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Unique Dispositional Precursors to Early-Onset Conduct Problems and Criminal Offending in Adulthood

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Abstract

Objective—The aims of this study were to examine whether dispositional interpersonal callousness, negative emotionality, and hyperactivity/impulsivity uniquely influence the development of childhood-onset conduct problems and persistent criminal behavior in males, and to determine whether specific facets of negative emotionality (dysregulated anger versus anxiety) in childhood are differentially associated with the development of chronic antisocial behavior.

Method—Childhood dispositional features and conduct problems were assessed semiannually using parent- and teacher-report measures across 9 consecutive assessments in a school-based sample of 503 boys (~7–11 years of age). Participants' criminal behavior was assessed using official records from adolescence into the early 30s.

Results—Interpersonal callousness, dysregulated anger, and hyperactivity/impulsivity were uniquely associated with the development of childhood-onset conduct problems. None of these features significantly predicted official records of juvenile offending after controlling for co-occurring conduct problems. However, interpersonal callousness was robustly and uniquely associated with a pattern of persistent and violent adult offending that continued into the early 30s. In contrast, anxiety problems were inversely associated with criminal offending in adolescence and adulthood after controlling for conduct problems and the other dispositional factors.

Conclusion—Findings are consistent with theoretical models indicating that interpersonal callousness, dysregulated anger, and hyperactivity/impulsivity influence the development of childhood conduct problems. In contrast, anxiety problems in childhood tend to reduce the likelihood that boys will engage in later criminal offending. Results suggest that delinquency

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prevention programs should target children exhibiting features of interpersonal callousness, given that they are at high risk for engaging in chronic and violent offending in adulthood.

Keywords

anger; callous/unemotional; hyperactivity/impulsivity; crime; violence

Studies have consistently found that youth who exhibit symptoms of conduct disorder (CD) in childhood are at increased risk for exhibiting severe and protracted criminal behavior.¹ However, many children with early conduct problems desist from criminal offending during early adulthood,² and there is considerable heterogeneity in the etiological factors underlying early behavior problems.³ This has fostered research examining various dispositional features that may underlie the development of childhood conduct problems and that may delineate those children at high risk for exhibiting chronic and severe criminal behavior into adulthood. Three dispositional factors emphasized in the literature are as follows: (1) interpersonal callousness; (2) negative emotionality; and (3) hyperactivity/impulsivity. These features are conceptualized as unique factors underlying the development of early conduct problems and chronic antisocial behavior. However, longitudinal studies examining the incremental utility of these features in predicting childhood-onset conduct problems and persistent criminal behavior into adulthood are rare. Furthermore, few longitudinal studies have examined whether facets of negative emotionality (eg, dysregulated anger, anxiety) are differentially related to the development of chronic antisocial behavior. The current study is designed to examine whether these dispositional features are uniquely associated with the development of childhood conduct problems, as well as a pattern of chronic and severe criminal behavior that persists into adulthood.

Interpersonal Callousness

Evidence suggests that the interpersonal (eg, manipulative, deceitful) and affective (eg, lack of empathy, guilt/remorse) features consistent with adult psychopathy (hereafter referred to as interpersonal callousness) are associated with the development of early emerging and persistent antisocial behavior in youth. Longitudinal studies have found that interpersonal callousness in childhood predicts later aggressive behavior, serious delinquency, and repeated criminal offending across adolescence.^{4–7} Importantly, these findings remained significant after controlling for co-occurring conduct problems. Youth exhibiting conduct problems and interpersonal callousness also seem to have unique emotion-processing deficits (eg, low reactivity to punishment, insensitivity to other's distress), and may be less responsive to discipline-oriented parenting practices.^{4,5,8} Taken together, this body of research was used to support the recent adoption of a “limited prosocial emotions” specifier to CD.⁴

Negative Emotionality

High levels of temperamental negative emotionality have been implicated in the development of early-onset conduct problems and reactive aggression. Many studies characterize problems with negative emotionality as frequent experiences of negative affect, sudden mood swings, and intense negative emotional reactivity with very little provocation.⁹

