Published in final edited form as:

J Child Psychol Psychiatry. 2011 February ; 52(2): 167–175. doi:10.1111/j.1469-7610.2010.02300.x.

Contextual Risk Factors as Predictors of Disruptive Behavior Disorder Trajectories in Girls: The Moderating Effect of Callous-Unemotional Features

Leoniek M. Kroneman, Ph.D.¹, Alison E. Hipwell, PhD², Rolf Loeber, PhD², Hans M. Koot, PhD¹, and Dustin A. Pardini, PhD²

¹Department of Developmental Psychology, VU University, Amsterdam, The Netherlands

²Department of Psychiatry, School of Medicine, University of Pittsburgh, PA, USA

Abstract

Background—The presence of callous-unemotional (CU) features may delineate a severe and persistent form of conduct problems in children with unique developmental origins. Contextual risk factors such as poor parenting, delinquent peers, or neighborhood risk are believed to influence the development of conduct problems primarily in children with low levels of CU features. However, longitudinal studies examining the moderating effect of CU features on the relation between contextual risk factors and conduct problems trajectories in girls are rare.

Methods—Growth curve analysis was conducted using five annual measurements of ODD/CD behaviors in a community sample of 1233 girls aged 7–8 at study onset. The relation between contextual risk factors in multiple domains (i.e., family, peer, community) and trajectories of ODD/CD behaviors across time were examined for girls with differing levels of CU features.

Results—Growth curve analysis indicated that CU features were associated with chronically high levels of ODD/CD symptoms over time. Low levels of parental warmth were also associated with chronically high levels of ODD/CD, and this effect was particularly pronounced for girls with high CU features. Exposure to harsh parenting was associated with higher ODD/CD behaviors for girls in childhood regardless of their level of CU features, but this effect dissipated over time.

Conclusions—Girls with elevated CU features who are exposed to low levels of parental warmth seem to exhibit particularly severe ODD/CD symptoms and should be targeted for intensive intervention in childhood.

Keywords

CD; ODD; girls; callous-unemotional; longitudinal; contextual risk; moderation

It is commonly recognized that contextual factors are associated with the development of ODD/CD in both boys and girls. Studies have shown that boys and girls who are exposed to harsh punishment and low parental warmth are more likely to develop conduct problems over time (Hipwell et al., 2008; Pardini, Fite, & Burke, 2008). A link between affiliation with deviant peers and the development of antisocial behavior has also been established for both boys (Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998) and girls (Aseltine, 1995). On a macro level, boys and girls growing up in disadvantaged

LM.Kroneman@psy.vu.nl .

The authors report no conflict of interest.

neighborhoods are also at increased risk for developing disruptive behavior (Brooks-Gunn, Duncan, Klebanov & Sealand, 1993). However, individual difference characteristics also influence the development of ODD/CD in youth and may moderate the relation between contextual risk and future antisocial behavior (Loeber & Pardini, 2008).

Children with high callous-unemotional (CU) features, such as a lack of guilt and empathy, have been characterized as a subgroup of children whose conduct problems are not substantially influenced by contextual risk factors. Longitudinal research suggests that CU features are relatively stable from childhood to adolescence in mixed gender (Frick, Kimonis, Dandreaux, & Farrell, 2003) and male (Obradovic, Pardini, Long, & Loeber, 2007) samples. These features are associated with a severe and persistent form of antisocial behavior in males and females (Frick & White, 2008). Moreover, CU features may also help delineate a specific subgroup of children with ODD/CD whose antisocial behavior has unique developmental origins. Specifically, the development of ODD/CD symptoms in boys and girls with high CU features are putatively driven primarily by genetic and neurobiological factors, while exposure to environmental risk factors are more important for understanding the development of ODD/CD in children without CU features (Pardini & Loeber, 2007). However, several limitations in the existing literature must be addressed. First, current research on CU features has been conducted in male or mixed gender samples in adolescence, making it unclear to what extent these features prospectively predict ODD/CD symptoms in young girls. Second, studies examining whether environmental risk factors associated with ODD/CD differ for youth with varying levels of CU features have been based largely on cross-sectional data with male or mixed gender samples.

Despite the aforementioned limitations, an emerging body of evidence suggests that CU features may be important for understanding the development of girls' problem behaviors (Dadds, Fraser, Frost & Hawes, 2005; Frick, Cornell, Barry, Bodin, & Dane, 2003; Hipwell et al., 2007). Frick and colleagues (2003) found that CU behaviors in the absence of conduct problems predicted delinquency one year later in a small sample of nine girls. Dadds and colleagues (2005) also found that parent-reported CU features were predictive of changes in girls' (age 4 to 9) disruptive behavior over a 1-year period. However, these studies have not examined whether CU features predict within-individual changes in ODD/CD symptoms among girls from childhood through early adolescence; a developmental period when girls' conduct problems tend to escalate (Maughan, Rowe, Messer, Goodman, & Meltzer, 2004).

