Youth Violence and
Juvenile Justice

Maternal and Paternal Parenting and Maltreatment in Relation to Callous-Unemotional Traits in Detained Male Adolescents

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ABSTRACT

This study investigated the relationship between parenting practices, childhood maltreatment (CM), callous-unemotional (CU) traits, and conduct disorder (CD) symptoms among 275 detained adolescent boys (M_{age} = 16.96). CU traits, and paternal and maternal parenting were assessed via self-report questionnaires. A diagnostic interview was used to assess CD symptoms. Regression analyses revealed that harsh parenting and physical maltreatment were positively associated with CU traits after controlling for CD symptoms, whereas warm parenting was significantly negatively related to CU traits. After controlling for the overlap between parenting and CM, only parenting was significantly positively related to CU traits. Findings, finally, showed that CU traits did not moderate the link between parenting (or CM) and CD symptoms. The study underscores that it is important to consider experiences with parenting practices and CM in detained adolescents with heightened CU traits.

Keywords: adolescent offenders, callous-unemotional traits, parenting, childhood maltreatment, antisocial behavior

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Children and adolescents with conduct problems (CP) are heterogenous in etiological processes, severity, and prognosis (Fairchild et al., 2019; Moul et al., 2018), which may explain the great variability in treatment responsiveness (Perlstein et al., 2023). Evidence suggests that callous-unemotional (CU) traits are helpful to designate a subgroup of children and adolescents with CP who are more etiologically homogeneous. CU traits in youth are similar to the affective features of adult psychopathy and are commonly characterized by deficient empathy and guilt, insensitivity to others' feelings, shallow emotions, and sometimes also by a lack of concern about performance in important activities, such as education or work (e.g., Andershed et al., 2002; Colins et al., 2014; Frick, 2003). There is some evidence that criminal justice-involved youth with CP and CU traits, for example, are more likely to engage in aggression (e.g., Colins, 2023), to have an earlier onset of antisocial behavior (e.g., Colins & Andershed, 2015), to show anomalies in emotion processing (e.g., Aghajani et al., 2022), and to exhibit lower levels of treatment engagement (e.g. Bisback et al., 2022), relative to their counterparts with CP only. Hence, CU traits seem important for designating a clinically important subtype of CP in children and adolescent (e.g. Frick, 2022; APA, 2013). Findings from multiple studies support the viability of CU traits for subtyping CP, but significant limitations have also been reported (e.g. Colins et al., 2021; Colins et al., 2020; Frick et al., 2014), including work on the association between parenting, CU traits, and CP (Waller et al., 2013).

Parenting appears a critical risk factor in the etiology (Frick et al., 2014) and treatment of CP that co-occur with CU traits (e.g. Fleming et al., 2022; Waller, Gardner, et al., 2015). Yet, integration of research is difficult because markedly different research questions have been tested in varying samples and using different designs (Waller et al., 2013). Moreover, the bulk of studies focused on (early) childhood, with relatively few studies that examined associations between parenting, CU traits and CP (or other indices of antisocial behavior; e.g. Goagoses & Schipper, 2021) among adolescents. While (early) childhood is a particularly critical developmental period to study the role that parents play in the development and maintenance of CU traits and CP (e.g. Waller & Hyde, 2017), parenting in adolescence remains important

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(e.g. Rothenberg et al., 2020) and has been associated with CU traits (e.g. Kimonis, Cross, et al., 2013) and CP (e.g. Pinquart, 2017) in adolescents. Furthermore, preliminary evidence tentatively indicates that intervention programs for adolescents with a parenting component can lead to a reduction in CU traits (Perlstein et al., 2023), which is encouraging given CU traits in adolescence have been associated with poor developmental outcomes (e.g. Goulter et al., 2020). Hence, research is needed that scrutinizes if adolescents with CP and CU traits differ in their exposure to parenting practices from their counterparts without CU traits. Furthermore, associations between parenting, CU traits, and CP rarely have been examined in adolescents with clinically significant CP or severely antisocial behavior (but see Pauli et al., 2021). Therefore, work with high-risk youth is required to test if parenting is related to CU traits and if parenting is related to CP at different levels of CU traits (Waller et al., 2013).

