduct problems (Bohlin, Eninger, Brocki, & Thorell, 2012; Fite, Greening, & Stoppelbein, 2008; Pasalich, Dadds, Hawes, & Brennan, 2012). Potentially related to the problems in attachment, Dadds, Jambrak, Pasalich, Hawes, and Brennan (2011) reported that children with high levels of CU traits made less eye contact with both their mothers and fathers in both free play and in "emotional talk" situations, controlling for ADHD and conduct problems. In a second study, Dadds, Allen, et al. (2012) reported

that, compared to controls and children with conduct problems with normative levels of CU traits, children with both conduct problems and elevated CU traits showed lower levels of physical affection, lower levels of verbal affection, and less eye contact with mothers during a task where the mother said she loved the child and showed affection to him or her. Both of these studies led Dadds and colleagues to suggest that a deficit in the propensity to make eye contact with an attachment figure "signals the absence of a basic building block underlying social and moral development" (Dadds, Allen, et al., 2012, p. 195) in children with elevated CU traits.

Several studies included in Table 6 reported results suggesting that there may be two distinct groups of children and adolescents who show elevated CU traits. Specifically, research using various clustering techniques has consistently found one group with normative or low levels of anxiety and a second group with elevated levels of anxiety. A consistent finding is that those with elevated CU traits and elevated levels of anxiety have higher rates of physical and sexual abuse in their histories compared to those high on CU traits but low on anxiety (Kimonis, Frick, Cauffman, Goldweber, & Skeem, 2012; Kimonis, Frick, Muñoz, & Aucoin, 2008; Kimonis, Skeem, Cauffman, & Dmitrieva, 2011; Tatar, Cauffman, Kimonis, & Skeem, 2012; Vaughn, Edens, Howard, & Toney-Smith, 2009). In contrast, it is only those low on anxiety that show deficits in the emotional responding to distress stimuli, although this has been tested in only one study and requires replication (Kimonis et al., 2012). These findings suggest that there may be different causal pathways to the development of CU traits similar to what has been proposed for the development of psychopathic traits in adults (see Skeem, Poythress, Edens, Lilienfeld, & Cale, 2003). Importantly, the role of dysfunctional family factors, especially physical and sexual abuse, may differ across these pathways.

Very minimal research has been conducted on the peer groups of children with elevated levels of CU traits. In one of the few studies of the quality of friendships of youths with CU traits, Muñoz, Kerr, and Besic (2008) reported that, in a population-based sample (n=667) of adolescents ages 12–15, those with significant levels of CU traits had as many friends as other adolescents, but the friendships were less stable and were viewed by the youths high on CU traits as more conflictual. Further, Barker and Salekin (2012) reported that, in a large (n=5,923) population-based sample of children, peer victimization at age 10 predicted CU traits at age 13 in children who scored high on a measure of irritability.

One consistent finding on the peer groups of children and adolescents with high levels of CU traits is that these youths often associate with delinquent and antisocial peers, and this level of deviant peer association appears to be higher than what is found in children and adolescents with conduct problems but without a CU presentation (Goldweber, Dmitrieva, Cauffman, Piquero, & Steinberg, 2011; Kimonis, Frick, & Barry, 2004; Muñoz et al., 2008; Pardini & Loeber, 2008). Further, antisocial adolescents with elevated CU traits tend to be more likely to commit crimes in groups (Goldweber et al., 2011). However, it is unclear from this research to what extent the association with deviant peers influences the severity of antisocial behavior in youths with elevated rates of CU traits. To begin to address this issue, Kerr, Van Zalk, and Stattin (2012) used peer network analyses to test the effects of both the target adolescents' levels of CU traits and their peers' levels

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Table 6
Familial and Peer Correlates of Callous-Unemotional (CU) Traits

Study	Sample	Key methods	Summary of results
Barker et al. (2011) ^a	N = 7,000; age = 13; 51% male; population-based community sample.	Longitudinal; parent report of CU traits; parent report of parenting and conduct problems.	Prenatal maternal risk and harsh parenting at age 4 predicted both CU traits and conduct problems at age 13. In follow-back analyses, children high on conduct problems with a CU presentation experienced more maternal psychopathology, harsh parenting, lower levels of parental warmth, and lower levels of parent-reported "enjoyment of their child" than those with conduct problems only.
Barker & Salekin (2012) ^a	N = 5,923; age = 8–10; population-based community sample.	Longitudinal; parent report of CU traits; child report of peer vicitimization.	Irritability and peer victimization at age 10 predicted CU traits at age 13.
Bohlin et al. (2012)	N = 65; age = 5; 83% male; highrisk community sample.	Cross-sectional; parent and teacher ratings of CU traits; attachment styles assessed by story stem procedure.	Disorganized attachment at age 5 predicted CU traits at age 7, controlling for age 5 externalizing behavior problems.
Dadds et al. (2011) ^b	N = 92; age = 5–16; 100% male; outpatient clinic sample.	Cross-sectional; parent, teacher, and self-reports of CU traits; observational coding of eye contact during family interactions.	CU traits were associated with less eye contact from child to both parents and from father (but not mother) to child, controlling for hyperactivity and conduct problems.
Dadds, Allen, et al. (2012) ^b	N = 24; age = 5-8; 66% boys; clinic-referred sample and community controls.	Cross-sectional; parent report of CU traits; observations of mother—child interactions.	Children with conduct problems and elevated CU traits showed lower levels of physical affection, lower levels of verbal affection and less eye contact with mothers during a task where the mother said she loved the child and showed affection compared to controls and children with conduct problems but normative levels of CU traits.
Edens et al. (2008)	N = 76; mean age = 15.61; 100% male; forensic sample.	Cross-sectional; clinician ratings of CU traits.	Harsh and inconsistent discipline was associated with antisocial behavior but only in those adolescents with normative levels of CU traits.
Falk & Lee (2012)	N = 208; age = 6–9; 71% male; attention-deficit/hyperactivity disorder (ADHD) and control samples.	Cross-sectional; parent report of CU traits; parent ratings of parenting.	Independent of ADHD and corporal punishment, low levels of positive reinforcement and parental involvement were related to conduct disorder (CD) but only in children with normative levels of CU traits.
Fite et al. (2008)	N = 212; age = 6-12; 70% male; inpatient clinical sample.	Cross-sectional; parent report of CU traits and parental attachment.	Parent ratings of poor attachment with child were related to CU traits but not child impulsivity, after controlling for level of child conduct problems. (table continues)

Table 6 (continued)

Study	Sample	Key methods	Summary of results
Goldweber et al. (2011)	N = 937; age = 14–17; 100% male; forensic sample.	Longitudinal; clinician rating of psychopathic traits, including CU traits; file review of offending.	Psychopathic traits were associated with offending trajectories involving peers, and less associated with solo offending.
Hawes et al. (2011)	N = 1,008; age = 3–10; 52.6% male; community sample	Longitudinal; parent ratings for CU traits; parent ratings of parenting.	CU traits predicted change in inconsistent discipline, corporal punishment, and parental involvement over a 12-month period. Positive reinforcement, parental involvement, and poor monitoring supervision predicted change in CU traits.
Hipwell et al. (2007)	N = 990; age = 7–8; 0% boys; high-risk community sample.	Cross-sectional; parent and teacher reports of CU traits; parent report of parenting.	Harsh parenting and low warmth were associated with conduct problems only in those who showed normative levels of CU traits.
Kerig et al. (2012)	N = 276; age = 11–18; 75% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of emotional numbing, trauma exposure, and betrayal trauma.	The association between trauma exposure and CU traits was mediated by general numbing of emotions, and specifically by sadness. Numbing of fear and sadness mediated the association between traumatic experiences that involved betrayal and CU traits.
Kimonis et al. (2004)	N = 98; mean age = 12.36; 53% male; high-risk community sample.	Longitudinal; parent and teacher report of CU traits.	Across 4 yearly assessments, children with conduct problems with elevated CU traits had the highest level of affiliation with deviant peers.
Kimonis, Frick, Muñoz, & Aucoin (2008)	N = 88; age = 13–18; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of abuse; dot-probe task to assess emotional processing.	A subgroup of youths with CU traits did not show reduced emotional responses to pictures depicting distress and they showed the highest rates of abuse.
Kimonis et al. (2011)	N = 200; age = 14–17; 100% male; forensic sample.	Cross-sectional; clinician rating of psychopathic traits including CU traits; self-report of abuse.	Model-based cluster analysis identified two distinct groups of youths high on psychopathic traits, which differed on the level of anxiety. Those high on anxiety showed higher rates of abuse.
Kimonis et al. (2012)	N = 343; age = 13–17; 100% male; forensic sample.	Cross-sectional; self-report of psychopathic traits including CU traits; self-report of abuse.	Model-based cluster analysis identified two groups of youths high on psychopathic traits, which differed on level of anxiety. Those low on anxiety showed deficits in the emotional processing of distress cues; those high on anxiety showed higher rates of abuse.
Kimonis et al. (2013)	N = 227; age = 12–19; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of trauma and bonding.	Maternal bonding was correlated with CU traits even after controlling for abuse and neglect. Youths with high CU traits and low maternal bonding showed the highest rates of aggression. (table continues)

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Table 6 (continued)

Study	Sample	Key methods	Summary of results
Kroneman et al. (2011)	N = 1,233; age = 7–8; 0% male; high-risk community sample.	Longitudinal; parent and teacher reports of CU traits; parent report of parenting; growth curve analysis of conduct problems.	Harsh parenting was associated with more conduct problems in girls, irrespective of level of CU traits. Warm parenting was associated with less conduct problems but only in those with elevated levels of CU traits.
Muñoz et al. (2008)	N = 667; age = 12–15; population-based mixed sex community sample.	Longitudinal; self-report of psychopathic traits including CU traits; peer sociometric nominations.	Youths high on psychopathic traits had as many friends as other youths but the friendships appeared less stable. Youths high on psychopathic traits engaged in more illegal activities with friends and had friends who reported higher levels of psychopathic traits. Youths high on psychopathic traits viewed their friendships as more conflictual but their friends did not see them as more conflictual.
Muñoz, Qualter, & Padgett (2011)	N = 91; mean age = 14.5; 52% male; high-risk community sample.	Longitudinal; self-report of CU traits; self-report of parenting.	High levels of CU traits were associated with reduced parental monitoring and supervision over time.
Oxford et al. (2003)	N = 243; mean age = 8.24; highrisk community sample.	Cross-sectional; parent and teacher reports of CU traits; parent report of parenting.	Ineffective parenting was associated with externalizing behavior problems but only for those children with normative levels of CU traits.
Pardini & Loeber (2008)	N = 506; age = 14–18; 100% male; high-risk community sample.	Longitudinal; parent report of CU traits.	Dysfunctional parent-child communication was associated with CU traits across adolescence, controlling for ADHD and conduct problems. Delinquent peer influences on CU traits were no longer significant after controlling for ADHD, conduct problems, and parenting.
Pasalich et al. (2011) ^c	N = 95; age = 4–12; 100% boys; outpatient clinic sample.	Cross-sectional; parent report of CU traits; behavioral observations of parenting.	Harsh and coercive parenting was only associated with conduct problems in those with normative levels of CU traits; warm parenting was negatively associated with conduct problems but only for those with elevated CU traits.
Pasalich et al. (2012) ^c	N = 60; age = 3–9; 100% male; outpatient clinic sample.	Cross-sectional; parent report of CU traits; attachment assessed by story task.	High levels of CU traits were associated with insecure attachments, especially disorganized representation, controlling for conduct problems.
Tatar et al. (2012)	N = 373; age = 14–17; 100% male; forensic sample.	Cross-sectional; self-report of psychopathic traits including CU traits; self-report of abuse.	Model-based cluster analyses identified two groups of youths high on psychopathy that differed on level of anxiety. The group high on anxiety showed higher rates of trauma, including abuse. (table continues)

Table 6 (continued)

Study	Sample	Key methods	Summary of results
Vaughn et al. (2009)	N = 267; age = 13–17; 76% male; forensic sample.	Cross-sectional; self-report of psychopathic traits, including CU traits; self-report of abuse.	Finite mixture modeling revealed two groups of those high on psychopathic traits, one high on levels of distress (e.g., anxiety, depression; suicidal ideation). The group high on distress also reported higher rates of abuse.
Viding, Fontaine, et al. (2009)	N = 4,508; age = 7; 46% male; monozygotic twins from a community sample.	Longitudinal; parent and teacher ratings of CU traits; parent ratings of parenting; parent and teacher ratings of conduct problems.	Negative discipline at age 7 was related to conduct problems at age 12 but not to CU traits at age 12 after controlling for initial levels of outcomes.
Waller et al. (2012)	N = 731; age = 2–3 years; 51% male; low income community sample.	Longitudinal; parent report of CU traits; parent report and observations of harsh parenting.	Harsh parenting at age 2 was associated with CU traits at age 4.
Wootton et al. (1997)	N = 166; age = 6–13; 70% boys; outpatient clinic and community sample.	Cross-sectional; parent and teacher reports of CU traits; parent report of parenting.	Dysfunctional parenting was only associated with conduct problems in those low on CU traits.
Yeh et al. (2011)	N = 1,158; age = 9–10; 48.5% male; community sample.	Cross-sectional; parent report of psychopathic traits, including CU traits; self-report of parental affect.	Negative parental affect was positively correlated with reactive aggression and positive parental affect was negatively correlated with reactive aggression but only for those low on psychopathic traits. Negative affect was positively related to proactive aggression but only for those high on psychopathic traits.

of CU traits on the association between antisocial peers and delinquency in a large (n=847) community sample of adolescents (beginning in eighth grade). They reported results suggesting that the delinquent behavior of the target child was less influenced by peer delinquency if he or she was high on CU traits. However, if an adolescent had friends high on CU traits, his or her delinquent behavior was more influenced by their peer delinquency. These findings raise the provocative possibility that the antisocial behavior of the adolescent with elevated CU traits may be less likely to be influenced by deviant peers but that the adolescent with a CU presentation may be highly influential to the antisocial behavior of his or her peer group.

