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Predictive Validity of Callous-unemotional Traits Measured in Early Adolescence with Respect to Multiple Antisocial Outcomes

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Abstract

This study investigated the predictive validity of youth callous-unemotional (CU) traits, as measured in early adolescence (grade 7) by the Antisocial Process Screening Device (APSD; Frick & Hare, 2001), in a longitudinal sample ($N = 754$). Antisocial outcomes, assessed in adolescence and early adulthood, included self-reported general delinquency from 7th grade through 2-years post-high school; self-reported serious crimes through 2-years post-high school, juvenile and adult arrest records through 1-year post-high school; and antisocial personality disorder symptoms and diagnosis at 2-years post-high school. CU traits measured in 7th grade were highly predictive of five of the six antisocial outcomes: general delinquency, juvenile and adult arrests, and early adult antisocial personality disorder criterion count and diagnosis, over and above prior and concurrent conduct problem behavior (i.e., criterion counts of oppositional defiant disorder and conduct disorder) and ADHD (criterion count). Incorporating a CU traits specifier for those with a diagnosis of conduct disorder improved the positive prediction of antisocial outcomes, with a very low false positive rate. There was minimal evidence of moderation by sex, race, or urban/rural status. Urban/rural status moderated one finding, with being from an urban area associated with stronger relations between CU traits and adult arrests. Findings clearly support the inclusion of CU traits as a specifier for the diagnosis of CD, at least with respect to predictive validity.

Keywords

Callous-unemotional traits; antisocial personality disorder; predictive validity; delinquency; Antisocial Process Screening Device

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In the last several decades, a wide range of risk factors has been identified that is associated with the development and persistence of conduct problems in children and adolescents. Additionally, a growing body of longitudinal data has demonstrated that there is substantial heterogeneity in the developmental trajectories leading to conduct problem behavior (see Lahey, Moffitt, & Caspi, 2003; McMahon, Wells, & Kotler, 2006, for reviews). Increased understanding of these trajectories has contributed to a more accurate conceptualization of youth conduct problems, which, in turn, has provided a foundation for more successful intervention and prevention efforts.

However, even with this progress, youth conduct problems (which frequently result in disruptions at home and school and can also lead to crime and violence) continue to represent a serious and costly societal problem (e.g., Aos, Lieb, Mayfield, Miller, & Penncucci, 2004; Cohen, 1998). Thus, conduct problem behaviors and their sequelae have continued to be a focus of public concern and a priority for the field of psychology (e.g., Dodge, 2008). In this context, researchers have continued efforts to identify new causal factors and developmental pathways, especially for youth with severe, and often early onset, conduct problems who have not consistently responded to currently available treatments and preventive efforts.

Some researchers have looked to the adult literature to identify constructs that have been useful in conceptualizing and predicting antisocial behavior, with the assumption that these constructs might first appear in childhood and/or adolescence and might also be important in identifying unique etiological pathways to severe youth conduct problems. One such construct, psychopathy, has been extensively studied in adults (e.g., Cleckley, 1976; Hart & Hare, 1997; see Patrick, 2006, for a review). Traditional descriptions of the psychopathy construct include interpersonal aspects (e.g., superficial charm, grandiosity, manipulation, and lying), affective aspects (e.g., shallow emotions, callousness, lack of guilt and empathy), and a behavioral dimension (e.g., impulsivity, irresponsibility, need for excitement, using others, lack of realistic long-term goals) (Cooke & Michie, 2001). In samples of adults, psychopathic traits predict a particularly serious and violent pattern of antisocial behavior that has been shown to be quite resistant to treatment (e.g., Hart, Kropp, & Hare, 1988; Patrick, 2006; Serin, 1993). Further, the antisocial behavior associated with psychopathy in adults is widely thought to have a relatively different etiology from antisocial behavior in nonpsychopathic adults (e.g., Lykken, 1995).

These findings in adult populations prompted interest in whether conduct problems in some youth might be explained by a similar “youth psychopathy” correlate (e.g., Moffitt, Caspi, Dickson, Silva, & Stanton, 1996).¹ Just as this discussion began to take hold, Lynam (1996, 1997, 1998) proposed that psychopathy, widely theorized to be a personality attribute, ought to be recognizable prior to adulthood. Additionally, citing evidence that attempts to treat psychopathy in adulthood had proven unsuccessful (e.g., Hart et al., 1988) and that psychopathic individuals often had antisocial and criminal histories beginning prior to adulthood (Hart & Hare, 1997), Lynam concluded that efforts to interrupt and arrest the development of antisocial and criminal behavior would be aided by the early identification of psychopathic traits in youth. Taken together, these theoretical advancements prompted significant interest in a youth psychopathy construct and in the explicit testing of models of youth psychopathy (e.g., Forth, Hart, & Hare, 1990; Frick, O’Brien, Wootton, & McBurnett,

¹Although less explicit in nature, previous attempts have been made to extend the psychopathy construct to youth populations. Notably, the DSM-III (American Psychiatric Association, 1980) differentiated children with conduct disorder (CD) who were “socialized” or “undersocialized.” The undersocialized type was connected to traditional views of the adult psychopathic personality (primarily the interpersonal/affective factor), while the socialized type of CD focused more on an environmental/behavioral etiology of conduct problems. Within this system, youth were also categorized as aggressive/non-aggressive. See Frick and Ellis (1999) for a detailed discussion of this DSM-III subtyping approach and its association with the youth psychopathy construct.

1994). As a result, in the last 15 years, several research groups have independently worked toward (a) adapting and modifying the construct of adult psychopathy within a developmental context; (b) creating age-appropriate measurement tools to parallel measurement in adult populations; and (c) developing and testing models of youth psychopathy in a variety of cross-sectional and longitudinal youth samples (see Kotler & McMahon, 2005; Lynam & Gudonis, 2005; for reviews).