Some research with criminal justice-involved adolescents showed that maternal and paternal warmth were negatively associated with CU traits (Bisby et al., 2017; Chinchilla & Kosson, 2016; Kimonis, Cross, et al., 2013; Vaughan et al., 2023), whilst harsh parenting was not significantly associated to CU traits (Edens et al., 2007). However, these studies did not control for CP, rendering it unclear if warm parenting is associated with CU traits, independent of CP (Clark & Frick, 2018). There is one notable exception, though, showing that harsh and warm parenting in early childhood were not or inversely related to adolescent CU traits after controlling for CP, respectively (Goulter et al., 2020). Some studies also tested the theory that parenting is only related to CP in individuals without CU traits (Wootton et al., 1997). Findings confirmed this moderating effect of CU traits among detained youth, though only for negative parenting (Edens et al., 2007; Kimonis, Cross, et al., 2013), not for warm parenting (Chinchilla & Kosson, 2016). Yet, findings are mixed since warm parenting have also been shown to be inversely associated with CP for individuals with higher levels of CU traits (e.g. Clark & Frick, 2018; Pauli et al., 2021).

This Study

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The present study will substantially contribute to the literature on parenting, CU traits, and CP in various ways. First, zero and independent associations and moderator effects will be examined in a relatively large sample of detained male adolescents, who exhibit high levels of significant CP (Colins et al., 2010). Few studies included warm and harsh parenting in the same model. This is unfortunate because relations of harsh and warm parenting on CU traits could be distinct after accounting for their correlation (e.g.Waller et al., 2012), perhaps since parental harshness partially overlaps with low parental warmth (Waller & Hyde, 2017). Thus, this study will examine unique effects of measures of harsh and warm parenting. In addition, while fathers may have a larger effect than mothers on the development of delinquency in their offspring (e.g. Hoeve et al., 2009; Roetman et al., 2019), few studies tested if maternal and parental parenting practices are differently related to CU traits, as suggested in prior work (e.g. Pasalich et al., 2011). Therefore, we will also differentiate between maternal and paternal harsh and warm parenting. Finally, childhood abuse and neglect are highly prevalent among detained youth (Vahl et al., 2016), moderately related to CU traits (Todorov et al., 2023), and to some extent overlapping with harsh and low warm parenting (e.g. Bisby et al., 2017; Gao et al., 2010). Importantly, there is some evidence that parenting experiences of detained youth relate to CU traits beyond the influence of childhood maltreatment (e.g. Kimonis, Fanti, et al., 2013). Therefore, the study will also examine if harsh and warm parenting relates to CU traits after controlling for maltreatment.

Hypotheses

Based on prior work, we first expected that parental warmth would be significantly negatively associated with CU traits, but that no significant associations will emerge between parental harshness and CU traits (e. g. Edens et al., 2007; Goagoses & Schipper, 2021; Goulter et al., 2020). It was also expected that childhood trauma will be significantly positively associated with CU traits (Todorov et al., 2023). Notwithstanding the mixed findings (e.g. Gao et al., 2010; Vaughan et al., 2021), we tentatively expected different associations for maternal and paternal parenting (e.g. Pasalich et al., 2011). In line with some

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prior work (Bisby et al., 2017; Kimonis, Cross, et al., 2013), it is expected that association between parenting practices and CU traits will remain after controlling for childhood maltreatment. In line with theory and recent work (Clark & Frick, 2018), we finally expected that harsh parenting will be positively related to CD symptoms at low levels of CU traits, while warm parenting will be inversely related to CD symptoms at high levels of CU traits.

METHOD

Participants

Between August 2019 and December 2021, criminal justice-involved boys were recruited from two youth detention centers (YDCs) in Flanders. Detained boys were eligible to participate in the study if they were 16 or 17 years old, had no problems that could jeopardize their wellbeing or participation in the study (see Procedure), and had sufficient cognitive abilities and knowledge of Dutch. The latter two criteria were based upon both staff and interviewers' assessment of the boys' ability to participate in Dutch conversations and to read and comprehend the informed consent form. A total of 468 unique 16- and 17-year-old boys were detained in the YDC at the time of recruitment (COVID19 lockdown between March and June 2020 not included), of which 50 were not eligible according to our inclusion criteria. Of the 418 eligible boys, 13 boys could not be approached because we did not receive written consent from the psychologist on time (see Procedure), 57 were not approached in time to participate in the study, and 21 refused to participate, resulting in a sample size of 327. Data for one participant were deleted afterward upon request from the parents (see Procedure), resulting in a total sample size of 326 boys. The mean age at baseline was 17.0 years (SD = 0.6 years), and 40% were of Belgian origin (i.e., both parents were of Belgian nationality) as defined by the Belgian Statistical Office. Because the current study focusses on paternal and maternal experiences, we only included participants who reported to (have) had both a mother and a father figure (N = 275), and, therefore, excluded boys who only had a mother figure (n = 38; 11.7%) or a father figure (n = 3; 0.9%). For the 275 boys included in this study, the majority of the mother