Not only have CU features been characterized as predicting escalating conduct problems, the factors driving the development of conduct problems may differ for children with and without significant CU features. For example, cross-sectional findings indicate that conduct problems are not as strongly related to dysfunctional parenting practices for children with high CU traits in mixed-gender (Oxford, Cavell, & Hughes, 2003; Wootton, Frick, Shelton, & Silverthorn, 1997) and all female (Hipwell et al., 2007) samples. Studies with male (Hawes & Dadds, 2005) and mixed gender (Pardini, 2006) samples have also shown that children with significant CU features may not be as responsive to punishment-oriented discipline techniques. However, at least one longitudinal study consisting of high risk boys and girls found that dysfunctional parenting practices were related to future conduct problems irrespective of the presence of significant CU features (Pardini, Lochman, & Powell, 2007).

In addition to parenting practices, there has been increasing interest in whether the relation between conduct problems and other contextual risk factors differs for children with varying levels of CU features. Along these lines, longitudinal evidence using a mixed-gender sample suggests that youth with conduct problems and high levels of CU features show the highest affiliation with deviant peers across a 4-year period in adolescence (Kimonis, Frick, &

Barry, 2004). In addition, cross-sectional evidence from a large mixed gender sample suggests that the association between neighborhood risk and delinquency is more pronounced for youth with high versus low CU features, and no consistent evidence for substantive gender differences was found (Meier, Slutske, Arndt & Cadoret, 2008). Taken together, these findings suggest that peer and community risk factors may be more important for understanding the development of conduct problems in girls with high CU features.

Current Study

There remains a dearth of studies examining the association between CU features and within-individual changes in ODD/CD symptoms from childhood to early adolescence in girls. In addition, longitudinal studies examining the moderating effects of CU features on the relation between contextual risk factors and within-individual changes in conduct problems are scarce and have suffered from methodological problems, such as the reliance on a single informant. To address these limitations, this study examines the moderating effect of CU features on the association between contextual risk factors and developmental trajectories of ODD/CD symptoms in a large community sample of girls followed annually from age 7 to 12. Both CU features and trajectories of ODD/CD behaviors were assessed using multiple informants.

Method

Participants

Participants are part of a longitudinal study of the development of conduct problems in girls (PGS; Pittsburgh Girls Study). The PGS consists of four age-based cohorts who were ages (n = 588), 6 (n = 630), 7 (n = 611) and 8 (n = 622) when the study began. Participants were identified by a stratified, random sampling of households in Pittsburgh neighborhoods where households in low-income neighborhoods were over-sampled. Neighborhoods were deemed low-income if at least 25% of the families were living at or below the poverty level using 1990 Census data. In low-income neighborhoods all households were contacted to determine eligibility for the study, while half of the households in other neighborhoods were randomly sampled. Of those girls initially identified as meeting the age criterion, 2,876 were asked to take part in the longitudinal study. From this pool, a total of 2,451 (85.2%) girls agreed to participate (for further details, see Hipwell et al., 2002).

The current study sample comprises the two oldest PGS cohorts (N = 1233 girls) who were age 7–8 at the first assessment wave, because complete parenting measures were available for all participants. The current analyses used the first five waves of annually collected data (retention rates ranged from 97.2% in year 2 to 93.1% in year 5). The racial distribution was 52.2% African American, 42% Caucasian and 5.5% multiracial. In year 1, 36.5% of families received public assistance (i.e. WIC, food stamps, welfare) and 41.7% of girls lived in a single parent household.

Procedures

Approval for all study procedures was obtained from the University of Pittsburgh Institutional Review Board. Written informed consent from the caregiver and verbal assent from the child were obtained prior to data collection. Annual interviews were conducted separately with the parent and the child in the home by trained interviewers. Teacher data were obtained using self-administered questionnaires.

Measures

Demographic Characteristics—Parent reports of race (European American = 0, minority = 1), family structure (dual parent = 0, single parent = 1) and family poverty (no public assistance = 0, receiving assistance = 1) were collected via a demographic questionnaire (Loeber et al., 1998).