Negative emotionality is a higher-order construct composed of different components of negative affect, and evidence suggests that dysregulated anger may foster the development of early-onset conduct problems. For example, temperamental anger in infants and children has been associated with the development of early conduct problems,¹⁰ and adolescents with anger regulation problems are at risk for exhibiting persistent aggressive behaviors.¹¹ Moreover, children exhibiting anger regulation problems tend to misinterpret ambiguous social cues as threatening¹² and are more likely to become aggressive in response to minor provocation.¹³

In contrast, features of negative emotionality associated with fear/anxiety problems tend to be negatively associated with the development of severe antisocial behavior. For example, longitudinal studies have found that children exhibiting anxiety problems are less likely to exhibit chronic conduct problems,¹⁴ aggression,¹⁵ and delinquent behavior.¹⁶ Some have suggested that anxiety may protect children from developing conduct problems because they are overly concerned about being punished. However, findings in this area remain mixed,¹⁷ potentially because comorbid problems with dysregulated anger suppress the negative association that exists between anxiety problems and later antisocial behavior.

Hyperactivity/Impulsivity

Problems with hyperactivity and impulsivity have also been linked to the development of child-onset conduct problems,^{18,19} but it is less clear whether these features uniquely predict the emergence of serious and persistent criminal behavior.¹⁸ Several longitudinal studies using community-based samples have found that features of hyperactivity/impulsivity are often not associated with the emergence of delinquent behavior during adolescence after controlling for co-occurring conduct problems.¹⁹ However, there are a few longitudinal studies indicating that hyperactivity/impulsivity predicts future violence and later criminal offending, even after accounting for co-occurring conduct problems.^{6,20}

Predicting Criminal Behavior Into Adulthood

Relatively few studies have examined whether early dispositional factors predict severe and chronic criminal offending during adulthood. It is well established that most youth desist from criminal offending by their mid to late 20s, including those who exhibit early-onset conduct problems. Some longitudinal evidence suggests that early features of interpersonal callousness (but not hyperactivity/impulsivity and dysregulated anger) are associated with the development of psychopathic personality symptoms and serious criminal offending in adulthood, even after controlling for co-occurring conduct problems.^{7,21,22} However, these studies assessed features of interpersonal callousness during adolescence and the assessment of antisocial outcomes occurred when participants were in their early 20s, a period when the prevalence of criminal offending typically peaks. Consequently, it remains unclear whether features of interpersonal callousness in childhood are associated with a more chronic pattern of offending that persists well into adulthood.

Current Study

The present study was designed to investigate whether childhood features of interpersonal callousness, negative emotionality (ie, dysregulated anger, anxiety), and hyperactivity/impulsivity are uniquely associated with future antisocial behavior assessed from childhood to the early 30s. The unique relationship between each of these dispositional features and the emergence of childhood conduct problems will be examined using 9 semiannual assessments (~ages 7–11 years). Analyses will also examine whether each of these dispositional features predicts violent and persistent criminal offending across adolescence and young adulthood, after controlling for co-occurring conduct problems. It is hypothesized that higher interpersonal callousness, dysregulated anger, and hyperactivity/impulsivity will be uniquely associated with the development of conduct problems in childhood. In contrast, boys with higher anxiety problems are posited to exhibit fewer conduct problems during childhood, after controlling for co-occurring externalizing problems. Based on prior research, it is hypothesized that boys with higher interpersonal callousness will be at increased risk for exhibiting criminal offending into adulthood, even after controlling for co-occurring conduct problems.

METHOD

Participants

Participants were part of the youngest cohort of the Pittsburgh Youth Study (PYS), a longitudinal study of boys initially recruited from a list of enrolled students attending public schools in Pittsburgh, PA.²³ Boys in the youngest cohort were originally selected from a screening sample of 849 first graders in 1987 to 1988. Parent, teacher, and youth reports of externalizing behavior problems were collected on the screening sample, and those boys rated in the top 30% on behavior problems ($n = 256$), as well as a roughly equal number randomly sampled from the remainder ($n = 247$), were selected for longitudinal follow-up. The sample was predominately white (40.6%) or African American (55.7%). Nearly all primary caregivers were biological mothers (92%), with 45.3% cohabiting with a partner and 16.9% having completed less than 12 years of schooling. More than half (61.3%) of the families were receiving public financial assistance. Further details regarding sample selection can be found elsewhere.²³