figures most often was their biological mother (n = 313; 96%), followed by foster mother (n = 5; 1.5%),

female family member (e.g. grandmother or aunt; n = 2; 0.6%) or other female caretaker (n = 3; 0.9%).

Most of the father figures were biological father (n = 268; 82.2%), followed by stepfather (n = 10; 3.1%);

foster/adoption father (n = 5; 1.5%) or male family members and caretakers (e.g. grandfather or uncle, n

= 5; 1.5%), two participants had two mother figures, and stated that one of the females was their father

figure. Based on the YDC file information 69.0 % of the 275 boys had at least one violent arrest charge,

with assault being the most common violent arrest charge (44.1%), followed by robbery (43.9%), threats

(27.9%), sexual hands-on and hands-off offenses (7.6%), attempted homicide (5.0%), deprivation of liberty

(3.1%) and homicide (1.1%). Furthermore, 35.6% boys have been detained in the past.

Procedure

The YDC psychologist from each eligible participant was first asked for written consent to

approach the boy. Next, eligible participants were approached and received oral and written information

about the aims, content, and duration of the study, though only when their psychologist provided written

consent. They were assured their information would be treated confidentially and that refusal to

participate would not affect their judicial status or stay in the YDC. Written informed consent was given

by the participants before starting the assessment protocol. The detained boys' parents/caretaker

received a letter with information about the aims and practical aspects of the study and could decline

participation (i.e., passive informed consent). Participants were assessed in a private area in the YDC by a

PhD-student and received a small financial compensation. This study was approved by the institutional

review board of Ghent University and the board of the YDC centers.

Measures

Callous-Unemotional traits. CU traits were measured through the Youth Psychopathic traits

Inventory (YPI), a self-report questionnaire that is based on the three-factor model of psychopathy

(Andershed et al., 2002; Cooke & Michie, 2001). Its 50 items are organized into 10 subscales, with five

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items in each subscale. Each item is scored on a 4-point Likert-type scale ranging from 1 (*does not apply*

at all) to 4 (*applies very well*). In this study, only the CU dimension was used, which includes three

subscales: Callousness (e.g., *"I think that crying is a sign of weakness, even if no one sees you"*);

Unemotionality (e.g., *"I usually feel calm when other people are scared"*); and Remorselessness (e.g., *"To*

feel guilty and remorseful about things you have done that have hurt other people is a sign of weakness").

The psychometric qualities of the YPI hold in various settings, including detained boys (Colins et al., 2017).

In this study, Cronbach's alpha (α) coefficients and mean interitem correlations (MICs) for the YPI CU score

(sum of the 15 items) were good (α = .80) and acceptable (MIC = .22), which is beneficial given a key

limitation in many studies on the parenting-CU link is the low internal consistency for CU measures (Waller

et al., 2013).[1]

   Conduct Problems. Conduct problems were defined as conduct disorder (CD) symptoms and were

assessed via the *Schedule of Affective Disorders and Schizophrenia for School-Aged Children Present and*

Lifetime Version (K-SADS–PL) CD Symptoms (Kaufman et al., 1997). These K-SADS diagnostic interviews

were carried out by the three doctoral researchers, of whom two were certified K-SADS interviewers and

had ample clinical and forensic experience. To facilitate scoring of the information derived through

interviews, file information was also collected. All interviews were audiotaped. Each of the 15 CD

symptoms was first scored by the researcher who performed the interview as well as independently by a

second researcher (0 = absent, 1 = present). Next, in case of discrepancies in the original scores, the

interview and collateral information were reexamined and a "consensus score" was determined by both

raters. The 15 symptoms were summed to calculate the total number of CD symptoms (for more details,

see: Bisback, et al., 2022).

