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A Unique Path to Callous-Unemotional Traits for Children who are Temperamentally Fearless and Unconcerned About Transgressions: A Longitudinal Study of Typically Developing Children from Age 2 to 12

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Abstract

Despite the acknowledged significance of callous-unemotional (CU) traits in developmental psychopathology, few studies have examined their early antecedents in typically developing children, in long-term longitudinal designs, using observational measures. In 102 community mothers, fathers, and children (N = 51 girls), we examined main and interactive effects of children's fearless temperament and low concern about transgressions from toddler to early school age as predictors of CU traits in middle childhood and early preadolescence. In laboratory paradigms, we observed children's concern about breaking valuable objects (twice at each age of 2, 3, 4.5, 5.5, and 6.5 years) and about hurting the parent (twice at each age of 2, 3, and 4.5 years). We observed fearless temperament during scripted exposure to novel and mildly threatening objects and events (twice at each age of 2, 3, 4.5, and 5.5 years). Mothers and fathers rated children's CU traits and externalizing behavior problems at ages 8, 10, and 12. Children's low concern about both types of transgressions predicted CU traits, but those effects were qualified by the expected interactions with fearless temperament: Among relatively fearless children, those who were unconcerned about transgressions were at the highest risk for CU traits, even after controlling for the strong overlap between CU traits and externalizing problems. For fearful children, variation in concern about transgressions was unrelated to CU traits. Those interactions were not significant in the prediction of externalizing problems. The study highlights a potentially unique etiology of CU traits in early development.

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Keywords

Callous-unemotional traits; fearless temperament; concern about transgressions

Although relatively recent, the construct of callous-unemotional (CU) traits has inspired a flourishing body of research that has now matured to the point of generating multiple extensive reviews (e.g., Blair, Leibenluft, & Pine, 2014; Frick, Ray, Thornton, & Kahn, 2014a, 2014b; Frick & Viding, 2009; Hawes, Price, & Dadds, 2014; Longman, Hawes, & Kohlhoff, 2016; Waller, Hyde, Grabell, Alves, & Olson, 2015a). Keys features of CU traits are callousness (deficient guilt, remorse, and empathy), shallow and deficient affect, and lack of care or concern about performance on tasks and others' feelings (e.g., Frick & Ray, 2015). Developmental psychology and psychopathology have increasingly acknowledged the importance of CU traits. The inclusion of CU traits as a specifier ("limited prosocial emotion") for Conduct Disorder (CD) in Diagnostic and Statistical Manual of Mental Disorders (DSM-5, American Psychiatric Association, 2013) reaffirms the consensus with regard to their diagnostic and clinical significance.

The substantial majority of that research has focused on older children and adolescents, often in samples screened or referred for treatment due to elevated broad-spectrum disruptive behavior problems (typically Oppositional Defiant Disorder [ODD] and/or CD). Although conduct problems and CU traits do overlap, rapidly growing research has highlighted substantial differences between individuals who – in addition to elevated externalizing problems – do or do not have elevated CU traits (Frick et al., 2014a, b). Those differences encompass cognitive, affective, personality, biological, genetic, and social characteristics. In their extensive reviews, Frick and colleagues (2014a, b; 2015) suggest that etiology, developmental origins, and the causal processes underlying behavior problems of children with elevated CU traits may be quite different from those underlying behavior problems in children with normative levels of CU traits.

Because of the prevalent focus on clinical groups, we know a lot more about CU traits' role in diagnosis and prognosis in clinical samples of older children and adolescents than about early origins of those traits and their long-term developmental sequelae in typically developing young children. Yet, one of the core tenets of developmental psychopathology states that research on typical development in low-risk children and research on atypical development in high-risk children are complementary and inform each other. Both are necessary to advance the in-depth understanding of adaptation and maladaptation in development. Researchers have only recently begun to examine CU traits in young, typically developing children (e.g., Mills-Koonce et al., 2016; Willoughby, Mills-Koonce, Propper, & Waschbusch, 2013).

Consistent with the developmental psychopathology perspective, several research groups (e.g., Frick et al., 2014a,b; Hyde et al., 2013, Shaw, Bell, & Gilliom, 2000; Wakschlag et al., 2008; Wakschlag, Tolan, & Leventhal, 2010) have persuasively argued that the search for roots of future CU traits ought to be interwoven with and informed by research on early normative development of conscience. Over the last two to three decades, research has amply demonstrated that toddlers and preschoolers evince rich and diverse signs of

conscience. Those signs include tension, guilt, remorse, and discomfort following instances of transgressions, infractions, causing damage to objects, or hurting others (Brownell, 2013; Davidov, Zahn-Waxler, Roth-Hanania, & Knafo, 2013; Eisenberg, Spinrad, & Knafo-Noam, 2015; Killen & Smetana, 2015; Kochanska, Koenig, Barry, Kim, & Yoon, 2010; Thompson, 2012, 2013). Such signs of early conscience are now broadly seen as indicators of adaptive development in young children. Widely used standardized instruments, such as the Infant-Toddler Social and Emotional Assessment (ITSEA, Carter, Briggs-Gowan, Jones, & Little, 2003), routinely include concern about feelings of others as a sign of early socio-emotional adjustment and competence. Researchers view markedly absent or deficient tension, remorse, or discomfort in the aftermath of transgressions as early antecedents and markers of risk for future CU traits, and perhaps even as a fledgling form of those traits.