Procedure

To examine whether the targeted dispositional features were associated with the development of childhood-onset conduct problems, we used data collected on dispositional features and conduct problems every 6 months during the first 9 assessment waves (from mean age = 7.96 years, $SD = 0.55$ year, to mean age = 11.96 years, $SD = 0.55$ year). During each assessment wave, the boys' primary caregiver (referred to as "parent") and teacher completed a self-administered questionnaire assessing each of the targeted constructs. Outcomes associated with later criminal offending were assessed using official juvenile and adult arrests records. All procedures were reviewed and approved by the Human Resources Protection Office at the University of Pittsburgh. Written informed consent was obtained prior to each assessment.

Measures: Primary Study Predictors

Predictors were measured using items from the parent-reported Child Behavior Checklist²⁴ and the Teacher Report Form,²⁵ as well as supplemental items added by study originators. All items were rated using a 3-point (0–2) Likert scale. Scales were constructed using identical items administered to both parents and teachers. For each item, the higher of the two informants' ratings was taken before summing all the items to create a total score. This commonly used method of combining multi-informant ratings helps to minimize problems with underreporting, takes into account behaviors exhibited in multiple settings, and tends to work as well as (or better than) alternative methods for combining information.²⁶ Confirmatory factor analysis indicated that the items described below were assessing unique constructs (see Supplement 1, available online).

Interpersonal Callousness—This scale consists of eight items assessing interpersonal and affective features of adult psychopathy (eg, manipulative, deceitful, lack of guilt/remorse).²⁷ Evidence suggests that the items tap a relatively stable construct, distinct from traditional disruptive behavior disorders,²⁷ and that the scale exhibits strong correlations with other measures of the interpersonal and affective features of youth psychopathy.²⁸ Interpersonal callousness in youth has also shown to prospectively predict chronic criminal behavior,⁷ antisocial personality symptoms,²⁸ and features of adult psychopathy.²¹ The internal consistency of the scale was high across all assessments ($\alpha = .85-.91$).

Dysregulated Anger—Six items were used to assess the boys' tendency to experience dysregulated anger (ie, easily frustrated, temper tantrums, explosive and unpredictable behavior). These items are commonly used to assess problems with anger and irritability in children,^{29,30} and this scale has been shown to predict future offending in youth.³⁰ The internal consistency of the scale was high across all assessments ($\alpha = .81-.89$).

Anxiety Problems—Five items were used to assess the boys' tendency to experience fear and anxiety in various settings (eg, fearful of attending school, clingy with adults). These items were rated by clinicians as being very consistent with symptoms of anxiety disorders in youth.³¹ The internal consistency of the scale was modest across all assessments ($\alpha = .57-.66$), due in part to the low number of scale items.

Hyperactivity/Impulsivity—This scale consists of five items that have been consistently rated by clinicians as being indicative of the hyperactivity/impulsivity symptoms of attention-deficit/hyperactivity disorder.³¹ Prior studies have found that this scale is associated with persistent delinquency in children and adolescents.²⁷ The internal consistency of the scale was high across all assessments ($\alpha = .84-.89$).

Measures: Primary Study Outcomes

Conduct Problems—This scale consists of eight items that are consistent with symptoms of conduct disorder in children (eg, aggression, destruction of property, stealing).²⁷ Prior studies have found that this scale is a robust predictor of chronic delinquency in youth.^{27,32} The internal consistency of the scale was high across all assessment waves ($\alpha = .87-.92$).

Juvenile and Adult Criminal Charges—Official criminal records were obtained from the Pennsylvania Juvenile Court Judges' Commission, the Pennsylvania (PA) State Police, and the Federal Bureau of Investigation. These records were last updated when participants were, on average, in their early 30s (mean age = 31.0 years, SD = 0.76 year). Identical constructs were created for juvenile (up to age 18 years) and adult (age 18+) offending. Frequent and persistent offending was measured using the number of charges received (juvenile: mean = 4.5, SD = 8.3; adult: mean = 10.5, SD = 15.4) and the number of times that participants were arrested (juvenile: mean = 1.6, SD = 2.6; adult: mean = 3.3, SD = 4.2). A binary variable indicating whether participants had been charged with serious violence (ie, homicide, aggravated assault, sexual assault, robbery) was also created (juvenile: 21.3%; adult: 26%). Active criminal offending was defined as having been arrested within the past year (9%) or past 2 years (16%) of the last criminal record search.