In summary, the clearest statement that can be made based on the available research on parenting practices is that harsh and coercive parenting appears to have stronger associations with conduct problems in those without significant levels of CU traits. This finding provides very strong support for the contention that the two groups may have different etiological factors, given the importance of harsh parenting in many theories of how conduct problems develop (Frick & Viding, 2009). However, this research does not suggest that parenting is unimportant for children and adolescents with elevated CU traits, as a few studies have suggested that warm parenting may be directly related (negatively) to CU traits or to the conduct problems displayed by children and adolescents with elevated CU traits. Further, there may be some

subgroups of children and adolescents with elevated CU traits whose problems are more likely to have developed as a result of harsh and abusive parenting. Unfortunately, few studies have considered bidirectional effects of CU traits and parenting, and it could be the case that having a child with a CU presentation can elicit certain maladaptive types of parenting. Also, although it is clear that adolescents with CU traits tend to associate with deviant and antisocial peers, very little research has investigated the peer relationships of youths with elevated CU traits. This type of research could be quite important, given findings that adolescents high on CU traits may be highly influential in their peer groups.

Summary and Implications for Causal Models of Severe Conduct Problems

Based on this existing research, there appears to be strong support for the potential role of CU traits in designating etiologically distinct subgroups of children and adolescents with severe conduct problems. The most consistent evidence suggests that using behavioral measures, as well as using psychophysiological indices, youths with severe conduct problems and elevated CU traits show deficits in their response to punishment cues and in their emotional responding to signs of fear and distress in others. Children and adolescents with elevated levels of CU traits also

tend to exhibit lower levels of anxiety and more fearless and thrill-seeking personality traits compared to other antisocial youths. Finally, the conduct problems of youths with elevated CU traits tend to be more strongly associated with genetic influences and are less strongly related to hostile and coercive parenting practices compared to youths with severe conduct problems but without a CU presentation.

All of these differences have important implications for theories specifying different causal processes operating in the development of severe conduct problems for children and adolescents with and without elevated CU traits. For example, Frick and Viding (2009) outlined a developmental model for this group of youths with severe conduct problems suggesting that children and adolescents with elevated CU traits appear to have a temperament (i.e., fearless, insensitive to punishment, low responsiveness to cues of distress in others) that can interfere with the normal development of conscience and place the child at risk for a particularly severe and aggressive pattern of antisocial behavior. Such a contention would be consistent with a number of theories for the development of guilt, empathy, and other prosocial emotions. For example, Kochanska (1993) and Dadds and Salmon (2003) both proposed that the anxiety and discomforting arousal that follow wrong-doing and punishment are integral in the development of an internal system that functions to inhibit misbehavior, even in the absence of the punishing agent. These authors proposed that fearless children with deficits in their emotional responses to punishment may not experience this "deviation anxiety" that could impede conscience development. Blair and colleagues (Blair, 1995; Blair, Monson, & Frederickson, 2001) have also proposed a theoretical model focusing specifically on the development of empathetic concern in response to the distress in others. They suggest that humans are biologically prepared to respond to distress cues in others with increased autonomic activity in what they have labeled the Violence Inhibition Mechanism (VIM). This negative emotional response develops before the infant or toddler is cognitively able to take the perspective of others, such as when a young child becomes upset in response to the cries of another child (Blair, 1995). According to this model, these early negative emotional responses to the distress of others become conditioned to the child's behaviors that lead to distress in others (e.g., hitting another child; taking a toy away from another child). Through a process of conditioning, the child learns to inhibit such behaviors as a way of avoiding this negative arousal. Children who show reduced negative emotional responses to distress cues in others may not experience this negative arousal and, as a result, do not experience the conditioning necessary for the development of empathic concern.

Importantly, from this review of existing research, it appears that children with severe conduct problems but with normative levels of CU traits do not show problems in empathy and guilt; in fact, they often show high rates of anxiety, and they appear to be highly distressed by the effects of their behavior on others. Thus, the antisocial behavior in this group with normative levels of CU traits could not be adequately explained by a temperament characterized by a lack of fearful inhibitions and insensitivity to punishment leading to deficits in conscience development. Further, the research reviewed above suggests that the conduct problems in this group of youths show less strong genetic influences and are more highly related to hostile and inconsistent parenting practices. They are also more likely to show deficits in verbal intelligence

and hostile attribution biases, although these findings have not been as consistent. Such findings led Frick and Viding (2009) to suggest that the severe conduct problems of children with normative levels of CU traits involve deficits in the cognitive or emotional regulation of behavior. Specifically, the deficits in verbal abilities or other cognitive biases, combined with inadequate socializing experiences, could result in problems in the executive control of behavior, such as an inability to anticipate the negative consequence to behavior or an inability to delay gratification. Further, the cognitive and emotional (e.g., strong reactivity to negative stimuli and provocation) deficits, again combined with inadequate socializing experiences, could lead to problems regulating emotional responses. These problems in emotional regulation could result in the child committing impulsive and unplanned aggressive and antisocial acts for which he or she may be remorseful afterward but may still have difficulty controlling in the future.

These hypothesized developmental mechanisms underlying the problem behavior in the different subgroups of children and adolescents with severe conduct problems require much further testing. Further, other theories are possible for using the results from past research to explain the problem behavior across the different subgroups with serious conduct problems. However, the theoretical model outlined above illustrates the importance of considering the presence of elevated CU traits in causal theories and research. Specifically, the hypothesized genetic, cognitive, emotional, biological, and environmental correlates to severe conduct problems, and the developmental mechanisms that could be influenced by these characteristics, are likely to be different depending on the presence of elevated levels of CU traits (Frick, 2012). Further, the research reviewed above also clearly illustrates some important weaknesses in the available research that could guide future research on the causes of severe conduct problems in children and adolescents.

One area of weakness is in the relatively few studies testing functional and structural neurological abnormalities and possible genetic polymorphisms that might underlie the various emotional and cognitive deficits found in different subgroups of children and adolescents with severe conduct problems. There has been significant research documenting various neurological abnormalities in antisocial adolescents, which has led to important advances in causal theories (Raine & Yang, 2006). However, given differences in the genetic influence to severe conduct problems in those with and without elevated CU traits and given differences in their emotional and cognitive characteristics, these theories are likely to be advanced substantially by additional research documenting both shared and divergent neurological deficits between the subgroups of youths with severe conduct problems. Studies that specifically investigate brain regions (e.g., amygdala and areas of significant connectivity to the amygdala) or genetic polymorphisms (e.g., COMT or OSTR polymorphisms) that have been implicated in the emotional and cognitive deficits shown to be associated with CU traits would be particularly important for advancing causal theories (Frick & Viding, 2009).

Another clear limitation in the existing research is the relatively minimal research conducted on the peer groups and friendships of youths with elevated CU traits. That is, most of the research conducted to date has focused on documenting the tendency of youths with elevated CU traits to associate with antisocial peers. However, very little work has focused on how youths with ele-

vated CU traits are perceived by their peers, the quality of their peer relationships, or the quality of their social skills. Further, it would be important to explore the effects that children with CU traits may have on their peer group. Relatedly, more research is needed to clarify the association between parenting practices and CU traits. As noted previously, a clear and consistent finding from research is that hostile and coercive parenting is more related to conduct problems in those with normative levels of CU traits. However, less research has focused on the role that parenting may play in the development and maintenance of CU traits, especially using a design that can test the effects that having a child with these traits may have on the parent's behavior. Also, based on the available research, it appears that certain dimensions of parenting may have particular importance for the development of children with CU traits (e.g., organized attachment styles, parental warmth), but this requires much further study. Finally, available research suggests that certain types of traumatic background factors may play a role in the development of CU traits, at least in a subgroup of those with elevated levels of anxiety. Thus, further testing of different causal pathways to the development of CU traits, especially based on the presence or absence of significant levels of anxiety, is warranted.

Clinical and Predictive Utility of Callous-Unemotional Traits

The previous section reviewed research most directly related to the question of whether CU traits might be important for understanding distinct etiological pathways to serious conduct problems. In this section we review research most directly related to the question of whether these traits can help in classifying children and adolescents with more severe behavior problems by adding to the prediction of concurrent and future impairment, especially when controlling for conduct problem severity, level of aggression, age of onset of conduct problems, and the presence of impulsivity or ADHD. Table 7 summarizes research related to this question. Specifically, it reviews a significant body of research investigating the association between CU traits and the severity and stability of conduct problems, type and severity of aggression, and delinquency. Overall, 118 studies were identified including 70 crosssectional and 48 longitudinal studies. Ninety-one (77%) studies reported analyses using a measure specifically composed of CU traits, whereas the rest (n = 27) used a measure of psychopathic traits. One hundred and five (89%) studies provided evidence that CU traits were significantly associated with measures of antisocial and aggressive behavior in children and adolescents. The strength of the association varied greatly (-.15 to .84) with an average correlation of .33. Future research will need to test potential reasons to account for the variations in the degree of association between CU traits and antisocial and aggressive behavior. One of the most common associations was between CU traits and aggression that was reported in 65 studies included in Table 7.

Although the studies reviewed in Table 7 were weighted toward samples that were either totally or predominantly male, several studies used samples with a substantial representation of girls (Andershed, Gustafson, Kerr, & Stattin, 2002; Chabrol et al., 2011; Dadds, Fraser, Frost, & Hawes, 2005; Fanti & Kimonis, 2012; Hillege, Das, & de Ruiter, 2010; Kahn, Frick, Youngstrom, Findling, & Youngstrom, 2012; Roose et al., 2010; Rowe et al., 2010;

Ručević, 2010) or that consisted entirely of girls (Chauhan et al., 2012; Kunimatsu, Marsee, Lau, & Fassnacht, 2012; Marsee & Frick, 2007; Odgers, Reppucci, & Moretti, 2005; Pardini et al., 2012) with very similar findings. In addition, the majority of studies reported in Table 7 used samples from North America. However, CU traits have been associated with severity of antisocial behavior in several different countries including Australia (Dadds et al., 2005), the United Kingdom (Rowe et al., 2010), Belgium (Roose et al., 2010), Germany (Essau et al., 2006), the Netherlands (Feilhauer, Cima, & Arntz, 2012), Sweden (Andershed et al., 2002), Greece (Manti, Scholte, Van Berckelaer-Onnes, & Van Der Ploeg, 2009), Greek Cyprus (Fanti & Kimonis, 2012), and Israel (Somech & Elizur, 2009).

Thus, CU traits have been consistently associated with measures of antisocial behavior, whether defined as conduct problems, aggression, or delinquency. However, the more important question for whether CU traits designate an important subgroup of youths with severe conduct problems is whether CU traits predict antisocial outcomes after controlling for other measures of conduct problem severity (e.g., number of conduct problems, level of aggression, age of onset of conduct problems) or common problems in comorbidity (e.g., impulsivity). From the studies reviewed in Table 7, 30 studies reported that psychopathic or CU traits were associated with antisocial outcomes even after controlling for conduct problem severity (most including aggression) and 4 of these studies examined aggression separately from other conduct problems and reported that psychopathic or CU traits were associated with antisocial outcomes even controlling for level of aggression (Fritz, Wiklund, Koposov, Klinteberg, & Ruchkin, 2008; Loeber et al., 2005; Scholte, Stoutjesdijk, Van Oudheusden, Lodewijks, & Van der Ploeg, 2010; Sevecke, Kosson, & Krischer, 2009). Similarly, 25 studies showed that psychopathic or CU traits were associated with more severe antisocial outcomes controlling for impulsivity or ADHD. As an exemplar of these studies, Byrd, Loeber, and Pardini (2012) reported that parent and teacher-rated CU traits at age 7 predicted criminal behavior at age 25 among a sample of boys (n = 503) even when controlling for childhood CD, ADHD, and ODD (odds ratio of 1.48 for the independent effect of CU traits).