One limitation of the few existing studies of early development of CU traits is reliance on parental reports of early CU behaviors or symptoms. Those reports target compromised guilt and empathy, or more generally, absent or markedly shallow tension or discomfort following transgressions, such as breaking objects or hurting others (e.g., Hyde et al., 2013; Waller et al., 2014; Waller et al., 2015a, Waller at al., 2016; Willoughby, Waschbusch, Moore, & Propper, 2011). Although the reports used in those studies have excellent psychometric properties and are valuable, observational data would substantially benefit and advance the field. However, to our knowledge, no study of origins of CU traits has relied on scripted, rigorous laboratory paradigms that elicited young children's responses in situations when they believe they have transgressed (caused damage to objects or pain to others), and then captured those responses using observational coding. In noteworthy exceptions, Rhee and colleagues (2013) repeatedly observed young children's (14–36 months) concern and disregard for others' feelings in scripted empathy probes. Disregard predicted higher antisocial behavior, as rated by various informants from preschool age to adolescence. Hastings, Zahn-Waxler, Robinson, Usher, & Bridges (2000), using similar probes with preschool children, reported that children's higher concern was associated with decreased externalizing behavior problems 2 and 5 years later. Those studies, however, did not specifically distinguish between CU traits and broad externalizing measures as outcomes.

A very extensive and substantial body of research has linked individual differences in children's temperament to disruptive, externalizing behavior problems. Those characteristics encompass a broad and diverse spectrum. Low proneness to fear (fearlessness), and related low sensitivity to punishment, but also high anger, and generally, high negative emotionality (or difficulty) have all been implied in the origin of externalizing problems. As well, high impulsivity, poor effortful control and attention, and low agreeableness and affiliative tendencies have all been seen as part of the same "temperamental diathesis" (e.g., Blair, 2013; Dadds & Salmon, 2003; Frick et al., 2014a, 2014b; Kagan, 1998; Nigg, 2006; Rothbart & Bates, 2006; Tackett, Martel, & Kushner, 2012; Waller et al., 2015a). That heterogeneity reflects and corresponds to the heterogeneity in disruptive, externalizing, or conduct problems. Those problems can encompass ODD, CD, or Attention-Deficit/ Hyperactivity Disorder (ADHD, with or without elevated CU traits; Waller et al., 2015a; Willoughby et al., 2011).

Theory and emerging evidence indicates that CU traits may be specifically linked to fearlessness (Blair, 2013; Dadds & Salmon, 2003). A well-known study of a large group of adopted children (The Early Growth and Development Study, Waller et al., 2016) examined paths from biological mothers' self-reported fearlessness to children's fearlessness at 18 months, shown in response to a frightening toy, to (adoptive) parent-reported child CU, oppositional, and ADHD behaviors at 27 months. The authors demonstrated a path from the biological mother's fearlessness to the child's fearlessness to his or her higher CU behaviors. Of note, the analyses covaried children's scores of oppositionality and ADHD, thus producing impressive evidence for the specificity of the fearlessness path for CU traits.

Having extensively reviewed the current state of knowledge about etiology of CU traits, Frick and colleagues (2014a) argued: "Based on this review, it is clear that there has been a significant amount of research investigating factors related to the normal development of empathy and guilt, especially with respect to how temperament may influence conscience development. This research could be critical for understanding the development of CU traits and for developing effective prevention and treatment interventions for children who show elevated levels of these traits" (p. 537). Frick and colleagues (2014a) appear to suggest that a combination of early compromised emotions of discomfort and tension following a variety of transgressions and temperamental fearlessness poses a particular early risk for emerging CU traits. This perspective dovetails with recent claims by Bufferd, Dyson, Hernandez, and Wakschlag (2016), who emphasized that whereas deficits in early guilt and other signs of conscience indicate early risk for disruptive and antisocial psychopathology, the prediction is a dynamic and complex process, impacted by child temperament.

The objective of the current study was to examine the origins of CU traits, assessed from middle childhood to early preadolescence, in a community sample of typically developing children. We draw from repeated, longitudinal observational data, from toddler age, when children's concern, tension, distress, or discomfort following transgressions can be first observed, through early childhood and preschool age, up to early school age, using well-established, scripted, naturalistic laboratory paradigms and probes. We observed children's concern about two types of transgressions: breaking a valued object (for brevity, we will refer to this emotion as *guilt*) and hurting the parent during play (we will refer to this emotion as *empathy*). At the same times, we also observed children in behavioral paradigms designed to assess their rankings on the fearfulness – fearlessness dimension.

Consistent with the extant literature, we expected that children's low fearfulness (in other words, fearlessness) and low concern about transgressions would be associated with future higher levels of CU traits. Further, we predicted that fearfulness would moderate the path from children's concern about transgressions to future CU traits, such that among children with relatively low fearfulness (i.e., fearlessness), those who show low concern about transgressions would be at the highest risk for CU traits. To highlight a possibility of a unique and specific etiology for CU traits in early development, we examined the same predictions also for broadly assessed externalizing problems, given the strong overlap between CU traits and externalizing problems (as in Waller et al., 2016).