Data Analysis Plan

Generalized estimating equation (GEE) transitional models were run to examine the association between the dispositional factors and later childhood conduct problems across the initial nine assessment waves.³³ An identity link function (Gaussian family) was used to estimate the linear relationship between the predictors and childhood conduct problems. Within these models, dispositional factors assessed at time T were included as predictors of conduct problems assessed at time T+1, after controlling for co-occurring conduct problems at time T. This model was chosen because it provides an estimate of the association between each dispositional factor and future conduct problems aggregated across the entire time series, after controlling for co- occurring conduct problems.³³ Model parameters are estimated using all observed data across the available time points rather than resorting to listwise deletion. Each dispositional factor was initially examined as a predictor of future conduct problems in separate models. Then a final model including all five dispositional factors as predictors was estimated. All models controlled for linear and quadratic age trends in the outcome, family socioeconomic status (SES) at each wave using the Hollingshead Index,³⁴ race, and the time of year when the assessment occurred (ie, fall versus spring). The correlation structure of the outcome variable was specified as independent because prior conduct problems were included as a predictor in each model. Heteroscedasticity-consistent standard errors that are also robust to a misspecification of dependent variable covariance structure were used to calculate confidence intervals and *p* values.³⁵ Prior to conducting the analyses, dispositional and conduct problems variables were converted to *z* scores using their aggregate mean and SD across all time points. As a result, regression coefficients represent the SD unit change in the dependent variable per 1 SD unit increase in the independent variable (ie, standardized coefficients).

The association between the dispositional variables and official records of criminal offending were estimated using negative binomial regression for count outcomes (eg, number of arrests) and logistic regression for binary outcomes (eg, any serious violent charge). These models leveraged data collected on the dispositional variables across the nine assessment waves by treating each assessment point as a separate observation (ie, each row in the dataset represented one assessment per subject). This allowed each participant to contribute up to nine waves of data to the prediction model. Model parameters are estimated

using all observed data across the available time points rather than resorting to listwise deletion. Robust standard errors were used to account for the nonindependence of the repeated assessments within individuals.³⁵ This method of pooling information collected across multiple assessment points during childhood (as opposed to using a single assessment) provides a more reliable, efficient, and precise estimate of the association between each dispositional factor and later offending. All dispositional factors and conduct problems were initially examined as predictors in separate models, and then a final model that included all predictors was estimated. Race and family SES were included as covariates in all analyses.

Results depicting the effects of covariates in the final models are available in Tables S1 to S3, available online. Models using all three dispositional factors to predict criminal offending without controlling conduct problems are presented in Tables S4 and S5, available online. The moderating effect of age was examined in the final models by adding interactions between the study predictors and variables indexing age and age². After correction for multiple comparisons, none of the interactions tested were statistically significant. These analyses are available upon request.

Missing Data—Participant retention at each assessment never fell below 95%. The average number of assessments completed per participant was 8.6. There were no significant differences between participants with missing versus complete data in terms of race, dispositional and conduct problems scores at screening, and official records of criminal offending. Three participants were excluded from analyses involving adult outcomes because they died before turning 18 years old.

RESULTS

Correlations between primary predictors at each assessment wave are presented in Table S6, available online. The within-time correlations among conduct problems, interpersonal callousness, dysregulated anger, and hyperactivity/impulsivity were high and roughly equivalent across waves ($r = 0.62$ – 0.76). The within-time correlations among anxiety problems and the other 3 dispositional features ($r = 0.30$ – 0.51) and conduct problems ($r = 0.29$ – 0.37) were weaker, and roughly equivalent over time.