Callous-Unemotional Features—CU features were assessed using four items from both the parent- and teacher-report on the Antisocial Processes Screening Device (Frick et al., 2000; Frick & Hare, 2001). These four CU items were selected because they have exhibited acceptable factor loadings ($>.40$) across clinic and community samples with both boys and girls (Frick et al., 2000) and they are being considered as a specifier to the diagnosis of CD in DSM-V (Frick & Moffitt, 2010). The items include “Feels bad or guilty when she does something wrong (reverse),” “Is concerned about the feelings of others (reverse),” “Is concerned about doing well in school (reverse),” and “Does not show feelings or emotions.” Each item was rated on a 3-point scale. A best-estimate score was obtained by taking the highest rating of either informant and then summing the four items. The CU scale of the APSD has shown evidence of temporal stability (Loeber et al., 2009), construct validity (Hipwell et al., 2007) and predictive validity (Frick et al., 2003) in girls.

ODD/CD Symptom Severity—Parent and teacher-reports of ODD/CD behaviors were collected using the Child Symptom Inventory (CSI-4, Gadow & Sprafkin, 1994). Teachers rated 8 of the 15 DSM-IV symptoms of CD (American Psychiatric Association, 1994) on a 4-point scale. The other 7 CD symptoms were not included because teachers were not expected to have reliable knowledge about these behaviors. Parents rated all CD symptoms except for running away from home over night and regular truancy because they were believed to be practically non-existent in very young children. Parents and teachers also rated all eight DSM-IV symptoms of ODD. The highest rating between the two informants was used for each symptom, and items were summed to create a total ODD/CD symptom severity score. Based on the high inter-correlations (r s from .67–.73) in each wave of the current study, ODD and CD symptom scores were combined.

Harsh punishment—Parental harsh punishment was assessed using 6 items from the parent-reported Conflict Tactics Scale – Parent/Child version (CTS-PC; Straus, Hamby, Finkelhor, Moore, & Runyan, 1998). Because some girls lived with a single caregiver, only questions relating to the primary caregiver were used. Parents were asked to rate how often they used verbal and physical forms of aggression when disciplining their child in the past year. Items were rated on a 3-point scale (i.e., “never” = 1 to “often” = 3).

Low parental warmth—Parent-reports on a 6 item subscale from the Parent Child Relationship Scale (PCRS; Loeber et al., 1998) was used to assess low levels of parental warmth. Specifically, parents were asked to rate how often they perceived their relationship with their child as conflicted and lacking closeness over the past year. Each item was rated on a 3-point-scale (i.e., “almost never” = 1 to “often” = 3).

Peer Delinquency—The self-reported Peer Delinquency Scale (PDS) was developed to assess the deviant peer group affiliation in youth (Loeber et al., 1998). Girls were asked to rate how many of their friends engaged in ten deviant behaviors (e.g., shoplifting, selling drugs) in the last six months. The number of behaviors in which there was some level of peer involvement was summed to create a total peer delinquency score.

Neighborhood risk—A 17-item Neighborhood Scale was used to assess parent perceptions of risky neighborhood features, particularly those associated with different

forms of neighborhood crime such as assaults, drug dealing and vandalism (Loeber et al., 1998). For each item, parents rated the severity of the problem in the neighborhood using a 3-point scale. Items were summed so that higher scores indicated increased levels of neighborhood risk.

Data analysis plan

Growth curve models were specified using maximum likelihood estimation with standard errors and a chi-square statistic that are robust to non-normality (MLR) within Mplus 5.21 (Muthén & Muthén, 1998–2009). Overall model fit was assessed using the comparative fit index (CFI), the Tucker-Lewis Index (TLI), and the root mean square error of estimation (RMSEA). For the CFI and TLI, conventional cutoff values .90 or greater indicate acceptable fit, and .95 or greater indicate good fit. RMSEA values between .05 and .08 represent an acceptable fit, while values less than .05 indicate a good fit (McDonald & Ho, 2002).

An unconditional growth model for ODD/CD symptoms was estimated using an intercept (centered at year 1) and both a linear slope and quadratic slope using year 1–5 data. The moderating effect of CU features on the relation between contextual risk factors and ODD/CD growth curve parameters were tested using commonly recommended procedures (Aiken & West, 1991). In the first step, all latent growth curve parameters were regressed onto the independent variables of CU features, harsh punishment, low parental warmth, peer delinquency and neighborhood risk. This model also included the demographic control variables of age, race, household composition, and welfare status. In the second step of the model, interaction terms representing the product of CU features and each of the family, peer, and community level contextual variables were added as additional predictors. Significant interactions were probed by examining the relation between the contextual factor and growth curve parameter of interest at low (-1.25 SD; ~lower 10% of the distribution) and high ($+1.25$ SD; ~upper 10% of the distribution) levels of CU features. Finally, model parameters were re-examined with the intercept re-centered to represent the estimated level of ODD/CD symptoms at the last assessment (year 5) to examine whether the predictor was associated with higher levels of ODD/CD across the entire trajectory of the latent growth curve.