Four studies summarized in Table 7 reported that CU traits were more common in youths with childhood-onset to their antisocial behavior compared to those with an adolescent-onset (Bauer, Whitman, & Kosson, 2011; Brandt, Kennedy, Patrick, & Curtin, 1997; Dandreaux & Frick, 2009; Silverthorn, Frick, & Reynolds, 2001). However, five studies reported results showing that psychopathic or CU traits predicted more severe antisocial outcomes, even when controlling for age of onset (Basque, Toupin, & Cote, 2012; Loeber et al., 2005; McMahon, Witkiewitz, Kotler, & The Conduct Problems Prevention Research Group, 2010; Stickle et al., 2009; Vitacco, Caldwell, Van Rybroek, & Gabel, 2007). Of particular note, in a large high-risk community sample (n = 754), McMahon et al. (2010) reported that CU traits assessed in seventh grade significantly predicted adult antisocial outcomes (e.g., adult arrests, adult antisocial personality symptoms) controlling for ADHD, ODD, CD, and childhood-onset of CD.

As noted previously, CU traits are one component of the broader construct of psychopathy. Thus, an important question is whether these traits in children and adolescents convey risk for showing psychopathic traits in adulthood, especially in conveying incre-

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Table 7
Research Testing the Association Between Callous-Unemotional (CU) Traits and the Severity and Stability of Antisocial Behavior

Study	Sample	Key methods	Summary of results	Relevance to specifier
Andershed et al. (2002)	N = 1,077; mean age = 14.42; mixed sex community sample.	Cross-sectional; self-report of psychopathic traits including CU traits; self-report of antisocial behavior.	Youths with psychopathic traits reported more frequent and violent antisocial behavior compared to non-psychopathic controls and a group high on impulsivity and antisocial behavior but normative on psychopathic traits.	3
T. D. Barry et al. (2007)	N = 161; age = 9–12; 64% male; community sample.	Cross-sectional; parent and teacher reports of CU traits; parent and teacher reports of aggression; parent report of conduct problems.	CU traits were associated with proactive and reactive aggression and had a unique association with conduct problems after controlling for impulsivity.	3
Basque et al. (2012)	N = 27; age = 15–19; 100% male; clinical sample.	Longitudinal; clinician rating of CU traits; self-report of conduct problems and delinquency.	CU traits predicted violent recidivism and versatility of delinquency 24 months later controlling for age at first arrest and number of prior offenses.	4
Bauer et al. (2011)	N = 80; age = 14–19; 0% male; forensic sample.	Cross-sectional; clinician rating of CU traits; structured clinical assessment of conduct disorder (CD) symptoms; institutional files of violent offending and institutional violence.	CU traits were associated with CD symptoms, number of violent charges, total number of charges, age at first charge, and number of total and violent institutional infractions. The correlation between CU traits and number of violent charges and institutional infractions were significantly stronger than for impulsivity.	3
Bijttebier & Decoene (2009)	N = 182; age = 9–19; 45% male; community sample.	Cross-sectional; teacher and self-reports of CU traits; parent and teacher reports of symptoms of oppositional defiant disorder (ODD) and CD.	CU traits were associated with symptoms of ODD and CD.	3
Boccaccini et al. (2007)	A. N = 85; age = 11–18; 100% male; residential treatment sample. B. N = 198; age = 13–18; 100% male; residential treatment sample. C. N = 111; age = 15–18; 100% male; adult court sample. D. N = 55; age = 11–18; 71% male; diversion sample.	Longitudinal; self-report of CU traits; official and self- reports of offending behavior.	CU traits were associated with prior arrests among the treatment sample only. CU traits predicted post-release offending (official and self-reports) for the treatment sample.	3
Brandt et al. (1997)	N = 130; age = 14–18; 100% male; forensic sample.	Longitudinal; clinician rating of CU traits; facility staff and file reviews of CD symptoms; teacher report of aggression and externalizing behavior; official report of institutional infractions; official report of offending.	CU traits were associated with number of CD symptoms, aggression, externalizing behavior, earlier age of onset, number of prior commitments, and crime severity. CU traits also incrementally improved the prediction of recidivism over an 18–24 month follow-up period after controlling for criminal history, impulsivity, and antisocial behavior.	4
Burke et al. (2007) ^a	N = 177; age = 7–12; 100% male; clinical sample.	Longitudinal; parent and teacher reports of CU traits assessed annually until age 17; structured clinical assessment of psychopathic traits at ages 18–19.	Teacher, but not parent ratings, of childhood CU traits predicted adult psychopathy, controlling for childhood CD.	4
Burke et al. (2010) ^a	N = 177; age = 7–12; 100% male; clinical sample.	Longitudinal; parent and teacher reports for CU traits; clinician rating of Antisocial Personality Disorder in adults.	CU traits assessed in childhood (ages 7–12) predicted an Antisocial Personality Disorder diagnosis in adulthood (ages 18–20) but only in those without a diagnosis of CD.	4 le continues)

Table 7 (continued)

Study	Sample	Key methods	Summary of results	Relevance to specifier
Byrd et al. (2012)	N = 503; mean age = 7.43; 100% male; community sample.	Longitudinal; teacher and parent reports of CU traits; self-report and official records of criminal behavior.	CU traits in childhood (age 7) were associated with persistent criminal behavior in adulthood (age 25) even when controlling for attention-deficit/ hyperactivity disorder (ADHD), ODD, and CD.	4
M. A. Campbell et al. (2004)	N = 226; age = 12–19; 83% male; forensic sample.	Cross-sectional; clinician rating of psychopathic traits including CU traits; self-report of delinquency, aggressive behavior, and externalizing problems.	Psychopathic traits were associated with delinquency, aggression, and externalizing problems even after removal of items assessing the antisocial behavioral component of psychopathy.	2
Caputo et al. (1999)	<i>N</i> = 69; age = 13–18; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report and official records of criminal behavior.	CU traits were higher in offenders with violent sexual offenses, whereas impulsivity and conduct problems did not differ among different offending groups.	3
Catchpole & Gretton (2003)	N = 74; age = 15–19; 85% male; forensic sample.	Longitudinal; clinician rating of psychopathic traits including CU traits; official records of offending.	Psychopathic traits predicted both general and violent recidivism and shorter time to violent reoffending over a 12-month follow-up period.	2
Chabrol et al. (2011) ^a	<i>N</i> = 972; age = 14–21; 61% male; community sample.	Cross-sectional; self-report CU traits; self-report of antisocial behavior and substance use.	CU traits were associated with antisocial behavior, drug use, and alcohol use.	3
Chabrol et al. (2012) ^a	N = 972; age = 14–21; 61% male; community sample.	Cross-sectional; self-report of CU traits; self-report of borderline traits; self-report of antisocial behaviors and emotional distress.	Youths high on both CU traits and borderline traits reported more antisocial behaviors than youths with moderate or low levels of CU and borderline traits.	2
Charles et al. (2012)	N = 234; age = 10–12; 49.6% male; community sample.	Cross-sectional; parent report of CU traits; parent report of rule-breaking and aggression.	CU traits were associated with aggression and rule-breaking for boys and girls.	3
Chauhan et al. (2012)	N = 122; age = 13–19; 0% male; forensic sample.	Longitudinal; clinician rating and self-report of CU traits; self-report of conduct problems and delinquency.	CU traits predicted conduct problems and violent offending 2 years later controlling for prior conduct problems and violent offending, respectively.	4
Christian et al. (1997)	N = 120; age = 6–13; 80% male; clinical sample.	Cross-sectional; parent and teacher reports of CU traits; clinical rating of conduct problems; parent report of police contact and parental history of antisocial behavior.	Children with conduct problems and elevated CU traits showed more severe and more varied conduct problems, earlier police contact, and stronger family history of antisocial behavior than those with conduct problems but normative levels of CU traits.	4
Colins, Noom, & Vanderplasschen (2012)	N = 768; age = 12–18; 45% male; community sample.	Cross-sectional; self-report of CU traits; self-report conduct problems and delinquency.	CU traits predicted conduct problems, violent offending, threats and insults, and other offenses after controlling for impulsivity.	3
Colins, Vermeiren, et al. (2012)	N = 223; mean age = 16.49; 100% male; forensic sample.	Longitudinal; self-report of CU traits; official records of offending.	CU traits did not predict recidivism at three years after controlling for age at first arrest, total past arrests, and other personality dimensions, including impulsivity.	4
Corrado et al. (2004)	N = 182; age = 12–18; 100% male; forensic sample.	Longitudinal; clinician rating of CU traits; official reports of offending.	CU traits were associated with number of prior convictions, especially violent convictions. CU traits did not predict recidivism at follow-up (<i>M</i> = 14.5 months) after controlling for impulsivity and conduct problems.	4 le continues)

Table 7 (continued)

Study	Sample	Key methods	Summary of results	Relevance to specifier
Dadds et al. (2005)	N = 1,359; age = 4-9; 52% male; community sample.	Longitudinal; teacher, parent, and self-reports of CU traits; parent report of antisocial behavior.	CU traits predicted more severe antisocial behavior over a 12-month follow-up period. For younger boys (ages 4–6) and older girls (ages 7–9), children with both elevated CU traits and antisocial behavior showed higher rates of antisocial behavior at follow-up compared to those with antisocial behavior but normative levels of CU traits.	4
Dadds, Whiting, & Hawes (2006)	N = 131; age = 6–13; 51% male; community sample.	Cross-sectional; parent report of CU traits; parent and self-reports of cruelty to animals.	CU traits were associated with cruelty to animals controlling for level of externalizing behaviors.	4
Dandreaux & Frick (2009)	N = 78; age = 11–18; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; age of onset assessed using multiple sources including parent report, self-report, and official records.	Youths with childhood-onset of CD had higher rates of CU traits than those with adolescent-onset CD.	3
Declercq et al. (2009)	N = 536; age = 12–17; 44% male; community sample.	Cross-sectional; self-report of CU traits; self-report of delinquency and police contact.	CU traits were associated with level of delinquency and criminal versatility for boys and girls and were associated with police contact for boys.	3
Dolan & Rennie (2006)	N = 115; mean age = 16.12; 100% male; forensic sample.	Longitudinal; clinician rating of CU traits; self-report, parent report, and official records of antisocial behavior; caretaker report of aggression and externalizing problems.	CU traits were significantly associated with earlier self-reported age of first antisocial behavior, official records of number of violent offenses, aggression, and externalizing problems. Additionally, CU traits predicted institutional rule breaking at 6-month follow-up.	3
Edens & Cahill (2007)	N = 75; age = 13–17; 100% male; forensic sample.	Longitudinal; clinician rating of CU traits; official records of offending.	CU traits were unrelated to violent, felony, and general recidivism over 10-year follow-up period.	3
Enebrink et al. (2005)	N = 41; age = 6–13; 100% male; clinical sample.	Cross-sectional; parent report of CU traits; parent report of delinquency and aggression.	CU traits were associated with higher levels of delinquent and aggressive (proactive and reactive) behaviors.	3
Eremsoy et al. (2011)	N = 71; mean age = 9.37; 52.1% male; community sample.	Cross-sectional; parent report of CU traits; parent and teacher reports of antisocial and prosocial behavior.	CU traits were positively associated with parent and teacher reports of conduct problems/hyperactivity, emotional symptoms, and inattention symptoms; CU traits were negatively associated with reports of prosocial behaviors.	3
Essau et al. (2006)	N = 1,443; age = 13–18; 54% male; community sample.	Cross-sectional; self-report of CU traits; self-report of antisocial outcomes.	CU traits were associated with aggression, CD, and delinquency for both boys and girls.	3
Ezpeleta et al. (2013)	N = 622; age = 3-4; 51% male; community sample.	Longitudinal; teacher report of CU traits; teacher and parent reports of conduct problems; teacher report of aggression.	CU traits at age 3 predicted conduct problems at age 4 controlling for age 3 conduct problems. CU traits also predicted later teacher reported conduct problems controlling for temperament and executive functioning.	4
Fanti et al. (2009)	N = 347; age = 12–18; 51% male; community sample.	Cross-sectional; self-report of CU traits; self-report of bullying and aggression.	CU traits were associated with bullying. CU traits were also associated with both proactive and reactive aggression but this remained significant only with proactive aggression, after controlling for the correlation between the two types of aggression.	3 le continues)

Table 7 (continued)