Childhood Conduct Problems

Table 1 depicts results from the GEE models predicting childhood conduct problems at time T+1. When examined in separate models, dysregulated anger, interpersonal callousness, and hyperactivity/impulsivity were all positively associated with later conduct problems, after controlling for prior conduct problems and covariates. These dispositional features remained significant predictors of future conduct problems when included together in the final model. Anxiety problems were not associated with future conduct problems in any model.

Juvenile Criminal Offending

Analyses predicting the number of juvenile arrests are presented in Table 2. When examined in separate models, conduct problems, dysregulated anger, interpersonal callousness, and

hyperactivity/impulsivity (but not anxiety problems) were each associated with all juvenile offending outcomes. In the final model including all predictors, conduct problems remained significantly associated with all juvenile offending outcomes. The associations between dysregulated anger and hyperactivity/impulsivity and all juvenile offending outcomes were non significant. Interpersonal callousness continued to exhibit a marginally significant association with serious violence ($p < .07$). Higher anxiety problems were significantly associated with a lower number of juvenile charges, after controlling for the other dispositional factors and conduct problems.

Adult Criminal Offending

Analyses predicting adult criminal offending are presented in Table 3. When examined in separate models, conduct problems, dysregulated anger, interpersonal callousness, and hyperactivity/impulsivity (but not anxiety problems) each predicted the number of adult arrests and charges, being charged with serious violence, and being charged with a crime within 2 years of the final criminal record search. Interpersonal callousness was also significantly associated with a greater risk of being charged with a crime in the year prior to the final criminal record data collection. In contrast, boys with higher anxiety problems were less likely to have been arrested in the past year.

In models controlling for the co-occurrence among all study predictors, higher interpersonal callousness continued to significantly predict all adult offending outcomes. Conduct problems remained positively associated with all offending outcomes except being arrested in the past 2 years and past year. Conversely, higher anxiety problems were significantly associated with a decreased risk for all adult offending outcomes, except being charged with serious violence. Higher dysregulated anger was associated with a decreased risk of engaging in serious violence after controlling for all other predictors. Hyperactivity/impulsivity was not significantly associated with any adult offending outcomes in the final model.

To characterize the potential clinical significance of the findings, model-predicted values of the adult offending outcomes were graphed using sample-based cut-scores at extremely high (upper 10th percentile) and moderate (50th percentile) levels of interpersonal callousness and anxiety problems (Figure 1). Going from moderate to high levels of interpersonal callousness, the predicted number of adult charges increased by 1.6 times (7.62 versus 12.12), the probability of being charged with serious violence increased by 1.7 times (0.20 versus 0.33), and the probability of being arrested in the past year increased by 2.7 times (0.06 versus 0.16). In contrast, going from moderate to high levels of anxiety problems, the predicted number of adult arrests decreased by 33% (9.30 versus 6.18) and the probability of being arrested in the past year decreased by 56% (0.09 versus 0.04).

DISCUSSION

This is the first study to simultaneously examine childhood dispositional features as predictors of early-onset conduct problems, adolescent offending, and chronic adult criminal behavior in a longitudinal sample of boys followed from childhood into their early 30s. Consistent with developmental pathway models, results indicated that boys with higher

interpersonal callousness, dysregulated anger, and hyperactivity/impulsivity were at increased risk for exhibiting conduct problems across childhood. However, the strength of these associations was small in magnitude. After controlling for co-occurring conduct problems, there was no consistent evidence that these dispositional features uniquely predicted the three criminal offending outcomes assessed during adolescence. However, childhood features of interpersonal callousness (but not hyperactivity/impulsivity or dysregulated anger) were a significant predictor of persistent and violent criminal offending into adulthood, even after controlling for co-occurring conduct problems. Moreover, interpersonal callousness was the only predictor significantly associated with an increased risk for criminal offending into the early 30s. In contrast, the link between childhood anxiety problems and later criminal offending was more complex. Specifically, higher anxiety problems were associated with a decreased risk of adolescent and adult offending, primarily after controlling for its co-occurrence with other childhood dispositional features and conduct problems.