It should be noted that there remain significant concerns about whether the concept of psychopathy should be applied to youth (e.g., Hart, Watt, & Vincent, 2002; Seagrave & Grisso, 2002; Skeem & Petrila, 2004). Some of the debate surrounding this issue includes: (a) conflict about whether delineating psychopathic traits in youth is developmentally appropriate given the malleability of personality during development and the heterogeneity of antisocial youth; (b) questions about the stability of psychopathic traits from youth to adulthood;² and (c) concerns about the “psychopathy” label and its use in legal settings.³

As noted above, researchers have made an effort to more accurately assess dimensions of youth psychopathy. Child and adolescent psychopathy measures have been developed by either directly adapting adult assessment tools (primarily the Psychopathy Checklist-Revised [PCL-R]; Hare, 1991, 2003) or creating new screening measures (Forth, Kosson, & Hare, 2003; Frick & Hare, 2001; Lynam, 1997; see Kotler & McMahon, in press, for a review of youth psychopathy assessment methods and issues). The Psychopathy Checklist: Youth Version (PCL:YV; Forth et al., 2003), a direct adaptation of the PCL-R for adolescents, and the Antisocial Process Screening Device (APSD scale; originally called the Psychopathy Screening Device [PSD]; Frick & Hare, 2001), which includes all elements of the PCL-R unless absolutely not relevant for youth (e.g., multiple marriages), are the most commonly used tools to assess youth psychopathy. However, all of the currently used assessment tools purport to measure a psychopathy construct that is consistent with that described by Hare and colleagues. Further, most of the measures have items/scales that address the affective, interpersonal, and behavioral dimensions of the psychopathy construct. Thus, these youth measures can be viewed as attempting to capture aspects of the “psychopathic personality” (affective/interpersonal components) as well as the deviant lifestyle and antisocial behaviors that are typically associated with that personality. Moreover, although significant measurement issues continue to be debated, the pattern of relations between the youth psychopathy measures and temperamental and behavioral characteristics suggest that, overall, youth psychopathy assessment tools capture a construct that appears similar to adult psychopathy.

As theory development and research in the domain of juvenile psychopathy have progressed, increasing attention has been paid to the affective/interpersonal component of the psychopathy construct, typically referred to as “callous-unemotional [CU] traits” in the youth psychopathy literature. In part, this focus on CU traits may have come about as an effort to capture the “unique” components of the psychopathy construct that are not embedded in established behavioral descriptions of youth antisocial behavior. Further, data suggest that CU traits may be particularly useful in identifying a subgroup of antisocial youth with stable and severe antisocial behavior (Frick & White, 2008) who may differ in their social/emotional, cognitive, and biological functioning (Frick & Viding, 2009). In fact, Frick and colleagues (e.g., Frick, Cornell, Bodin et al., 2003; Frick & Viding, 2009) have proposed that CU traits are the key component of the juvenile psychopathy construct with

²Research findings indicating that the youth psychopathy construct actually seems fairly stable across multiple-year intervals (i.e., Frick, Cornell, Barry, Bodin, & Dane, 2003; Lynam et al., 2009) suggest that this concern may be less relevant than initially thought.

³It is notable that Murrie, Boccaccini, McCoy, and Cornell (2007) recently found that while behavioral history and personality descriptions influenced judges' decisions, the psychopathy label itself did not.

respect to identifying a unique etiological pathway for early onset conduct problems. Often CU traits are operationalized using the CU subscale from the APSD scale (Frick & Hare, 2001). More recently, measurement tools specific to CU traits have also been developed (e.g., “interpersonal callousness,” Pardini, Obradovi, & Loeber, 2006; Inventory of Callous-Unemotional Traits, Frick, 2004).

Using both CU trait-specific approaches and multidimensional youth psychopathy measures, researchers have documented relatively robust and consistent relations (see Frick, 1998; Frick & Marsee, 2006; Lynam & Gudonis, 2005, for reviews) between measures of child and adolescent psychopathy and a range of conduct problems in juvenile offender populations, clinic-referred populations, and community samples (e.g., Christian, Frick, Hill, Tyler, & Frazer, 1997; Dadds, Fraser, Frost, & Hawes, 2005; Forth, 1995; Lynam, 1997, 1998; Salekin, 2008). Taken together, these findings indicate that higher scores on measures of youth psychopathy are positively related to a more severe, pervasive, and stable constellation of conduct problems.

The majority of research on youth psychopathy has utilized concurrent measurements of psychopathy and conduct problems. Although the lack of longitudinal data in this domain is a notable weakness (Moffitt et al., 2008), measures of psychopathy are increasingly being included in longitudinal conduct problem data sets. For example, Loeber and colleagues (2001) assessed psychopathy using the Child Psychopathy Scale (CPS; Lynam, 1996, 1997, 1998) as part of the Pittsburgh Youth Study. The full-length version of the CPS was administered at one time point in the middle cohort of boys (12–13 years of age) while a short version of the CPS (composed of 18 items drawn directly from the Child Behavior Checklist; Achenbach, 1991) was available at all assessment points. Boys with high scores on the CPS were the most frequent, severe, aggressive, and temporally stable delinquent offenders. They were impulsive and prone to externalizing behavior disorders. Moreover, psychopathy predicted serious, stable, antisocial behavior in adolescence above and beyond other known predictors and classification approaches. A recent mixed-model analysis (utilizing the short form of the CPS) indicated that youth psychopathy was relatively stable from childhood through adolescence (i.e., from 7 to 17 years old; intervals examined for stability analyses ranged from 6 months to 5 years), and that both measurement reliability and predictive validity were maintained throughout this lengthy developmental period (Lynam et al., 2009). Lynam and colleagues (Lynam, Caspi, Moffitt, Loeber, & Stouthamer-Loeber, 2007) also conducted a follow-up assessment of psychopathy in a subsample of the boys from the Pittsburgh Youth Study ($n = 271$) at the age of 24 using the Psychopathy Checklist: Screening Version (PCL:SV; Hart, Cox, & Hare, 1995). These authors reported that psychopathy from early adolescence to early adulthood was moderately stable ($r = .31$), irrespective of initial risk status or initial psychopathy level and after controlling for 13 other constructs (e.g., demographic information, parenting, delinquency).

Also using data from the Pittsburgh Youth Study, Pardini and colleagues (2006) constructed a measure of “interpersonal callousness” and found that higher scores on this measure predicted delinquency persistence in the adolescent cohort. Pardini and Loeber (2008) further identified trajectories of interpersonal callousness over a 4-year period in adolescence, and reported that boys with higher initial levels of interpersonal callousness, and those with trajectories that increased or did not decline, had the highest level of antisocial personality characteristics at age 26.

