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Callous-Unemotional Behaviors and Harsh Parenting: Reciprocal Associations across Early Childhood and Moderation by Inherited Risk

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Abstract

Callous-unemotional (CU) behaviors increase children's risk for subsequent antisocial behavior. This risk process may begin in early childhood with reciprocal pathways between CU behaviors and harsh parenting. In a sample of 561 linked triads of biological mothers, adoptive parents, and adopted children, the present study examined bidirectional links between CU behaviors and harsh parenting across three time points from 18 to 54 months and investigated moderation by inherited risk for psychopathic traits. Child CU behaviors and harsh parenting were measured using adoptive mother and adoptive father reports, and biological mothers provided reports of their personality characteristics. Findings supported reciprocal associations between harsh parenting and CU behaviors during early childhood, especially during the transition from toddlerhood (27 months) to the preschool period (54 months). Moreover, multiple-group analyses showed that level

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of inherited risk moderated associations between CU behaviors and harsh parenting. Specifically, there were statistically reliable associations between CU behaviors at 27 months and adoptive mothers' harsh parenting at 54 months, and between adoptive fathers' harsh parenting at 27 months and CU behaviors at 54 months among children at higher inherited risk, but not among those at lower inherited risk. The findings illustrate the dynamic interplay between parenting, CU behaviors, and heritable risk.

Keywords

Callous-unemotional behaviors; parenting; early childhood; genetic risk

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Youth antisocial behavior predicts numerous problems in adulthood, including crime, substance dependence, mental health concerns, and work-related difficulties (Moffitt, Caspi, Harrington, & Milne, 2002). Two early childhood risk markers for severe and chronic antisocial behavior are harsh parenting and children's callous-unemotional (CU) behaviors (Frick & White, 2008; Trentacosta & Shaw, 2008). Harsh parenting during early childhood includes physical responses (e.g., spanking or hitting) and verbal responses (e.g., yelling or threatening; O'Leary, Slep, & Reid, 1999). CU behaviors include low guilt and empathy and callousness toward others (Frick & White, 2008). Recent research supports associations between harsh parenting and CU behaviors, but there are important limitations to these findings. First, reciprocal associations between harsh parenting and CU behaviors during toddlerhood and the preschool years have received little attention, even though problematic CU behaviors are known to emerge during this developmental period (Waller & Hyde, 2017). Second, the traditional research designs used to investigate reciprocal associations are not well suited to disentangling whether associations are due to socialization processes or gene-environment correlations.

Reciprocal Associations

Parents play a key role in socializing child behavior (Laible, Thompson, & Froimson, 2014; O'Leary et al., 1999), but children also shape their own environment (Bell, 1968; Lorber & Smith Slep, 2015). Reciprocal and transactional effects models meld these perspectives by emphasizing the bidirectional unfolding of parents' and children's behaviors (Lytton, 1990; Sameroff, 2009). For example, within Patterson's (1982) coercion model, negative child behaviors evoke negative behaviors from parents, including hostile verbal responses and harsh discipline. In turn, children who are more likely to show behavior problems as they react to parental harshness with heightened negativity, may lead to an entrenched pattern of acrimony within the dyad. Longitudinal studies have investigated bidirectional associations between school-age children's conduct problems (e.g., fighting, arguing) and harsh parenting, providing evidence for this coercion model (Lansford et al., 2011; Pardini, Fite, & Burke, 2008). However, fewer longitudinal studies have examined bidirectional associations between harsh parenting and conduct problems during early childhood even though parent-child exchanges characterized by harshness and negativity often emerge early in life (Bell, 1968; Plamondon, Browne, Madigan, & Jenkins, 2018; Scaramella & Leve, 2004; Shaw & Bell, 1993; Shaw et al., 1998).

Negative parent-child exchanges could also lead to other problem behaviors by undermining the emergence of morality, a key domain of early childhood development (Dunn, 2013; Kochanska, 1997). Young children with serious early impairments in morality may fail to develop adequate guilt and may lack empathy, both of which are key features of early CU behaviors (Waller, Shaw, Neiderhiser, et al., 2017; Waller & Hyde, 2017). Factor analyses of multiple samples of young children show that CU behaviors are distinct from other early behavior problem dimensions, including oppositional defiant and ADHD behaviors (Waller, Hyde, Grabell, Alves, & Olson, 2015; Willoughby, Waschbusch, Moore, & Propper, 2011). Consistent with Patterson's (1982) coercion model, young children's impairments in guilt and empathy may evoke more emotionally intense negative reactions from parents attempting to enforce rules, and these harsh responses could further hinder children's development of guilt and empathy.

A growing body of evidence supports this latter pathway from harsh parenting to CU behaviors. For example, longitudinal studies suggest an association between harsh parenting during toddlerhood and CU behaviors in the preschool period (Mills-Koonce, Willoughby, Garrett-Peters, Wagner, & Vernon-Feagans, 2016; Waller et al., 2012). However, longitudinal studies initiated in the toddler years have yet to examine multiple waves of data including both harsh parenting and CU behaviors to consider whether CU behaviors predict increased harsh parenting, while simultaneously examining whether harsh parenting predicts increases in CU behaviors over time with a coercion model framework.

Disentangling Social from Inherited Influences

Most longitudinal research designs cannot disentangle whether socialization processes underlie associations between parenting and child behavior or whether gene-environment correlations (*r*GE) account for reported associations. One form of *r*GE, termed passive *r*GE (Scarr & McCartney, 1983), refers to parents' provision of both genes and the parenting environment. Thus, correlations between parenting and child CU behaviors could reflect underlying inherited tendencies that contribute to both harsh parenting and child CU behaviors. Genetically-informed designs, including twin and adoption studies, can disentangle whether the links between child behavior problems and harsh parenting are due to *r*GE. Twin studies indicate that both harsh parenting and child behavior problems, including CU behaviors, are influenced by genetic factors (Oliver, Trzaskowski, & Plomin, 2014; Viding & McCrory, 2012). Moreover, a shared genetic etiology underlies much of the association between harsh discipline and conduct problems (Button, Lau, Maughan, & Eley, 2008), indicating possible *r*GE.