Method

Participants

Two-parent community families with normally developing infants volunteered for the longitudinal study in response to flyers and ads posted broadly in the community venues and mailed to day care providers, pediatricians, etc., in a Midwestern area. The families' education ranged broadly: Among mothers, approximately 25% had a high school education (or less), 54% had an associate or college degree, and 21% had a postgraduate education; among fathers, the respective figures were approximately 30%, 51%, and 20%. The annual family incomes were as follows: less than $20,000 (8%), $20,000–$40,000 (17%), $40,000-$60,000 (26%), over $60,000 (49%). In terms of ethnicity, 90% of mothers were White, 3% Hispanic, 2% African American, 1% Asian, 1% Pacific Islander, and 3% other non-White; 84% of fathers were White, 8% Hispanic, 3% African American, 3% Asian, and 2% other (in 20 % of families, one or both parents were non-White). Parents signed informed consent (after age 7, children signed assent).

We created a family's SES score by standardizing and averaging both parents' level of education (1 = less than high school, 2 = high school, 3 = associate degree, 4 = bachelor's degree, and 5 = greater than a bachelor's degree) and family income (1, <$10,000; 2, $10,00120,000; 3, $20,001–30,000; 4, $30,001–40,000; 5, $40,001–50,000; 6, $50,001–60,000; 7, $60,001–70,000; and 8, >$70,001). Education levels for both parents and family income inter-correlated, average $r = .35$. This score, $M = -.01$, $SD = .76$, was a covariate in the analyses.

Overview

At entry to the study, children were 7 months old (N=102). This article reports data collected at 7 months (SES), 25 months (age 2, N=100), 38 months (age 3, N=100), 52 months (age 4.5, N=99), 67 months (age 5.5, N=92), 80 months (age 6.5, N=90), 100 months (age 8, N=87), 123 months (age 10, N=82), and 147 months (age 12, N=79). At most of those times, there were two lengthy (2–4 hr) observational sessions in a laboratory, one with each parent, conducted by female experimenters [Es]. The sessions were video-recorded. The exceptions were age 3, when the sessions were at home and in the laboratory, with each parent participating in half of each session, and age 8, when there was one laboratory session, with the assessments focused on the child. The behavioral paradigms were conducted throughout the age range when a given measure was developmentally appropriate, based on extant research: Children's concern about transgressions was observed from ages 2 to 6.5 (concern about broken objects, or guilt, from 2 to 6.5, and concern about hurting parent, or empathy, from 2 to 4.5), and fearfulness from ages 2 to 5.5. Mother- and father-reported data on children's CU traits and externalizing behavior problems were collected at ages 8, 10, and 12.

Multiple teams of coders coded behavioral data. Approximately 15–20% of cases were used for reliability, followed by frequent realignments. We aggregated data at multiple levels and across assessments, as the goal was to produce final robust, trait-like constructs (Rushton, Brainerd, & Pressley, 1983).

Measures

Predictor measure: Concern about breaking objects (guilt; ages 2, 3, 4.5, 5.5, and 6.5)

Observed contexts: Children were observed in well-established, highly scripted, contrived paradigms, one during each laboratory session (thus two paradigms at each age, one during the session with each parent, and 10 total across the five assessments; for details, see Kim, Kochanska, Boldt, Nordling, & O'Bleness, 2014; Kochanska, Gross, Lin, & Nichols 2002). E asked the child to be "very careful" while handling her "special object." Various objects were used (e.g., a stuffed cat, a doll, a toy boat, a decorative flower). In each paradigm, the object fell apart as soon as the child began to handle it (a mishap). At that point, E expressed mild regret (e.g., "Oh, my cat"), sat silently for 60 seconds, and then queried the child using scripted questions (e.g., "What happened?", "Who did this?"). E then left the room with the object for 30 seconds "to fix it," returned with an exact undamaged replica, and reassured the child that he or she had not caused the damage (e.g., referring to a pre-existing damage that was easily fixed).

Coding and data aggregation: The child's overall distress was rated for each of the first three "epochs" in the paradigm (60 s after the mishap, 60 s during the queries, 30 s during E's absence to "fix" the toy). The coders rated distress as 1 = child oblivious to, not distressed or affected by the mishap in any way, 2 = child notices mishap, briefly, mildly distressed or affected, 3 = child distressed or affected by mishap, stilling, uneasy, concerned, and 4 = child strongly distressed or affected, freezes, cries, very uncomfortable or uneasy. Reliability, kappas (if more than two coders, averaged across teams), were .67 at age 2, .76 at age 3, .63 at age 4.5, and .70 at ages 5.5 and 6.5. For each paradigm, the scores for the three "epochs" were summed.

Having averaged the two scores for each of the five assessments, we submitted them to Principal Component Analysis (PCA). PCA indicated the coherence of the scores by producing only one component, which accounted for 39.42% of the variance, Eigenvalue = 1.97. Consequently, the five scores were then averaged into an overall guilt score.

Predictor measure: Concern about hurting parent (empathy; ages 2, 3, and 4.5)

Observed contexts: The scripted empathy probes were adapted from the classic work of Zahn-Waxler and Radke-Yarrow (e.g., Zahn-Waxler, Cole, & Barrett, 1991; Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992) and ours (Kochanska et al., 2010). As instructed by E, the parent played with the child using a peg-hammering toy. At some point, the parent pretended that the child had hit his or her finger, and simulated pain (then, said the finger was all better and reassured the child). There were two paradigms at each age, one during the session with each parent, and six total across the three assessments.

Coding: Coders rated the child's overall distress for the whole paradigm as 1 = none, 2 = mild, 3 = moderate, or 4 = strong. The coding started when the parent began to simulate pain and lasted, on average (mother first, father second), at age 2, 49 and 46 seconds, at age 3, 28 and 29 seconds, and at age 4.5, 36 and 35 seconds. Reliability, kappas, were as follows: .68

at age 2, .64 at age 3, and .57 at age 4.5. Although moderate, they are in the acceptable range (kappas over .60 are considered "substantial," Landis & Koch, 1977).

