Symptoms of Conduct Disorder, Oppositional Defiant Disorder, Attention-Deficit/Hyperactivity Disorder, and Callous-Unemotional Traits as Unique Predictors of Psychosocial Maladjustment in Boys: Advancing an Evidence Base for *DSM-V*

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Abstract

Objective—The incremental utility of symptoms of conduct disorder (CD), oppositional defiant disorder (ODD), attention-deficit/hyperactivity disorder (ADHD), and callous-unemotional (CU) traits for predicting psychosocial outcomes across multiple domains was examined in a community sample of 1,517 boys.

Method—Several outcomes were assessed semiannually across a 2-year follow-up, including antisocial behavior, internalizing problems, peer conflict, and academic difficulties. Official criminal charges were also examined across adolescence.

Results—CD symptoms emerged as the most robust predictor of future antisocial outcomes. However, ODD symptoms predicted later criminal charges and conduct problems, and CU traits were robustly associated with serious and persistent criminal behavior in boys. Attention-deficit/hyperactivity disorder symptoms predicted increases in oppositional defiant behavior and conduct problems over time and were uniquely related to future academic difficulties. Both ADHD and ODD symptoms predicted social and internalizing problems in boys, whereas CU traits were associated with decreased internalizing problems over time.

Conclusions—The current findings have implications for revisions being considered as part of the *DSM-V*. Specifically, incorporating CU traits into the diagnostic criteria for Disruptive Behavior Disorders (DBD) may help to further delineate boys at risk for severe and persistent delinquency. Although currently prohibited, allowing a diagnosis of ODD when CD is present may provide unique prognostic information about boys who are at risk for future criminal behavior, social problems, and internalizing problems.

Keywords

callous-unemotional traits; oppositional defiant disorder; attention-deficit/hyperactivity disorder; conduct disorder; longitudinal

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In preparation for the fifth edition of *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-V*), the advisory committee for disruptive behavior disorders (DBD) has outlined a research agenda to inform possible revisions to the diagnostic criteria and associated features of oppositional defiant disorder (ODD) and conduct disorder (CD). An issue that has emerged is whether attention-deficit/hyperactivity disorder (ADHD) and ODD symptoms provide unique predictive utility to various forms of psychosocial impairment beyond CD symptoms in youth. In terms of ODD symptoms, this issue has particular relevance for *DSM-V,* as a diagnosis of ODD can not be given when the criteria for CD are met. More recent downward translations of the affective features of psychopathy to youth have raised similar questions regarding the incremental predictive utility of CU traits, which includes a lack of empathy and guilt. Emerging evidence indicates that CU traits may not be adequately captured by the current *DSM-IV* framework.[1] To address these issues, the unique contributions of symptoms of ADHD, ODD and CU traits in predicting psychosocial impairment across multiple domains was examined while controlling for co-occurring CD symptoms in a large community sample of boys.

Facets of Antisocial Behavior

There is little doubt that early CD symptoms are one of the most robust predictors of serious antisocial behavior later in life.[1] However, the incremental utility of ADHD, ODD, and CU traits in predicting future antisocial behavior remains unclear. Some evidence supports a developmental cascade of problem behavior that partially explains the co-occurrence of ADHD, ODD, and CD symptoms. Specifically, children with elevated ADHD symptoms are more likely to develop ODD symptoms, and this increase in ODD symptoms subsequently places children at risk for developing CD symptoms.[2] On the other hand, CU traits are believed to contribute to the development of CD symptoms over time, even after controlling for co-occurring ADHD and ODD symptoms. Although longitudinal studies have shown that CU traits predict changes in conduct problems over time,[3] many of these studies have failed to control for co-occurring ADHD, ODD, and CD symptoms.