Interpersonal Callousness

Boys with higher levels of interpersonal callousness were at increased risk for exhibiting later childhood conduct problems, but the magnitude of this association was relatively small. This is not particularly surprising, given there are multiple etiological factors implicated in the development of early conduct problems.¹⁹ Although interpersonal callousness was not significantly associated with juvenile offending in the final multivariate models, supplemental analyses indicated that interpersonal callousness (but not hyperactivity/impulsivity or dysregulated anger) significantly predicted all juvenile offending outcomes when childhood conduct problems was removed from the model (see Table S2, available online). More importantly, interpersonal callousness predicted all adult offending outcomes, even after controlling for early conduct problems and other model covariates. Results from the final model indicated that boys with high (upper 10th percentile) versus moderate (50th percentile) interpersonal callousness accumulated 1.6 times as many charges in adulthood, were 1.7 times more likely to be charged with a serious violent crime, and were 2.7 times more likely to be arrested in their early 30s (Figure 1). This suggests that the predictive utility of childhood interpersonal callousness may be most pronounced when trying to delineate risk factors for criminal offending into adulthood. More generally, it emphasizes the importance of studying criminal offending at different developmental periods, including the transition to young adulthood when desistance from crime becomes increasingly common.⁷

Negative Emotionality: Dysregulated Anger Versus Anxiety

Although high levels of negative emotionality have been implicated in the development of serious conduct problems,^{36,37} results indicate that combining specific components of negative emotionality into a single construct may obscure associations with early-onset conduct problems and persistent criminal behavior. Although dysregulated anger and anxiety problems were moderately correlated, only dysregulated anger predicted conduct problems in childhood. This is consistent with longitudinal studies linking dysregulated anger with the development of conduct problems and aggression.³⁶ However, problems with dysregulated anger in childhood were not associated with criminal offending during adolescence or

adulthood, after accounting for co-occurring conduct problems. Some recent evidence suggests that childhood features of dysregulated anger may actually be a more robust risk factor for later internalizing versus externalizing psychopathology, which prompted the creation of a new diagnostic category focused on problems with anger regulation called disruptive mood dysregulation disorder.³⁸

Findings indicated that boys with higher anxiety problems were less likely to exhibit certain forms of criminal offending during adolescence and young adulthood, primarily after controlling for other co-occurring dispositional factors and conduct problems. This type of suppression effect has been found in other studies examining the association between childhood anxiety and externalizing psychopathology.³⁹ Although the reason for this pattern of findings is unclear, several theories have been proposed. It is possible that children with higher anxiety (including those with co-occurring conduct problems) may be less likely to engage in future criminal offending due to concerns about being caught and punished for their actions, or because they shy away from deviant peer groups.⁴⁰ Consistent with the latter, boys exhibiting a childhood-limited pattern of conduct problems have been found to be at increased risk for exhibiting agoraphobia, social anxiety, and social isolation in adulthood.⁴¹

Hyperactivity/Impulsivity

Consistent with prior studies, childhood hyperactivity/impulsivity did not predict adolescent and adult criminal behavior after controlling for co-occurring conduct problems and other dispositional factors.¹⁹ However, hyperactivity/impulsivity was associated with increased levels of future conduct problems in childhood. This is consistent with development pathway models in which hyperactivity/impulsivity fosters the initial emergence of conduct problems, which in turn increases the likelihood that children will engage in criminal behavior into young adulthood.¹⁹ Although beyond the scope of the current study, future investigations examining this development cascade model are needed.

It is important to consider these findings in light of several limitations. First, the current study did not include environmental, genetic, or neurobiological risk factors that may mediate or confound the observed associations. Second, the use of a community sample of at-risk boys limits generalizability to girls. Third, criminal offending was assessed using official arrest records because these were available for all participants across adolescence and young adulthood. Although official records avoid response biases associated with self-reported offending, a significant portion of criminal behavior goes undetected by police, and some arrests may be unjustified.⁴² Another limitation is that the predictors were all derived from the same instrument, which may have artificially inflated their intracorrelations. Some scales also contained relatively few items assessing the targeted dispositional factors. This limited our ability to further delineate potentially important facets of the constructs examined (eg, social versus general anxiety). In addition, the interpersonal callousness scale used in the current study differs from traditional measures of “callous-unemotional” (CU) traits, which include reverse-scored items assessing deficient affect, empathy/guilt, and concern about performance.⁴³ It is unclear whether measures of childhood CU traits would similarly predict chronic criminal offending in early adulthood. Finally, findings related to

anxiety problems should be viewed with caution, because the scale exhibited low internal consistency, which can lead to unreliable parameter estimates and attenuated correlations.