Adoption research on dyadic parent-child processes has the advantage of eliminating passive *r*GE because children adopted into genetically-unrelated families do not share genes with their rearing parents. No adoption studies have examined the transactional interplay between harsh parenting and CU behaviors across early childhood, the primary goal of the current investigation. We have already begun to leverage the current adoption study to inform our understanding of heritable and non-heritable processes involved in the development of CU behaviors, finding support for heritable (i.e. birth mother characteristics) and non-heritable (i.e. adoptive parents' positive parenting) pathways to toddlers' CU behaviors at 27 months

(Hyde et al., 2016; Waller et al., 2016). However, we have yet to investigate these pathways beyond age 2, have not investigated harsh parenting in relation to CU behaviors, nor potential bidirectional pathways between parenting and CU behaviors, which are critical steps to establish whether socialization processes exist. Thus, through a novel research design within an adoption study, we aimed to study whether harsh parenting predicted increases in CU behaviors over time (i.e., socialization effects that eliminated passive *r*GE), while simultaneously examining whether CU behaviors evoke increases in harsh parenting across early childhood.

Moderation of Cross-Lagged Associations by Inherited Risk

Parent-offspring adoption studies can also parse inherited risk from environmental mechanisms in the etiology of problem behaviors. For example, in a study of adopted adolescents, biological parents' psychiatric disorders predicted adoptive parents' negative parenting practices, suggesting inherited risk (Ge et al., 1996). The current study includes information collected from biological parents to assess inherited risk, including temperament characteristics that are linked to risk for psychopathy. Psychopathy is a marker of especially severe forms of antisocial behavior in adults that shares some features with childhood CU behaviors, particularly the affective deficits linked to low empathy and concern for others (Frick & White, 2008; Waller & Hyde, 2017). Temperament characteristics linked to psychopathy include fearlessness, which involves low arousal to distress cues of others and punishment, which are thought to lead to impairments in learning from harmful behaviors (Blair, 2003; Frick, Ray, Thornton, & Kahn, 2014); and low interpersonal affiliation, which may undermine the development of empathy and low emotional sensitivity (Dadds et al., 2014; McCord & McCord, 1964). Empirical evidence is mounting on early risks associated with these temperament characteristics, including recent findings from the current adoption study documenting associations between biological mothers' fearlessness and low affiliation and adopted children's CU behaviors at 27 months (Waller et al., 2016). However, studies have yet to test whether inherited risk influences reciprocal associations between child CU behaviors and harsh parenting.

The Present Study

The current study addresses several limitations in the existing literature on harsh parenting and CU behaviors. First, using cross-lagged path models, we examined whether early CU behaviors and harsh parenting were reciprocally associated across early childhood, while controlling for child oppositional defiant behaviors. We included child oppositional behavior as a covariate because disobedience, temper tantrums, and other indicators of defiance are often the focus of empirical research informed by Patterson's (1982) model of coercive family processes (e.g., Burke, Pardini, & Loeber, 2008). Therefore, controlling for oppositional defiant behaviors provided a more stringent test of the specificity of possible reciprocal associations between CU behaviors and harsh parenting. We investigated these associations with data from an adoption study that eliminated passive *r*GE. Second, inherited risk for psychopathic traits, defined for the present study as the combination of high fearlessness and low affiliation among biological mothers, was included as a moderator to

test whether pathways between child CU behaviors and harsh parenting were stronger among children who may be at relatively higher inherited risk for CU behaviors.

Method

Participants

Participants were 561 adoptive families from the Early Growth and Development Study (EGDS), a prospective, longitudinal study of two cohorts of adopted children and their adoptive and biological parents (Cohort I, N=361; Cohort II, N=200; for additional details, see Leve et al., 2013). Most (92%) of the adoptive parents were mother-father dyads. However, 41 (7%) were same-sex couples and 9 (2%) were single parents. No significant differences were found for harsh parenting or CU behaviors when comparing opposite-sex married couples to other family constellations. Therefore, all families were included in analyses. In nearly all families (> 93%), adoptive mothers reported that the other parent was involved in some of the daily caregiving at the time of the first wave of data collection included in the current analyses (child age 27 months). On the other hand, based on a rating provided by the research assistant after completion of the 27-months data assessment, the research assistant perceived the adoptive mother to be solely or "mostly" the primary caregiver in approximately 75% of the families.

Over 90% of adoptive parents were White. On the other hand, the children were relatively racially and ethnically diverse (55.6% Caucasian, 19.3% multiracial, 13% African-American, 10.9% Latino). Adoptive families had relatively high household incomes, with a median annual household income that ranged from $100,000 to $125,000. Biological mothers' median annual household income ranged from $15,001 to $25,000. Both biological mothers and adoptive parents provided written informed consent. Adoptive parents provided written informed consent for the adopted child. The EGDS was approved by the Institutional Review Boards of George Washington University, Oregon Social Learning Center, the Pennsylvania State University, the University of California, Davis, the University of Minnesota, and the University of Oregon.

Procedure

Measures assessing behavior problems and harsh parenting were completed via mail or by web interface prior to 2–3 hour home-based assessments that are not part of the present study. The current study focused on questionnaires completed by adoptive parents at child ages 18, 27, and 54 months and by biological mothers at 3–6 months postpartum (biological mothers' reports of affiliation for both cohorts and biological mothers' reports of fearlessness for Cohort II) and when children were 56 months of age (biological mothers' reports of fearlessness for Cohort I). Biological fathers' data were not included in this report because a rather small percentage of the biological fathers (approximately 33%) provided data, precluding meaningful analyses.

Measures

Callous-unemotional behaviors.—The preschool version of the Child Behavior Checklist (CBCL) was used to assess behavior problems (Achenbach & Rescorla, 2000).