A related issue is whether ADHD, ODD, and CU traits are predictive of a transition to more serious and persistent forms of criminal behavior after accounting for co-occurring CD symptoms. Longitudinal studies suggest that CU features may be particularly useful in distinguishing youth who will develop severe and persistent delinquency.[4–6] Although several studies indicate that ADHD symptoms are largely unrelated to severe and persistent antisocial behavior, after controlling for co-occurring conduct problems,[7–9] significant associations between childhood ADHD and later arrest have been reported.[10] In contrast, the link between ODD symptoms and delinquency is less clear, as symptoms of ODD and CD are often combined into a single construct.[6,10] When the two disorders are considered independently, evidence suggests that CD, but not ODD, predicts persistent antisocial behavior after controlling for other covariates.[8,9]

Social Problems

Children with externalizing problems often exhibit poor social skills and are frequently rejected by peers. Symptoms of ADHD and ODD in particular have been linked to conflicted peer relationships.[11] Children with ADHD are prone to exhibit aversive behavior during peer interactions[11] and are at risk for later peer rejection,[12] even after controlling for co-occurring conduct problems.[13] Children with ODD tend to have more pervasive social problems with parents and peers in comparison to children with other psychiatric diagnoses, including ADHD and CD.[11,14] Although CD symptoms and CU traits have also been associated with peer difficulties,[15] it is unclear whether these problems are accounted for by co-occurring ADHD and ODD symptoms.

Internalizing Symptoms

Disruptive behavior and internalizing symptoms often co-occur throughout childhood.[16] However, a growing body of literature suggests that the link between CD and later internalizing problems may be primarily accounted for by co-occurring ODD symptoms.[17–19] In contrast, several studies have found that CU traits are negatively related to anxiety and fearfulness, particularly after controlling for co-occurring conduct problems.[20–22] Although ADHD has also been found to be positively associated with internalizing problems,[23] there is some evidence that this association may be due to co-occurring ODD and dysfunctional parenting.[18]

Academic Difficulties

Longitudinal research indicates that ADHD symptoms are particularly strong predictors of academic problems in boys.[24] Although studies have also shown a link between CD/ODD symptoms and academic problems,[16] co-occurring symptoms of ADHD may account for this association.[25,26] Although longitudinal studies examining the association between CU traits and the development of academic problems are rare, CU traits do not seem to be strongly associated with factors related to poor academic performance, such as lower intelligence, after controlling for co-occurring conduct problems.[27]

Current Study

To expand the evidence needed to guide possible revisions to DBD diagnoses for *DSM-V,* this study examined whether ADHD, ODD, and CU traits uniquely predict future psychosocial adjustment in boys across a number of different domains while controlling for co-occurring CD symptoms. Based on prior research, it was anticipated that CU traits would uniquely predict serious and persistent forms of antisocial behavior but would be negatively related to future internalizing problems. It was also believed that ADHD symptoms would predict increases in ODD symptoms over time, and that ODD symptoms would in turn be related to later increases in conduct problems. Oppositional defiant disorder was also expected to robustly predict increased internalizing problems, whereas ADHD symptoms were anticipated to have the strongest relationship to future academic difficulties. Both ODD and ADHD symptoms were postulated to predict increased social problems.

METHOD

Participants

The Pittsburgh Youth Study (PYS) consists of boys who were in the first, fourth, and seventh grades when the study began. The staff of the Board of Public Education provided names and addresses of a random pool of 1,165 first-graders, 1,146 fourth-graders, and 1,125 seventh-graders for potential participation in the screening phase of the study. Consent for the screening was obtained from 849 (84.6%) first-grade, 868 (86.3%) fourth-grade, and 856 (83.9%) seventh-grade families. The screening interview combined parent, teacher, and self-report measures of antisocial behavior together to generate an overall risk index. This risk score was then used to select youth for longitudinal follow-up. Specifically, all boys scoring in the top 30% ($n \approx 250$) on the antisocial behavior risk measure in each grade, and a roughly equal number of boys randomly selected from the remaining sample (*N* high-risk = 775; *N* non–high-risk = 742) were selected for longitudinal follow-up. This resulted in a total of 1517 boys (mean age = 10.7 years, standard deviation [SD] = 2.7) who participated in the follow-up assessments. The boys were approximately half African American (55.2%) and half white (44.8%). This study will use the initial five waves of data collection from the PYS, with each assessment taking place every 6 months. Participation rates across these assessments were high for the first-graders (95.1%–99.6%), fourth-graders (93.9%–99.4%),

and seventh graders (89.7%–99.8%). Further details regarding the sample selection can be found elsewhere.[28]

Procedures

Data collection included interviews with the boy and his primary caregiver, as well as questionnaires completed by the boy's teacher. Informed written consent was obtained in accordance with the University of Pittsburgh institutional review board. Most interviews were conducted within the participants' homes, but some were completed by phone or within the PYS offices. The primary study predictors (i.e., ODD, CD, ADHD, CU traits) were measured at the first follow-up assessment because this was the only phase in which diagnostic interview information was available for all boys. Psychosocial outcomes were measured across the subsequent four waves of semiannual data collection spanning 2 years. One exception is that official criminal records were collected until the age 18 years, making it possible to predict all juvenile criminal charges.