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[1] To evaluate the internal consistency, Cronbach's alphas (α) were calculated and interpreted as follows: <.60 = insufficient; .60 to .69 = marginal; .70 to .79 = acceptable; .80 to .89 = good; and ≥.90 = excellent (Barker, Pistran, & Elliot, 1994). Given that α depends on the number of items, we also calculated the MIC, which is independent of scale length and should be in the range of .15 to .50 to be considered acceptable (Clark & Watson, 1995).

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Parenting: Measures of parenting that have been used in prior work on the topic used a restricted number of items and were hallmarked by low internal consistency (Waller, Gardner, & Hyde, 2013). To improve the assessment of harsh and warm parenting through youth self-report, we selected eight items about harsh parenting and eight items about warm parenting from existing questionnaires and where needed, modified some items to enhance readability of the items, rephrased some items into a self-report, and changed the scoring format so that each item needs to be rated on a 5-point Likert scale ranging from 1 (never) to 5 (very often). The adolescent first received written information that the questions were about their childhood and how often they have occurred. If there was a father and/or a mother figure, the adolescent was then asked to complete 16 questions for each available parental figure separately. The 16 items can be retrieved from Supplement 1, available online. In the current sample, internal consistency of harsh parenting (α: mother/father = .90/.94; MIC: mother/father = .53/.65) and warm parenting (α: mother/father = .90/.94; MIC: mother/father = .57/.68) scores are excellent (α) and good (MIC). Confirmatory factor analysis confirmed that the unidimensionality for harsh and warm parenting scores[2].

Maltreatment: Participants also reported about maltreatment experiences by means of the well-established Childhood Trauma Questionnaire – Short Form (CTQ-SF; (Bernstein et al., 2003). Items are scored using a 5-point scale that is structured to reflect the frequency of maltreatment experiences, ranging from 1 (never) to 5 (very often true). The CTQ has five empirically derived scales (with five items

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[2]For harsh and warm maternal parenting, fit indices were RMSEA = .09, SRMR = .05, CFI = .96, and TLI = .95, with loadings ranging from .44 to .94 and .57 to .91, respectively. For paternal parenting, fit indices were RMSEA = .10, SRMR = .05, CFI = .98, and TLI = .97, with loadings for harsh and warm paternal parenting ranging from .78 to .95 and .59 to .92, respectively (details can be found in Supplement 1).

each), physical, sexual, and emotional abuse, and physical and emotional neglect. The Dutch version's

sexual abuse scale includes four instead of five items, due to an ambiguity of one item (Thombs, Bernstein

et al., 2009). The items were summed to create the five subscale scores, where these subscale scores were

also summed to calculate total maltreatment, emotional maltreatment (sum of emotion abuse and

emotional neglect), and physical maltreatment (sum of physical abuse and physical neglect). The internal

consistency of the scores is good to excellent in terms of α (except for physical neglect) and at least

acceptable in term of MIC. Specifically, α/MIC for the scores were: emotional abuse = .81/.46; physical

abuse = .83/.51; sexual abuse = .86/.63; emotional neglect = .85/.53; physical neglect = .61/.26; emotional

maltreatment = .87/.40; physical maltreatment: .80/.30 and total maltreatment = .90/.27.

Data-Analyses

Zero-order correlations between all main study variables were examined and interpreted as: weak (< .30);

moderate (.30 to .50); and strong (≥ .50) (Cohen,1988). A series of simple (and multiple) regression

analyses were performed, testing associations between parenting or maltreatment and CU traits, before

(unadjusted model) and after (adjusted model) adjusting for the number of CD symptoms. Main and

interaction effects between parenting variables and CU traits and between maltreatment and CU traits

were examined next in a series of multiple regression models, and significant interaction effects were

probed. In addition, a series of multiple regression analyses were performed that simultaneously included

multiple parenting variables as independent variables, allow us to test the unique and interaction effects

of (maternal and paternal) harsh and warm parenting. Similarly, the unique effects of multiple

maltreatment variables (e.g., emotional and physical maltreatment) and CU traits were examined in a

series of multiple regression models. We also repeated these latter two analyses whilst simultaneously

including both parenting and maltreatment variables, to test unique and interaction effects of parenting

and maltreatment variables in relation to CU traits. Finally, to test if the relationship between parenting

(or maltreatment) and conduct problems is moderated by CU traits, we ran a series of multiple regression

analyses that included CU traits, parenting (or maltreatment) features, along with their multiplicative interaction terms. When probing significant interaction effects in any of the aforesaid analyses, independent variables were first mean centered (Dawson, 2014). SPSS 27 was used for all, unless otherwise specified, analyses, with $p <.05$ as the standard for statistical significance. Unless otherwise specified, all assumptions for (multiple) regression analyses (i.e., linearity, homoscedasticity, normality of residuals, and multicollinearity) were met.