Both adoptive mothers (AMs) and adoptive fathers (AFs) completed the CBCL. The CU behavior subscale (5 items; e.g., lack of guilt after misbehavior) was derived from factor analyses. Psychometric support for the separation of the CU behavior subscale from other subsets of early behavior problems (e.g., oppositional behavior, symptoms of ADHD) has been replicated across five independent samples, including the present sample (Waller et al., 2015; Waller, Shaw, & Hyde, 2017; Waller, Shaw, Neiderhiser, et al., 2017; Willoughby et al., 2011; Willoughby, MillsKoonce, Gottfredson, & Wagner, 2014). In our prior factor analytic work with this sample using AM report on the CBCL at age 27 months (Waller, Shaw, Neiderhiser et al., 2017), a three factor model was the best fit, with distinct factors for CU behaviors (5 items), oppositional behaviors (6 items), and ADHD behaviors (6 items). Statistically significant loadings for the five individual CU items on the CU behavior factor ranged from .41 to .80, and similar loadings were obtained in a model using AF report. Across samples, this 5-item CU behavior subscale has demonstrated longitudinal associations with later aggression and antisocial behavior (Waller et al., 2015). Based on the moderate level of correlations between AM and AF reports within each time point in the present study (range, r = .32 to .40, all ps < .001), we computed mean CU subscale scores combining AM and AF reports at each time point for our primary analyses.

Harsh parenting.—The Parenting Scale assessed harsh parenting practices from AM and AF report (Arnold, O'Leary, Wolff, & Acker, 1993). Items were rated on 7-point scales anchored by an effective discipline strategy at the low end and an ineffective strategy at the high end of the scale. The overreactivity subscale includes 10 items pertaining to harsh parenting (e.g., "when my child misbehaves… I speak to my child calmly/raise my voice and yell"; α, range =.72 to .79 for adoptive mother and .76 to .77 for adoptive father). At 54 months, this measure was unavailable for Cohort II, but data were estimated using the procedures outlined below.

Inherited risk for psychopathic traits.—The Behavioral Inhibition System (BIS) scale (Carver & White, 1994) assessed biological mothers' self-reported fearlessness. This scale is based on Gray's (1981) conceptualization of a motivational system pertaining to sensitivity to cues of punishment, non-reward, or novelty. Seven items were rated on 4-point Likert scale ranging from "very true" to "very false" (e.g., "even if something bad is about to happen, I rarely experience fear/nervousness."). Fearlessness was conceptualized as low scores on the scale (i.e., lack of inhibition; α=.73).

Biological mothers' interpersonal affiliation was assessed with the Harter Adult Self-Perception Profile scale (Messer & Harter, 1986). Forty-eight items were rated on a forced-choice 4-point Likert scale. We used the mean of three subscales (each containing four items) that fit with conceptualizations of interpersonal affiliation across different contexts: *nurturance* (e.g., caring for others, particularly children; α=.68), *intimate relationships* with a partner, spouse, or lover (e.g., seeking relationships; α=.74), and *sociability* with people in general (e.g., ease with others; α=.79). Low affiliation was conceptualized as lower scores on these subscales.

Based on our past findings that both high fearlessness and low interpersonal affiliation were heritable risk factors for CU behaviors (Waller et al., 2016), we created extreme groups

based on the combination of biological mother fearlessness and low affiliation for the moderation analyses. Higher inherited risk ($n = 124$) was defined as the combination of high biological mother fearlessness and low biological mother affiliation after dichotomizing at each scale's median. Lower inherited risk ($n = 146$) was the combination of low biological mother fearlessness and high biological mother affiliation. Although these groups are termed "higher" and "lower" risk for analyses, it is important to note that the measures are not based on clinical cut-offs, and these groupings are relative and not intended to be clinical or diagnostic classifications.

Covariates.—Reports of children's oppositional behaviors were included as a covariate (6 items on the CBCL; e.g., "defiant", "angry"). Based on the relatively strong and statistically significant correlations between AM and AF reports of oppositional behavior within each time point in the current sample (range, $r = .42$ to .44, all ps $< .001$), we computed mean oppositional behavior subscale scores for our primary analyses that averaged AM and AF of oppositional behavior within each time point. Consistent with past studies using the EGDS data, child gender, adoption openness, and pregnancy and birth complications were also included as covariates. Adoption openness was measured at each wave with items pertaining to the level of contact and knowledge between the biological and adoptive families (Leve et al., 2013). Pregnancy and birth complications included pre-eclampsia, prenatal substance use, low birth weight, and related problems assessed with the McNeil-Sjöström Scale for Obstetric Complications (McNeil, Cantor-Graae, & Sjostrom, 1994).

Missing Data and Analytic Plan

Primary analyses were cross-lagged path models conducted with Mplus version 7.31 (Muthen, 2015), which used full information maximum likelihood (FIML) procedures to account for missing data. Although a sizable proportion of data were missing for a few of the measures, including data on harsh parenting that was not measured in Cohort II families at 54 months, overall attrition was limited. Specifically, data were available on children's CU behaviors from at least one informant for 92% of the sample at 18 months, 89% at 27 months, and 76% at 54 months. Moreover, when comparing families with complete harsh parenting and CU behaviors data across time to families missing at least one measure of harsh parenting or CU behaviors, non-significant independent samples t-tests indicated that mean levels of each of the individual measures of harsh parenting and CU behaviors did not differ between those participants with complete versus incomplete data.

When data are missing at random (MAR) or missing completely at random (MCAR), maximum likelihood estimation procedures, including FIML procedures, produce accurate and unbiased estimates that are superior to other methods (Enders, 2013; Schafer & Graham, 2002). This recommendation was confirmed in a simulation study of three-wave longitudinal data where FIML and other estimation methods proved superior to other approaches, particularly listwise deletion, especially when there is a relatively large proportion of missing data (Newman, 2003). To more specifically evaluate whether FIML procedures were appropriate for our sample, we performed Little's (1988) missing completely at random (MCAR) test on a dataset that included all of the raw scale scores used to compute measures of CU behaviors, harsh parenting, inherited risk (biological mothers' fearlessness and low

affiliation), oppositional behaviors, and the other covariates (child gender, adoption openness, and pregnancy complications). A non-significant $\chi 2$ suggests that data are MCAR, which is what the Little's MCAR test showed for these data, $\chi 2$ (1958) = 1993.69, $p > .05$).