Measures

ADHD, ODD, and CD Symptoms—*DSM*-related symptoms were assessed using the Diagnostic Interview Schedule for Children, Parent Version (DISC-P),[29] which was modified to include *DSM-III* and *DSM-III-R* criteria for mental disorders. The DISC-P is a structured interview in which symptoms were coded as present for each of the disorders if they occurred in the past year. The scoring of the DISC-P was modified to accommodate changes in diagnostic criteria made from *DSM-III* and *DSM-III-R* to *DSM-IV*.[30] Specifically, the ODD symptom of "often swears or uses obscene language" was eliminated, and the two symptoms of CD added in *DSM-IV* were assessed with supplemental questions from the DISC-P assessing curfew violations ("Does he often stay out past the time he is supposed to be home?") and bullying others ("Does he ever bully kids or is he mean to them?"). Consequently, all 15 symptoms associated with a *DSM-IV* diagnosis of CD ($\alpha = 0.59$) and all eight symptoms of ODD ($\alpha = 0.79$) were assessed. Items included in the modified DISC-P were also evaluated in an attempt to assess the 18 *DSM-IV* symptoms of ADHD. Items indexing 16 of the symptoms of ADHD were identified ($\alpha = 0.86$), with only two inattention symptoms being absent (i.e., "often forgetful in daily activities," "avoids tasks that require sustained mental effort").

Callous-Unemotional Traits—The core features of CU traits were assessed using two sources. The first source consisted of DISC-P items that were originally used to assess the undersocialized subtype of CD. Recent conceptualizations of CU traits in children were based on this subtyping scheme.22 Three questions from the DISC-P were used: (1) "Has he helped other people, even when he did not get anything out of it?" (2) "When kids he knows have problems, does he try to help them?" (3) "When he does something wrong, does he feel bad about it?" Each item was assessed using a three-point scale (0 = "no," 1 = "sometimes," 2 = "yes") and, consistent with commonly used measures of CU traits,31 each positively worded item was reverse scored to reflect higher CU traits. An additional item from the parent-reported Child Behavior Checklist (CBCL)32 was used to augment these questions: "Does not seem to feel guilty after misbehaving?" This item was also assessed using a three-point scale (0 = "not true," 1 = "sometimes true," 2 = "definitely true"). All four items were summed to create a CU traits severity score.

The temporal stability and construct validity of this scale was examined using the first-grade cohort of the PYS. This cohort was chosen because the measures used to create the CU scale were administered to the boys' parents at age 15 years and the previously validated Child Psychopathy Scale–Revised (CPSr)[21] was administered to their parents 1 year later. The 8-year temporal stability of the CU scale from the age 7 to age 15 assessment was moderate

(intraclass correlation = 0.44). Moreover, the CU scale assessed at age 15 was moderately correlated with the affective facet of psychopathy measured using the CPSr 1 year later ($r = 0.49$, $p < .001$). Consequently, the CU scale is indexing a relatively stable trait roughly commensurate with other scales used to measure the affective features of psychopathy in youth.

Psychosocial Outcomes

Juvenile Charges—Official criminal records were available for all boys from age 10 to 17 years. Criminal records were collected from the Allegheny County Juvenile Court records and the Pennsylvania Juvenile Court Judges' Commission in 2001. A variable indicating whether or not the participant had been charged with a crime before the initial interview was used to control for prior arrest history. Outcomes included the total number of charges received, the number of different ages at which the participant was charged with a crime, and the presence of any serious criminal charge (i.e., homicide, aggravated assault, sexual assault, robbery, burglary, auto theft).