RESULTS

Descriptive Information and Correlations

Table 1 reports mean scores (SD) for and bivariate correlation coefficients between all study variables. Moderate correlations were revealed between harsh and warm parenting, between harsh paternal and harsh maternal parenting, and between warm paternal and warm maternal parenting. Harsh parenting was also strongly positively correlated to emotional maltreatment and physical maltreatment, whereas the correlation between warm parenting and emotional maltreatment and physical maltreatment were strong and moderate, respectively. All but two of the parenting variables (i.e., warm total parenting and warm paternal parenting) and all but one of the maltreatment variables (i.e., emotional neglect) were significantly positively or negatively (i.e., warm maternal parenting) weakly correlated to the number of CD symptoms. Table 1, finally, shows that the correlation between CU traits and CD symptoms was moderate.

Parenting Features in Relation to CU Traits: Main and Interaction Effects

Associations between singular parenting variables and CU traits, before (i.e., unadjusted model) and after (i.e., adjusted model) adjusting for the number of CD symptoms are reported in Table 2. In the unadjusted models, (total, paternal, and maternal) harsh parenting were significantly positively associated with CU traits, whilst significant negative relations were revealed between total, paternal, and maternal warm parenting, and CU traits. After controlling for the number of CD symptoms, all but two of these

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parenting variables (i.e., warm paternal and warm maternal parenting) remained significantly related to

CU traits. Table 3 (Model 1) shows that after controlling for CD symptoms and their shared overlap, total

harsh parenting was significantly positively related to CU traits. Further, when also including paternal

harsh and maternal harsh parenting in the model, only maternal harsh parenting was significantly

positively related to CU traits (Table 3, Model 2). Including both paternal warm and maternal warm

parenting in a model revealed that neither one of these parenting features were significantly related to

CU traits (Table 3, Model 3). Finally, in the model that included paternal harsh and warm and maternal

harsh and warm parenting, only maternal harsh parenting was positively significantly associated with CU

traits (Table 3, Model 4). To explore if harsh and warm parenting as well as paternal and maternal

parenting practices have multiplicative effects in predicting CU traits, five interaction effects were tested,

after adjusting for the number of CD symptoms (details can be retrieved from Supplementary Table 4).

Results show that only one of these interaction effects (total harsh x total warm) was statistically

significant (β = .14, p <.05). When probing this interaction effect, parental warmth was related to lower

levels of CU traits, though only at lower levels of harsh total parenting (Figure 1a).

Maltreatment Features in Relation to CU Traits: Main and Interaction Effects

Table 2 also reports associations between singular maltreatment variables and CU traits before

(i.e., unadjusted model) and after (i.e., adjusted model) controlling for the number of CD symptoms. In

the unadjusted models, total maltreatment, physical maltreatment, physical abuse, and physical neglect

were significantly positively associated with CU traits, whilst emotional maltreatment, emotional neglect,

emotional and sexual abuse were not significantly associated to CU traits. After controlling for the number

of CD symptoms (adjusted models), only physical maltreatment remained significantly positively related

to CU traits (Table 2). To explore if indices of maltreatment have multiplicative effects, three interaction

effects were tested, after adjusting for the number of CD symptoms (for details, see: Supplementary Table

4). Two interaction effects were statistically significant, being emotional x physical maltreatment (β = -

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.15, *p* <.05) and physical maltreatment x sexual abuse (*β* = -.15, *p* <.05). Probing these two interactions

shows that emotional maltreatment is positively related to CU traits, but only at lower levels of physical

maltreatment (Figure 1b) and that physical maltreatment is positively related to CU traits, though also

only at lower levels of sexual abuse (Figure 1c).