Study	Sample	Key methods	Summary of results	Relevance to specifier
Fanti & Kimonis (2012)	N = 1,416; age = 12–14; 50% male; community sample.	Longitudinal; self-report of CU traits; self-report of conduct problems and bullying.	A group high on conduct problems and with elevated CU traits showed the highest level of bullying across a three-year follow-up period compared to those high on only conduct problems and a control group. The results were similar for boys and girls.	4
Feilhauer et al. (2012)	N = 383; age = 13-20; 100% male; mixed community, clinic-referred, and forensic sample.	Cross-sectional; self-report of CU traits; self-report of aggression.	CU traits were associated with aggression.	3
Fink et al. (2012)	N = 160; age = 14–19; 77% male; forensic sample.	Cross-sectional; self-report, parent report, and clinical report of CU traits; convictions recorded from official records.	CU traits from any source were not significantly associated with either violent or non-violent convictions.	3
Fite et al. (2009)	N = 105; age = 6–12; 69% male; inpatient sample.	Cross-sectional; parent report of CU traits; self-report of aggression; parent report of externalizing behaviors.	CU traits were positively correlated with externalizing behaviors. However, CU traits were unrelated to proactive or reactive aggression when controlling for externalizing behavior.	4
Fite et al. (2010)	N = 335; age = 16; 100% male; community sample.	Cross-sectional; self-report of psychopathic traits; self-report of aggression.	Psychopathic traits were associated with both reactive and proactive aggression.	2
Flight & Forth (2007)	N = 51; age = 16–20; 100% male; forensic sample.	Cross-sectional; clinician rating of CU traits; semi-structured interview and file review to assess motives for violence.	CU traits were associated with both instrumental and reactive forms of violence. CU traits predicted only instrumental violence when controlling for impulsivity and conduct problems.	4
Fontaine et al. (2011)	N = 9,578; age = 7; 47% male; community twin sample.	Longitudinal; teacher report of CU traits; group trajectory modeling for CU assessed at ages 7, 9, and 12.	Joint trajectory models identified that children with high, stable trajectories of CU traits were also likely to have high, stable trajectories of conduct problems.	3
Forth et al. (1990)	N = 70; age = 13–20; 100% male; forensic sample.	Longitudinal; clinician rating of psychopathic traits including CU traits.	Psychopathic traits were associated with number of CD symptoms, prior violent offenses, and institutional violence, and predicted violent recidivism over a 27-month follow-up period.	2
Frick et al. (2000) ^c	 A. N = 160; age = 6-13; 77% male; clinical sample. B. N = 1,136; mean age = 10.65; 47% male; community sample. 	Cross-sectional; parent and teacher reports of CU traits; parent and teacher reports of ODD and CD symptoms.	CU traits were associated with ODD and CD symptoms controlling for impulsivity.	3
Frick, Cornell, Barry, et al. (2003) ^c ; Frick et al. (2005) ^c	N = 98; age = 10–17; 53% male; community sample.	Longitudinal; teacher and parent reports of CU traits; self-report of aggression and delinquency; parent report of police contacts.	Children with conduct problems and a CU presentation showed higher levels of aggression, especially proactive aggression, at a 1-year follow-up and showed higher rates of delinquency and police contacts across a 4-year follow-up period compared to youths with conduct problems but with normative levels of CU traits.	4
Frick & Dantagnan (2005) ^e	N = 79; mean age = 12.36; 53% male; high-risk community sample.	Longitudinal; parent and teacher reports of CU traits; parent report of conduct problems.	CU traits were associated with more stable trajectories of conduct problems over a 4-year study period.	3
Fritz et al. (2008)	N = 174; age = 14–19; 100% male; forensic sample.	Cross-sectional; correctional staff ratings of psychopathic traits including CU traits; self-report of offending.	Psychopathic traits distinguished between violent and nonviolent offenders controlling for aggression, impulsivity, and alcohol use.	3

(table continues)

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Table 7 (continued)

				Relevance
Study	Sample	Key methods	Summary of results	specifier
Gretton et al. (2004)	N = 157; age = 12–18; 100% male; forensic sample.	Longitudinal; clinician rating of psychopathic traits including CU traits; official report of offending.	Psychopathic traits predicted shorter time to violent reoffending over a 10-year follow-up period.	2
Hillege et al. (2010)	N = 776; age = 14–19; 47% male; community sample.	Cross-sectional; self-report of CU traits; self-report of drug and alcohol use; self- report of aggression.	CU traits were associated with aggression and drug use among both boys and girls but were associated with alcohol use among boys only.	3
Howard et al. (2012)	N = 88; age = 13–18; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of delinquency.	CU traits were associated with self- report drug offenses, property offenses, and violent offenses.	3
Kahn et al. (2012) ^e	A. N = 1,136; mean age = 10.65; 47% male; community sample. B. N = 566; age = 5–18; 60% male; clinic-referred.	Cross-sectional; parent, teacher, and self-reports of CU traits; parent and self- reports of aggression and cruelty.	Results indicate between 10% and 50% of youths with CD showed elevated CU traits, depending on the assessment method and type of sample. Those with CD and elevated CU traits showed more aggression and cruelty.	5
Kaplan & Cornell (2004)	N = 122; age = 13–18; 100% male; forensic sample.	Cross-sectional; clinician rating of psychopathic traits; staff rating of institutional aggression, institutional records of violence, official report of offending.	Psychopathic traits were associated with aggression and violent offending controlling for ADHD. Psychopathic traits predicted having a history of violent offending and differentiated those that used instrumental violence from those whose offenses were reactive only, after controlling for ADHD.	2
Kerig & Stellwagen (2010)	N = 252; Grades 6–8; 44% male; community sample.	Cross-sectional; teacher report of CU traits; teacher ratings of aggression.	CU traits were associated with proactive physical aggression controlling for impulsivity.	3
Kimonis et al. (2006)	N = 49; age = 2–5; 43% male; community sample.	Longitudinal; teacher and parent reports of CU traits; teacher rating of aggression.	CU traits predicted teacher ratings of aggression at a 6-month follow-up.	3
Kimonis, Frick, Skeem, et al. (2008)	N = 248; age = 12–20; 76% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of aggression and official reports of delinquency.	CU traits were associated with reactive and proactive overt aggression, reactive and proactive relational aggression, and official reports of delinquency.	3
Kimonis et al. (2011)	N = 373; mean age = 16.43; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of violence and aggression.	CU traits explained unique variance in self-reported lifetime violence and aggression controlling for prior victimization and anger.	3
Kosson et al. (2002)	N = 115; age = 12–16; 100% male; forensic sample.	Cross-sectional; clinician rating of psychopathic traits including CU traits; official and self-reports of offending; parental report of aggression, delinquency, and attention problems; clinician rating of ADHD, ODD, and conduct problems.	Psychopathic traits were associated with delinquency, conduct problems, ODD, ADHD, and aggression even after removal of antisocial behavior items from the definition of psychopathic traits.	3
Kruh et al. (2005)	N = 100; age = 16–21; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; official and self-reports of offending.	CU traits were associated with more frequent and varied violent acts. CU traits were higher among those with more repeated, instrumental, and sadistic violence and with more severe harm to the victim.	3
Kumsta et al. (2012)	N = 135; age = 15; adoptees from Romanian orphanages.	Cross-sectional; parent and self-reports of CU traits; parent report of ODD and CD symptoms.	CU traits were associated with more ODD symptoms and diagnoses but not more CD symptoms and diagnoses.	3 ole continues

Table 7 (continued)

Study	Sample	Key methods	Summary of results	Relevance to specifier
Kunimatsu et al. (2012)	N = 59; age = 12–18; 0% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of	CU traits were associated with both violent and non-violent delinquency.	3
Långström & Grann (2002)	N = 98; age = 15–20; 100% male; forensic sample.	delinquency. Longitudinal; clinician rating of CU traits; official records of offending.	CU traits were unrelated to violent recidivism during a 2-year follow-up period.	3
Lau & Marsee (2013)	N = 141; age = 11–17; 100% male; community sample.	Cross-sectional; self-report of CU traits; self-report of aggression and delinquency.	CU traits were associated with relational aggression, physical aggression, and delinquency and this remained significant after controlling for narcissistic personality traits.	3
Lawing et al. (2010)	N = 150; age = 12–20; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; clinical rating of sexual offense risk factors.	CU traits were associated with having a greater number of sexual offense victims, use of more severe violence toward victims, and more sexual offense planning after controlling for severity of prior antisocial behaviors.	4
Lee et al. (2010)	N = 94; age = 12–18; 100% male; forensic sample.	Longitudinal; clinician rating and self-report of psychopathic traits including CU traits; official records of offending.	Groups high on psychopathic traits did not differ from those low on psychopathic traits in violent recidivism or time until reoffending over 3-year follow-ups.	2
Lexcen et al. (2004)	N = 481; age = 12–17; 100% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of antisocial behavior and aggression.	CU traits were associated with aggression, delinquency, and substance use accounting for their shared variance.	4
Loeber et al. (2002) ^a	N = 177; age = 7–12; 100% male; clinical sample.	Longitudinal; parent and teacher reports of CU traits; clinician rating of antisocial personality disorder; official records of offending.	CU traits predicted antisocial personality disorder at ages 18 or 19 controlling for CD, drug use, and depression. CU traits predicted those with continuity in disruptive behavior (i.e., those diagnosed with CD up to age 17 who also were diagnosed with antisocial personality disorder in adulthood) controlling for drug use and depression.	4
Loeber et al. (2005) ^d	N = 1,517; age = 7-13; 100% male; community sample.	Longitudinal; self-report of CU traits; official and self-reports of offending.	CU traits differentiated violent offenders from non-violent offender types controlling for other indicators of antisocial severity (e.g., age of delinquency onset, aggression).	4
Loney et al. (2007)	N = 352; age = 16-18; 100% male; community twin sample.	Longitudinal; self-report of CU traits; clinician rating of ODD, ADHD, drug and alcohol use, and antisocial personality disorder.	CU traits were unrelated to externalizing behaviors (e.g., ADHD, CD, alcohol, and drug dependence) at baseline and 6-year follow-ups after controlling for conduct problems.	4
López-Romero et al. (2012)	N = 138; age = 6–11; 73% male; community sample.	Longitudinal; teacher and parent reports of psychopathic traits including CU traits; teacher and parent reports of conduct problems and aggression; teacher report of delinquency.	Children high on psychopathic traits and conduct problems showed the most severe and persistent delinquency and aggression over 6 years compared to a conduct problem only group, a psychopathic only group, and a non-problematic group.	3
Lotze et al. (2010)	N = 50; age = 6–12; 38% male; high-risk community sample.	Cross-sectional; self-report of CU traits; self-report of externalizing behavior.	CU traits were unrelated to externalizing behavior.	3
Lynam (1997) ^d	N = 430; mean age = 10.2; 100% male; community sample.	Longitudinal; mother report of psychopathic traits including CU traits; self- report of delinquency.	Psychopathic traits distinguished stable, serious offenders from non-offenders and other less serious/stable offenders. Psychopathic traits predicted self-reported delinquency three years later controlling for behavioral and cognitive impulsivity as well as prior delinquency.	3 le continues

Table 7 (continued)