Given the growing evidence that interpersonal callousness is an important predictor of long-term offending, items assessing these features could be used to help screen children for targeted delinquency prevention programs. These programs have traditionally used ad hoc screening tools that focus solely on ratings of children's conduct problems. Augmenting existing screeners with items assessing interpersonal callousness may help to better identify those youth who are most in need of delinquency prevention programming. Toward this end, we are conducting research aimed at delineating a cut-score on the interpersonal callousness scale that accurately identifies children at risk for exhibiting persistent and/or severe criminal offending, which is a critical step in screener development.

The findings suggest that the dispositional features of interpersonal callousness, dysregulated anger, and hyperactivity/impulsivity seem to have a small (but consistent) influence on the development of childhood conduct problems. Results also emphasize the importance of delineating specific components of dispositional negative emotionality, because anger and anxiety seem to have differential associations with later criminal offending. Finally, our findings further validate childhood interpersonal callousness as a robust predictor of persistent and violent criminal offending across young adulthood.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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FIGURE 1.

Model Predicted Adult Patterns at Moderate (50th Percentile) and High (Upper 10th Percentile) Levels of Childhood Interpersonal Callousness (Top) and Anxiety Problems (Bottom)

Note: Marginal predicted values and delta method standard errors were calculated using parameters from the full model, holding all other variables constant at the mean. Arrest in the past year and past two years are from the date of the last criminal record search when participants were in their early 30s (mean age = 31.0, SD = 76).

TABLE 1

Childhood Dispositional Factors Predicting Conduct Problems 6 Months Later Across 9 Consecutive Assessment Waves (Ages ~7–11 Years)

Predictors at Time T	Conduct Problems (T+1)	
	β	95% CI
Predictors examined in separate models^a		
Interpersonal callousness	0.11 ***	[0.07, 0.16]
Dysregulated anger	0.10 ***	[0.06, 0.14]
Hyperactivity/impulsivity	0.10 ***	[0.06, 0.13]
Anxiety problems	0.08	[0.00, 0.05]
Predictors included in a single model		
Conduct problems	0.50 ***	[0.44, 0.55]
Interpersonal callousness	0.07 *	[0.02, 0.12]
Dysregulated anger	0.06 *	[0.02, 0.11]
Hyperactivity/impulsivity	0.06 *	[0.02, 0.10]
Anxiety problems	-0.02	[-0.05, 0.02]

Note: Models based on 502 participants with a total of 3,811 observations. All models include covariates of time of year, race, family socioeconomic status, age, and age². β = the SD unit change in the dependent variable per 1 SD unit increase in the independent variable.

^aConduct problems at time T was included as a covariate in these models.

*
p < .05

p < .001.

TABLE 2
Childhood Dispositional Factors Predicting Official Records of Juvenile Criminal Offending

	Juvenile Criminal Records					
	No. of Arrests		No. of Charges		Serious Violence	
	IRR	95% CI	IRR	95% CI	OR	95% CI
Predictors examined in separate models						
Conduct problems	1.41 ***	[1.28, 1.57]	1.40 ***	[1.24, 1.58]	1.48 ***	[1.27, 1.73]
Interpersonal callousness	1.33 ***	[1.20, 1.47]	1.28 ***	[1.13, 1.45]	1.44 ***	[1.24, 1.68]
Dysregulated anger	1.25 ***	[1.12, 1.39]	1.21 ***	[1.08, 1.37]	1.28 ***	[1.10, 1.48]
Hyperactivity/impulsivity	1.23 ***	[1.09, 1.38]	1.19 ***	[1.04, 1.36]	1.27 ***	[1.08, 1.50]
Anxiety problems	1.06	[0.95, 1.17]	0.98	[0.88, 1.09]	1.06	[0.91, 1.24]
Predictors included in a single model						
Conduct problems	1.42 ***	[1.23, 1.64]	1.49 ***	[1.26, 1.75]	1.45 ***	[1.17, 1.82]
Interpersonal callousness	1.09	[0.94, 1.27]	1.06	[0.89, 1.28]	1.24 [§]	[0.99, 1.56]
Dysregulated anger	0.96	[0.83, 1.11]	0.97	[0.82, 1.14]	0.89	[0.71, 1.12]
Hyperactivity/impulsivity	0.98	[0.85, 1.12]	0.97	[0.82, 1.15]	0.95	[0.77, 1.18]
Anxiety problems	0.92	[0.83, 1.02]	0.84 *	[0.75, 0.95]	0.92	[0.77, 1.08]