Recent studies have also examined scores on the PCL:YV (Forth et al., 2003) as a predictor of future recidivism. Schmidt, McKinnon, Chattha, and Brownlee (2006) examined the PCL:YV in a multiethnic community sample of 130 adjudicated male and female adolescents. At a mean follow-up of 3 years, the PCL:YV predicted general and violent

recidivism in male Caucasian and Native Canadian youth. Examining a sample of 130 youth involved in court assessments, Salekin (2008) showed that, after controlling for a host of variables relating to offending, PCL:YV scores predicted general and violent recidivism over a 3- to 4-year period from mid-adolescence to young adulthood.

Several studies utilizing community samples have also provided valuable longitudinal outcome data. For example, Frick and colleagues (Frick, Stickle, Dandreaux, Farrell, & Kimonis, 2005) followed a sample of 98 youth (grades 4–7 at baseline) for 4 years. They found that youth with both baseline conduct problems and CU traits subsequently demonstrated the highest rates of conduct problems, self-reported delinquency, and police contacts. Compared to youth without initial conduct problems, youth with baseline conduct problems who did not evidence CU traits also showed higher rates of conduct problems, but rates of self-reported delinquency were not elevated. Piatigorsky and Hinshaw (2004) constructed a “psychopathy prototype” using items from the California Child Q-Set and found that children with a high degree of similarity to the prototype had more severe delinquency at a 5–7 year prospective follow-up, even after controlling for baseline conduct problems. Similarly, Dadds and colleagues (2005) found that, after accounting for initial antisocial behavior, CU traits predicted antisocial behavior for boys (ages 4–9 years) and older girls (ages 7–9 years) at a 12-month follow-up. Examining a very large community sample in Great Britain ($n = 7,636$ youth aged 5 to 16 years), Moran et al. (2009) found that CU traits were positively associated with psychopathology at a 3-year follow-up.

Overall, the currently available longitudinal data suggest that measures of youth psychopathy account for significant variation in later conduct problem outcomes and even adult antisocial behavior. However, it is notable that the magnitude of these relations has varied widely across studies and tends to be larger in offender populations.

In the context of this limited but growing body of longitudinal findings, there has been significant concern about overlap between youth psychopathy (both the multidimensional construct and the CU traits component) and conduct problem constructs, especially when psychopathy is measured in non-offender populations where baseline levels of conduct problems vary widely (e.g., Burns, 2000; Dadds et al., 2005). In particular, it is possible that many relations between youth psychopathy and subsequent conduct problems are due to significant shared variance between measures of psychopathy and other established measures of conduct problem severity (e.g., initial severity of conduct problems, timing of conduct problem onset). Consequently, some researchers have questioned whether psychopathy constructs can provide added value to existing conduct problem models and current DSM-IV (APA, 1994) and proposed DSM-V conduct disorder (CD) and subtyping criteria (e.g., Burns, 2000; Moffitt et al., 2008). To provide an accurate response to this question, dimensions of youth psychopathy must be evaluated in the context of other commonly used predictors of conduct problem outcomes (Burns, 2000; Dadds et al., 2005; Frick, 2000). As noted in the review of extant longitudinal data, several authors have begun to address this issue. For example, Dadds et al. (2005), Moran et al. (2009), and Piatigorsky and Hinshaw (2004) found that psychopathy measures predicted significant variance in conduct problem behavior after controlling for baseline conduct problems. However, not all studies have yielded this pattern of results. Salekin and colleagues (Salekin, Neumann, Leistico, DiCicco, & Duros, 2004) found that, although the PCL:YV (Forth et al., 2003) predicted previous offenses above and beyond oppositional defiant disorder (ODD) and CD diagnoses, the APSD scale (Frick & Hare, 2001) did not do so.

In addition, whether CU traits contribute incremental utility over information provided by comorbid attention-deficit hyperactivity disorder (ADHD) has not been well-established (Frick & Moffitt, 2010). ADHD is the comorbid condition most commonly associated with

conduct problems, and is thought to precede the development of conduct problems in the majority of cases. In fact, some investigators consider ADHD (or, more specifically, the impulsivity or hyperactivity components of ADHD) to be the “motor” that drives the development of early onset conduct problems, especially for boys (e.g., Burns & Walsh, 2002; Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998). Coexisting ADHD also predicts a more negative life outcome than do conduct problems alone (see Waschbush, 2002).

The current study was designed to specifically address the issue of whether the youth psychopathy construct provides added value to existing models of conduct problems, including the diagnostic subtyping criteria of CD in the DSM-IV, and the presence of comorbid ADHD. We have focused our investigation on CU traits because this affective/interpersonal component of the psychopathy construct can be more clearly differentiated from behavioral definitions of conduct problems, and because CU traits are under consideration as a specifier for CD in the DSM-V (Frick & Moffitt, 2010). In particular, we examined the predictive validity of CU traits measured in early adolescence (grade 7) to subsequent antisocial outcomes and early adult antisocial personality disorder characteristics in the context of existing predictors of conduct problem severity. Three primary research questions were evaluated: (1) Do CU traits predict later antisocial outcomes above and beyond existing measures of childhood conduct problems and ADHD? (2) How accurately do CU traits identify individuals who engage in antisocial behavior in young adulthood compared to other established predictors of antisocial behavior, and does a CU trait specifier (as proposed for DSM-V) add predictive value to an existing CD diagnosis? (3) Does the predictive validity of CU traits vary as a function of youths’ sex, race, or urban/rural status?

In order to address these questions, CU traits were measured in grade 7 using the CU traits subscale of the parent-report version of the APSD scale (Frick & Hare, 2001). Antisocial outcomes, measured in adolescence and early adulthood, included: (1) self-reported delinquency from 7th grade through 2-years post-high school; (2) self-reported serious crimes through 2-years post-high school, as well as both juvenile and adult arrest records through 1-year post-high school; and (3) antisocial personality disorder symptoms and diagnosis at 2-years post-high school. We controlled for earlier measures of conduct problems (e.g., ODD and CD criterion counts, childhood onset of CD) and ADHD (criterion count). Finally, there is a significant shortage of research on girls and ethnic minority youth who exhibit CU traits (Moffitt et al., 2008); furthermore, to our knowledge, urban versus rural status of these youth also has not been investigated. Thus, sex, race, and urban/rural status were explored as potential moderators.