Results

Descriptive statistics and correlations

Table 1 shows the means, standard deviations, observed ranges, alphas and correlations for the study variables in year 1. CU was moderately correlated with ODD/CD symptoms. The parenting variables harsh punishment and low parental warmth were also moderately correlated. All contextual risk factors were significantly associated with higher levels of ODD/CD behaviors in year 1.

Unconditional growth model

A three-factor latent growth curve model with both a linear and quadratic slope produced a good fit to the data ($\chi^2 = 6.19$, $p = .40$, CFI = 1.00, TLI = 1.00, RMSEA = .01) and represented an improved fit over a linear model ($\Delta\chi^2$ (4, $N = 1218$) = 19.43, $p < .001$). Growth curve parameter means (i.e., intercept = 8.99, linear slope = $-.97$, quadratic slope = .19) and variances (i.e., intercept = 25.37, linear slope = 5.44, quadratic slope = .26) were all significantly different from zero at $p < .01$. Mean growth curve parameters indicated that there was an overall tendency for ODD/CD behavior to decrease across the initial assessments and then began to increase during the last assessments. However, variance

estimates indicated that there was significant individual variability in the initial status and pattern of ODD/CD change over time.

Conditional growth models

Results for the regression analyses predicting the ODD/CD growth parameters are presented in Table 2. While controlling for ethnicity, welfare status, household composition and girls' age, several main effects were found. Higher levels of CU features were significantly associated with higher initial levels of ODD/CD, lower ODD/CD linear slope values, and higher quadratic ODD/CD slope values. A visual depiction of this effect was created by plotting growth curves for participants exhibiting high and low levels of CU features (see Figure 1). As seen in Figure 1, girls with high CU traits had higher initial levels of ODD/CD symptoms that decreased at a faster rate over the short-term and then escalated by year 5 in comparison to girls with low CU traits. Re-centering of the intercept to represent year 5 levels of ODD/CD symptoms confirmed that girls with high CU traits continued to show higher levels of ODD/CD than girls with low CU traits at the last assessment ($B = .61$, $SE = .10$, $p < .001$).

Both parental warmth and harsh parenting also significantly predicted ODD/CD symptom trajectories. Lower parental warmth was significantly related to higher initial levels of ODD/CD symptoms, but was not significantly related to the linear or quadratic change components of ODD/CD symptom severity trajectories (see Figure 2). As expected, re-centering of the intercept to represent year 5 levels of ODD/CD symptoms showed that girls exposed to lower level of parental warmth continued to exhibit higher levels of ODD/CD symptoms four years later ($B = .87$, $SE = .09$, $p < .001$).

A more complex pattern of findings was observed for the main effect of harsh parenting predicting ODD/CD symptoms trajectories. Specifically, harsh parenting was not significantly related to initial levels of ODD/CD, but was positively associated with ODD/CD linear slope values and negatively related to the quadratic ODD/CD slope values. Figure 2 shows that girls exposed to high harsh parenting exhibited relatively little change in ODD/CD symptoms over time relative to girls exposed to low levels of harsh parenting. However, the association between harsh parenting and ODD/CD symptoms became non-significant by the year 5 assessment ($B = .17$, $SE = .10$, $p = .10$), as girl in the low harsh parenting group began experiencing an escalation in ODD/CD symptoms.

Interactions between CU and Contextual Factors

The interactions between CU features and each of the contextual risk factors were then added as predictors of the ODD/CD growth curve components (see Table 2). The CU by low warmth interaction exhibited a significant positive association with the intercept and a significant negative relation with the linear slope of the ODD/CD trajectories. No other interaction terms were statistically significant. The association between parental warmth and ODD/CD symptom severity trajectories was then probed at low (-1.25 SD; ~lower 10% of the distribution) and high ($+1.25$ SD; ~upper 10% of the distribution) levels of CU features. Plots were generated using mean values of all other variables in the model. As seen in Figure 3, results indicated that the association between low parental warmth and higher initial levels of ODD/CD symptoms was substantially stronger for girls with high ($B = 1.38$, $SE = .16$, $p < .001$) versus low ($B = .43$, $SE = .11$, $p < .001$) CU features. However, lower parental warmth was associated with a greater linear reduction in ODD/CD symptoms over time for girls with high CU features ($B = -.25$, $B = .12$, $p < .05$), but this effect did not reach statistical significance for girls with low CU features ($B = .14$, $SE = .10$, $p = .19$). Analysis re-centering the intercept to represent year 5 levels of ODD/CD symptoms revealed that the interaction between CU features and low parental warmth in predicting ODD/CD behaviors

was no longer significant at the last assessment ($B = .05$, $SE = .05$, $p = .37$). In sum, the association between low parental warmth and ODD/CD symptoms no longer differed between girls with high and low CU features by the year 5 assessment.