Having averaged the two scores at each of the three assessments, we submitted the three scores to PCA, which indicated their coherence by producing only one component, 45.06% of the variance, Eigenvalue = 1.35. Consequently, those three scores were then averaged into an overall empathy score.

Moderator measure: Children's fearfulness, ages 2, 3, 4.5, and 5.5

Observed contexts: At each age, the child was observed in two carefully scripted "Risk Room" contexts, lasting 7–8 min, one with each parent (eight observations total), adapted broadly from Kagan's and our own work (Kagan, Reznick, & Gibbons, 1989; Kochanska, Aksan, & Joy, 2007; Kochanska, Coy, & Murray, 2001). The child was exposed to a range of non-social and social novel, unfamiliar, or slightly risky stimuli and events (Kagan & Fox, 2006). The parent remained neutral. The scripts were very similar, with only very minor variations. The laboratory room was decorated with many odd-looking and slightly frightening objects (e.g., Halloween masks, skeletons, plastic bats, worms, rats, and spiders, a pirate's portrait) and objects that could potentially involve mildly challenging physical activities (e.g., balance beam, a big black box, trampoline, ladder). After a brief free exploration, a female stranger entered and attempted to engage the child in an interaction, using several standard prompts (e.g., asking about child name and favorite toy, showing a toy). Next, the stranger, using standard graded prompts, encouraged the child to perform a series of "risky acts" (e.g., put a hand in the black box, jump on the trampoline, touch the frightening objects). At ages 3 and 4.5, at the end, a person in a costume (e.g., cow, clown) entered briefly (this was considered another "risky act").

Coding and data aggregation: Coding and data aggregation were parallel at all ages. Higher scores indicated more fearfulness. Proximity to parent was coded for each 30-s segment (e.g., further than 1/3rd of room, hovers near parent, within arm's length). Spontaneous acts of touching the frightening objects were coded during free exploration (and the score was reversed). During the social interaction with stranger, the child's fearfulness was coded (e.g., initiates talk, responds, does not respond, shows distress). During "risky acts," the reluctance to perform each behavior was coded (e.g., performs before prompt, after first, second, third prompt, never performs, shows distress). Reliability was high at all t; alphas ranged from .74 to 1.00.

The scores were standardized and aggregated into four composites at each age, two for the session with each parent: (a) fearfulness toward objects (free exploration, "risky acts"), and (b) fearfulness during the social interaction with the stranger. The respective Cronbach's alphas for fearfulness toward objects in sessions with mothers and fathers were .85 and .82 at age 2, .81 and .61 at age 3, .85 and .83 at age 4.5, and .90 and .87 at age 5.5. The Cronbach's alphas for fearfulness during the social interaction in mother and father sessions, respectively, were .77 and .76 at age 2, .82 and .81 at age 3, .83, and .78 at age 4.5, and .82 and .84 at age 5.5.

The four composites strongly cohered at each age: Cronbach's alphas were .82, .78, .89, and .83, at ages 2, 3, 4.5, and 5.5, respectively. Consequently, at each age, they were averaged into one fearfulness score. Consistent with the concept of fearfulness as a temperament trait expressed in behavior across the range of non-social and social stimuli and occasions, at each age, PCA for the four scores produced only one component, which accounted for 53.47% of the variance, Eigenvalue = 2.14. Consequently, we aggregated the four scores into the child's overall fearfulness score from age 2 to 5.5.

Outcome measures: Children's CU traits and externalizing problems, ages 8, 10, and 12

CU traits: At each age, both parents completed the well-established Inventory of Callous-Unemotional Traits (ICU, Frick, 2003; Frick, Bodin, & Barry, 2000; Frick & White, 2008). ICU has 24 items, rated as 0 = *not at all true*, 1 = *somewhat true*, 2 = *very true*, and 3 = *definitely true.* It targets the key dimensions of CU traits, such as absence of guilt and empathy and disregard for rules and standards of behavior (e.g., "does not care if s/he is in trouble," "does not like to put time into doing things well," "feelings of others are unimportant"). We computed the mean of all items for each parent at each age. Cronbach's alphas were, at age 8, for mothers and fathers, .80 and .84; at age 10, .84 and .87; and at age 12, .86 and .83.

All six scores (across parents and ages) were inter-correlated. The range of correlations was .27, $p < .025$ to .74, $p < .001$ (average $r = .54$). Cronbach's alpha for the six scores was .87; we therefore aggregated them into one overall CU score from age 8 to 12.

The overall mean level of CU traits, $M = 0.72$, $SD = 0.26$ (then multiplied by 24 to obtain comparable metric, $M = 17.36$, $SD = 6.18$), was lower than the mean score reported for a community sample by Essau, Sasagawa, and Frick (2006) for 13–14-year-olds, $M = 22.50$, $SD = 6.5$. This, however, may have been due to the fact that our children were substantially younger.