Study	Sample	Key methods	Summary of results	Relevance to specifier
Lynam et al. (2007) ^d	N = 250; age = 13; 100% male; high-risk community sample.	Longitudinal; self-report of psychopathic traits, including CU traits at age 13; clinician rating of psychopathic traits, including CU traits at age 24.	Psychopathic traits at age 13 were correlated with psychopathic traits in adulthood ($r = .31$), and this remained significant after controlling for a variety of other age 13 variables (e.g., low socioeconomic status, delinquency, parenting, and impulsivity).	3
Lynam, Charnigo, et al. (2009) ^d	N = 1,517; age = 7–13; 100% male; community sample.	Longitudinal; self-report of psychopathic traits including CU traits; self- report of delinquency.	Psychopathic traits predicted delinquency at age 17 after controlling for prior delinquency.	3
Lynam, Miller, et al. (2009) ^d	N = 338; age = 13; 100% male; community sample.	Longitudinal; self-report of psychopathic traits including CU traits; official reports of offending.	Psychopathic traits assessed at age 13 predicted variety of arrests and convictions at age 26 controlling for age 13 peer delinquency, impulsivity, CD, and ADHD.	3
Manti et al. (2009)	Dutch sample: $N = 1,748$; age = 4–12; 50% male; community sample. Greek sample: $N = 384$; age = 4–12; 49% male; community sample.	Cross-sectional; parent report of CU traits; parent report of aggressive and antisocial behavior.	CU traits were unrelated to aggression and antisocial behavior after controlling for concurrent aggression, antisocial behavior, and narcissism. However, CU traits interacted with narcissism to predict aggressive behavior.	3
Marsee et al. (2005)	N = 200; age = 10–17; 43% male; community sample.	Cross-sectional; teacher and self-reports of psychopathic traits including CU traits; self- report of aggression and delinquency.	Psychopathic traits were associated with overt aggression, relational aggression, and delinquency.	2
Marsee & Frick (2007)	N = 58; age = 12–18; 0% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of aggression.	CU traits were associated with proactive physical aggression and proactive relational aggression.	3
McMahon et al. (2010)	N = 754; Grade 7; 58% male; high-risk community sample.	Longitudinal; parent report of CU traits; official records of arrests; self-report of antisocial personality.	CU traits assessed in 7th grade predicted negative adult outcomes (e.g., adult arrests, antisocial personality symptom and diagnosis) after controlling for ADHD, CD, ODD, and childhood onset of CD. Those with both elevated CU traits and CD showed greater predictive power for antisocial outcomes than those with CD only.	5
Moran et al. (2009)	N = 7,636; age = 5–16; 51% male; population-based sample.	Longitudinal; parent report of CU traits; parent report of psychopathology.	CU traits predicted conduct problems at 3-year follow-ups accounting for initial levels of conduct problems, hyperactivity, peer problems, and emotional problems.	4
Muñoz & Frick (2007) ^e	N = 91; mean age = 13.4; 52% male; community sample.	Longitudinal; parent and self- reports CU traits; parent and self-reports of conduct problems; self-report of delinquency.	CU traits predicted self and parent- reported conduct problems and self- reported delinquency 3 years later. However, these associations were not significant after controlling for Time 1 antisocial behavior.	4
Muñoz, Pakalniskiene, & Frick (2011) ^e	N = 201; age = 11–12; 50% male; community sample.	Cross-sectional; self-report of CU traits; self-report of bullying.	CU traits were associated with both direct and indirect bullying.	3
(2011) Murrie et al. (2004)	N = 113; age = 13–18; 100% male; forensic sample.	Cross-sectional; institutional staff ratings and self-report of psychopathic traits including CU traits; official records of violence.	Psychopathic traits were significantly associated with a history of violent offending, especially instrumental violence, and institutional violence.	2

(table continues)

Table 7 (continued)

				Relevance
Study	Sample	Key methods	Summary of results	specifier
Nijhof et al. (2011)	N = 214; age = 12–18; 53% male; inpatient sample.	Cross-sectional; self-report of CU traits; self-report of externalizing and delinquent behaviors.	CU traits were associated with externalizing and delinquent behaviors.	3
Odgers et al. (2005)	N = 125; age = 13–19; 0% male; forensic sample.	Cross-sectional; clinician rating of CU traits; self-report of aggression.	CU traits were associated with aggression controlling for impulsivity and antisocial behavior.	4
Pardini (2006)	N = 169; age = 11–18; 57% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of violent offending.	CU traits were associated with severe violence and mediated the relations between low fear and severe violence.	3
Pardini et al. (2006) ^d	N = 1,517; age = 5–16; 100% male; high-risk community sample.	Longitudinal; parent and teacher reports of CU traits; self-report of delinquency.	CU traits were unrelated to self-reported delinquency during a 3-year follow-up period after controlling for overlap with CP, hyperactivity/impulsiveness, and inattention in the two younger cohorts. However, CU traits were the only predictor of delinquency for the oldest cohort (age = 11–16) after controlling for these constructs.	4
Pardini et al. (2007)	N = 120; age = 9–12; 59% male; community sample	Longitudinal; parent and teacher reports of CU traits; parent and teacher reports of antisocial behavior.	CU traits predicted antisocial behavior 1 year later, controlling for prior antisocial behavior at the initial assessment.	4
Pardini & Fite (2010) ^d	N = 1,517; mean age = 10.7; 100% male; community sample.	Longitudinal; parent report of CU traits; official records of delinquency.	CU traits were associated with more serious and persistent delinquent outcomes at 2-year follow-ups controlling for ADHD, CD, and ODD symptoms.	4
Pardini & Loeber (2008) ^d	N = 506; mean age = 13.9; 100% male; high-risk community sample.	Longitudinal; parent report of CU traits; growth curve modeling.	Mean levels of CU traits showed considerable stability from ages 14 to 18. Stable trajectories of CU traits were associated with antisocial personality disorder in adulthood.	4
Pardini et al. (2012)	N = 1,862; age = 6-8; 0% male; community sample.	Longitudinal; parent and teacher reports of CU traits; parent, teacher, and self-reports of mental health and academic outcomes; parent and clinician ratings of impairment.	Young girls with CD and elevated levels of CU traits showed lower anxiety, more severe aggression, more CD symptoms, more academic problems, and more global impairment at baseline and 6 years follow-up compared to girls with CD alone. The differences at 6-year follow-up were accounted for by baseline differences.	5
Penney & Moretti (2007)	N = 142; age = 12–18; 54% male; forensic sample.	Cross-sectional; clinician rating of CU traits; self-report of aggression.	CU traits were associated with relational and overt aggression controlling for	4
Piatigorsky & Hinshaw (2004)	N = 122; age = 6–12; 100% male; combined clinical and community sample.	report of aggression. Longitudinal; mother report of psychopathic traits including CU traits.	impulsivity and antisocial behavior. Psychopathic traits predicted severity of delinquency over 5 to 7 years controlling for ADHD, ODD, and externalizing behavior.	3
Poythress et al. (2006)	N = 165; age = 11–18; 52% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of delinquent and externalizing behaviors.	CU traits were associated with externalizing problems controlling for impulsivity and antisocial behavior; however, CU traits were unrelated to past year delinquency.	3
Raine et al. (2006)	N = 335; mean age = 16.15; 100% male; community sample.	Cross-sectional; parent report of psychopathic traits including CU traits; self- report of aggression.	Psychopathic traits were associated with both proactive and reactive aggression.	2
Ridenour et al. (2001)	N = 80; age = 14–18; 100% male; community sample.	Longitudinal; clinician rating of psychopathic traits, including CU traits; official records of delinquency.	Psychopathic traits predicted official delinquency 1 year later, controlling for CD diagnoses and history of delinquent behavior.	3

(table continues)

Table 7 (continued)

Study	Sample	Key methods	Summary of results	Relevance to specifier
Roose et al. (2010)	N = 455; age = 14–21; 56% male; community sample.	Cross-sectional; self-report of CU traits; self-report of antisocial behavior.	CU traits were associated with antisocial behavior.	3
Rowe et al. (2010)	N = 5,326; age = 5–16; population based sample.	Longitudinal; parent report of CU traits; structured interview of psychopathology; parent, teacher, and self-reports of police contact.	Children and adolescents with CU traits and CD were 5 times more likely to have retained a CD diagnosis 3 years later compared to those with CD but normative levels of CU traits at the initial assessment.	5
Ručević (2010)	N = 706; age = 12–19; 32% male; community sample.	Cross-sectional; self-report of CU traits; self-reported delinquency.	CU traits were associated with self- reported non-violent delinquent behavior and versatility in delinquency when controlling for impulsivity and antisocial behavior.	4
Salekin et al. (2003) ^f	N = 55; age = 13–17; 64% male; forensic sample.	Longitudinal; self-report of CU traits; official records of offending.	CU traits predicted both violent and non- violent recidivism, as well as the total number of offenses incurred during a 24–30 month follow-up period.	3
Salekin, Leistico, et al. (2004) ^f	N = 130; age = 9–18; 71% male; forensic sample.	Cross-sectional; clinician rating and self-report of psychopathic traits including CU traits; official records of offending.	Psychopathic traits predicted number of previous violent and nonviolent offenses, as well as early age of first antisocial behavior controlling for ODD, CD, and ADHD.	3
Salekin (2008) ^f	N = 130; age = 9–18; 71% male; forensic sample.	Longitudinal; clinician rating and self-report of CU traits; official records of offending.	Clinical assessments of CU traits predicted both general and violent recidivism three years from time of assessment; however, self-reports of CU traits did not predict either forms of recidivism.	3
Schmidt et al. (2006)	N = 127; age = 12–18; 62.3% male; forensic sample.	Longitudinal; clinician rating of psychopathic traits including CU traits; official reports of offending.	Psychopathic traits predicted violent recidivism even when controlling for prior externalizing problem behaviors.	3
Scholte et al. (2010)	N = 1,324; age = 4–18; 51% male; combined community and forensic sample.	Cross-sectional; teacher and professional caretaker ratings of CU traits; self-report of aggression and antisocial behavior.	CU traits were associated with antisocial behavior controlling for level of aggression.	4
Seals et al. (2012)	N = 171; age = 8–18; 100% male; community sample.	Cross-sectional; self-report of CU traits; parent report of externalizing behavior; self-report of aggression, and peer report of aggression.	CU traits were associated with self- reported aggression and parent reported rule-breaking.	3
Sevecke et al. (2009)	N = 214; age = 14–19; 43% male; forensic sample.	Cross-sectional; clinician rating of CU traits; clinician rating of aggression; self-report of externalizing problems.	CU traits were associated with aggression for boys but not girls, controlling for externalizing problems. However, CU traits were associated with externalizing problems controlling for aggression among girls but not boys.	4
Silverthorn et al. (2001)	N = 72; age = 13–18; 44% male; forensic sample.	Cross-sectional; self-report of CU traits; parent and self- reports of offending.	CU traits were associated with early onset of offending in boys.	3
Skeem & Cauffman (2003)	N = 160; age = 14–17; 100% male; forensic sample.	Longitudinal; self-report and clinician rating of CU traits; self-report and institutional records of antisocial behavior; official reports of offending.	CU traits were not associated with past offending behavior. CU traits measured via self-report predicted institutional infractions at one-month follow-up but clinical assessments did not. However, clinical assessments of CU traits predicted disciplinary action and violence at one-month follow-ups, while self-reports of CU traits did not.	3 le continues)

(table continues)

Table 7 (continued)

Study	Sample	Key methods	Summary of results	Relevance to specifier
Skilling et al. (2011)	N = 373; age = 12–17; 100% male; forensic sample.	Cross-sectional; parent and self-reports of CU trait; parent and self-reports of delinquency and aggression.	Sexual offenders and non-sexual offenders did not differ in level of CU traits.	3
Somech & Elizur (2009)	N = 136; age = 12–18; 100% male; community sample.	Cross-sectional; self-report of CU traits; self-report and teacher reports of conduct problems.	CU traits were associated with conduct problems.	3
Stafford & Cornell (2003)	<i>N</i> = 72; age = 12–17; 51% male; clinical sample.	Cross-sectional; clinician rating of psychopathic traits including CU traits; staff report of aggression.	Psychopathic traits were associated with both reactive and instrumental aggression during a hospital stay of 14–45 days.	2
Stickle et al. (2009) ^g	<i>N</i> = 150; age = 11–17; 60% male; forensic sample.	Cross-sectional; self-report of CU traits; self-report of aggression.	CU traits explained self-reported aggression after controlling for early onset of antisocial behavior and impulsivity.	4
Stickle et al. (2012) ^g	N = 150; age = 11–17; 60% male; forensic sample.	Cross-sectional; teacher, staff, and self-reports of CU traits; teacher and staff reports of aggression.	CU traits distinguished a group with high reactive and high proactive aggression from a group high on reactive aggression only and a group low on aggression.	3
van Baardewijk et al. (2009)	N = 224; mean age = 10.81; 53% male; community sample.	Cross-sectional; self-report of psychopathic traits including CU traits.	Psychopathic traits were related to aggression when distress cues were not present but unrelated to aggression when distress cues were present.	2
van Baardewijk et al. (2011)	N = 159; age = 9–12; 52% male; community sample.	Longitudinal; self-report of CU traits; teacher, peer, and self-reports of conduct problems; self-report of aggression.	CU traits were related to peer and teacher-rated conduct problems at baseline and follow-up controlling for prior conduct problems and impulsivity. CU traits were related to proactive and reactive aggression again controlling for conduct problems but not controlling for impulsivity.	4
Vaughn et al. (2009)	N = 267; mean age = 15; 86% male; forensic sample.	Cross-sectional; self-report of psychopathic traits including CU traits	Youths high on psychopathic traits had significantly higher levels of drug use, self-reported delinquency, violent offending, property offending, and victimization compared to individuals with normative levels of psychopathic traits.	2
Viding, Simmonds, et al. (2009)	N = 704; age = 11–13; 51% male; community sample.	Cross-sectional; self-report of CU traits; peer report of bullying.	CU traits and conduct problems interacted in predicting direct and indirect forms of bullying. Those with conduct problems and a CU presentation showed the highest rate of bullying.	4
Vincent et al. (2003)	N = 173; age = 12–19; 100% male; forensic sample.	Longitudinal; clinician rating of psychopathic traits including CU traits; official records of offending.	Psychopathic traits predicted general and violent recidivism, and shorter time to re-offending over 27 months.	3
Vitacco et al. (2006) ^h	N = 122; age = 12–17; 100% male; forensic sample.	Cross-sectional; clinician rating of psychopathic traits including CU traits; official records for assessment of violence.	Psychopathic traits were associated with instrumental violence.	2
Vitacco et al. (2007) ^h	N = 168; age = 12–17; 100% male; forensic sample.	Cross-sectional; clinician rating of CU traits; file reviews of victim injury.	CU traits were associated with extent of victim injury beyond the effects of age of onset, CD, and criminal versatility.	4