Discussion

The current study examined the potential moderating effect of CU features on the relation between several contextual risk factors and developmental trajectories of ODD/CD behaviors across a five year period in a large community sample of young girls. Findings indicated that ODD/CD behaviors in girls decreased in late childhood, but these behaviors then begin to escalate as girls enter early adolescence. Consistent with previous findings (Frick et al., 2003; Dadds et al., 2005), CU features were associated with chronically high levels of ODD/CD behaviors from childhood to early adolescence in girls. While low levels of parental warmth were more strongly associated ODD/CD behaviors in girls with high versus low levels of CU features in childhood, by early adolescence low parental warmth predicted increased ODD/CD equivalently for girls with varying levels of CU features. There was no evidence that the relation between peer and community risk factors and later ODD/CD symptoms varied according to girls' CU features.

The increase in overall levels of ODD/CD symptoms in the later phases of the current study may be associated with early pubertal development in a subset of girls. Early puberty has been associated with increased mental health problems in girls, including externalizing problems (Graber, Lewinsohn, Seeley, & Brooks-Gunn, 1997). For example, one study found that girls who begin menarche at 12 years, 5 months or earlier exhibited higher behavior problems than girls with a later pubertal onset, particularly when enrolled in mixed sex schools like those in the Pittsburgh public school system (Caspi, Lynam, Moffitt, & Silva, 1993). Since girls in the current study were aged 11–12 at the final assessment wave, the increase in mean levels of ODD/CD symptoms observed may be accounted for by a subset of girls experiencing early pubertal development.

Girls exposed to harsh parenting exhibited higher levels of ODD/CD regardless of their level of CU features as they progressed through late childhood, but this effect dissipated into early adolescence. Close evaluation of this effect revealed that girls exposed to harsh parenting do not seem to experience an escalation in their conduct problems during childhood. Instead, they were more likely to exhibit stable levels of ODD/CD behaviors in late childhood, while girls exposed to low harsh parenting experience a decrease in ODD/CD behaviors during the same developmental period. This effect underscores the benefit of using an within-individual modeling approach, as the findings revealed that the positive association between harsh parenting and ODD/CD behaviors does not mean that girls show an escalation in their conduct problems over time, just slower decreases. It is possible that the effects of harsh parenting on children's conduct problems are relatively small unless they escalate to more severe physical abuse. In addition, longitudinal evidence suggests that the relation between physical punishment and increases conduct problems may be most pronounced during the early elementary school years in boys, but this detrimental effect quickly dissipates (Pardini et al., 2008). It is possible that the girls in the current study may have passed the developmental period in which harsh parenting practices most often result in poor behavioral functioning.

The lack of an association between peer delinquency and ODD/CD symptoms severity was somewhat surprised. However, longitudinal evidence suggests that prospective associations between deviant peer group affiliation and both parent- and teacher-reported conduct problems in young girls may be negligible after controlling for factors such as dysfunctional parenting and prior behavior (Miller, Loeber & Hipwell, 2009). Parental influences are

likely to be more influential in the development of girls' conduct problems in childhood, while the influence of peers may increase over time as young girls enter into adolescence. Developmental studies following girls into middle adolescence would help to elucidate whether the relative influence of peers and parents shifts over time.

The only interaction effect observed indicated that the association between low parental warmth and trajectories of ODD/CD behaviors was more pronounced in girls displaying high versus low CU features. While some cross-sectional studies have reported that contextual risk factors may be less strongly related to conduct problems for girls and boys high on CU features (Hipwell et al., 2007; Oxford et al., 2003; Wootton et al., 1997), other studies have found the opposite effect in both boys and girls (Meier et al., 2008). The current results are also consistent with a growing body of longitudinal evidence in mixed gender samples indicating that parenting practices are associated with reductions in CU features over time (Frick et al., 2003), and parental warmth in particular may protect children with low fearfulness from developing CU features (Pardini et al., 2007). It may be that girls who are high on CU features are particularly in need of a warm and close relationship with their primary caregiver in order to develop an internalized sense of morality and adopt prosocial behaviors.