Methods

Participants

Participants came from the control schools of a longitudinal multi-site investigation of the development and prevention of childhood conduct problems, the Fast Track project (Conduct Problems Prevention Research Group, 1992, 2000). Schools within four sites (Durham, NC; Nashville, TN; Seattle, WA; and rural Pennsylvania) were identified as high risk based on crime and poverty statistics of the neighborhoods that they served. Within each site, schools were divided into sets matched for demographics (size, percentage free or reduced lunch, ethnic composition), and the sets were randomly assigned to control and intervention groups. Using a multiple-gating screening procedure that combined teacher and parent ratings of disruptive behavior, 9,594 kindergarteners across three cohorts (1991–93) from 55 schools were screened initially for classroom conduct problems by teachers, using the Teacher Observation of Child Adjustment-Revised (TOCA-R) Authority Acceptance score (Werthamer-Larsson, Kellam, & Wheeler, 1991). Those children scoring in the top

40% within cohort and site were then solicited for the next stage of screening for home behavior problems by the parents, using items from the Child Behavior Checklist (Achenbach, 1991) and similar scales, and 91% agreed ($n = 3,274$). The teacher and parent screening scores were then standardized and summed to yield a total severity-of-risk screen score. Children were selected for inclusion into the high-risk sample based on this screen score, moving from the highest score downward until desired sample sizes were reached within sites, cohorts, and groups. Deviations were made when a child failed to matriculate in the first grade at a core school ($n = 59$) or refused to participate ($n = 75$), or to accommodate a rule that no child would be the only girl in an intervention group. The outcome was that 891 children (control = 446 and intervention = 445) participated. In addition to the high-risk sample of 891, a stratified normative sample of 387 children was identified to represent the population normative range of risk scores and was followed over time. From among the control schools ($n = 27$), teachers completed ratings of child disruptive behavior to identify a normative, within-site stratified sample of about 10 children within each decile of behavior problems.

The current study utilized data from the high-risk control group (65% male; 49% African American, 48% Euro American, 3% other race) and normative sample (51% male; 43% African American, 52% Euro American, 5% other race). Because 79 of those recruited for the high-risk control group were also included as part of the normative sample, the final sample for the current analyses included 754 participants. Weighting was used in all analyses to reflect the over-sampling of high-risk children. Participants from the high-risk intervention sample were not included in this study.

Measures

Antisocial Process Screening Device (APSD)—Youth psychopathy was assessed in the summer after 7th grade using the parent version of the APSD scale (Frick & Hare, 2001). Scoring on this 20-item rating scale of youth behaviors is based on a 3-point scale: “0” (not at all true), “1” (sometimes true) or “2” (definitely true). The APSD scale has been shown to have adequate test-retest reliability (Christian et al., 1997). We used the APSD scale three-factor structure identified by Frick, Bodin, and Barry (2000) that includes CU traits, narcissism, and impulse control/conduct problems factors. A confirmatory factor analysis indicated that this factor structure adequately fit the APSD scale data from participants in the current study (Kotler, McMahon, & CPPRG, 2002; CFI = .91; GFI = .92). Only the CU factor score was employed in the present investigation. Similar to findings reported by Frick et al. (2000) in their examination of the APSD scale in a large community sample, CU scores in our normative sample were moderately skewed (skewness = 0.241). In contrast, CU scores in our high-risk sample were not significantly skewed (skewness = -0.004). This finding is consistent with results from other studies utilizing the APSD scale with high-risk populations (e.g., Pardini, Lochman, & Powell, 2007). In addition, a CU trait specifier was calculated for use in the sensitivity analyses. This specifier was developed using the criteria described by Frick and Moffitt (2010) and proposed for DSM-V. The Frick and Moffitt criteria include a conduct disorder diagnosis as well as the presence of two or more of the following CU traits for at least 12 months and in more than one setting: (1) lack of remorse or guilt; (2) callous-lack of empathy; (3) unconcerned about performance; and (4) shallow or deficient affect. In the current study, four items from the CU factor of the APSD scale that correspond to the four traits described by Frick and Moffitt were used to create the CU specifier: (1) does not feel guilty; (2) unconcerned about the feelings of others; (3) unconcerned about school/work; and (4) does not show emotion. For the purposes of the current study we calculated a CU trait cutoff, defined as having a score of “2” (“Definitely true”) on at least two of the four items from the APSD CU traits scale. This cutoff, in

combination with a CD diagnosis, was utilized as the CU trait specifier in the sensitivity analysis.

Self-Report of Delinquency—The Self-Report of Delinquency (SRD; Elliott, Huizinga, & Ageton, 1985) measure was administered from grades 7 through 12, as well as the 2 years following high school, and captured the number of times in the past year the respondent committed 34 different offenses. Offenses range from lying about one's age to get something to attacking someone with the intent to hurt. Following earlier use of the measure (e.g., Elliott et al., 1985), the items in each grade were capped at three to avoid creating an extremely skewed distribution. The SRD *general delinquency* outcome measure was defined as the mean of all 34 items within each year, with a possible range of 0–1. A count measure of *serious crimes* in the 2 years following high school was created by summing the number of 13 items from the SRD that represent serious offenses, including stealing, physical violence towards others, and selling drugs. Thus, the possible range for the serious crimes variable was 0–13.

Court records—Juvenile and adult arrest information was collected from the court system in the child's county of residence and surrounding counties through 1-year post-high school. A court record of arrest indicates any crime for which that youth was arrested and adjudicated, with the exception of probation violations (which were inconsistently reported in courts across the four sites) and referrals to youth court diversion programs for very young first time offenders (starting at age 11). Other offenses leading to youth diversion programs were included as long as there was an identified arrest in the records.

The data collected from the courts included a description of the offense, the date of offense, the adjudication date for the arrest, and the outcome of the arrest. To capture both frequency and severity of the crimes for which youth were arrested, we created a lifetime severity weighted frequency of juvenile and adult arrests (Cernkovich & Giordano, 2001). Each offense for each arrest was assigned a severity score ranging from 1 to 5. Level 5 included all violent crimes such as murder, rape, kidnapping, and first-degree arson. Level 4 contained crimes involving serious or potentially serious harm and included assault with weapon and first-degree burglary. Level 3 crimes reflected medium severity, such as simple assault, felonious breaking and entering, possession of controlled substances with intent to sell, and firesetting. Level 2 included low-severity crimes such as breaking and entering, disorderly conduct, possession of controlled substance, shoplifting, vandalism, and public intoxication. Level 1 involved status and traffic offenses. We then summed the severity level of the most severe offense from each arrest from grade 6 through grade 12 (separately for adult and juvenile arrests).