Table 7 (continued)

Study	Sample	Key methods	Summary of results	Relevance to specifier
Vitacco et al. (2010) ^h	N = 120; mean age = 15.28; 100% male; forensic sample.	Longitudinal; clinician rating of CU traits; official records for assessing aggression.	CU traits predicted criminal offending 5 years later through its effect on instrumental aggression.	3
Waschbusch & Willoughby (2008)	N = 214; age = 5–13; 50% male; community sample.	Cross-sectional; teacher report of CU traits; teacher report of aggression.	CU traits moderated the association between conduct problems and aggression such that the effects of conduct problems on aggression was stronger when CU traits were high.	4

Note. Studies with shared superscripts used overlapping samples. Rating of relevance to specifier proposal was done on a 2–5 scale based on relevance of the methodology for justifying including a specifier related to elevated CU traits to the diagnosis of CD (2 = minimal relevance; 3 = moderate relevance; 4 = significant relevance; 5 = extreme relevance).

mental risk over childhood conduct problems. Two studies in Table 7 reported that either psychopathic (Lynam, Caspi, Moffitt, Loeber, & Stouthamer-Loeber, 2007) or CU (Burke, Loeber, & Lahey, 2007) traits measured in childhood were significantly correlated with measures of psychopathic traits in adulthood, even controlling for childhood conduct problems. Lynam et al. (2007) reported several findings that provide an important context for interpreting this association between childhood and adult psychopathic traits. First, this study reported that the 11-year stability (from age 13 to 24) of psychopathic traits was r = .31, indicating that only about 9% of the variance in adult measures of psychopathy were accounted for by the childhood measures. Further, this study also reported that only 21% of the boys who scored in the upper 10% on the measure of psychopathic traits at age 13 showed clinical elevations on the measure of psychopathy at age 24. Thus, these estimates clearly suggest that CU traits are not immutable and that most children high on psychopathic traits will not be elevated on measures of psychopathy in adulthood. On the other hand, these results suggest that psychopathic traits appear to be as stable as other personality dimensions from childhood to adulthood (Roberts & DelVecchio, 2000). Further, although most children in the upper 10% of psychopathic traits at age 13 did not show elevated scores as adults, they were still 3.22 times more likely to show elevations compared to those scoring lower on psychopathic traits in childhood. Thus, showing high rates of psychopathic traits, including CU traits, in childhood appears to convey a modest level of risk for showing significant levels of psychopathic traits as an adult.

Implications for Diagnostic Classification

The research reviewed in this section indicates that CU traits are associated with antisocial behavior and, more important, that they predict antisocial outcomes even controlling for other methods of defining subgroups of children with severe conduct problems, such as controlling for number of conduct problems, level of aggression, age of onset of conduct problems, and level of impulsivity or ADHD symptoms. From the studies summarized in Table 7, these findings generalize across different methods of assessing CU traits (e.g., self-report, parent-report, clinician rating), across different types of samples (e.g., community, clinical, forensic), across a wide age range of children and adolescents, across gender, and

across different countries and cultures. The actual rate of elevated levels of CU traits within youths who show serious conduct problems varies greatly depending on the type of sample, how the traits are measured, and how cutoffs for "elevated" are defined, but, most studies have indicated that between 20% and 50% of children with serious conduct problems exhibit nonnormative levels of CU traits. This subgroup of youths with severe conduct problems and elevated CU traits seem to exhibit a more severe and stable pattern of antisocial behavior compared to other youths with severe conduct problems. Such findings, combined with the previous section suggesting that the causal factors underlying conduct problems in those with and without elevated CU traits may differ, support the change in the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) to the criteria for CD which adds a specifier to designate those youths with serious conduct problems who also show elevated rates of CU traits (Frick & Nigg, 2012). Specifically, the specifier is given if the individual a) meets criteria for CD and b) shows two more of the following CU traits persistently over 12 months in more than one relationship or setting: lack of remorse or guilt; callous-lack of empathy; unconcern about performance at school, work, or in other important activities; shallow or deficient affect.

Importantly, the findings of the studies reviewed in Table 7 vary greatly in their relevance to this change to the diagnostic criteria for CD. That is, studies that solely documented that psychopathic traits in general were correlated with measures of antisocial behavior have only minimal relevance to the specifier but the relevance increases if the study focused on CU traits specifically. If the study tested the association of CU traits after controlling for conduct problem severity, level of aggression, or age of onset of conduct problems, the relevance to the specifier is even greater. Such studies show that the association with antisocial outcomes is not solely due to greater conduct problem severity. Of most direct relevance, however, are studies that directly compared children or adolescents with a CD diagnosis with and without elevated levels of CU traits on the severity and stability of their antisocial behavior. To capture this varying level of relevance to the new specifier, studies in Table 7 were rated on a 2–5 point scale: 2 = minimalrelevance; 3 = $moderate \ relevance$; 4 = $significant \ relevance$; 5 = extreme relevance. Using this rating system, 31 studies showed significant relevance ("4"), and four studies were rated as having *extreme relevance*. These four studies are summarized here.

First, as noted previously, McMahon et al. (2010) reported that CU traits assessed in seventh grade significantly predicted adult antisocial outcomes (e.g., adult arrests, adult antisocial personality symptoms) controlling for ADHD, ODD, CD, and childhood-onset of CD. However, these authors also reported that the combination of a CD diagnosis and elevated CU traits, defined using the criteria for the new specifier, showed greater positive predictive power for adult antisocial outcomes than the diagnosis of CD alone. Second, Rowe et al. (2010) reported on a population-based sample (n =5,326) of children and adolescents ages 5 to 16 and used a definition that was close to the new specifier. Specifically, they used a 2-symptom cutoff similar to the specifier criteria but the definition included seven items (rather than 4) and included some symptoms not included in the criteria (e.g., fails to keep promises, too full of his or her abilities). This resulted in a less restrictive definition of elevated CU traits and 46% of the children and adolescents who met criteria for CD also met the criteria for the CU specifier. However, even with this more lenient definition of elevated CU traits, children and adolescents with both CD and the specifier were 5 times more likely to continue to have a diagnosis of CD 3 years later, compared to youths with CD without elevated CU traits. Third, Kahn et al. (2012) provided data from both community (n = 1,136) and clinic-referred (n = 566) samples and reported that between 10% and 50% of youths with CD met criteria for the specifier, depending on the sample and method of assessment (i.e., parent, teacher, youth, or combined informants). Further, across samples and methods, those meeting criteria for the specifier were more severe than those with CD only, especially by being more aggressive and cruel. Fourth, Pardini et al. (2012) tested the new specifier in a community sample of 1,862 girls ages 6 to 8 and reported that 25% of girls who met criteria for CD also met criteria for the specifier. Girls with both CD and elevated CU traits were more aggressive, had more severe CD symptoms, and had more global impairment both at baseline and across a 6-year follow-up period, although the differences at follow-up were largely accounted for by the differences at baseline.

Despite these promising findings supporting the proposed specifier for the diagnosis of CD, there are also some significant limitations in the existing research that should be the focus of future studies. First, the studies summarized in Table 7 were limited to those testing the role of CU traits in predicting antisocial outcomes (e.g., conduct problems, aggression, and delinquency). However, there is evidence that CU traits may predict other problematic outcomes for children and adolescents with severe conduct problems as well. For example, Wymbs et al. (2012) reported that adolescents (n = 521) in sixth grade with both CD and elevated CU traits were at higher risk for recurrent adolescent marijuana use, use of both alcohol and marijuana, and substance use related impairment in ninth grade compared to those with CD only. Interestingly, these results were found for boys only. In girls, a combination of CD and elevated CU traits was associated with less risk for later substance use and impairment. Similar findings were reported in a study of suicidal behaviors, with adolescent girls who were elevated on CU traits showing lower risk for suicide attempts (Javdani, Sadeh, & Verona, 2011). Besides supporting the need for research on more diverse types of mental health outcomes, these

studies also indicate that more research on potential gender differences in both the causes (Fontaine et al., 2010) and outcomes (Hillege, Das, & de Ruiter, 2010; Sevecke et al., 2009) of children and adolescents with elevated CU traits is needed.

Second, if CU traits are going to be integrated into diagnostic classification system, there needs to be much more research investigating the best indicators of this construct. Specifically, CU traits have often been assessed as part of the broader construct of psychopathy and, as a result, measures have often been limited by having only a few items specifically assessing CU traits (Forth, Kosson, & Hare, 2003; Frick & Hare, 2001). Recently, a more extended measure of CU traits has been developed and tested in samples of children of widely varying ages and using several different language translations (Essau et al., 2006; Ezpeleta, de la Osa, Granero, Penelo, & Domenech, 2013; Fanti, Frick, & Georgiou, 2009; Kimonis, Frick, Skeem, et al., 2008; Roose et al., 2010). Across these different samples, factor analyses have consistently indicated that the structure of CU traits are best represented by a factor model specifying an overarching CU dimension and three subdimensions of callous (e.g., not caring about the feelings of others), uncaring (e.g., does not feel bad or guilty when he or she does something wrong), and unemotional (e.g., does not express feelings openly) traits (although see Feilhauer et al., 2012, for an alternative factor structure). Although the ability to replicate this structure across samples and languages is promising, more work is needed to test the theoretical and practical importance of the CU dimensions (Kimonis, Frick, Skeem, et al., 2008) and to determine if other ways of operationalizing these traits show a similar structure (Latzman, Lilienfeld, Latzman, & Clark, 2012).

Third, in addition to clarifying the best indicators of CU traits, it is also critical that research investigates the optimal ways to assess these indicators, especially since the affective and interpersonal features of CU traits should be assessed differently than the behavioral symptoms of CD. Specifically, to assess the behavioral symptoms of CD, the diagnostician would need to document if the behavior had ever occurred over a specific time frame (e.g., past 6 or 12 months). In contrast, to assess the indicators of the CU specifier, characteristics should be shown "persistently over at least 12 months and in more than one relationship or setting" (Frick & Nigg, 2012, p. 96). This makes it critical to obtain information from multiple sources who can aid in determining if the characteristics reflect the child or adolescent's typical pattern of interpersonal and emotional functioning and not just occasional occurrences in some situations.

However, given the importance of obtaining multiple sources of information, it will be critical for research to test different methods for making such a multisource assessment to guide clinical practice, as has been the case for other forms of psychopathology (De Los Reyes et al., 2011). The available data suggests that, again consistent with other forms of childhood psychopathology (De Los Reyes & Kazdin, 2005), there tends to be modest agreement across measures of CU traits when they are assessed using different informants and methods. Specifically, across 13 studies that reported 24 correlations between measures of CU traits using different informants or methods, the average correlation was r=.24 and ranged from -.09 to .54 (Andershed, Hodgins, & Tengstrom, 2007; Burke et al., 2007; Dillard, Salekin, Barker, & Grimes, 2012; Feilhauer et al., 2012; Fink, Tant, Tremba, & Kiehl, 2012; Muñoz & Frick, 2007; Roose et al., 2010; Salekin et al., 2005;

Skeem et al., 2003). This included 10 correlations between clinician-rated and self-report measures (mean r = .28), five correlations between other (i.e., parent and teacher) reports and clinician ratings (mean r = .16), and nine correlations between self and other reports (mean r = .32). In contrast, across nine studies that administered multiple measures of CU traits using the same informant or method, there was much higher concordance across measures (Bijttebier & Decoene, 2009; Falkenbach, Poythress, & Heide, 2003; Fink et al., 2012; Kimonis, Frick, Skeem, et al., 2008; Moran et al., 2009; Poythress, Dembo, Wareham, & Greenbaum, 2006; Roose et al., 2010; Sakai et al., 2012; Salekin, Lester, & Sellers, 2012). Across these studies there were a total of 22 correlation coefficients reported (parent report, n = 5; self-report, n = 17) with a mean correlation of r = .51 (range = .24-.84). The average correlation between self-report measures of CU traits was r = .49, whereas the average correlation between parent reports of CU traits was r = .57.