Unique Effects of Parenting and Maltreatment Features in Relation to CU Traits

Next, we examined if parenting and maltreatment indices are related to CU traits after controlling

for their shared overlap and number of CD symptoms. Table 4 (Model 1) shows that only total harsh

parenting was significantly positively related to CU traits, whereas no significant associations emerged for

total warm parenting and total maltreatment. Table 4 also demonstrates that when including multiple

indices of parenting and maltreatment in one model, only total harsh parenting was significantly related

to CU traits (Model 2). Table 4, finally, shows that only harsh maternal parenting was significantly

positively related to CU traits when including indices of paternal and maternal parenting and

maltreatment (Model 3).[3]

Interaction Effects of Parenting and Maltreatment Features in relation to CU Traits

Significant interaction effects (adjusted models) were found between total maltreatment (i.e., the

total CTQ score) and various indices of parenting (Table 5, adjusted models). Probing these interaction

effects shows that (*i*) harsh parenting was positively associated with CU traits, at high and low levels of

total maltreatment, but that it's effect was attenuated at higher levels of maltreatment (Figure 2a); (*ii*)

paternal harsh parenting was positively associated with CU traits at low levels of total maltreatment

(Figure 2b); (*iii*) maternal harsh parenting was positively associated with CU traits at low levels of

maltreatment (Figure 2c); (*iv*) parental warmth was negatively associated with CU traits at low levels of

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[3] We do not report findings of a model that simultaneously included four parenting and five maltreatment (i.e. the five

CTQ scale scores) variables, due to problems with multicollinearity.

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total maltreatment (Figure 2d); and (*v*), paternal warmth was negatively associated with CU traits at low

levels of total maltreatment (Figure 2e).

CU Traits as a Moderator Between Environmental Features and Conduct Problems

To test if the relation between parenting (or maltreatment) and the number of CD symptoms is

moderated by CU traits, multiple regression analyses were performed in which CU traits and each

parenting or maltreatment variable were entered as predictors along with the multiplicative interaction

term between the predictors. No significant interactions emerged (see Supplementary Tables 5 and 6).

DISCUSSION

This study first examined if maternal and paternal parenting practices were uniquely related to

CU traits, independent of CD symptoms. Findings revealed that harsh (maternal and paternal) parenting

was positively related to CU traits, whereas warm (maternal and paternal) showed negative associations

with CU traits. These zero-order associations were, overall, replicated when controlling for CD symptoms,

suggesting that reported links between parenting practices and CU traits are not explained by the overlap

between CU traits and CD symptoms. Contrary to our hypothesis, results from analyses that included both

parenting practices in the same model showed that only harsh parenting was uniquely related to CU traits,

after controlling for CD symptoms. Probing the significant interaction effect that emerged between harsh

and warm parenting suggests that warm parenting may serve as a buffer for CU traits, though only in the

presence of low parental harshness. This finding bears relevance in the light of evidence that interventions

that target harsh and warm parenting may reduce CU traits (e.g. Fleming et al., 2022; Hawes et al., 2014;

Pardini et al., 2007). Even though parents of detained youth are not always available or often not willing

or able to enrol in parent training programs (e.g. Bourion-Bédès et al., 2023), our findings tentatively

underscore the importance of ongoing attempts to increase parental participation and implement family-

centred approaches in forensic settings (e.g. Simons et al., 2017).

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Based on previous research (Pasalich et al., 2011; Gao et al., 2010; Kimonis, Cross, et al., 2013), it was expected that paternal and maternal parenting are differently related to CU traits. Our findings partially support this hypothesis, since maternal harsh parenting, but not paternal harsh parenting was positively associated with CU traits. Nevertheless, it must be noted that neither maternal and paternal warmth were significantly associated with CU traits, after controlling for CD symptoms (Table 5). Hence, it is important for future research to systematically account for conduct problems when examining the parenting-CU link, as recommended in the literature (e.g., Clarck & Frick, 2018). Analyses that simultaneously included maternal and paternal parenting and maltreatment, showed that harsh maternal parenting was uniquely related to CU traits, converging with previous research in juvenile delinquent boys (Waller et al., 2018). Specifically, this finding can be explained by evidence that maternal harsh parenting affects a child's emotion regulation more strongly than father's (Chang et al., 2003; Kyranides et al., 2017; Ridings & Lutz-Zois, 2014) and that emotion regulation deficits hallmark youth with CD and CU traits (Frick, et al., 2014). Importantly, our parenting measure did not consider the time frame the parent figure was actively engaged or the availability and role the parent figure took in the participants life. Therefore, our findings need replication but, nevertheless, underscore the importance of considering maternal parenting when working with detained youth with CU traits.