Psychiatric criterion counts and disorders—The Parent Interview version of the NIMH Diagnostic Interview Schedule for Children (DISC) is a well-validated, highly structured, laptop computer-administered, clinical interview to assess DSM-IV symptoms in children and adolescents ages 6 to 17 years. We used version 2.3 in grade 3 (and the published anticipated DSM-IV criteria for diagnosis at that time) and version IV in grades 6, 9, and 12 (Shaffer et al., 1996; Shaffer, Fisher, Lucas, & Comer, 2003; Shaffer & Fisher, 1997). Lay interviewers, blind to control/normative status, were trained until they reached reliability. Administration took place in the child's home with the primary parent, usually the mother, during the summer following grades 3, 6, 9, and 12. Variables were computed for past-year criterion counts and diagnoses for CD, ODD, and ADHD. Criteria were solicited for the past 6 months for ODD and for the past 12 months for CD and ADHD. CD scores were based on 15 criteria derived from 23 symptom items, with actual scores ranging from 0 to 9. ODD scores were based on 8 criteria derived from 12 symptom items, with scores ranging from 0 to 8. ADHD scores were based on 18 criteria derived from 21

symptom items, with scores ranging from 0 to 18. Diagnoses for grade 3 followed from DSM-III-R criteria, and diagnoses for grades 6, 9, and 12 followed from DSM-IV criteria.

The DISC–Young Adult version (DISC-YA; Shaffer et al., 2000) was administered to the youth at 2-years post-high school. Antisocial personality disorder diagnosis was based on having three or more criteria derived from seven symptom items, with actual scores ranging from 0 to 7 ($M = 0.95$, $SD = 1.45$).⁴

Analysis Plan

In order to address the primary research questions described earlier, we conducted three sets of analyses to examine the relation between CU traits measured in grade 7 using the APSD scale and six antisocial outcome measures: self-reported delinquency averaged across grade 7 through 2 years post-high school⁵, self-reported serious crimes in the 2 years following high school, severity-weighted juvenile and adult arrests, and antisocial personality disorder criterion count and diagnoses 2 years following high school. In the first set of analyses, we estimated the relation between CU traits and antisocial outcomes, while controlling for measures of conduct problems (i.e., CD and ODD criterion counts or diagnosis, childhood onset of CD, assessed in grades 3, 6, 9, and 12) and ADHD (criterion score or diagnosis, assessed in grades 3, 6, 9, and 12). For continuous outcomes (self-reported delinquency, serious crimes, juvenile and adult arrests and ASPD criterion count), the criterion counts of CD, ODD, and ADHD were included as covariates. For the binary outcome (antisocial personality disorder diagnosis), CD, ODD, and ADHD diagnoses were included as covariates.

In the second set of analyses, we examined the predictive accuracy of CU traits and other measures of conduct problems for successfully identifying individuals who engaged in antisocial behavior in young adulthood. In the third set of analyses, we incorporated three demographic measures to determine whether the predictive validity of CU traits applies equally to all individuals, regardless of sex, race, or urban/rural status.

All of the continuous antisocial outcome measures were count measures with significant positive skew (skewness ranged from 1.73 for antisocial personality disorder criterion count to 6.10 for self-reported serious crimes post-high school). In order to accommodate the distributions, we used a negative binomial regression model (Hilbe, 2007), which is an extension of the Poisson model that allows for overdispersion (when the variance of the outcome is greater than the mean of the distribution). For the dichotomous outcome - antisocial personality disorder diagnosis - a logistic regression model was used. The second set of analyses was a binary classification test to determine the sensitivity, specificity and predictive value of the various measures of conduct problems and ADHD in the prediction of antisocial outcomes (Altman & Bland, 1994). Sensitivity represents the proportion of individuals who exhibited antisocial outcomes, given the predictor (i.e., CU traits) was present. One minus the sensitivity provides the false negative rate, or the rate of missing the prediction of antisocial outcomes. Specificity is the proportion of individuals who do not exhibit antisocial outcomes, given the predictor was absent. One minus the specificity provides the false positive rate, which is the proportion of individuals who were inaccurately

⁴Validity studies for the DISC-YA, including the antisocial personality disorder module, have not been conducted (P. Fisher, personal communication, March 24, 2010). However, support for the construct validity of the DISC-YA antisocial personality disorder criterion count and diagnosis comes from their positive and statistically significant associations with measures of self-reported general delinquency and serious crimes, and juvenile and adult arrests in the current sample (coefficients ranging from .25 to .39; all p s < 0.01) (see Table 1).

⁵Initially, latent growth models were estimated for the SRD scores from grade 7 through 12; however, the results indicated non-significant change in SRD over time and a main effect for mean level of SRD. Thus, to simplify the results we report the relations between conduct problems, CU traits, and mean SRD over time.

predicted to exhibit antisocial outcomes. The positive predictive value of an indicator was calculated as the proportion of individuals who exhibited antisocial outcomes, who were predicted to exhibit antisocial outcomes. Negative predictive value was the proportion of individuals who did not exhibit antisocial outcomes, who were not predicted to exhibit antisocial outcomes. Ideally, both sensitivity and specificity are high, which would indicate that the predictor correctly identifies those who will develop antisocial outcomes and correctly identifies those who will not develop antisocial outcomes.

For the third set of analyses, we conducted moderated regression analyses (Aiken & West, 1991) to examine whether sex, race, and urban/rural status moderated the relation between CU traits and antisocial outcomes. The interaction between CU traits and the potential moderators (sex, race, and urban/rural status) was calculated by mean centering the CU traits score and multiplying the centered CU traits scale score by dummy coded moderators. The regression models described above for the first set of analyses were repeated with the main effects of CU traits, the main effects of each moderator, and the interaction between CU traits and each moderator. Given the large number of tests, we used a corrected alpha of $p < 0.01$.