Using FIML estimation procedures with the full sample ($N = 561$), two sets of cross-lagged path models were tested, one for AM harsh parenting and one for AF harsh parenting. Each path model included stability paths from one time point to the next (i.e., within-construct; CU behaviors from 18 to 27 months) and cross-lagged paths (e.g., 18 months CU behaviors to 27 months harsh parenting). Both path models also included the covariates listed and accounted for the correlations between CU behaviors, oppositional behaviors, and harsh parenting at the same time point to stringently model unique reciprocal effects across time between harsh parenting and CU behaviors while accounting for links with oppositional behaviors. Primary models included averaged CU behaviors (averaged AM and AF reports) and averaged oppositional behaviors, and additional models included either AM or AF report of CU and oppositional behaviors to examine associations within and across informants. Model fit was considered adequate if the Root Mean Square Error of Approximation (RMSEA) and the Comparative Fit Index (CFI) values met established guidelines for good to fair fit (Hu & Bentler, 1999).

Finally, multi-group modeling was used to establish whether pathways between CU behaviors and harsh parenting were different for children at relatively higher versus lower inherited risk for psychopathic traits. These multi-group models included the same pathways as the initial model. Models where all cross-lagged pathways involving CU behaviors and harsh parenting and other parameters were free to vary across subgroups (the unconstrained model) were compared to a series of models where each of the cross-lagged pathways were fixed to be equal (constrained models). Chi-square difference tests were used to evaluate whether constraining each focal cross-lagged path coefficient worsened model fit, with a statistically significant difference indicating that constraining the pathway to be equal worsened model fit.

Results

Table 1 presents means, standard deviations, and ranges for study variables. **Table 2** presents bivariate correlations between study variables. With one exception, CU behaviors at a given time point were significantly positively correlated with harsh parenting at the following time point. AM and AF harsh parenting measures were also significantly positively correlated with CU behaviors at the following time point.

Are There Reciprocal Associations between CU Behaviors and Harsh Parenting?

The primary cross-lagged path model of AM harsh parenting, which examined associations between average (mean AM and AF report) CU behaviors and AM reports of harsh parenting, demonstrated adequate fit (see **Figure 1**). In addition to significant within-construct pathways across time, there were significant cross-lagged pathways: AM harsh parenting at 27 months predicted CU behaviors at 54 months, and CU behaviors at 27 months predicted AM harsh parenting at 54 months[1].

Additional cross-lagged path models examining AM harsh parenting included either AM reports of child CU behaviors or AF reports of CU behaviors. The model with AM reports of CU behavior demonstrated adequate fit, $\chi^2(28) = 66.75$, $p < .001$, CFI = .98, RMSEA = .05. AM harsh parenting at 27 months predicted AM-reported CU behaviors at 54 months ($\beta = .14$, $p < .01$), but AM-reported CU behaviors at 27 months did not predict AM harsh parenting at 54 months ($\beta = .07$, $p > .05$). The model with AF reports of CU behavior also demonstrated adequate fit, $\chi^2(28) = 59.08$, $p < .001$, CFI = .98, RMSEA = .04. AF-reported CU behaviors at 27 months predicted AM harsh parenting at 54 months ($\beta = .17$, $p < .01$), but AM harsh parenting at 27 months did not predict AF-reported CU behaviors at 54 months ($\beta = .08$, $p > .05$).

The primary model for AF reports of harsh parenting, which examined associations between average (mean AM and AF report) CU behaviors and AF reports of harsh parenting, also demonstrated adequate fit (see **Figure 2**). Aside from significant within-construct pathways, there was a significant cross-lagged pathway from AF harsh parenting at 27 months to CU behavior at 54 months[2].

Additional cross-lagged path models examining AF harsh parenting included either AM reports of child CU behaviors or AF reports of CU behaviors. The model with AM reports of CU behavior demonstrated adequate fit, $\chi^2(28) = 66.35$, $p < .001$, CFI = .98, RMSEA = .05. Furthermore, AF harsh parenting at 27 months predicted AM-reported CU behaviors at 54 months ($\beta = .13$, $p < .01$). The model with AF reports of CU behavior also demonstrated adequate fit, $\chi^2(28) = 57.11$, $p < .001$, CFI = .99, RMSEA = .04. Consistent with the prior models, AF harsh parenting at 27 months predicted AF-reported CU behaviors at 54 months ($\beta = .12$, $p < .05$).

Does Inherited Risk Moderate the Reciprocal Associations?

We next investigated inherited risk for psychopathic traits by first comparing the higher inherited risk group (high biological mother fearlessness and low interpersonal affiliation; $n = 124$) to the lower inherited risk group (low biological mother fearlessness and high interpersonal affiliation; $n = 146$). Based on t-tests comparing mean levels of all primary variables (CU behaviors and harsh parenting across waves) and covariates (oppositional behaviors, adoption openness, child gender, pregnancy complications), there were no differences between subgroups (all ps > .05), with the exception of pregnancy complications, which were lower within the higher inherited risk group ($t = 2.03$, $p < .05$). These findings supported our focus on exploring differences in associations between variables rather than mean-level differences.