Externalizing problems: At each age, both parents completed age-appropriate, established clinical instruments: Child Symptom Inventory (CSI-4; Gadow & Sprafkin, 2002) at ages 8 and 10, and Adolescent Symptom Inventory (ASI-4R; Gadow & Sprafkin, 2008) at age 12. We used parents' Symptom Severity ratings (0 = *never*, 1= *sometimes*, 2 = *often*, 3 = *very often).* At each age and for each parent, we created a broad externalizing problems score by summing the severity scores for ODD and CD (and at age 12, also Antisocial Personality Disorder, APD). Most children were in the normative range, based on the norms for clinical diagnoses in the manuals. Across the three ages, depending on the informant, 0–1 girls reached clinical levels for ODD and no girls reached clinical levels for CD; the respective values for boys were 1–3 for ODD and 0–1 for CD.

All six scores (across parents and ages) were inter-correlated. The range of correlations was .35, $p < .005$ to .75, $p < .001$ (average $r = .56$). Cronbach's alpha for the six scores was .87; we therefore aggregated them into one overall externalizing problem score from age 8 to 12. Table 1 presents descriptive data for all constructs.

Results

Preliminary Data Analysis

We analyzed the pattern of missing data using Little MCAR test (Little, 1988). The results indicated that the data were missing at random, χ^2 (41) = 21.90, ns. We then imputed missing data in SPSS 23 using one imputation.[1] Consequently, the analyses take advantage of the entire sample.

We examined correlations among the constructs for the entire sample. Children's overall guilt and empathy scores correlated modestly, $r(102) = .31$, $P < .001$. Children's fearfulness from age 2 to 5.5 was not associated with either CU traits, $r(102) = .00$, ns, or externalizing behavior problems, $r(102) = -.12$, ns. Fearfulness correlated with guilt, a typical finding, $r(102) = .46$, $p < .001$, but not with empathy, $r(102) = .08$, ns. Children who were more concerned about breaking objects (guilt) from age 2 to 6.5 were seen as having lower CU traits and fewer externalizing behavior problems at age 8–12, $r(102) = -.32$, $p = .001$ and $r(102) = -.28$, $p < .01$, respectively. Children who were more concerned about hurting parents (empathy) from age 2 to 4.5 were seen as having significantly lower CU traits, $r(102) = -.26$, $p < .01$, but there was no significant link for externalizing behaviors $r(102) = -.15$, ns. Parents' ratings of children's CU traits and externalizing problems were robustly related, $r(102) = .62$, $p < .001$. SES was not significantly correlated with guilt, $r(102) = .09$, ns; empathy, $r(102) = .13$, ns; fearfulness, $r(102)$, $= -.18$, ns; CU traits, $r(102) = -.12$, ns; or externalizing problems, $r(102) = -.17$, ns.

Prediction of CU Traits and Externalizing Problems at Age 8–12: Regression Analyses

We conducted two main series of hierarchical multiple regressions, testing (a) predictions for CU traits, and (b) predictions for broadly assessed externalizing problems. For each of these dependent variables, we tested two equations: In one, the overall fearfulness score, concern about breaking objects (guilt), and their interaction were the predictors, and in the other, the overall fearfulness score, concern about hurting parent (empathy), and their interaction were the predictors. Child gender and family SES were the covariates in all equations. Table 2 presents the findings for all four equations. We then probed significant interactions effects using simple slopes. We used ModGraph (Jose, 2013) to calculate the simple slopes (Aiken & West, 1991).

Additionally, for (a) – when predicting CU traits – we supplemented those two main analyses with two additional regressions, in which we added children's externalizing problems as another covariate, following Waller et al. (2016), to examine the uniqueness of the prediction for CU traits specifically, controlling for their strong overlap with externalizing problems. We present those additional findings in the text.

[1]We also conducted all analyses using multiple imputation; all the effects in regression analyses were essentially identical to those obtained with single imputation. However, we report the results for single imputation because SPSS does not provide pooled statistics necessary for the simple slopes analyses.

Hierarchical Multiple Regressions: Predicting CU Traits at Age 8–12

Fearfulness and concern about breaking objects (guilt) as predictors—In the regression, the covariates (children's gender and SES), were entered at Step 1. Children's fearfulness and guilt were entered at Step 2. The interaction of fearfulness and guilt was entered at Step 3.

In the final model, which was significant, with all predictors entered, gender, SES, and fearfulness were not significant predictors. Lower scores on guilt significantly predicted children's higher CU traits. As hypothesized, there was a significant interaction of fearfulness and guilt, which qualified the main effect of guilt. The interaction was probed in simple slopes analyses. As expected, for children who were relatively fearless (1 *SD* below the fearfulness mean) and for those who were average (at the mean of fearfulness), variation in guilt was significantly associated with CU traits, such that children who expressed less guilt scored higher on CU traits, $B = -0.14$, $SE = 0.04$, $p < .001$ and $B = -0.09$, $SE = 0.03$, $p < .01$, respectively. By contrast, for children who were relatively fearful (1 *SD* above the fearfulness mean), variation in guilt was unrelated to CU traits, $B = -0.04$, $SE = 0.04$, ns.

In the supplemental equation, following Waller et al. (2016), we added another covariate – children's externalizing problems scores, concurrent to CU traits. We thus entered three covariates in Step 1: gender, family SES, and externalizing problems. The final model was significant, $R^2 = .47$, $F(6, 95) = 13.84$, $p < .001$. Not surprisingly, externalizing problems were a robust significant predictor, $\beta = .56$, $p < .001$. The effect of guilt was also significant, $\beta = -.24$, $p < .05$, with children who were less concerned about breaking objects having higher CU scores. The effect of fear was not significant, $\beta = .13$, ns. The interaction between fearfulness and guilt remained a significant predictor of CU traits, $\beta = .18$, $p < .05$.