Regression models were conducted with Mplus v5.2 (Muthén & Muthén, 2007). Missing outcome data were accommodated using full information maximum likelihood (ML) with robust standard errors and numerical integration, which provides an estimate of variance-covariance matrix using all of the available information from the observed data (Schafer, 1997; Schafer & Graham, 2002). ML assumes data are missing at random (MAR), which means the function by which data are missing can be characterized (probabilistically) by the observed data.⁶ By controlling for observed variables that predict the missingness function, the conditional likelihood of the missing value becomes independent of the outcome of interest (Rubin, 1976). The most missing data occurred on the DISC-YA measure, with 33% ($n = 250$) missing at 2 years post-high school. Attrition analyses indicated that race, urban/rural status, and CU trait scores were significantly associated with whether data were missing; therefore, data were assumed to be MAR with these variables included in all models. Our effective sample sizes were 754 for the SRD and arrests models, and 504 for the antisocial personality disorder criterion counts/diagnosis models.

Results

Descriptive information (i.e., means and standard deviations of continuous measures) and the bivariate correlations for all measured variables are provided in Table 1. As shown in the shaded section, many of the predictor variables were significantly correlated ($p < 0.01$) with the six primary outcome variables. There were also significant correlations within each scale (e.g., DISC, SRD). Overall, self-report of general delinquency from grade 7 to 2-years post-high school was most highly correlated with CD criterion count. Self-report of serious crimes during the 2-years post-high school was most highly correlated with CD and ADHD criterion counts. Adult arrests were most highly correlated with CD criterion count and CU traits. Juvenile arrests were most highly correlated with ADHD and CD criterion counts. Antisocial personality disorder criterion count and diagnosis were most strongly correlated with CD criterion count and child onset of CD. Table 1 also provides the frequencies (% of sample endorsing) of antisocial personality disorder diagnosis as well as child-onset of CD.

⁶There is no way of determining whether the MAR assumption holds in any one data set. Fortunately, Collins and colleagues (2001) have shown that inaccurately assuming MAR, when data are missing not at random, has a minor impact on the ML estimates and standard errors.

Predictive Validity of CU Traits

The first set of analyses evaluated whether CU traits predicted additional variance in later antisocial outcomes over existing measures of childhood conduct problems and ADHD. As seen in Table 2, the CU traits subscale of the APSD was significantly associated with average SRD scores (i.e., general delinquency), juvenile and adult arrests, and both antisocial personality disorder criterion count and diagnosis. The direction of the effects was such that higher levels of CU traits predicted higher levels of self-reported general delinquency, more juvenile and adult arrests, greater number of antisocial personality disorder criterion met, and a higher likelihood of antisocial personality disorder diagnosis. CD criterion count significantly predicted self-reported general delinquency scores and juvenile and adult arrests. ODD criterion count⁷ and ADHD criterion count significantly predicted self-reported serious crimes, and child onset of CD predicted antisocial personality disorder criterion count and diagnosis.

Positive Predictive Value and Specificity of CU Traits

The level of the predictive accuracy of the CU traits scale of the APSD, in comparison to other predictors of antisocial outcomes, was evaluated by calculating the sensitivity, specificity, positive predictive value, and negative predictive value of each predictor (Altman & Bland, 1994). A total antisocial index, defined by one or more antisocial outcomes (i.e., the presence of any severity weighted juvenile or adult arrests, at least one serious crime, or a diagnosis of antisocial personality disorder), was used as the outcome in the sensitivity/specificity analyses. Forty-seven percent of the sample ($n = 356$) qualified for at least one antisocial outcome.

Table 3 provides each value. ODD diagnosis has the highest level of sensitivity (43%), whereas CD diagnosis with CU traits cutoff score had the highest specificity (.99). The CD diagnosis with the CU traits cutoff score also had the highest positive predictive value (.89). Therefore, incorporating the CU traits specifier for those with a diagnosis of CD improves positive prediction of antisocial outcomes, with a very low false positive rate (.01). In the current sample, only one of the nine individuals who were diagnosed with CD and exhibited CU traits did not also exhibit later antisocial outcomes. Negative predictive values and sensitivity were relatively low across the conduct problem and ADHD predictors because of the large number of individuals with antisocial outcomes.

Consistency of Effects across Sex, Race, and Urban/Rural Status

In the final set of analyses, sex, race, and urban/rural status were examined as moderators of the relation between CU traits and each antisocial outcome using moderated regression analyses. CU traits scale scores were centered and multiplied by the dichotomized sex, race, and urban/rural status variables to create separate interaction terms (Aiken & West, 1991). The only significant interaction effect was an interaction between CU traits and urban status in the prediction of adult arrests ($\beta = -0.84$, $p < 0.001$). Probing the interaction using simple slopes indicated that the association between CU traits and adult arrests was significantly greater among individuals from urban areas ($r = 0.26$, $p < 0.001$) as compared to rural areas ($r = 0.11$, $p = 0.17$).

⁷In the context of the regression analyses, the regression coefficient for ODD predicting self-reported serious crimes was in the opposite direction as the bivariate correlation, indicating a suppression effect (Cohen, Cohen, West, & Aiken, 2003) due to high intercorrelations between CD, ODD, and ADHD criterion counts and the stronger associations between serious crimes and both CD and ADHD criterion counts.

Discussion

This study focused on the predictive validity of CU traits, measured in early adolescence, with respect to multiple antisocial outcomes in adolescence and young adulthood. We employed a longitudinal sample with 15 years of annual data collection beginning in kindergarten and extending through 2-years post-high school. Multiple antisocial outcomes were measured, including general delinquent behavior from 7th grade through 2-years post-high school (approximately age 20) and serious crimes in the 2 years following high school, both derived from youth self-report; juvenile and adult arrests through 1-year post-high school, as measured by both youth self-report and court records; and antisocial personality disorder criterion count and diagnosis, as measured by youth self-report.

Three primary research questions were addressed using analytic models designed to focus on assumptions regarding the underlying distribution of the data in the population: (1) Do CU traits predict later antisocial outcomes above and beyond existing measures of childhood conduct problems and ADHD? (2) How accurately do CU traits identify individuals who engage in antisocial behavior in young adulthood compared to other established predictors of antisocial behavior, and does a CU trait specifier (as proposed for DSM-V) add predictive value to an existing CD diagnosis? (3) Does the predictive validity of CU traits vary as a function of youths' sex, race, or urban/rural status? Our findings with regard to each of these questions are discussed below.