Given the modest correlation across methods, it will be important for research to investigate and compare the utility of the different methods (Dirks, De Los Reyes, Briggs-Gowan, Cella, & Wackschlag, 2012). Although to date this issue has not been the focus of substantial research, one notable exception is a study of 94 male adolescents who had been arrested for a sexual offense (White, Cruise, & Frick, 2009). This study compared the correlations of parent-report and youth self-report of CU traits (which were correlated r = .29, p < .01) with several clinician rated indicators of risk for antisocial behavior in general, and sexual offending specifically, and with clinician rated indicators of the severity of antisocial behavior. They reported that both parent and youth reports of CU traits were significantly related to risk indicators of general antisocial behavior and with the severity of antisocial behavior, although the parent report of CU traits was somewhat stronger. Further both parent and self-report of CU traits were related to risk factors for sexual offending, with parent report being more highly associated with dispositional risk factors (e.g., sexual drive and preoccupations), whereas the youth report was more highly associated with environmental risk factors (e.g., unstable home environment) and predictors of poor response to interventions.

Another issue not adequately addressed in the available research is whether CU traits should be tied to severe conduct problems or whether these traits provide important diagnostic information even in the absence of severe conduct problems. This is an important issue in that the workgroup developing diagnostic criteria for the International Classification System of Diseases (ICD-11) published by the World Health Organization has proposed a syndrome to diagnose those high on CU traits, irrespective of whether the person also meets criteria for CD (Rutter, 2012). Such a proposal is supported by several lines of research. First, although high levels of CU traits in the absence of conduct problems is rare in large representative community samples (Fontaine, McCrory, Boivin, Moffitt, & Viding, 2011), this may not be the case in samples with high rates of early trauma and deprivation (Kumsta, Sonuga-Barke, & Rutter, 2012). Second, Moran, Ford, Butler, and Goodman (2008) reported results from a large (n = 5,770) and nationally representative sample of children and adolescents (ages 5–16) indicating that CU traits predicted behavioral and emotional problems 12 and 24 months later, even in the absence of significant levels of CD symptoms. Third, Burke, Waldman, and Lahey

(2010) reported that CU traits measured in childhood were actually a stronger predictor of antisocial personality disorder in adulthood in the absence of significant conduct problems. Finally, Musser, Galloway-Long, Frick, and Nigg (2013) reported that children with a diagnosis of ADHD without a diagnosis of CD showed different patterns of autonomic responding (both sympathetic and parasympathic) to emotional stimuli depending on the presence of significant levels of CU traits, and this difference remained even controlling for number of conduct problems. Thus, there is some promising evidence that elevated levels of CU traits designate impaired individuals with distinct patterns of emotional responding, even in the absence of CD or significant conduct problems. However, the vast majority of studies to date, as illustrated by Tables 1-7, have focused on CU traits in the presence of other antisocial behaviors. More research would be needed on persons with CU traits without significant levels of conduct problems to justify their inclusion in formal diagnostic classification systems.

A final issue that should be considered when evaluating the inclusion of a specifier for the diagnosis of CD is a consideration of potential harmful consequences associated with such a change. In the new criteria for *DSM*–5, the specifier is only used for those who would already meet criteria for CD. Thus, there would be no new persons meeting criteria for a mental disorder as a result of this change, although this is not true of the ICD proposal. For the *DSM*–5 though, the main potential for harm relates to any potential stigmatization associated with adding a label associated with CU traits.

Although there is minimal evidence for the stigmatizing effects for many diagnostic labels, this is not true for diagnostic labels associated with antisocial behavior. Specifically, research has consistently shown that labels such as "conduct disorder," "antisocial personality," "delinquent," and "psychopathic" can have harmful labeling effects, especially in forensic settings (Edens & Cox, 2012; Rockett, Murrie, & Boccaccini, 2007). Unfortunately, much of this research has been conducted with adults and no study has addressed the potential stigmatizing effect of a label specifically associated with CU traits. However, there is a body of research studying the effects of descriptions of antisocial behavior and the use of labels such as "conduct disorder" and "psychopathic disorder" when applied to children and adolescents that could inform this issue.

Specifically, several studies tested the effects of antisocial labels on juvenile court judges (S. Jones & Cauffman, 2008), juvenile probation officers (Vidal & Skeem, 2007), and mental health clinicians who work in the juvenile justice system (Rockett et al., 2007). Typically, these studies provided descriptions of adolescents who have committed the same crime but the descriptions varied as to whether various antisocial labels were included. This research consistently demonstrated that antisocial labels led to more negative connotations related to treatment amenability compared to descriptions providing no mental disorder label. However, this appears to be more related to the antisocial behavior itself and not to a specific diagnostic label per se. For example, the diagnosis of CD was viewed by persons' in the mental health and juvenile justice systems (e.g., jurors, clinicians, judges, parole officers) just as negatively as the label "psychopathic." In addition, using colloquial terms like "a psychopath" or simply describing antisocial behaviors in youths led to more negative views of risk for reoffending and treatment amenability than the diagnostic labels of either "conduct disorder" or "psychopathic disorder" (Boccaccini, Murrie, Clark, & Cornell, 2008; Murrie, Boccaccini, McCoy, & Cornell, 2007). From this research, it appears that providing descriptions of someone acting in a callous or unemotional manner would likely have more negative effects than a label given as part of an official diagnosis.

Further, Boccaccini et al. (2008) reported on a study of 891 potential jury pool members comparing the effects of both descriptions of antisocial behavior and the use of diagnostic (i.e., "conduct disorder," "psychopathic disorder") and colloquial (i.e., "is a psychopath") labels provided in a psychological evaluation. As in past studies, there were effects on the potential jurors' estimation of potential risk for future crime and ratings of whether the youth deserved greater punishment. However, again consistent with past research, this was greatest for descriptions of antisocial behavior and use of the colloquial term "psychopath," and there was no difference between vignettes using the diagnostic terms "conduct disorder" or "psychopathic disorder." Importantly, use of diagnostic terms-either "conduct disorder" or "psychopathic disorder"-led to more recommendations for mental health treatment for the hypothetical juvenile offenders. Thus, this research suggests that despite some negative risk associated with any antisocial label, there may also be some potentially beneficial labeling effects associated with the specifier by discouraging colloquial uses of the term "psychopath" and by encouraging greater mental health treatment for those diagnosed with the specifier.

Another consideration in trying to minimize any harmful effects of the specifier relates to the choice of label. The term "callousunemotional" has been used consistently in research because it provides a clear description of key features of the construct. This is important because, as noted previously, early attempts to capture CU traits in the DSM-III attempted to minimize potential stigmatizing effects of the label by using the term "undersocialized" (American Psychiatric Association, 1980). It was not clear that this term had any less negative connotations and the lack of clarity in this term led to great variability in how the construct was conceptualized and assessed by researchers and clinicians. Thus, it potentially retained the stigmatizing effects and did not clearly convey the clinical construct to others. Further, there is a danger in using terms that seem to connote a less severe disturbance (e.g., with uncaring features) for the specifier in an effort to decrease the potential for stigmatization. Such definitions could actually be more harmful by resulting in children and adolescents with less severe disturbances or even with levels of these traits within a more normative range being diagnosed with the specifier.

In short, there are legitimate concerns about potential stigmatizing effects of diagnostic labels associated with antisocial behaviors and traits, especially in forensic settings. A diagnostic term needs to be clearly descriptive of the construct, which for constructs related to antisocial behavior often are undesirable traits, yet attempts to limit potential stigmatizing effects as much as possible. This results in quite a difficult balancing act in selecting an appropriate diagnostic label for the construct of elevated CU traits in terms that avoid sounding so pejorative that they outweigh any potential benefit of their use (e.g., psychopathy) and that avoid sounding so normative that they are not adequately descriptive of a clinically important construct that predicts significant impairment for the individual (e.g., with uncaring features). These con-

siderations led to the label "with Limited Prosocial Emotions" being given for the specifier for CD in the *DSM*–5 (American Psychiatric Association, 2013).

Callous-Unemotional Traits and Response to Treatment

The third and final question addressed by this review was whether existing research suggests that CU traits identify children and adolescents with conduct problems who require intensive and specialized treatment relative to other individuals with severe conduct problems. Table 8 summarizes 24 studies that investigated the response to treatment of children and adolescents with either psychopathic traits (n = 9) or CU traits (n = 15). Of the 20 studies that compared the outcome of treatment for youths with conduct problems with and without elevated levels of CU traits, 18 (90%) studies reported that the group high on CU traits showed poorer treatment outcomes. Specifically, several studies of adolescents in the juvenile justice system demonstrated that adolescents with elevated psychopathic or CU traits were less likely to participate in treatment, showed lower rated quality of participation in treatment, showed poorer institutional adjustment, and were more likely to reoffend after treatment than those low on these traits (Falkenbach et al., 2003; Gretton, McBride, Hare, O'Shaughnessy, 2001; O'Neill, Lidz, & Heilbrun, 2003; Spain, Douglas, Poythress, & Epstein, 2004). Similarly, in inpatient psychiatric settings, children (ages 7–11) with elevated levels of CU traits had longer lengths of stay and experienced more physically restrictive interventions (e.g., higher rates of seclusion and physical restraint) during hospitalization (Stellwagen & Kerig, 2010a, 2010b). In a study of children (ages 7-12) with ADHD and conduct problems who participated in an outpatient summer treatment program, CU traits were associated (negatively) with 9 of the 14 outcome measures (Haas et al., 2011). Even after controlling for level of conduct problems, CU traits were associated with poorer staff ratings of improved social skills and problem solving, and they were correlated with more negative behaviors while in time-out. This latter study is important in suggesting that poor treatment response is not solely related to the more severe conduct problems of children with CU traits, although this should be tested further in future

Thus, CU traits designate a group of children and adolescent with conduct problems who appear to present as a true treatment challenge. However, several studies reviewed in Table 7 also provide data to suggest that some intensive treatments can reduce the level of conduct problems in children with high levels of CU traits. For example, in a study of 177 clinic-referred children (ages 6-11), those children with conduct problems and elevated CU traits who received an individualized and comprehensive modular intervention involving medication for ADHD, cognitive behavioral treatment, parent management training, school consultation, peer relationship development, and crisis management showed similar rates of improvement to other children with severe conduct problems who showed normative levels of CU traits (Kolko & Pardini, 2010). Similarly, Waschbusch, Carrey, Willoughby, King, and Andrade (2007) reported that children (ages 7-12) with ADHD, conduct problems, and parent-reported CU traits responded less well to very intensive behavior therapy alone than children with conduct problems with normative levels of CU traits.

Table 8
Research on the Response to Treatment for Children and Adolescents With Callous-Unemotional (CU) Traits

Study	Sample	Key methods	Summary of results
Brandt et al. (1997)	N = 130; age = 14–18; 100% male; forensic sample.	Cross-sectional; clinician rating of psychopathic traits, including CU traits; file reviews of infractions and placement.	Psychopathic traits were associated with more institutional infractions, as well as placement in Intensive Supervision Programs.
Butler et al. (2011)	N = 108; age = 13–17; 82% male; forensic sample.	Longitudinal; parent report of psychopathic traits including CU traits.	Youths assigned to Multisystemic Therapy showed larger decreases in psychopathic traits 18 months post-treatment compared to those receiving treatment as usual.
Caldwell et al. (2006)	N = 141; adolescents;100% male; forensic sample.	Longitudinal; clinician rating of psychopathic traits including CU traits; official records of offending.	For those high on psychopathic traits, intensive treatment was associated with lower rates of violent recidivism and longer time to recidivism over 2-year follow-up period compared to treatment as usual.
Caldwell et al. (2007)	N = 86; adolescents;100% male; forensic sample.	Longitudinal; clinician rating of psychopathic traits including CU traits; official records of offending.	Psychopathic traits were associated with worse institutional maladjustment, historical behavioral problems, and aggression before treatment; however, they were unrelated to treatment response or recidivism over 4 years.
Dadds, Cauchi, et al. (2012)	N = 195; age 6–16; 76% male; clinic- referred sample.	Cross-sectional; teacher, parent, and self-reports of CU traits; mother ratings of empathy.	Children with high levels of CU traits showed poorer responses to treatment as usual than other clinic-referred children but showed significant increases in levels of empathy after emotional–recognition training.
Das et al. (2007)	N = 147; mean age = 16; 100% male; forensic sample.	Cross-sectional; clinician rating of CU traits.	CU traits were unrelated to institutional infractions during treatment.
Falkenbach et al. (2003)	N = 69; age = 9-17; 60% male; forensic sample.	Longitudinal; parent and self- reports of CU traits; file review of program compliance, official records of offending.	CU traits were associated with non-compliance to a diversion program and predicted rearrest at 1-year follow-up.
Gretton et al. (2001)	N = 220; age = 12–18; 100% male; forensic sample.	Longitudinal; clinician rating of psychopathic traits including CU traits; official records of offending.	Psychopathic traits predicted more breaches of probation, more violent offenses, more sexual offenses, and shorter time to reoffending following release from a sexual offender treatment program.
Haas et al. (2011)	N = 70; age = 7-12; 70% male; clinical sample.	Longitudinal; self-report of CU traits.	CU traits were associated with poor treatment outcomes including poorer social skills, poorer problem solving, and negative response to punishment (i.e., time-out) while controlling for level of conduct problems.
Hawes & Dadds (2005) ^a	N = 55; age = 4-8; 100% male; clinical sample.	Longitudinal; parent report of CU traits; clinical assessment of oppositional defiant disorder (ODD).	Children with conduct problems and elevated CU traits showed poorer response to a parenting intervention (i.e., more likely to have ODD diagnosis at 6-month follow-up) than those with conduct problems but normative levels of CU traits.
Hawes & Dadds (2007) ^a	N = 49; age = 4–8; 100% male; clinical sample.	Longitudinal; parent report of CU traits.	Boys with high stable patterns of CU traits showed poorest treatment outcomes to a behavioral parent training program at 6-month follow-ups.
Hicks et al. (2000)	N = 82; mean age = 15.78; 100% male; inpatient sample.	Longitudinal; clinician rating of psychopathic traits, including CU traits; file reviews of institutional infractions.	Psychopathic traits were associated with more violent institutional infractions during inpatient treatment.
Kolko & Pardini (2010)	N = 177; age = 6–11; 81% male; clinical sample.	Longitudinal; teacher report of CU traits; self-report of delinquency, conduct disorder (CD), ODD, and attention-deficit/hyperactivity disorder (ADHD).	CU traits were unrelated to any post-treatment outcomes of a comprehensive multi-component treatment, including delinquency, CD, ODD, and ADHD after controlling for pretreatment ODD, CD, and ADHD.
Masi et al. (2011)	N = 38; age = 6–14; 74% male; clinic- referred sample.	Longitudinal; parent and self-reports of CU traits.	Non-responders to a 6-month psychosocial treatment showed higher self-reported CU traits but not higher parent reported CU traits. (table continues)