Numerous studies also have examined the associations between indices of maltreatment and CU traits, with recent meta-analytical evidence showing that the relation between total and all but one subtype of maltreatment (i.e., sexual abuse) and CU traits is significant, with effect sizes (r) in the .17 to .23 range (Todorov et al., 2023). Our study adds to this body of evidence by confirming that total maltreatment, physical neglect, and physical abuse, but not sexual abuse, was related to CU traits at the zero-order level. Yet, emotional neglect and emotional abuse were non-significantly related to CU traits in our sample, a finding that converges with the non-significant zero-order correlations between emotional maltreatment and CU traits (total score), that was reported in a study with detained boys (Bisby

et al., 2017; Kimonis, Cross, et al., 2013). Results also demonstrated that correlations between childhood

maltreatment and parenting practices can be strong (with *r*'s up to .62), but not to the degree that both

features measure the same construct. Interestingly, unique effects were only revealed for harsh

parenting, but neither for warm parenting nor indices of childhood maltreatment (Table 3). To further add

to the literature, and to inform ecological models of the development and persistence of CU traits in high-

risk samples (Waller et al., 2018), we explored interaction effects between parenting practices and

maltreatment in relation to CU traits, controlling for the number of CD symptoms. The explication of

significant interact effects, overall, suggested that parental (total and paternal) warmth is a protective

factor, though only at lower levels of childhood maltreatment. Additionally, parental harshness (total,

maternal and paternal) was positively associated with CU traits, though the strength of this association

was attenuated at higher levels of total maltreatment. Because interaction effects are difficult to replicate,

our findings must be confirmed in other studies. Yet, one study reported a similar interaction effect

between maternal warmth and emotional neglect (Bisby et al., 2017), encouraging future efforts to

systematically test interaction effects between environmental factors in relation to CU traits.

　　　　Finally, we purportedly tested if CU traits moderated the relationship between parenting and CD

symptoms, thereby using a cross-sectional design, as did pioneer studies on this topic (Oxford et al., 2003;

Wootton et al., 1997). We found no evidence that CU traits moderated the parenting-CD symptoms link,

thereby contrasting earlier findings (Oxford et al., 2003; Wootton et al., 1997). Our findings also contrast

with prior cross-sectional work with detained youth showing that CU traits moderated the association

between harsh parenting and delinquency (Edens et al., 2007) and between warm parenting and CD

symptoms (Chinchilla & Kosson, 2016). These latter studies relied on parents and teachers (Oxford et al.,

2003; Wootton et al., 1997) or experts (Chinchilla & Kosson, 2016; Edens et al., 2007) to assess CU traits,

whereas we used a self-report format. Though unlikely and difficult to be reconciled with other findings,

such as the zero-order associations between parenting and CU traits (Table 2), it cannot be excluded that

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interaction effects would have emerged if CU traits were measured through other informants. Some work suggested that CU traits also moderate the association between childhood maltreatment and externalizing problems (e.g. Batky et al., 2023; Li et al., 2022). But here again, we failed to replicate this finding in our sample of detained boys. Thus, results suggest that parenting and maltreatment experiences are no differently related to CD symptoms in detained boys with higher versus lower levels of self-reported CU traits.

Strengths and limitations

This study has various strengths, including the usage of a relatively large sample of detained adolescent boys, well-established measures of CU traits (i.e., YPI), maltreatment (i.e., CTQ), and CD symptoms (i.e., K-SADS), and a parenting measure that separated between maternal and paternal harsh warm parenting. Yet, as always, this study is not without limitations. First, parenting practices were rated through a newly developed questionnaire that has not yet been validated. Yet, the proposed factor structure was confirmed in our sample, whilst the harsh and warm parenting scores also were internally consistent, thereby addressing a major limitation of prior work (for a review, see: Waller et al., 2013). Second, we did not chart the frequency of the contact with the parental figures. This is unfortunate since exposure to harsh and warm parenting practices likely differ across participants and vary from occasional to consistent exposure (Backman et al., 2021). Third, retrospective self-reports of childhood maltreatment and negative experiences with parenting can be biased for a variety of reasons, such as the desire to protect the perpetrator, normal process of forgetting, or current mood states (e.g. Fergusson et al., 2000; Goltermann et al., 2023). Thus, the sole reliance on self-reports to index the environmental-level features should be acknowledged as a study limitation. Fourth, the study design did not allow to account for the possibility that parenting is not a pure environmental feature but also reflects gene-environment correlations (Waller, et al., 2018). Thus, we cannot exclude that associations between parenting and CU traits arose because biological parents' pass on genes that increase risk for CU traits. Fifth, we only used

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data from detained male adolescents. Future research is needed to ascertain to what extent the current findings can be generalized to detained female adolescents or community-residing and clinic-referred children and adolescents.