Note: Models based on 503 participants with a total of 4,304 observations across 9 assessments. Effects are after controlling for race and family socioeconomic status. IRR = incident rate ratio; OR = odds ratio.

*
p < .05

p < .001

[§]
p < .07.

TABLE 3
Childhood Dispositional Factors Predicting Official Records of Adult Criminal Offending

	Adult Criminal Records									
	No. of Arrests		No. of Charges		Serious Violence		Arrest Past 2 Years		Arrest Past Year	
	IRR	95% CI	IRR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Predictors examined in separate models										
Conduct problems	1.36 ^{***}	[1.26, 1.47]	1.41 ^{***}	[1.29, 1.56]	1.63 ^{***}	[1.40, 1.90]	1.30 [*]	[1.10, 1.53]	1.22	[0.99, 1.51]
Interpersonal callousness	1.34 ^{***}	[1.23, 1.45]	1.39 ^{***}	[1.26, 1.53]	1.60 ^{***}	[1.38, 1.86]	1.40 ^{***}	[1.20, 1.63]	1.35 [*]	[1.10, 1.65]
Dysregulated anger	1.22 ^{***}	[1.14, 1.32]	1.25 ^{***}	[1.15, 1.37]	1.29 ^{***}	[1.12, 1.50]	1.16 [*]	[1.00, 1.35]	1.05	[0.87, 1.26]
Hyperactivity/impulsivity	1.24 ^{***}	[1.14, 1.35]	1.27 ^{***}	[1.14, 1.40]	1.40 ^{***}	[1.19, 1.64]	1.25 [*]	[1.05, 1.48]	1.15	[0.94, 1.40]
Anxiety problems	1.02	[0.94, 1.11]	1.01	[0.93, 1.12]	1.06	[0.92, 1.22]	0.92	[0.78, 1.08]	0.78 [*]	[0.66, 0.93]
Predictors included in a single model										
Conduct problems	1.28 ^{***}	[1.14, 1.47]	1.32 ^{***}	[1.14, 1.52]	1.61 ^{***}	[1.30, 2.00]	1.11	[0.86, 1.44]	1.09	[0.78, 1.51]
Interpersonal callousness	1.19 [*]	[1.05, 1.35]	1.23 [*]	[1.07, 1.41]	1.36 [*]	[1.11, 1.68]	1.46 [*]	[1.15, 1.85]	1.62 [*]	[1.19, 2.19]
Dysregulated anger	0.96	[0.86, 1.08]	0.96	[0.83, 1.10]	0.76 [*]	[0.61, 0.94]	0.88	[0.70, 1.11]	0.81	[0.60, 1.10]
Hyperactivity/impulsivity	1.03	[0.92, 1.15]	1.02	[0.89, 1.18]	1.05	[0.85, 1.29]	1.08	[0.85, 1.38]	1.05	[0.81, 1.35]
Anxiety problems	0.86 ^{***}	[0.79, 0.94]	0.84 ^{***}	[0.75, 0.92]	0.88	[0.75, 1.02]	0.77 [*]	[0.64, 0.93]	0.67 ^{***}	[0.55, 0.81]

Note: Models included 500 participants (3 were deceased) with a total of 4,277 observations across 9 assessments. Models included race and family socioeconomic status as covariates. Arrest in the past year and past 2 years are from the date of the last criminal record search when participants were in their early 30s (mean age = 31.0 years, SD = .76). IRR = incident rate ratio; OR = odds ratio.

* p < .05

*** p < .001.