The primary models to examine moderation were constrained versus unconstrained models that compared the strength of each cross-lagged association for higher relative to lower

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[1]Because harsh parenting data at 54 months were missing for Cohort II, we reran the identical model but restricted analyses to Cohort I ($n = 361$). The path from CU behaviors at 27 months to harsh parenting at 54 months was statistically significant ($\beta = .16$, $p = .01$). The path from harsh parenting at 27 months to CU behaviors at 54 months was similar in magnitude but marginally significant ($\beta = .11$, $p < .07$), likely due to the reduced power associated with the smaller sample size.
[2]When we reran the identical model but restricted the sample to Cohort I ($n = 361$), the path from harsh parenting at 27 months to CU behaviors at 54 months continued to be statistically significant ($\beta = .18$, $p < .01$).

inherited risk subgroups. For AM harsh parenting, three of the four cross-lagged paths in the unconstrained model were significant in the higher inherited risk group, and none of these paths were significant in the lower inherited risk group (see **Figure 3**). However, only the model that fixed the single pathway from CU behaviors at 27 months to harsh parenting at 54 months had worse fit relative to a model where this pathway varied across groups, suggesting moderation by inherited risk ($\chi^2 = 5.11$, $df = 1$, $p < .05$). Specifically, CU behaviors at 27 months significantly predicted higher AM harsh parenting at 54 months in the higher inherited risk subgroup, but not in the lower inherited risk subgroup. Comparison of the size of the standardized beta coefficients for this pathway across the two subgroups suggests that the magnitude of the association was ~38 times larger in the higher inherited risk subgroup.

For AF harsh parenting, one cross-lagged path in the unconstrained model was significant in the higher inherited risk group, and none of these paths were significant in the lower inherited risk group (see **Figure 4**). More specifically, harsh parenting at 27 months significantly predicted CU behaviors at 54 months in the higher inherited risk subgroup, but not in the lower inherited risk subgroup. In addition, the magnitude of this pathway from harsh parenting at 27 months to CU behaviors was significantly different, based on the comparison of the model constraining this path to be equal to the unconstrained model ($\chi^2 = 7.26$, $df = 1$, $p < .01$). Comparison of the size of the standardized beta coefficients for this pathway across the two subgroups suggests that the magnitude of the association was ~14 times larger in the higher inherited risk subgroup.

Discussion

The present study investigated reciprocal associations between CU behaviors and harsh parenting across early childhood in an adoption sample. This is the first investigation of reciprocal associations between these constructs across early childhood in a genetically-informed research design that eliminates potential confounds of shared genes between rearing parents and their child. The research design also permitted investigation of whether inherited risk for temperament characteristics linked to psychopathic traits and CU behaviors moderated these reciprocal associations. Bidirectional links from 27 to 54 months were supported in the primary cross-lagged model for AM harsh parenting and CU behaviors, but only the path from harsh parenting at 27 months to CU behaviors at 54 months was evident in the primary cross-lagged model of AF parenting. Moreover, inherited risk moderated some of the identified associations, highlighting that bidirectional links may be stronger among children with elevated inherited risk for CU behaviors, based on fearlessness and low interpersonal affiliation of biological parents.

Reciprocal Associations

Harsh parenting at 27 months predicted subsequent CU behaviors at 54 months in both primary models of AM harsh parenting and AF harsh parenting. This finding builds on associations between harsh parenting and later CU behaviors reported in other, non-geneticallyinformed samples of preschool children (e.g., Mills-Koonce et al., 2016; Waller et al., 2012). This developmental transition seems to be a key period where parents' tendencies

to use harsh discipline may undermine the development of guilt and empathy. Specifically, it has been proposed that overly harsh parenting interferes with children's ability to internalize rules and develop conscience (Kochanska, 1997), which could, in turn, result in children developing CU behaviors (Waller & Hyde, 2016). The findings fit with evidence that the toddler and preschool periods are vital for the development of concern for others (Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). Importantly, the pathway from harsh parenting at 27 months to CU behaviors at 54 months was consistently supported across informant reports of CU behaviors in models of AF harsh parenting but somewhat less consistently in models of AM harsh parenting. This finding suggests that fathers' harshness may be an especially robust factor in the development of later CU behaviors, whereas mothers' parenting may specifically influence her own perception of the child's later CU behaviors.

Importantly, there was a reciprocal association between CU behaviors and harsh parenting during this transition from toddlerhood to the preschool period in the primary AM model that included averaged AM/AF reports of CU behaviors. Specifically, CU behaviors at 27 months predicted AM harsh parenting at 54 months. This finding suggests that while accounting for children's oppositional behavior, toddlers' lack of guilt, affection, and empathy may increase mothers' harsh responses over time, perhaps out of frustration with their toddlers' lack of emotional engagement and concerns that children are not changing their behavior in response to typical caregiving (Waller & Hyde, 2018).

In addition, this pathway was not supported in the adoptive father model of harsh parenting, which suggests that child effects involving CU behaviors may have less influence on fathers' parenting. Notably, AFs were less likely to be perceived as the child's "primary caregiver" based on research assistant impressions, even though nearly all AMs reported that AFs were involved in at least "some" of the daily caregiving. That AFs might spend less time with their children than AMs may partially explain why fathers' parenting was not as influenced by the child's CU behaviors. On the other hand, as noted above, fathers' harsh parenting did consistently predict later CU behaviors, which supports the idea that, on average, AFs have sufficient day-to-day involvement in their young children's lives to influence their behavior.

Tests of the reciprocal associations in the current study were especially stringent because, in addition to controlling for children's oppositional behaviors, analyses accounted for earlier reports of harsh parenting and CU behavior from 18 to 27 months. Additionally, it is noteworthy that all significant cross-lagged paths across primary and additional analyses spanned the 27 to 54 months transition rather than the earlier transition (18 to 27 months) included in this study. This consistent pattern of cross-lagged associations underscores the importance of the interplay between parenting and children's CU behaviors across the toddlerhood to preschool period transition.