Moderate/Serious Delinquency—Information on delinquent behaviors was collected through interviews with the child using the 36-item Self-Report of Delinquency (SRD)[33] and the 33-item Self-Report of Antisocial Behavior (SRA).[28] Both the SRA and SRD have been validated in studies of antisocial behavior in youth.[28] This information was augmented by parent and teacher reports of delinquent behaviors using seven items added to the CBCL and 1 item added to the Teacher Report Form (TRF).[34] At each assessment, participants were classified as having committed moderate/serious violence and moderate/serious theft over the previous 6 months. Moderate/serious violence was defined as gang fighting, attacking someone to seriously hurt/kill, forced sex, and robbery. Moderate/serious theft included behaviors such as receiving stolen property, stealing a bike/skateboard, burglary, and auto theft.

Conduct Problems and Oppositional Defiant Problems—Two scales were created to index problems consistent with symptoms of CD and ODD across the 2-year follow-up. These scales were created using common items from parent and teacher report on the CBCL and TRF with the higher of the two informants' ratings being used. The items included in these scales have been rated by clinicians as being consistent with *DSM-IV* conceptualizations of CD and ODD.[35] The conduct problems scale includes eight items ($\alpha = 0.85$–0.89), and the oppositional defiant problems scale consists of five items ($\alpha = 0.84$–0.87).

Anxious/Depressed—The anxious/depressed scales from the CBCL and TRF were used to assess affective problems in the boys. Both the 14-item parent-report scale and the 18-item teacher-report scale include descriptions of problems related to anxiety and depression in youth. The internal consistency of the scale across time points was good for both the parent-report ($\alpha = 0.81$–0.84) and teacher-report ($\alpha = 0.84$–0.86). To account for differences in the number of items in the parent and teacher scales, raw scores were converted to t scores using age- and sex-specific norms. The higher of the parent and teacher scores were then used.

Social Problems—Difficulties with social interactions were assessed using the social problems scales from the CBCL and TRF. The eight-item parent-report scale and the 13-item teacher-report scale both assess features of peer rejection and conflict. The internal consistency of the social problems scale across time points was adequate for both the parent-report ($\alpha = 0.67$–0.68) and teacher-report ($\alpha = 0.80$–0.85). Raw scores were converted to t

scores using age- and sex-specific norms. The higher of the parent and teacher scores were used.

Low Academic Achievement—Low levels of academic achievement were assessed using the CBCL and TRF. Parents and teachers both rated the child's academic achievement on four items assessing reading, writing, mathematics, and spelling abilities using a four-point scale. Items were reverse scored before being summed so that higher scores represented lower academic achievement. The internal consistency of the academic achievement scale across time points was good for both the parent-report ($\alpha = 0.88$–0.95) and teacher-report ($\alpha = 0.85$–0.94). The higher of parent and teacher ratings were used.

Data Analysis Plan

Because the PYS oversampled high risk youth from the Pittsburgh public schools, all analyses were weighted using the inverse of the probability of being included in the sample because of the sampling design. Robust standard errors were also used in all analyses. As a result, parameter estimates and standard errors, as well as prevalence estimates, are representative of the original screening sample of boys from the Pittsburgh public schools. The primary study predictors of ADHD, ODD, CD, and CU traits were converted to z scores before conducting all analyses to place them on the same metric, as were the continuous outcomes variables.

Linear regression in STATA version 9.231 was used to model outcomes associated with the total number of juvenile charges and the number of years charged from age 10 to 17 years. The robust standard errors used are relatively insensitive to failures to meet assumptions concerning normality and homogeneity of variance in the residuals.[36] Logistic regression was used to model the binary outcome of any serious charge from age 10 to 17. Predictors included in the model were demographic covariates (age, minority status), a history of any prior criminal charge, and the primary study predictors (i.e., ADHD, ODD, CD, and CU traits).

Models predicting the remaining outcomes assessed every 6 months were analyzed using population-averaged generalized estimating equation (GEE) models with STATA version 9.2. Generalized estimating equation models account for nonindependent observations on dependent variables, such as repeated assessments on a single outcome over time. To account for the panel design of the data, an unstructured working correlation matrix was specified. A logistic GEE model was used for the binary delinquency variables, and a linear GEE model with an identity link function appropriate for Gaussian distributed outcomes was used for the continuous scales. Although the conduct problems, anxious/depressed, and social problems scales were positively skewed, the robust standard errors used are relatively insensitive to failures to meet assumptions concerning normality and homogeneity of variance in the residuals.[36] For each outcome, initial levels of the outcome, age, race/ethnicity, and time were added as covariates.