Limitations and Conclusions

It is important to interpret the findings in light of several study limitations. First, the associations reported were likely attenuated due to low levels of internal consistency among some of the measures, including the CU scale. For the measure of CU traits in particular, this is primarily due to the use of only those four items that have been proposed as a CU specifier of CD for DSM-V (Frick & Moffitt, 2010), because coefficient alpha is reduced as the number of items making up a scale decreases. To address this issue, a more comprehensive measure of CU traits that expands on these four core items has recently been developed (for review see Frick & Moffitt, 2010) and should be used in future studies. Another limitation is that the generalizability of the findings is limited by the use of an all-female sample within inner-city Pittsburgh. While an growing number of studies have begun supporting the temporal stability (Loeber et al., 2009), construct validity (Hipwell et al., 2007) and predictive validity (Frick et al., 2003) of CU in girls, studies on the development of antisocial behavior in girls are limited and in need of further study. Moreover, it will be important for future studies to replicate the current findings with males. In addition, developmental changes in ODD/CD were only examined from late childhood to early adolescence. While there was no evidence that CU features influenced substantive changes in ODD/CD during this period, it is possible that CU features may be predictive of changes in ODD/CD behaviors in early childhood and/or later adolescence. We also relied on parental perceptions of parenting skills rather than using direct observations, and child reports of peer delinquency which may be unreliable.

Despite these limitations, this is the largest investigation examining the potential moderating effect of CU features on the association between contextual risk factors and within-individual change ODD/CD behaviors in girls. While many investigators contend that the link between contextual risk factors and ODD/CD behaviors is stronger in children without significant CU features, empirical evidence following girls longitudinally suggests that this may not be the case. In fact, those girls with elevated CU traits who are exposed to low levels of parental warmth seem to exhibit particularly severe ODD/CD symptoms in childhood.

- Callous-unemotional features may be useful for identifying girls at risk for persistent conduct problems that are not strongly influenced by contextual risk factors.
- Findings indicated that CU features are associated with chronically high levels of ODD/CD in girls across a five year period.
- Counter to theoretical conjecture, low parental warmth was more strongly associated with high levels of ODD/CD in childhood for girls with elevated CU features.
- Exposure to harsh parenting was associated with higher levels of ODD/CD in girls regardless of their level of CU features, but this effect dissipated over time.
- The findings contradict the notion that contextual risk factors are primarily associated with ODD/CD symptoms in girls with low CU features.

Acknowledgments

The first author was supported by the Fulbright Foundation, Prins Bernhard Cultuurfonds (Niemans-Schootemeijer Fonds), Stichting Fonds Doctor Catharine van Tussenbroek and Foundation “De Drie Lichten” in The Netherlands. Drs. Hipwell (K01MH071790) and Pardini (K01MH078039) are supported by the National Institute of Mental Health. The PGS is supported by funding from National Institute of Mental Health (MH056630) National Institute on Drug Abuse (DA012237), the FISA Foundation, and the Falk Foundation. Special thanks to the Pittsburgh Public Schools.

Abbreviations

(CD)	Conduct Disorder
(ODD)	Oppositional Defiant Disorder
(CU)	Callous-Unemotional

References

- Aiken, LS.; West, SG. Multiple regression: Testing and interpreting interactions. Sage; Thousand Oaks, CA: 1991.
- American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4th ed.. Author; Washington, DC: 1994. DSM-IV
- Aseltine RH. A reconsideration of parental and peer influences on adolescent deviance. *Journal of Health and Social Behavior*. 1995; 36:103–121. [PubMed: 9113137]
- Brooks-Gunn J, Duncan GJ, Klebanov PK, Sealand N. Do neighborhoods influence child and adolescent development? *American Journal of Sociology*. 1993; 99:353–395.
- Caspi A, Lynam D, Moffitt TE, Silva PA. Unraveling girls' delinquency: Biological, dispositional, and contextual contributions to adolescent misbehavior. *Developmental Psychology*. 1993; 29:19–30.
- Dadds MR, Fraser J, Frost A, Hawes DJ. Disentangling the underlying dimensions of psychopathy and conduct problems in childhood: A community study. *Journal of Consulting and Clinical Psychology*. 2005; 73:400–410. [PubMed: 15982138]
- Frick PJ, Bodin SD, Barry CT. Psychopathic features and conduct problems in community and clinic-referred samples of children: Further development of the psychopathy screening device. *Psychological Assessment*. 2000; 12:382–393. [PubMed: 11147105]
- Frick PJ, Cornell AH, Barry CT, Bodin DS, Dane HA. Callous-unemotional features and conduct problems in the prediction of conduct problem severity, aggression and self-report of delinquency. *Journal of Abnormal Child Psychology*. 2003; 31:457–470. [PubMed: 12831233]