Does the CU Traits Construct Provide Added Value to Existing Models of Conduct Problems?

Overall, the results indicated that the measure of CU traits administered to parents in 7th grade (i.e., from the APSD scale) was highly predictive of five of the six antisocial outcomes: self-reported general delinquency, juvenile and adult arrests, and both early adult antisocial personality disorder criterion count and diagnosis. Of import, however, was whether information about CU traits provided incremental value in terms of predictive validity over other well-established predictors of antisocial outcomes, such as criterion counts of ODD and CD, childhood-onset status of CD, and ADHD criterion count, assessed from grade 3 to grade 12. Surprisingly, the measure of CU traits was more predictive of later antisocial outcomes than any of these other predictors. This was the case for general delinquency, juvenile and adult arrests, and antisocial personality disorder criterion count and diagnosis.

The current findings add to the existing literature in several key ways. First, there have been conflicting results regarding the added predictive value of CU trait and psychopathy data taken from psychopathy screening measures above and beyond frequently used predictors of antisocial behavior (e.g., baseline conduct problems, ODD and CD diagnoses). While several research groups have found that psychopathy measures predict significant variance in conduct problem behavior after controlling for baseline conduct problems (e.g., Dadds et al., 2005; Moran et al., 2009; Piatigorsky & Hinshaw, 2004), Salekin et al. (2004) looked specifically at the predictive validity of the APSD scale above and beyond ODD and CD diagnoses and did not find a significant effect. Thus, our results lend further weight to the contention that data from CU trait and psychopathy screening measures can provide added predictive validity in the context of a rigorous analytic design including multiple often-used predictors of antisocial behavior. Second, in the extant CU trait and psychopathy literature, insufficient attention has been paid to ADHD as a primary predictor of antisocial behavior (Frick & Moffitt, 2010). Thus, our findings demonstrating the incremental predictive validity of CU traits above and beyond an ADHD measure also augment the current knowledge base in this regard. Finally, results from the current study move beyond demonstrating that CU traits provide incremental predictive validity, in that, with respect to

a number of key antisocial outcomes, CU traits are shown a more salient predictor than other frequently-used conduct problem measures. Establishing CU traits as a key predictor of antisocial outcomes is of primary importance when considering the addition of a CU trait specifier in the diagnosis of CD in DSM-V.

It is important to note that only 5% of participants in the current sample met the criteria for CU traits described by Frick and Moffitt (2010), suggesting that children who meet the CU traits criteria are at extremely high risk for engaging in antisocial acts. Considering that recent prevalence estimates of antisocial personality disorder in the general population are only 3.6% (Grant et al., 2004) and the high degree of specificity for CU traits in predicting antisocial outcomes, it is not surprising that so few participants in the current sample reported CU traits. Nonetheless, the results from the current study should be interpreted with some caution until replicated in a larger sample.

How Accurately Do CU Traits Identify Individuals Who Engage in Antisocial Behavior in Young Adulthood Compared To Other Established Predictors of Antisocial Behavior, and Does a CU Trait Specifier (as Proposed for DSM-V) Add Predictive Value To An Existing CD Diagnosis?

In order to examine the predictive accuracy of the CU traits scale, in comparison to other predictors of antisocial outcomes, we calculated the sensitivity, specificity, positive predictive value, and negative predictive value of each predictor with respect to a total antisocial index (Altman & Bland, 1994). This index was defined by one or more of four antisocial outcomes (i.e., the presence of any severity weighted juvenile or adult arrests, at least one serious crime, or a diagnosis of antisocial personality disorder). Almost half of the sample displayed at least one antisocial outcome, providing a wide range of individuals who engage in antisocial behavior. However, the high rate of antisocial outcomes resulted in low sensitivity (below .43) across all predictors, primarily because of the high number of “false negatives” (meaning youth engaged in antisocial behavior but did not meet diagnostic criteria).

Incorporating the CU traits specifier for those with a diagnosis of CD improved positive prediction of antisocial outcomes, with a very low false positive rate (.01) and with the highest positive predictive value (.89). Only one of the nine individuals who was diagnosed with CD and exhibited CU traits did not also exhibit later antisocial outcomes. As noted previously, several recent studies have evaluated the predictive validity of CU traits and the psychopathy construct in the context of other predictors of antisocial outcomes (e.g., Dadds et al., 2005; Piatigorsky & Hinshaw, 2004; Salekin, 2008). However, to our knowledge, this is the first investigation to specifically address the predictive accuracy of CU traits in relation to other commonly-used predictors of antisocial behavior (cf. Frick & Moffitt, 2010). When combined with the findings from our first analysis showing that, compared to other commonly-used measures, CU traits provide superior prediction with respect to a number of antisocial outcomes, results demonstrating that the inclusion of CU traits data improves predictive accuracy lend additional weight to the assertion that a CU traits specifier for the diagnosis of CD would be a valuable addition to the diagnostic framework.

It is also important to note that child onset of CD, which is currently a subtype of CD in the DSM-IV, also had a low false positive rate (.04) and good positive predictive value (.82). These findings provide support for the current proposal to retain the age-of-onset distinction in the DSM-V (Frick & Moffitt, 2010).

Does the Predictive Validity of CU Traits Vary as a Function of Youths' Sex, Race, or Urban/Rural Status?

As noted above, there has been a paucity of research concerning whether or not various demographic variables might serve to moderate the predictive validity of CU traits on antisocial outcomes. To our knowledge, this is the first study to examine sex, race (African American vs. non-African American), and urban/rural status in the same sample.

There was minimal moderation of the effects of CU traits by sex, race, or urban/rural status. The relation between CU traits and adult arrests was somewhat stronger for urban African Americans and whites than it was for rural whites. This interaction can be partially explained by the significantly higher rate of adult arrests among youth from urban areas and the correspondingly significantly higher scores on the CU traits scale among African Americans from urban areas. To our knowledge, this was the first study to examine urban/rural status as a potential moderator of the effects of CU traits on later antisocial outcomes. The failure of these demographic variables to moderate the predictive relationship between CU traits and nearly all antisocial outcomes (measured up to 7 years later) underscores the robustness of the link between CU traits and antisocial outcomes. However, it is important to note that detecting significant interaction effects can be extremely difficult, particularly when variable distributions are skewed (McClelland & Judd, 1993). Future research should continue to examine whether demographic characteristics may moderate the association between CU traits and antisocial outcomes.