Fearfulness and concern about hurting parent (empathy) as predictors—The predictors and their order were the same as in the previous regression, with one exception: Empathy scores replaced the guilt scores. The final model was significant. In the final model, with all predictors entered, gender, SES, and fearfulness were not significant predictors. Empathy was a significant predictor: Children who had lower empathy scores were seen as having higher CU traits. As hypothesized, there was a significant interaction of fearfulness and empathy, which qualified the main effect of empathy.

The interaction was probed using simple slopes analyses. As expected, for children who were relatively fearless (1 *SD* below the fearfulness mean) and for those who were average (at the mean of fearfulness), variation in empathy was significantly associated with CU traits, such that children who expressed less empathy scored higher on CU traits, $B = -0.13$, $SE = 0.04$, $p < .01$ and $B = -0.06$, $SE = 0.03$, $p < .05$, respectively. By contrast, for children who were relatively fearful (1 *SD* above the fearfulness mean), variation in empathy was unrelated to CU traits, $B = 0.01$, $SE = 0.03$, ns.

Again, in the supplemental equation, we added children's externalizing problems scores, concurrent to CU traits, as a covariate, along with gender and family SES. The final model was significant, $R^2 = .48$, $F(6, 95) = 14.72$, $p < .001$. Not surprisingly, externalizing problems were a robust significant predictor, $\beta = .59$, $p < .001$. The effect of empathy

remained significant, β = −.20, $p < .05$, with less empathic children scoring higher on CU traits. The interaction between fearfulness and guilt remained a significant predictor of CU traits, β = .24, $p < .01$.

Hierarchical Multiple Regressions: Predicting Externalizing Problems at Age 8–12

Fearfulness and concern about breaking objects (guilt) as predictors—In the regression, the covariates (children's gender and SES), were entered at Step 1. Children's fearfulness and guilt were entered at Step 2. The interaction of fearfulness and guilt was entered at Step 3. The final model was significant. Children's guilt was the only significant predictor of externalizing problems: Lower levels of guilt were associated with higher levels of externalizing problems. There was no significant interaction of fearfulness and guilt.

Fearfulness and concern about hurting parent (empathy) as predictors—The predictors and their order were the same as in the previous regression, with one exception: Concern about hurting parent (empathy) scores replaced the guilt scores. The final model was not significant, and no predictor had a significant effect.

Discussion

This study makes a useful contribution to our understanding of early origins of CU traits. With a few noteworthy exceptions (e.g., Waller et al., 2016; Willoughby et al., 2011; Willoughby, Mills-Koonce, Gottfredson, & Wagner, 2014), young, typically developing children have been rarely studied in this context. Most studies have involved children with elevated conduct problems or disruptive symptoms, and often at older ages. Yet, research with toddlers and preschoolers may be particularly revealing. As Waller and colleagues (2015b) persuasively argue, the study of young children is significant for several reasons: Early-onset behavior problems are particularly predictive of future stable and antisocial trajectories, and interventions implemented at early age may be especially effective. Additionally, the study of early individual differences in children's conscience, including distress, tension following transgressions, and guilt, can be particularly informative, given that those emotions and behaviors are among the key components of CU traits. Waller et al. (2015b) suggest that such research should refer to "CU behaviors" rather than "CU traits," to emphasize the malleability of early characteristics.

Our research design had several useful features. Robust, carefully scripted observational measures of young children's behavioral and emotional responses to transgressions and established parent-rated measures of CU traits in middle childhood and adolescence reduced definitional and shared variance issues that inevitably arise with an exclusive reliance on reports. Further, we obtained data on children's reactions of concern to two types of transgressions: breaking an object (guilt) and hurting the parent (empathy). Responses indicating low concern about both types of transgressions are typically considered to be among the key aspects of callousness, but very few – if any – studies have employed separate observations of both. Repeated data across the span of several years, from age 2 to 6.5, revealed that the child's patterns of response indicating concern, for both types of wrongdoing, were relatively coherent over time. This suggests a possibility of emerging

latent traits, which, at particularly low levels, may potentially signal early diathesis for future CU characteristics.

Further, the robust observational data on children's fearfulness, also assessed across occasions and assessments, allowed us to test and support the hypothesis about the particular importance of individual differences in concern about transgressions for children who were relatively low in fearfulness (i.e., relatively fearless). Finally, the availability of data on children's broadly assessed externalizing problems scores strengthened our design in an important way. We were able to demonstrate that our predictions applied to CU traits specifically, but not to externalizing problems in general. In particular, although those scores overlapped robustly, we have shown that the significant expected interaction effect was unique for CU traits, even when the externalizing scores were covaried.

The findings were clear and straightforward. Children who were relatively unconcerned about their wrongdoing – either breaking objects or hurting others – were likely to score higher on CU traits in middle childhood and early adolescence. Those links, however, were moderated by the child's early fearless temperament: For children who were relatively fearless, low concern about transgressions potentiated the path to higher CU traits, but for children who were relatively fearful, there was no link between their concern about transgressions and CU traits. The results were replicated across both types of observed concern: breaking objects and hurting the parent.

The additional regressions, conducted for the broadly assessed externalizing problems rather than CU traits, were informative, because they *did not yield* comparable significant findings. Children who showed relatively low concern in the aftermath of breaking objects (guilt) were rated as more disruptive and antisocial. However, there was no significant interaction of fearfulness and guilt. We did not find a significant prediction from early concern about hurting others (empathy), nor its interaction with fearfulness, to disruptive, externalizing problems.