- Frick, P.J.; Hare, R. The antisocial processes screening device. Multi-Health Systems; Toronto: 2001.
- Frick PJ, Kimonis ER, Dandreaux DM, Farrell JM. The 4-year stability of psychopathic features in non-referred youth. *Behavioral Sciences and the Law*. 2003; 21:713–736. [PubMed: 14696028]
- Frick, P.J.; Moffitt, T.E. A proposal to the DSM-V Childhood Disorders and the ADHD and Disruptive Behavior Disorders Work Groups to include a specifier to the diagnosis of Conduct Disorder based on the presence of callous-unemotional traits. 2010. Retrieved May 28, 2010 from, <http://www.dsm5.org/Proposed%20Revision%20Attachments/Proposal%20for%20Callous%20and%20Unemotional%20Specifier%20of%20Conduct%20Disorder.pdf>
- Frick PJ, White SF. Research review: The importance of callous-unemotional features for developmental models of aggressive and antisocial behavior. *Journal of Child Psychology and Psychiatry*. 2008; 49(4):359–375. [PubMed: 18221345]
- Gadow, K.; Sprafkin, J. Child Symptom Inventories manual. Checkmate Plus; Stonybrook, NY: 1994.
- Graber JA, Lewinsohn PM, Seeley JR, Brooks-Gunn J. Is psychopathology associated with the timing of pubertal development? *Journal of the American Academy of Child & Adolescent Psychiatry*. 1997; 36:1768–1776. [PubMed: 9401339]
- Hawes D, Dadds M. The treatment of conduct problems in children with callous-unemotional features. *Journal of Consulting and Clinical Psychology*. 2005; 73:737–741. [PubMed: 16173862]
- Hipwell AE, Loeber R, Stouthamer-Loeber M, Keenan K, White HR, Kroneman L. Characteristics of girls with early onset disruptive and antisocial behaviour. *Criminal Behaviour and Mental Health*. 2002; 12:99–118. [PubMed: 12357260]
- Hipwell AE, Pardini D, Loeber R, Sembower M, Keenan K, Stouthamer-Loeber M. Callous-unemotional behaviors in young girls: Shared and unique effects. *Journal of Clinical Child and Adolescent Psychology*. 2007; 36:293–304. [PubMed: 17658975]
- Hipwell AE, Keenan K, Kasza K, Loeber R, Stouthamer-Loeber M, Bean T. Reciprocal influences between girls' behavioral and emotional problems and parental punishment and warmth: A six year prospective analysis. *Journal of Abnormal Child Psychology*. 2008; 36:663–675. [PubMed: 18172753]
- Kimonis ER, Frick PJ, Barry CT. Callous-unemotional features and delinquent peer affiliation. *Journal of Consulting and Clinical Psychology*. 2004; 72(6):956–966. [PubMed: 15612843]
- Leventhal T, Brooks-Gunn J. The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin*. 2000; 126(2):309–337. [PubMed: 10748645]
- Loeber, R.; Farrington, D.P.; Stouthamer-Loeber, M.; Van Kammen, W. Antisocial behavior and mental health problems: Explanatory factors in childhood and adolescence. Erlbaum; Mahwah, NJ: 1998.
- Loeber R, Pardini D. Neurobiology and the development of violence: Common assumptions and controversies. *Philosophical Transactions of the Royal Society B: Biological Sciences*. 2008; 363:2491–2503.
- Loeber R, Pardini D, Stouthamer-Loeber M, Hipwell AE, Sembower M. Are there stable factors in girls' externalizing behaviors in middle childhood? *Journal of Abnormal Child Psychology*. 2009; 37:777–791. [PubMed: 19437114]
- Maughan B, Rowe R, Messer J, Goodman R, Meltzer H. Conduct disorder and oppositional defiant disorder in a national sample: Developmental epidemiology. *Journal of Child Psychology and Psychiatry*. 2004; 45(3):609–621. [PubMed: 15055379]
- McDonald RP, Ho M-HR. Principles and practice in reporting structural equation analyses. *Psychological Methods*. 2002; 7:64–82. [PubMed: 11928891]
- Meier MH, Slutske WS, Arndt S, Cadoret RJ. Impulsive and callous features are more strongly associated with delinquent behavior in higher risk neighbourhoods among boys and girls. *Journal of Abnormal Psychology*. 2008; 117(2):377–385. [PubMed: 18489213]
- Miller S, Loeber R, Hipwell AE. Peer deviance, parenting and disruptive behavior among young girls. *Journal of Abnormal Child Psychology*. 2009; 37(2):139–152. [PubMed: 18777132]
- Muthén, L.K.; Muthén, B.O. Mplus User's Guide. Fifth edition. Muthén & Muthén; Los Angeles: 1998–2009.