RESULTS

Prevalence of DSM Diagnoses

Although the current analyses used symptom counts, the proportion of individuals who met diagnostic symptom thresholds was examined to provide an index of the level of psychopathology in the sample. Prevalence estimates are weighted, represent past-year diagnoses, and are slightly different from those previously reported for the PYS because of scoring modifications to approximate *DSM-IV* criteria.[28] Using *DSM-IV* symptom threshold criteria, 15.7% of children had ADHD, 13.4% had ODD without CD, and 5.9% had CD.

Among children with a CD diagnosis, 68.2% also met criteria for ODD, and 63.6% met criteria for ADHD. Just under half of the children (48.9%) with ODD also had ADHD. Among the boys with CD, nearly all (93.3%) were childhood-onset cases using the *DSM-IV* subtyping criteria necessitating at least one symptom before the age of 10. Of the boys with subclinical levels of CD symptoms (i.e., one to two symptoms) in the past year, a majority (72.2%) had at least one symptom present before age 10 years. Therefore, most boys exhibiting CD symptoms in the past year were childhood-onset cases. This high rate of childhood-onset cases is largely due to the young age of the boys at the time of the diagnostic assessment (mean age = 10.66 years, standard deviation = 2.71 years).

Official Juvenile Charges and Delinquency

Models predicting official criminal charges and delinquency outcomes are presented in Table 1. Conduct disorder and ODD symptoms significantly predicted all criminal charge outcomes. Conduct disorder symptoms also predicted both moderate/serious theft and violence. Callous-unemotional traits significantly predicted moderate/serious violence, the number of years with a criminal charge, and receiving a serious criminal charge. Attention-deficit/hyperactivity disorder symptoms predicted moderate/serious violence after controlling for other covariates.

Conduct Problems and Oppositional Defiant Problems

Results predicting levels of oppositional defiant and conduct problems across the 2-year follow-up period are presented in Table 2. As anticipated, ODD symptoms emerged as the strongest predictor of future oppositional defiant behaviors, whereas CD symptoms were the strongest predictor of future conduct problems. Attention-deficit/hyperactivity disorder symptoms significantly predicted future conduct problems and oppositional defiant behaviors. However, CU traits and CD symptoms did not significantly add to the prediction of oppositional defiant problems. Although ODD and ADHD symptoms predicted later conduct problems, CU traits did not significantly add to the prediction.

Internalizing, Social, and Academic Problems

Models predicting internalizing, social, and academic problems are also presented in Table 2. Both ADHD and ODD symptoms predicted increased anxiety/depression, whereas higher levels of CU traits were associated with lower anxiety/depression over time. Higher levels of ADHD and ODD symptoms also independently predicted increased social problems, but ADHD symptoms emerged as the only significant predictor of academic problems over time.

Differential Prediction: Inattention versus Hyperactivity/Impulsivity Symptoms

To examine whether the inattentive and/or hyperactivity/impulsivity dimensions of ADHD best accounted for the significant associations found, analyses were re-run with symptoms of inattention and hyperactivity/impulsivity included as separate predictors. Standardized regression parameters are reported below for analyses involving continuous outcomes. Results indicated that hyperactive/impulsive symptoms significantly predicted an increased risk for moderate/serious violence (odds ratio [OR] = 1.26, $p < .005$), oppositional defiant behaviors ($B = 0.08$, $p < .001$), conduct problems ($B = 0.07$, $p < .001$), anxiety/depression ($B = 0.08$, $p < .002$), and social problems ($B = 0.07$, $p < .003$), whereas inattentive symptoms did not significantly predict these outcomes ($p > .05$). In contrast, only inattention symptoms uniquely predicted lower levels of academic achievement over time ($B = 0.09$, $p < .001$). Neither facet independently predicted any other study outcomes ($p > .05$). Further details regarding these analyses are available upon request.