Although fearfulness served as a significant moderator of the paths to CU traits, we did not find main effects for fearfulness. These results were surprising, because generally, low levels of fear are often implied as risk factors for and correlates of CU traits and externalizing problems (although note that Mills-Koonce et al., 2015, reported the opposite results, having found higher fear reactivity at 15 months for children who were high in conduct problems and CU traits in first grade). Perhaps our pattern of results was due to the absence of parenting measures in the analyses. Several studies have indicated that fearfulness and parenting interact to predict antisocial child outcomes, including CU traits. For example, in the study cited earlier, Waller et al. (2016) demonstrated that the links between adopted children's fearlessness, observed at 18 months, and their higher CU behaviors at 27 months were significant only for children whose adoptive mothers were rated as average or low on positive parenting style, as observed at 18 months. Mothers' high positive parenting appeared to moderate that link: For highly positive mothers, children's fearlessness was unrelated to future CU behaviors. Furthermore, for adoptive mothers who were highly positive, the indirect pathway from the biological mothers' fearlessness to the children's observed fearlessness to CU behaviors was not significant. However, for children of the

remaining adoptive mothers, that indirect pathway was significant. In other words, it is possible that the main effects of biologically-based fearlessness on antisocial outcomes emerge only in a specific range of parenting environments. High warmth, and perhaps other factors, such as a secure attachment, may effectively block such risks.

Several limitations need to be acknowledged. This was a relatively homogenous, low-risk community sample of typically developing children who were generally well adjusted. Although no norms exist for distress following transgressions in laboratory paradigms, most children responded in a developmentally appropriate and typical manner. Their scores on CU traits and externalizing behavior problems were low. Nevertheless, by implementing aggregation across two informants and three assessments (ages 8, 10, 12), we were able to produce final constructs that were well distributed. Note that although the nature of the sample limits the generalizability of the findings, it may also be considered a useful feature, given that most of the extant research on CU traits has been conducted with clinical or at-risk samples.

This research has not addressed the possibility that developmental predictors, assessed at different time windows, may have different effects on the path toward future CU traits. Recent evidence suggests that physiological reactivity at 15 months (but not 6 months) predicted a future combination of conduct problems and CU behaviors (Mills-Koonce et al., 2015). In a study of origins of CU traits assessed at age 3, Willoughby and colleagues (2013) found that maternal harsh-intrusive parenting in the first year (but not later) was a unique predictor. In additional analyses, we separately examined the predictions from the assessments at different ages, and found no consistent differential patterns of findings. This is, however, an important future direction from the perspective of developmental psychopathology.

Although the findings clearly highlighted a particular risk for future CU traits in children who were relatively low on the dimension of fearfulness – or fearless – they did not elucidate the potential causal mechanisms involved. One possibility is an increased parental deployment of power-assertive and harsh discipline as response to transgressions toward children who have a history of fearlessness and insensitivity to punishment (Briggs-Gowan et al., 2014; Dadds & Salmon, 2003; Hawes, Dadds, Frost, & Hasking, 2011; Kochanska, Brock, & Boldt, 2016).

Given the burdens of antisocial and disruptive disorders on individuals, families, and societies, and the broadly acknowledged heightened risk for severe antisocial paths for children with elevated CU traits, the understanding of unique early origins and developmental sequelae of those traits is an important goal. Although a large body of research has focused on disruptive behavior problems, generally, CU traits have been treated as an important qualifier of those problems, signaling a higher developmental risk. But as a separate outcome, CU traits have been studied much less often. Consequently, we know much less about unique paths leading to CU traits specifically, particularly in typically developing children and at early ages. This study contributes to progress in our understanding of this question.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent: Informed consent was obtained from all individual participants included in the study.

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Table 1

Descriptive data for all measures

Construct	*M*	*SD*	Range	*N*
Concern About Broken Objects, Guilt (Overall Distress)[a]				
Age 2, Session with M	7.78	1.44	4–12	92
Age 2, Session with F	7.56	1.55	4–11	97
Age 3, Session with M	7.63	1.32	4–11	99
Age 3, Session with F	7.68	1.47	3–11	96
Age 4.5, Session with M	8.00	1.26	5–12	99
Age 4.5, Session with F	7.90	1.19	5–12	99
Age 5.5, Session with M	7.91	1.11	5–9	90
Age 5.5, Session with F	7.77	1.26	5–10	90
Age 6.5, Session with M	7.24	1.53	3–11	85
Age 6.5, Session with F	7.37	1.44	5–12	86
Overall Guilt[b], Age 2–6.5	7.69	0.72	4.88–9.50	100
Concern About Hurting Parent, Empathy (Overall Distress)[c]				
Age 2, Session with M	1.84	0.69	1–4	97
Age 2, Session with F	1.96	0.69	1–4	94
Age 3, Session with M	1.57	0.66	1–4	98
Age 3, Session with F	1.56	0.68	1–4	95
Age 4.5, Session with M	1.91	0.78	1–4	97
Age 4.5, Session with F	1.69	0.71	1–4	98
Overall Empathy[d], Age 2–4.5	1.75	0.39	1.00–2.83	100
Fearfulness Composite[e]				
Age 2	−0.00	0.61	−1.04 – 1.20	100
Age 3	−0.01	0.60	−0.78 – 1.94	100
Age 4.5	0.01	0.69	−0.86 – 1.69	99
Age 5.5	0.01	0.76	−0.83 – 3.00	91
Overall Fearfulness[f], Age 2–5.5	0.01	0.49	−0.73 – 1.46	100
CU Traits				
Age 8, M Rating	0.71	0.30	0.08 – 1.67	86
Age 8, F Rating	0.75	0.29	0.17 – 1.42	82
Age 10, M Rating	0.69	0.32	0.13 – 1.83	81
Age 10, F Rating	0.74	0.35	0.13 – 1.83	78
Age 12, M Rating	0.73	0.36	0.00 – 2.50	77
Age 12, F Rating	0.73	0.31	0.21 – 1.88	74
Overall CU Traits Score[g], Age 8–12	0.72	0.26	0.27 – 1.67	87
Externalizing Behavior Problems Score				
Age 8, M Rating	6.67	4.25	0 – 28	86
Age 8, F Rating	6.26	3.68	0 – 16	82
Age 10, M Rating	6.73	4.31	0 – 21	81