Moderation by Inherited Risk

Two longitudinal pathways involving harsh parenting and CU behaviors were stronger among children who may be at relatively higher inherited risk for psychopathic traits, defined as biological mothers' low levels of affiliation and high levels of fearlessness. In the AF model, harsh parenting during toddlerhood was more strongly linked to subsequent CU

behaviors among children with relatively higher inherited risk for psychopathic traits. This suggests that fathers who engage in hostile behaviors toward their children are more likely to promote callousness and impede the development of morality among children at risk based on temperament characteristics related to psychopathic traits. These findings are similar to a prior study where harsh and intrusive parenting by mothers was associated with CU behaviors during early childhood, but only among children with the methionine allele of the brain-derived neurotrophic factor (*BDNF*) gene (Willoughby, Mills-Koonce, Propper, & Waschbusch, 2013), a genetic allele thought to impair fear conditioning. In this example, parental harshness exacerbated genetic risk for fearlessness, which in turned increased risk for CU behaviors.

In the AM model, CU behaviors during toddlerhood predicted increases in harsh parenting more strongly among children with relatively higher inherited risk for psychopathic traits. That is, children rated as high on CU behaviors who also have relatively higher inherited risk evoked harsher parenting. This finding could mean that when adoptive parents rate their child high on CU behaviors, it specifically affects AM parenting when the child is at higher inherited risk. Among children at higher inherited risk, CU behaviors could also manifest in ways not adequately captured by our measure of CU. These genetically-driven characteristics, including low fear and low affiliation (Waller et al., 2016), may evoke harsher responses from mothers over time. For example, low fear to threat based on inherited risk could lead to high approach, reward dominance, and low sensitivity to punishment, which typically characterize children high on both aggression and CU behaviors (Blair, 2013; Frick et al., 2014) that could further evoke harsher parenting responses.

Importantly, the biological mothers' measures were, at most, weakly correlated with children's CU behaviors, which is not consistent with prior twin studies that suggest relatively high levels of genetic influence on CU behaviors, including CU behaviors during the early childhood period (Flom & Saudino, 2017). However, it is important to note that heritability estimates are often lower in parent-offspring adoption studies than in twin studies, which may be attributable to the different ways that constructs are operationalized and measured in parents and the adopted children (Rhee & Waldman, 2002). This scenario holds true in the present study for pragmatic reasons (i.e., we did not have a measure of biological mothers' CU behaviors or psychopathic traits in this non-clinical sample) and conceptual reasons (i.e., we were interested in biological mothers' personality characteristics that may confer risk for children). Furthermore, previous findings with the present sample indicate that, rather than uncovering a direct association between biological mother characteristics and child CU behaviors, biological mother fearlessness was directly linked to children's fearlessness that, in turn, predicted child CU behaviors (Waller et al., 2016).

Study Limitations

Although the study is strengthened by a prospective adoption design with multiple assessment waves and multiple informants, as well as stringent cross-lagged models that accounted for early child oppositional behaviors and other relevant covariates, the study also has multiple limitations. First, we relied solely on questionnaires to assess constructs, using either informant-report or self-report, including the measure of parenting that focused only

on harsh parenting. Although the EGDS included structured observations of parenting behavior, harsh behaviors were very uncommon during observations and were not included in our analyses. We focused specifically on harsh parenting rather than positive parenting behaviors because we were interested in applying reciprocal models of coercive processes to CU behaviors in early childhood. However, positive parenting behaviors are also relevant to the development of CU behaviors, as shown in a prior report using EGDS that tracked CU behaviors to age 27 months (Hyde et al., 2016). Future studies could examine reciprocal positive parenting-CU behaviors pathways over time with observational data.

Second, adoptive families were relatively advantaged in terms of their sociodemographic characteristics, which could limit the generalizability of these findings. Biological mothers were relatively disadvantaged in terms of their sociodemographic characteristics, but showed sufficient levels of variability in their temperament traits to potentially confer inherited vulnerability to their offspring. Unfortunately, we did not have a direct measure of biological mothers' psychopathy to more directly assess children's inherited risk for psychopathy/CU behaviors, and the measures we used were not clinical or diagnostic measures. The pattern of moderation may have differed had we used other measures of biological mothers' personality or psychopathology or other analytic methods to evaluate inherited risk. Finally, because of difficulties of identifying and recruiting biological fathers, data were unavailable for most biological fathers, which precluded inclusion of the limited biological father data in analyses of moderation by inherited risk.

Conclusions and Future Directions

Findings provide evidence of reciprocal links between harsh parenting and CU behaviors across the transition from toddlerhood to preschool. These findings advance theory on dyadic parent-child processes during early childhood by emphasizing that overly harsh parenting may lead to CU behaviors, even in parent-child dyads where passive rGE is eliminated. CU behaviors may also evoke harsh parenting responses, especially among mothers, that could further undermine children's socio-emotional development. These processes seem to be especially likely to occur among children with inherited risk. Future research will track children from the toddler years into the school-age years and beyond to probe whether the strength of these reciprocal associations changes as school, peer, and neighborhood influences increase.

Abbreviations:

(CU) Callous-unemotional

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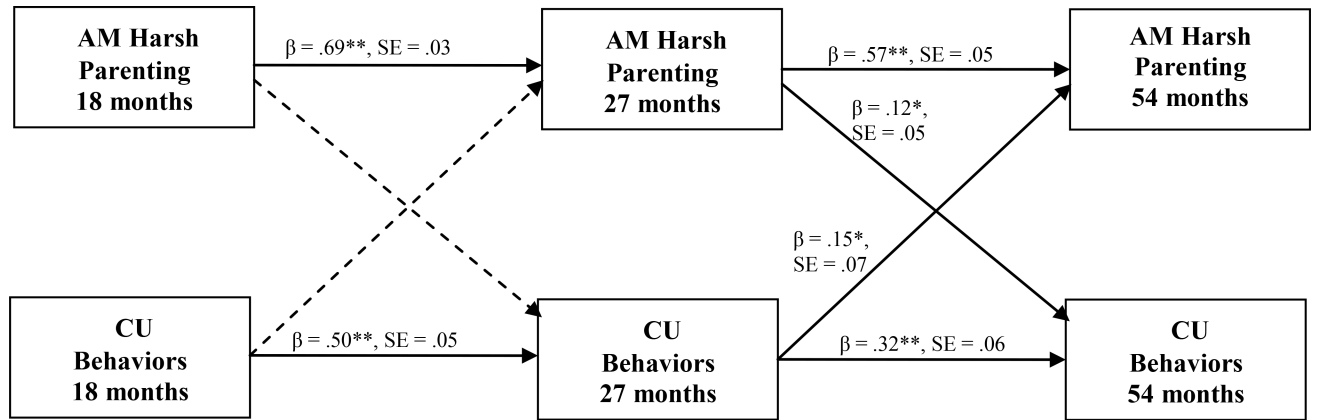
Figure 1.
Path Model of Cross-Lagged Associations among Callous-Unemotional Behaviors and Adoptive Mothers' Harsh Parenting.