DISCUSSION

The primary goal of the current study was to examine issues related to the incremental predictive utility of symptoms of ADHD, ODD, and CU traits above and beyond co-occurring symptoms of CD across multiple domains of psychosocial functioning in boys. Although CD symptoms were the most robust predictor of severe and persistent forms of antisocial behavior, ODD symptoms predicted persistent involvement in the juvenile justice system, even when controlling for co-occurring CD symptoms. Moreover, ODD and ADHD symptoms independently predicted increases in conduct problems over time, as well as the development of internalizing and social problems. There was also consistent evidence that CU traits identify children at risk for severe and persistent delinquent behaviors, and that these traits are associated with lower internalizing problems over time after controlling for co-occurring DBD symptoms. Only ADHD symptoms were uniquely predictive of increased academic difficulties over time.

Criminal Behavior and Externalizing Outcomes

Even when controlling for CD symptoms, children with elevated ODD symptoms exhibited persistent involvement in the juvenile justice system and a greater probability of receiving charges for serious crimes. Consistent with findings in clinic-referred youth,[1] ODD symptoms were also uniquely associated with higher levels of conduct problems over time. Although the current *DSM-IV* diagnostic criteria suggest that nearly all children with CD will also meet criteria for ODD, roughly one-third of children in the current study who met the symptom threshold for CD did not meet criteria for ODD. This was somewhat surprising, given that nearly all the boys with CD in the current sample met criteria for the childhood-onset subtype, purportedly the most severe and persistent form of the disorder. These findings suggest that allowing a dual diagnosis of ODD and CD may provide useful information about the clinical course of juvenile justice involvement in boys. Based on the current results, clinicians should be aware that ODD symptoms may provide unique information about what children are at risk for severe criminal behavior, above and beyond a CD diagnosis.

There has been increasing interest in whether callous-unemotional traits provide useful prognostic information above and beyond current *DSM-IV* criteria for DBD. Although there are several studies supporting the predictive utility of CU traits for future antisocial behavior in youth, most have failed to control for co-occurring ADHD, ODD, and CD symptoms.[3,37] Adding to this literature, the evidence from the current study indicates that CU traits provide unique prognostic information about persistent involvement in the juvenile justice system, including being charged with serious crimes. CU traits also predicted an increased risk for violent delinquency across the 2-year follow-up period. Interestingly, CU traits did not significantly predict more minor forms of conduct problems over time such as oppositional defiant behaviors. The findings stress the importance of considering CU traits as a risk factor for serious and persistent forms of criminal behavior in *DSM-V*.

It is important to recognize that the findings regarding CU traits in the current study are limited by the use of an ad hoc measure that contained a limited number of items that negatively affected its reliability. In light of this limitation, it is impressive that robust associations were found between CU traits and delinquent outcomes measured using multiple sources. If a more comprehensive and reliable measure was used, one would expect that CU traits may have actually been more strongly associated with the antisocial outcomes assessed. As a result, the current findings may have minimized the impact that CU traits have on future antisocial behavior. However, evidence indicated that the scale exhibited moderate temporal stability from childhood to adolescence and was correlated with a previously validated measure of the affective features of psychopathy.

In the current study, ADHD symptoms did not contribute to the prediction of juvenile justice involvement after controlling for co-occurring symptoms of ODD, CD, and CU traits. Instead, the ADHD symptoms of hyperactivity/impulsivity seemed to be most useful in predicting the development of later oppositional behaviors and conduct problems among boys in the current sample. Although these findings are consistent with research indicating that there is a developmental progression in which ADHD symptoms place children at risk for behaviors consistent with ODD, previous studies with clinic-referred youth often find that ADHD symptoms do not predict CD after controlling for co-occurring ODD symptoms.[1] This inconsistency may reflect differences between clinic-referred and community-based samples, or may be due to the high levels of power to detect relatively small effects in the current study.

Internalizing Problems

High levels of ODD and ADHD symptoms were uniquely related to increased internalizing problems in boys. Because ADHD children are prone to experience social[12] and academic problems[38] over time, it is possible that failures within these domains may lead to subsequent internalizing problems. Future studies should examine whether the relation between ADHD and later internalizing problems is mediated by conflicts with parents and/or peers, as well as academic difficulties. In contrast, the link between ODD and later internalizing problems may result from a common underlying mechanism, namely, problems regulating negative affect.[39] Recent evidence suggests that a subset of ODD symptoms associated with irritable mood are robustly associated with later internalizing problems, even after controlling for co-occurring ADHD and CD.[17,19] Moreover, irritability is recognized as a symptom or associated feature of several childhood mood disorders in *DSM-IV-TR*[30] and represents part of a higher-order construct of negative affect that includes anger, anxiety, and sadness.[40] Although research in this area is still relatively new, further exploration of the different facets of ODD symptoms may prove useful for understanding the heterotypic continuity of the disorder.