Construct	*M*	*SD*	Range	*N*
Age 10, F Rating	6.17	4.24	0 – 19	78
Age 12, M Rating	6.60	6.46	0 – 47	78
Age 12, F Rating	5.76	5.15	0 – 23	75
Overall Externalizing Behavior Problems Score[h], Age 8–12	6.52	3.88	0.33 – 25.17	87

M=Mother. F=Father. CU=Callous-Unemotional.

[a]Overall child overall distress scores across 3 epochs for each “broken object” (guilt) paradigm.

[b]A composite of child overall distress scores across all “broken object” (guilt) paradigms.

[c]Overall child distress score for each “hurt parent” (empathy) paradigm.

[d]A composite of standardized child overall distress scores across all “hurt parent” (empathy) paradigms.

[e]A composite of standardized multiple constituent scores, coded in Risk Room paradigms at each age.

[f]The fearfulness composite across all ages.

[g]The CU traits composite across ages and informants.

[h]The externalizing behavior problems composite across ages and informants.

Table 2

Hierarchical multiple regressions: Predicting CU traits and externalizing problems at age 8–12

	DV = CU Traits[a]							DV = Externalizing Problems[a]						
Predictors	***F***	R^2	F_{ch}	ΔR^2	***B***	**SE**	**β**	***F***	R^2	F_{ch}	ΔR^2	***B***	**SE**	**β**
Step 1	3.58*	.07	3.58*	.07				3.43*	.07	3.43*	.07			
Gender					0.12*	0.05	.23					1.45	0.74	.19
SES					−0.05	0.03	−.14					−0.93	0.49	−.19
Step 2	4.48**	.16	5.07**	.09				3.10*	.11	2.65	.05			
Gender					0.09	0.05	.17					0.88	0.77	.12
SES					−0.02	0.03	−.07					−0.80	0.49	−.16
Fearfulness					0.10	0.06	.20					−0.06	0.85	−.01
Guilt					−0.09**	0.03	−.35					−0.86*	0.43	−.23
Step 3	4.55***	.19	4.24*	.04				2.54*	.12	0.38	.00			
Gender					0.07	0.05	.14					0.81	0.78	.11
SES					−0.01	0.03	−.03					−0.73	0.51	−.15
Fearfulness					0.06	0.06	.11					−0.26	0.91	−.03
Guilt					−0.09**	0.03	−.37					−0.89*	0.43	−.24
Fearfulness × Guilt					0.10*	0.05	.22					0.46	0.75	.07

	DV = CU Traits[b]							DV = Externalizing Problems[b]						
Predictors	*F*	R^2	F_{ch}	ΔR^2	*B*	SE	β	*F*	R^2	F_{ch}	ΔR^2	*B*	SE	β
Step 1	3.58*	.07	3.58*	.07				3.43*	.07	3.43*	.07			
Gender					0.12*	0.05	.23					1.45	0.74	.19
SES					−0.05	0.03	−.14					−0.93	0.49	−.19
Step 2	2.83*	.11	2.01	.04				2.15	.08	0.87	.02			
Gender					0.10	0.05	.19					1.09	0.79	.14
SES					−0.03	0.03	−.10					−0.95	0.50	−.19
Fearfulness					0.03	0.05	.05					−0.79	0.77	−.11
Empathy					−0.05	0.03	−.20					−0.30	0.38	−.08

Predictors	DV = CU Traits[a]							DV = Externalizing Problems[a]						
	F	R^2	F_{ch}	ΔR^2	*B*	SE	β	*F*	R^2	F_{ch}	ΔR^2	*B*	SE	β
Step 3	3.85**	.17	7.19**	.06				1.73	.08	0.15	.00			
Gender					0.08	0.05	.15					1.04	0.80	.14
SES					−0.03	0.03	−.08					−0.93	0.50	−.19
Fearfulness					−0.00	0.05	−.01					−0.86	0.79	−.11
Empathy					−0.06*	0.03	−.25					−0.33	0.39	−.09
Fearfulness × Empathy					0.12**	0.05	.26					0.27	0.69	.04

*$p < .05$;

**$p < .01$;

***$p < .001$

DV=Dependent variable. CU = Callous-unemotional. SES=Socioeconomic status.

[a]Equations with the following predictors: gender, SES, fearfulness, guilt, and fearfulness × guilt

[b]Equations with the following predictors: gender, SES, fearfulness, empathy, and fearfulness × empathy

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