Note. * $p < .05$; ** $p < .01$. Model fit: $\chi^2(28) = 65.18$, $p < .001$, CFI = .98, RMSEA = .05. Standardized coefficients are presented. Dashed lines (- - -) indicate non-significant pathways. Model uses averaged adoptive mother and adoptive father reports of child callous-unemotional behaviors and controls for oppositional behavior, child gender, adoption openness, and pregnancy complications. AM = Adoptive Mother. CU = Callous-Unemotional.

Figure 2.
Path Model of Cross-Lagged Associations among Callous-Unemotional Behaviors and
Adoptive Fathers' Harsh Parenting.

Note. * $p < .05$; ** $p < .01$. Model fit: $\chi^2(28) = 69.16$, $p < .001$, CFI = .98, RMSEA = .05;
Standardized coefficients are presented. Dashed lines (- - -) indicate non-significant
pathways. Model uses averaged adoptive mother and adoptive father reports of child callous-
unemotional behaviors and controls for oppositional behavior, child gender, adoption
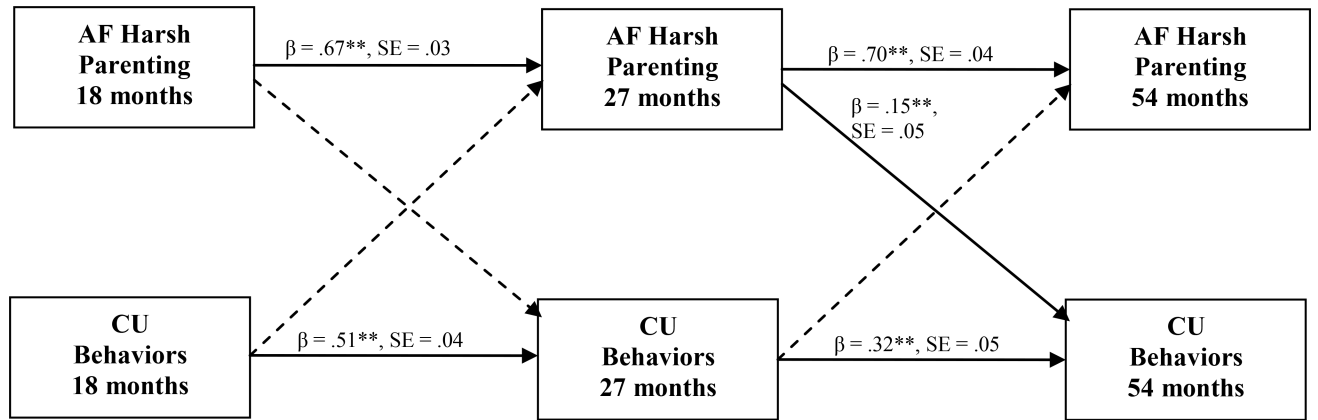openness, and pregnancy complications. AF = Adoptive Father. CU = Callous-Unemotional.

Figure 3.
Unconstrained Path Model of Cross-Lagged Associations among Callous-Unemotional Behaviors and Adoptive Mothers' Harsh Parenting. Standardized Coefficients for the Lower Inherited Risk Group are presented first followed by the Higher Inherited Risk Group in parentheses.