In contrast to the findings for ODD and ADHD symptoms, CU traits predicted decreased levels of internalizing problems over time when controlling for co-occurring DBD symptoms and other covariates in the model. This is consistent with evidence indicating that the development of CU traits may be partially driven by a relative fearless temperament and an insensitivity to punishment cues,[20] which could buffer children with DBD from developing co-occurring internalizing problems. Neurobiological evidence has also begun to suggest that children with conduct problems and CU traits exhibit a blunted response to cues of emotional distress in brain regions associated with fear conditioning such as the amygdala.[41] Although this relatively low level of amygdala reactivity to emotion cues may help to explain the negative associations between CU traits and internalizing problems, functional magnetic resonance imaging studies comparing amygdala reactivity to emotion cues in youth with CU traits and CD versus those exhibiting CD alone are still needed. In contrast, it is posited that the behavior problems of children without CU traits may actually be driven by features of emotional dysregulation and an overreactivity to cues of potential danger and threat.[22] A growing number of studies in this area have found that child and adolescent conduct problems are associated with higher levels of negative emotionality, fearfulness, and personal distress in stressful situations after accounting for co-occurring CU traits.[3,42,43]

Social and Academic Problems

Problematic peer relationships were uniquely predicted by ODD and ADHD symptoms. Prior evidence suggests that children with ADHD are at particular risk for future social rejection,[12] and these social difficulties are likely due to the hyperactive/impulsive facet of

the disorder, which is partially characterized by aversive social behaviors such as talking excessively and interrupting others. Similarly, ODD is characterized by outbursts of anger and retaliatory behaviors that are caustic to the formation of positive peer relationships. Longitudinal research suggests that these behaviors may also lead to a deterioration of the parent–child relationship over time, which in turn escalates the child's problem behavior.[14] The nonsignificant findings for CD symptoms and CU traits may be due to the fact that these features are more strongly associated with increases in deviant peer group affiliation rather than peer conflict.[15]

Attention-deficit/hyperactivity disorder symptoms emerged as the only unique predictor of low academic achievement in boys. This is consistent with prior evidence indicating that ADHD symptoms are more strongly related to poor academic performance[24,38] and executive function deficits[44,45] than behaviors consistent with ODD/CD. Interestingly, when the two facets of ADHD symptoms were separated in the current study, only the inattentive symptoms uniquely predicted future academic difficulties. Previous cross-sectional studies have found that the inattentive symptoms of ADHD are more strongly related to learning problems[23,46] and executive function deficits[47] than the hyperactive/impulsive symptoms. There is also evidence that the inattentive symptoms of ADHD are uniquely related to characteristics of a sluggish cognitive tempo, which includes behaviors such as daydreaming, becoming easily confused, and lacking mental alertness.[48] This suggests that the association between ADHD inattentive symptoms and decrements in academic achievement over time may be due to the presence of subtle neurocognitive impairments.

The findings from the current study are limited by the focus on a community sample of boys, and the results may not generalize to girls or to clinical samples. The findings are also restricted to a relatively young group of youth followed over a restricted period for most outcomes. Similarly, the boys were assessed at different developmental periods across the follow-up because of age differences at baseline, which is less desirable than studying a developmentally homogeneous group of boys across time. Moreover, most of the boys exhibited their first CD symptom in childhood, making it unclear whether the results would generalize to adolescent-onset CD cases. The reliance on parent-report to assess the core predictor variables at a single point in time was also a limiting factor in the current study. In addition, although we were able to index nearly all *DSM-IV* ADHD symptoms, future research should use more updated assessments tapping the full range of ADHD symptoms. As previously discussed, future research should also replicate the current findings using more established and comprehensive measures of CU traits. It is also important to note that the current study was focused on prediction in the sense that we examined the unique associations between CD, ODD, ADHD, and CU traits and later psychosocial outcomes. This should not be confused with predictability or cross-validation, where the goal is to assess how accurately a predictive model will perform on an independent dataset or in practice. Finally, there were modest internal consistencies associated with the CD, CU, and social problems measures, which may have attenuated relations.