Table 8 (continued)

Study	Sample	Key methods	Summary of results
McDonald et al. (2011)	N = 66; age = 4–9; high-risk community sample.	Longitudinal; mother report of psychopathic traits including CU traits.	Children randomly assigned to a family intervention program showed larger decreases in psychopathic traits compared to those receiving treatment as usual over a follow-up period of 20 months. The effects on psychopathic traits remained even controlling for the effects of treatment on conduct problems.
O'Neill et al. (2003)	N = 64; age = 15–18; 100% male; forensic sample.	Longitudinal; clinician rating of psychopathic traits; urinalysis for substance use; staff rating of quality of participation; clinician rating of improvement; official records of offending.	Psychopathic traits were associated with fewer days of attendance, lower rated quality of participation, more substance use, less clinical improvement, and higher rates of rearrests 12-months following a treatment program for adjudicated youths with substance abuse problems.
R. Rogers et al. (2004)	N = 82; mean age = 15.37; 65% male; inpatient sample.	Longitudinal; self-report of psychopathic traits including CU traits; file reviews of treatment compliance and outcomes.	Psychopathic traits were associated with poor course of treatment (i.e., peer conflicts, non-compliance, and fights with staff) as well as poorer level of improvement, controlling for CD/aggression and poly-substance abuse.
Somech & Elizur (2012)	N = 209; age = 3-5; 78% male; community sample.	Longitudinal; parent report of CU traits.	A randomized controlled trial of an intensive (14 two-hour sessions) parent training program led to improvements in CU traits post-treatment and at 1-year follow-up, relative to a minimal intervention control group.
Spain et al. (2004)	N = 85; age = 11-18; 100% male; forensic sample.	Longitudinal; clinician rating and self-report of CU traits; file review of treatment outcomes and progress.	CU traits were associated with number of disciplinary infractions and longer time to progress through a residential treatment program for adjudicated youths; however, these associations disappeared after controlling for impulsivity and antisocial behavior.
Stafford & Cornell (2003)	N = 72; age = 12–17; 51% male; inpatient sample.	Longitudinal; clinician rating of psychopathic traits; staff report of aggressive behavior.	Psychopathic traits predicted verbal aggression, aggression towards peers, and instrumental aggression during treatment.
Stellwagen & Kerig (2010a) ^b	N = 101; age = 8-16; 64% male; inpatient sample.	Longitudinal; clinician rating of CU traits; file reviews of involuntary seclusion and use of restraints.	CU traits were associated with higher rates of involuntary seclusion and use of restraint during inpatient psychiatric treatment.
Stellwagen & Kerig (2010b) ^b	N = 100; age = 7-17; 64% male; inpatient sample.	Longitudinal; clinician rating of CU traits; file reviews of length of stay.	CU traits were associated with longer length of stay in psychiatric units.
Waschbusch, Carrey, et al. (2007)	N = 37; age = 7-13; 78% male; clinical sample.	Longitudinal; parent report of CU traits; file reviews of treatment outcomes.	Children with ADHD and conduct problems, who also showed elevated CU traits, responded worse to behavior therapy than those with ADHD and conduct problems but normative levels of CU traits. Differences between groups were reduced by the addition of stimulant medication.
White, Frick, et al. (2012)	N = 134; age = 11-17; 71.6% male; forensic- clinical sample.	Longitudinal; self-report of CU traits; parent, child, and therapist reports of treatment success; official arrest record.	Within arrested youths, CU traits were associated with greater improvements in conduct problems and emotional symptoms during Functional Family Therapy. However, CU traits were related to poorer adjustment post-treatment, despite improvement. CU traits were associated with more violent reoffending during treatment but this association decreased at 6- and 12-month follow-up periods.

Note. Studies with shared superscripts used overlapping samples.

However, these differences were reduced when stimulant medication was added to behavior therapy.

Several studies have also reported results suggesting that if interventions are tailored to the unique emotional, cognitive, and motivational styles of children and adolescents with CU traits,

treatments can reduce their behavior problems. To illustrate this, Hawes and Dadds (2005) reported that clinic-referred boys (ages 4–9) with conduct problems and elevated CU traits were less responsive to a parenting intervention than boys with conduct problems who showed normative levels of CU traits. However,

this differential effectiveness was not consistently found across all phases of the treatment. That is, children with and without elevated CU traits seemed to respond equally well to the first part of the intervention that focused on teaching parents methods for using positive reinforcement to encourage prosocial behavior. In contrast, only the group with normative levels of CU traits showed added improvement with the second part of the intervention that focused on teaching parents to use more effective discipline strategies. This outcome is consistent with the reward-oriented response style that, as noted previously, appears to be characteristic of children with elevated levels of CU traits. Another controlled treatment study by Dadds, Cauchi, et al. (2012) further illustrates the potential benefit of treatments specifically tailored to the unique needs of children with CU traits. In a study of children and adolescents (ages 6-16; mean age = 10.52 years) randomly assigned to either a typical parenting training intervention (n = 109) or an emotional-recognition training group (n = 87), children with elevated CU traits showed poorer response to the typical parenting training program in terms of the change in their levels of conduct problems d = 0.26). However, children high on CU traits who received training in the accurate perception and interpretation of emotions of others showed greater improvements in affective empathy relative to those in the typical parent training group (d =0.38).

Although both studies reported by Dadds and colleagues (Dadds, Cauchi, et al., 2012; Hawes & Dadds, 2005) involved relatively young children, White, Frick, Lawing, and Bauer (2012) reported on the effectiveness of Functional Family Therapy (FFT) in a sample of adolescents (ages 11-17) who had been arrested and referred to mental health treatment. This comprehensive and individualized treatment provided in a community mental health center led to reductions in conduct problems and in lower rates of rearrest 6 months and 1 year after treatment in youths with CU traits. However, CU traits were related to violent reoffending during treatment and, despite improvements with respect to conduct problems, youths with elevated CU traits still showed higher levels of conduct problems at the end for treatment compared to those with normative levels of CU traits. In a controlled test of a comprehensive approach to treatment tailored to the unique characteristics of youths with elevated CU traits, Caldwell, Skeem, Salekin, and Van Rybroek (2006) reported that adolescents with high levels of clinician-rated psychopathic traits in a secure facility for serious offenders improved with the use of an intensive treatment program that utilized reward-oriented approaches, targeted the self-interests of the adolescent, and taught empathy skills. Specifically, they reported that adolescent offenders with psychopathic traits who received the intensive treatment were less likely to recidivate in a 2-year follow-up period compared to offenders with psychopathic traits who underwent a standard treatment program in the same correctional facility.

Thus, certain intensive interventions can reduce the level of antisocial behavior (e.g., conduct problems, aggression, and delinquency) in children and adolescents with elevated CU traits. Unfortunately, very little research has focused on whether CU traits themselves respond to treatment, although a few studies have provided promising results. First, Hawes and Dadds (2007) reported additional analyses to their controlled trial of a parent-training intervention for young boys (ages 4–8) that, as described previously, showed that CU traits predicted less reduction in

conduct problems after treatment. Specifically, these authors reported a decline in level of CU traits from pre- to posttreatment (d = 0.49) and from pretreatment to 6-month follow-up (d =0.57). Second, Somech and Elizur (2012) demonstrated even stronger intervention effects on CU traits in a sample of younger children (ages 3- 5) and with a more intensive parent-training program, which consisted of 14 2-hr treatment sessions and included components focused on both parent and child selfregulation. Specifically, relative to a minimal intervention control group, there was a significant decline in level of CU traits from pre- to posttreatment (d = 0.85), and these gains were maintained at a 1-year follow-up. Third, McDonald, Dodson, Rosenfield, and Jouriles (2011) reported on a controlled trial of a parenting intervention for 66 families with children ages 4 to 9. The intervention was intensive in that parents received 20 sessions of the intervention administered in the home; it focused on training parents on appropriate behavior management skills and providing emotional and instrumental support to the parents. Psychopathic traits showed a greater reduction over the course of treatment in the intensive treatment group compared to a no-treatment comparison group, and this improvement was maintained over a 20-month follow-up period. The within-group effect size for the reduction in psychopathic traits from baseline to posttreatment was d = 0.95and from baseline to the 20-month follow-up was d = 0.89.

In the only study testing the amenability of psychopathic traits to treatment in adolescents (ages 13–17), Butler, Baruch, Hickey, and Fonagy (2011) tested the effects of a comprehensive treatment (Multisystemic Therapy [MST]) in a randomized control trial with 108 families of arrested youths. Compared to youths receiving typical community-based treatment, those receiving the intensive MST showed a greater decline in parent-reported psychopathic traits compared to adolescents in the control group from pre- to posttreatment. Importantly, however, the decline was not significant for youth-reported psychopathic traits, and there was no posttreatment follow-up. Thus, much further work is needed to test the effectiveness of interventions for reducing CU traits in older children and adolescents. Still, these results are at least somewhat encouraging that CU traits may be reduced by intensive treatments, even in older children and adolescents.

Implications for Advancing Treatment of Serious Conduct Problems in Children and Adolescents

In summary, the available research suggests that children and adolescents with elevated levels of CU traits are a treatment challenge as they often do not respond positively to typical treatments administered in mental health or juvenile justice settings. However, recent research has also suggested that children and adolescents with elevated CU traits are not "untreatable" and that they can improve with interventions are intensive and tailored to the unique emotional, cognitive, and motivational styles of children and adolescents with elevated CU traits, treatments can be effective for this group in reducing both the severity of their behavior problems and their level of CU traits. Perhaps one of the most important areas for future research is to continue to test new and innovative treatments for children and adolescents who show severe conduct problems and elevated levels of CU traits.

This critical need for more treatment research relates to all areas covered in this review. Specifically, research showing that children and adolescents with severe conduct problems and CU traits are at risk for serious antisocial outcomes clearly makes them an important focus of clinical intervention. Recognizing this group in widely used diagnostic classification systems is likely to promote more research on treatment for these children and adolescents and could lead to more funding for such research. Further, research on the distinct cognitive, emotional, biological, personality, and environmental correlates to CU traits could help to guide innovative treatment research. The available, albeit limited, research to date clearly suggests that interventions that are tailored to the unique characteristics of this group (e.g., reward dominance, lack of empathy) can reduce the level and severity of their behavior problems and possibly the CU traits themselves. As a result, as research advances our understanding of the causal mechanisms underlying the problems in social and behavioral adjustment displayed by youths with severe conduct problems and elevated CU traits, this progress could inform treatments that directly target these mechanisms (Frick, 2012). Further, separating those children and adolescents with severe conduct problems and elevated CU traits from other youths with severe conduct problems has helped to refine our understanding of the causal factors related to the severe conduct problems in those without CU traits as well. This refined understanding could lead to enhanced, tailored treatments for all children with severe conduct problems (Frick, 2012).

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