- Obradovic J, Pardini D, Long JD, Loeber R. Measuring interpersonal callousness in boys from childhood to adolescence: An examination of longitudinal invariance and temporal stability. *Journal of Clinical Child and Adolescent Psychology*. 2007; 36:276–292. [PubMed: 17658974]
- Oxford M, Cavell TA, Hughes JN. Callous/unemotional features moderate the relation between ineffective parenting and child externalizing problems: A partial replication and extension. *Journal of Clinical Child and Adolescent Psychology*. 2003; 32:577–585. [PubMed: 14710466]
- Pardini DA. The callousness pathway to severe violent delinquency. *Aggressive Behavior*. 2006; 32:590–598.
- Pardini DA, Fite P, Burke JD. Bidirectional associations between parenting practices and conduct problems in boys from childhood to adolescence: The moderating effect of age and African-American ethnicity. *Journal of Abnormal Child Psychology*. 2008; 36:1573–2835.
- Pardini DA, Lochman JE, Powell N. The development of callous-unemotional features and antisocial behavior in children: Are there shared and/or unique predictors? *Journal of Clinical Child and Adolescent Psychology*. 2007; 36:319–333. [PubMed: 17658977]
- Pardini DA, Loeber R. Interpersonal and affective features of psychopathy in children and adolescents: Advancing a developmental perspective: Introduction to the special section. *Journal of Clinical Child and Adolescent Psychology*. 2007; 36:269–275. [PubMed: 17658973]
- Straus M, Hamby S, Finkelhor D, Moore D, Runyan D. Identification of child maltreatment with the Parent-Child Conflict Tactics Scales: Development and psychometric data for a national sample of American parents. *Child Abuse and Neglect*. 1998; 22:249–270. [PubMed: 9589178]
- Wootton JM, Frick PJ, Shelton KK, Silverthorn P. Ineffective parenting and childhood conduct problems: The moderating role of callous-unemotional features. *Journal of Consulting and Clinical Psychology*. 1997; 65:301–308. [PubMed: 9086694]

Figure 1.
Main effect of callous-unemotional features predicting the intercept and slope components of ODD/CD symptom severity trajectories.

Figure 2. Main effect of low parental warmth predicting the intercept of ODD/CD symptoms severity trajectories (top) and harsh punishment predicting the linear and quadratic components of ODD/CD symptom severity trajectories (bottom).

Figure 3. Differential associations between parental warmth and the intercept and linear slope components of ODD/CD symptom severity trajectories for girls with high (+1.25 SD) and low (−1.25 SD) levels of callous-unemotional features.

Table 1

Descriptive statistics and correlations for year 1 study variables

year 1 Variables	Mean	SD	α	1	2	3	4	5	6
1. ODD/CD behaviors (PT)	9.00	6.03	.89		.45**	.23**	.42**	.15**	.11**
2. Callous-Unemotional (PT)	2.66	1.75	.60			.12**	.18**	.11**	.10**
3. Harsh Punishment (P)	9.48	1.97	.72				.37**	.23**	.14**
4. Low parental warmth (P)	9.11	2.09	.69					.10**	.09**
5. Neighborhood risk (P)	21.94	6.76	.94						.11**
6. Peer delinquency (C)	5.21	4.31	.87						

Note: T = Teacher; P = Parent; C = Child**
 $p < .01$

Table 2
Callous-unemotional features and contextual risk factors predicting ODD/CD growth trajectories

Predictors	ODD/CD Behaviors (year 1–5)					
	Intercept		Linear slope		Quadratic slope	
	B	SE	B	SE	B	SE
<i>Step 1: Main Effects</i>						
Callous-unemotional (CU)	1.24	.10***	-.58	.09***	.11	.02***
Neighborhood risk	.04	.02	.03	.02	-.01	.01
Peer delinquency	.03	.04	.00	.03	.00	.01
Low warmth	.96	.08***	-.08	.07	.01	.02
Harsh punishment	.09	.09	.18	.08*	-.04	.02*
<i>Step 2: Interactions</i>						
CU*harsh punishment	-.03	.06	.02	.06	-.01	.01
CU*neighborhood risk	.00	.02	.00	.02	.00	.00
CU*peer delinquency	.00	.02	.03	.02	-.01	.01
CU*low warmth	.22	.05***	-.09	.04*	.01	.01

Note. Unstandardized regression parameters are reported. Effects are after controlling for age, race, household composition, and welfare status.

*
 $p < .05$

**
 $p < .01$

 $p < .001$