This study represents one of the largest and most comprehensive examinations of the unique association between symptoms of ADHD, ODD, CD, and CU traits and future psychosocial adjustment in males. If the findings can be replicated, the *DSM-V* committee on DBD may want to consider making the following revisions to the current diagnostic classification system. Because symptoms of ODD provide unique information about future criminal justice involvement and internalizing problems in boys even after accounting for co-occurring CD symptoms, not allowing a diagnosis of comorbid ODD and CD seems unwise. Second, CU traits appear to be robustly related to the development of serious delinquency and persistent involvement in the juvenile justice system, supporting the incorporation of these traits into *DSM-V*. Finally, ADHD symptoms associated with hyperactivity/impulsivity

seem to represent a developmental precursor to future conduct problems, as well as a risk factor for future internalizing and social problems, while the inattentive symptoms of ADHD are more prognostic of future academic difficulties.

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TABLE 1

Symptoms of Attention-Deficit/Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD), Conduct Disorder (CD), and Callous-Unemotional Traits Predicting Later Juvenile Charges and Delinquent Behavior

Predictor	Total No. of Charges		No. of Years with a Charge		Any Serious Charge		Moderate/Serious Violence		Moderate/Serious Theft	
	B	95% CI	*B*	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
ADHD symptoms	0.01	−0.05 to 0.08	0.00	−0.07 to 0.07	0.97	0.82 to 1.13	1.19*	1.01 to 1.39	1.12	0.95 to 1.32
ODD symptoms	0.07*	0.01 to 0.14	0.08*	0.01 to 0.16	1.23*	1.05 to 1.44	1.13	0.95 to 1.33	1.12	0.96 to 1.30
CD symptoms	0.12**	0.04 to 0.20	0.12**	0.05 to 0.20	1.22*	1.04 to 1.42	1.16**	1.04 to 1.31	1.19*	1.02 to 1.38
Callous-unemotional	0.03	−0.02 to 0.09	0.06*	0.00 to 0.11	1.14*	1.01 to 1.29	1.12*	1.00 to 1.26	1.06	0.93 to 1.20

Note: All predictors were converted to *z*-scores to place them on the same metric. Effects are after controlling for baseline levels of the outcome, age, and minority status. Outcomes of moderate/serious theft and violence were assessed semiannually across a 2-year follow-up. *B* = standardized regression coefficient; CI = confidence interval; OR = odds ratio.

*
p < .05;

**
p < .01.

TABLE 2

Symptoms of Attention-Deficit/Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD), Conduct Disorder (CD), and Callous-Unemotional Traits Predicting Later Externalizing, Internalizing, Social, and Academic Problems

Predictors	Oppositional Defiant		Conduct Problems		Anxious/Depressed		Social Problems		Low Academic Achievement	
	B	95% CI	B	95% CI	B	95% CI	B	95% CI	B	95% CI
ADHD symptoms	0.05**	0.01 to 0.09	0.05*	0.01 to 0.10	0.06**	0.02 to 0.10	0.09***	0.04 to 0.13	0.08***	0.04 to 0.12
ODD symptoms	0.11***	0.07 to 0.15	0.06*	0.01 to 0.10	0.10***	0.05 to 0.14	0.07**	0.02 to 0.11	0.02	−0.02 to 0.05
CD symptoms	0.02	−0.02 to 0.06	0.08***	0.03 to 0.12	0.02	−0.02 to 0.06	0.02	−0.02 to 0.06	0.00	−0.04 to 0.04
Callous-unemotional	0.01	−0.02 to 0.04	0.01	−0.02 to 0.04	−0.04*	−0.07 to −0.01	0.00	−0.03 to 0.03	0.02	−0.01 to 0.05

Note: Standardized regression coefficients (B) were calculated by converting all predictors and outcomes to z-scores before the analysis. Effects depicted after controlling for baseline levels of the outcome, time, age, and minority status. All outcomes were assessed semiannually across a two-year follow-up. CI = confidence interval.

*
$p < .05$;

**
$p < .01$;

***
$p < .001$.