Implications for DSM-V

Findings clearly support the inclusion of presence of CU traits as a possible specifier for the diagnosis of CD (Frick & Moffitt, 2010), at least with respect to predictive validity. Higher levels of CU traits (measured in 7th grade) were associated with a more negative prognosis on five of six antisocial outcomes employed in this study, including self-reported general delinquency, juvenile and adult arrests, and antisocial personality disorder criterion count and diagnosis. Of even greater significance, our indicator of CU traits provided incremental value in terms of predictive validity over other well-established predictors of antisocial outcomes, including previous and current criterion counts of ODD, CD, and ADHD, and childhood-onset status of CD. strongly suggests that it may have a place in the diagnostic system for CD in the forthcoming DSM-V, along with retention of the age-of-onset subtyping distinction currently in place.

Finally, the findings supported the general robustness of the relation between CU traits and later antisocial outcomes. This was the case during adolescence, with no evidence of moderation by sex, race, or urban/rural status found for either general delinquency or juvenile arrests, as well as early adulthood, with no evidence of moderation for serious crimes or antisocial personality disorder criterion count and diagnosis. The only evidence of moderation was that the connection between CU traits and adult arrests was stronger for urban African Americans and whites than for rural whites. Future research should be conducted to examine the interaction between living in urban areas and CU traits in the prediction of adult arrests.

Overall, these findings are supportive of serious consideration of the inclusion of CU traits as a specifier for the diagnosis of CD in the upcoming DSM-V.

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Table 1
Bivariate Correlations, Means and Standard Deviations for All Measured Variables

	<i>n</i>	<i>M (SD) or %</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Sex	754	58% male	1.00													
2. Race	754	46% AA	-0.02	1.00												
3. Urban status	749	74% urban	-0.02	0.89*	1.00											
4. CD criterion	701	.48 (.84)	-0.19*	-0.02	-0.01	1.00										
5. ODD criterion	701	.85 (1.38)	-0.11*	-0.12*	-0.08	0.61*	1.00									
6. ADHD criterion	701	2.37 (3.06)	-0.20*	-0.04	-0.01	0.48*	0.63*	1.00								
7. Child onset	538	21%	-0.21*	0.00	0.03	0.40*	0.31*	0.36*	1.00							
8. CU traits	618	.62 (.37)	-0.15*	0.23*	0.22*	0.31*	0.27*	0.27*	0.22*	1.00						
9. General delinq.	754	.02 (.04)	-0.21*	0.12*	0.13*	0.26*	0.19*	0.17*	0.11*	0.16*	1.00					
10. Serious crimes	754	.28 (1.02)	-0.17*	0.08	0.09	0.15*	0.10*	0.15*	0.11	0.05	0.56*	1.00				
11. Adult arrests	754	1.46 (3.88)	-0.21*	0.19*	0.18*	0.28*	0.11*	0.05	0.14*	0.25*	0.20*	0.01	1.00			
12. Juvenile arrests	659	2.54 (4.99)	-0.23*	0.20*	0.18*	0.25*	0.18*	0.27*	0.19*	0.24*	0.26*	0.15*	0.32*	1.00		
13. ASPD criterion	511	.92 (1.45)	-0.27*	0.03	0.07	0.23*	0.20*	0.19*	0.25*	0.16*	0.39*	0.38*	0.25*	0.26*	1.00	1.00
14. ASPD diagnosis	503	12%	-0.22*	-0.05	-0.01	0.21*	0.20*	0.18*	0.24*	0.15*	0.38*	0.34*	0.27*	0.28*	0.78*	

* *Note.* $p < 0.01$;

AA = African American; CU = callous-unemotional traits; ASPD = antisocial personality disorder; CD = conduct disorder. ODD = oppositional defiant disorder; ADHD = attention-deficit hyperactivity disorder; Child onset indicates the presence of a CD diagnosis and the onset of at least one CD criterion prior to age 10.

Table 2

Standardized regression coefficients for CU traits predicting outcomes, including CD, ODD, ADHD and child-onset criteria as covariates

	SRD general delinquency	SRD serious crimes	Juvenile arrests	Adult arrests	ASPD criterion count	ASPD diagnosis
CU scale	0.11 *	0.21	0.52 **	0.87 **	0.46 *	0.30 *
CD criterion/diagnosis ^a	0.27 **	0.31	0.49 *	0.43 **	0.19	-0.02
ODD criterion/diagnosis ^a	-0.07	-0.46 *	-0.06	-0.17	0.19	0.20
ADHD criterion/diagnosis ^a	0.10	0.75 **	0.24	0.002	-0.04	0.01
Child onset	-0.09	0.35	0.13	-0.11	0.58 *	0.33 *

Note. SRD = Self-Report of Delinquency; ASPD = antisocial personality disorder; CU = callous-unemotional traits; CD = conduct disorder; ODD = oppositional defiant disorder; ADHD = attention-deficit hyperactivity disorder

* $p < 0.01$,

** $p < 0.05$;

^aFor continuous outcomes (SRD general delinquency, SRD serious crimes, juvenile and adult arrests and ASPD criterion count) the criterion counts of CD, ODD, and ADHD were included as covariates. For the binary outcome (ASPD diagnosis), CD, ODD, and ADHD diagnoses were included as covariates.

Table 3
Sensitivity and specificity of antisocial outcomes for each conduct problem/ADHD predictor

Predictor	Base rates ^a	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
ODD diagnosis	152	0.43	0.83	0.65	0.60
ADHD diagnosis	130	0.38	0.83	0.67	0.59
CD diagnosis	79	0.29	0.95	0.82	0.60
CD+ child onset	55	0.20	0.96	0.82	0.57
CU traits cutoff	36	0.06	0.95	0.58	0.51
CD + CU traits cut-off	9	0.04	0.99	0.89	0.53

^aNumber of individuals who met diagnosis/cutoff criteria for each predictor.