Note. $*p < .05$; $**p < .01$. Model uses averaged adoptive mother and adoptive father reports of child callous-unemotional behaviors and controls for oppositional behavior, child gender, adoption openness, and pregnancy complications. AM = Adoptive Mother. CU = Callous-Unemotional.
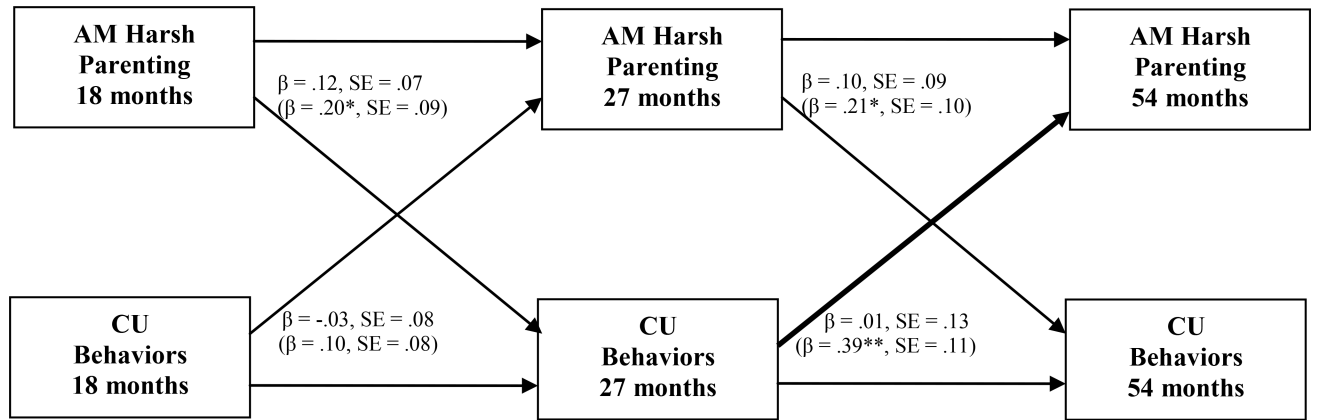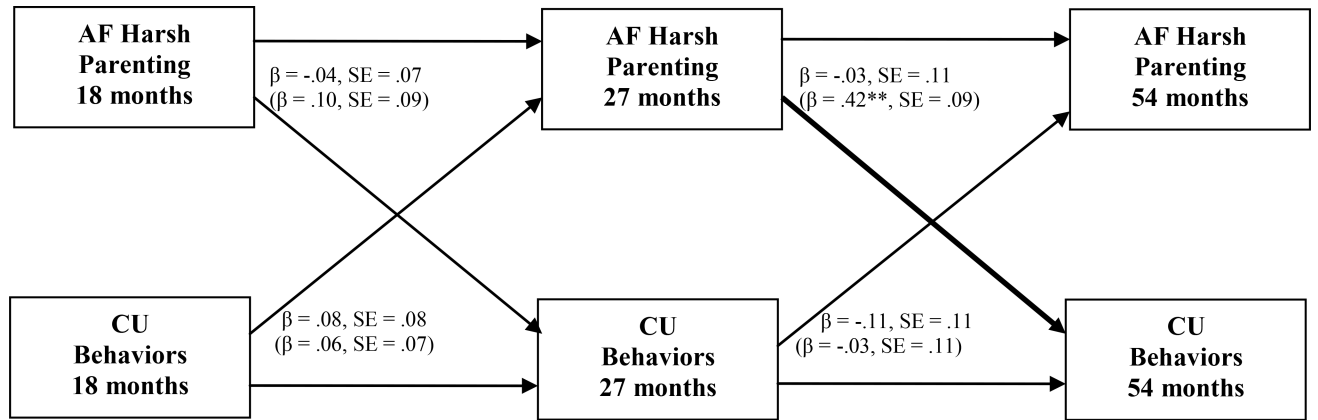
Figure 4.
Unconstrained Path Models of Cross-Lagged Associations among Callous-Unemotional Behaviors and Adoptive Fathers' Harsh Parenting. Standardized Coefficients for the Lower Inherited Risk Group are presented first followed by the Higher Inherited Risk Group in parentheses.

Note. * $p < .05$; ** $p < .01$. Model uses averaged adoptive mother and adoptive father reports of child callous-unemotional behaviors and controls for oppositional behavior, child gender, adoption openness, and pregnancy complications. AF = Adoptive Father. CU = Callous-Unemotional.

Table 1

Means, Standard Deviations, and Range of Scores for Study Variables

Variable	*n*	Range	*M*	*SD*
Pregnancy Complications	561	0 to 14	4.65	3.18
Adoption Openness (18 months)	541	−2.73 to 2.05	.00	.95
Adoption Openness (27 months)	483	−2.73 to 2.11	.02	.96
Adoption Openness (54 months)	260	−2.59 to 2.17	.01	.96
Oppositional Behaviors (18 months)	515	.00 to 1.83	.42	.30
Oppositional Behaviors (27 months)	500	.00 to 1.83	.52	.31
Oppositional Behaviors (54 months)	427	.00 to 1.92	.61	.35
Callous-Unemotional Behaviors (18 months)	515	.00 to 1.20	.32	.24
Callous-Unemotional Behaviors (27 months)	499	.00 to 1.20	.26	.22
Callous-Unemotional Behaviors (54 months)	427	.00 to 1.40	.26	.23
Adoptive Mother Harsh Parenting (18 months)	519	1.00 to 4.90	1.86	.60
Adoptive Mother Harsh Parenting (27 months)	495	1.00 to 4.30	2.06	.61
Adoptive Mother Harsh Parenting (54 months)	258	1.00 to 4.60	2.39	.57
Adoptive Father Harsh Parenting (18 months)	491	1.00 to 4.40	1.89	.61
Adoptive Father Harsh Parenting (27 months)	469	1.00 to 4.20	2.06	.62
Adoptive Father Harsh Parenting (54 months)	236	1.00 to 4.30	2.32	.64
Birth Mother Fearlessness	513	7 to 28	14.78	3.47
Birth Mother Affiliation	545	2.13 to 6.00	4.67	.81

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Table 2

Bivariate Correlations

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. CU Behaviors (18 mos.)													
2. CU Behaviors (27 mos.)	.56**												
3. CU Behaviors (54 mos.)	.35**	.41**											
4. OD Behaviors (18 mos.)	.56**	.38**	.25**										
5. OD Behaviors (27 mos.)	.42**	.53**	.32**	.62**									
6. OD Behaviors (54 mos.)	.29**	.28**	.60**	.46**	.50**								
7. AM Harsh Parenting (18 mos.)	.23**	.20**	.20**	.27**	.22**	.18**							
8. AM Harsh Parenting (27 mos.)	.23**	.23**	.19**	.30**	.28**	.22**	.71**						
9. AM Harsh Parenting (54 mos.)	.17**	.26**	.21**	.24**	.21**	.31**	.52**	.58**					
10. AF Harsh Parenting (18 mos.)	.13**	.12*	.18**	.20**	.17**	.10	.33**	.26**	.19**				
11. AF Harsh Parenting (27 mos.)	.15**	.20**	.24**	.18**	.27**	.21**	.26**	.26**	.21**	.68**			
12. AF Harsh Parenting (54 mos.)	.02	.10	.25**	.09	.15*	.22**	.27**	.31**	.29**	.59**	.68**		
13. BM Low Fearlessness	.05	−.01	.01	.06	.02	.01	.03	.07	.00	.03	.05	.06	
14. BM Affiliation	−.11*	−.11*	−.05	−.04	−.08	−.04	−.01	.07	−.04	−.08	−.05	.04	.16**

*
$p < .05$;

**
$p < .01$.

CU = Callous-Unemotional. OD = Oppositional Defiant. AM = Adoptive Mother. AF = Adoptive Father. BM = Biological Mother.