Implications

While acknowledging these limitations, our findings have implications for research, theory, and practice. Our results illustrate that maltreatment and parenting practices, while showing overlap, are distinguishable concepts and also are differently associated to CU traits. Furthermore, interaction effects between parenting and maltreatment indices were found. This set of findings is relevant for theories that speculate about the role of the environment in the emergence and persistence of CU traits (Waller, Shaw, et al., 2015). Our findings are also informative for theories about how parenting may influence the relationship with conduct problems differently for children and adolescents with high and low levels of CU traits. Evidence of the moderating effect of CU traits (see: Wootton et al., 1997) has been used to support the etiological validity of using CU traits as a specifier for CP or CD. Result from the current study suggests that youth scoring high or low on CU traits show no differences in the relationship between their recollection of experiences with parenting practices and CD symptoms, challenging the earlier notion that CU traits designate an etiologically distinct group of youth with conduct problems, at least with regard to self-reported recollections of parenting practices of detained male adolescents.

Furthermore, our study bears some practical implications. First, we showed that youth with elevated levels of CU traits tend to experience the highest levels of negative parenting. However, while studies have shown promising results for interventions focusing on the parent-child relationship and emphasizing parental warmth (e.g. Fleming et al., 2022; Perlstein et al., 2023), it will be crucial to acknowledge the youth's parenting experiences before all stakeholders enroll in such intervention. Even when parents are available and willing to enroll, the negative experiences with their parents suggest that often time will need to be invested to restore the trust in their parent and to (re)establish a bond between

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the youth and his parent figures. Second, the strong correlations between the various indices of maltreatment once more suggest that detained boys have experienced multiple forms of abuse and neglect (e.g., Vahl et al., 2016). Maltreated detained boys are not only at an increased risk for CU traits (this study) but also for mental health problems (e.g., Vahl et al., 2016) and recidivism (e.g., Vitapoulos et al., 2019). Thus, the data presented here highlight the importance of systematically ascertaining trauma histories in detained boys.

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Table 1

Pearson's Correlations between Parenting and Maltreatment Variables (N = 275)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Harsh total parenting	-														
(2) Harsh paternal parenting	.85***	-													
(3) Harsh maternal parenting	.77***	.32***	-												
(4) Warm total parenting	-.47***	-.42***	-.33***	-											
(5) Warm paternal parenting	-.36***	-.46***	-.09	.87***	-										
(6) Warm maternal parenting	-.42***	-.21***	-.51***	.78***	.37***	-									
(7) Total maltreatment	.58***	.48***	.44***	-.60***	-.45***	-.55***	-								
(8) Emotional maltreatment	.53***	.42***	.45***	-.61***	-.45***	-.58***	.94***	-							
(9) Emotional abuse	.62***	.52***	.48***	-.50***	-.38***	-.46***	.85***	.85***	-						
(10) Emotional neglect	.34***	.24***	.32***	-.57***	-.41***	-.55***	.80***	.90***	.54***	-					
(11) Physical maltreatment	.58***	.49***	.45***	-.50***	-.36***	-.49***	.90***	.73***	.74***	.57***	-				
(12) Physical abuse	.58***	.48***	.45***	-.40***	-.30***	-.37***	.76***	.58***	.68***	.38***	.89***	-			
(13) Physical neglect	.39***	.33***	.30***	-.47***	-.32***	-.47***	.78***	.67***	.56***	.62***	.81***	.45***	-		
(14) Sexual abuse	.10	.14*	.02	-.14*	-.18**	-.04	.40***	.24***	.24***	.19***	.23***	.17**	.23***	-	
(15) Total CD Symptoms[a]	.19**	.18**	.12*	-.11	-.07	-.12*	.19***	.16**	.19***	.10	.22***	.16**	.22***	.02	-
Mean	38.30	19.85	18.45	55.28	25.32	29.96	43.23	20.84	8.93	11.91	16.68	8.35	8.33	5.72	5.92
SD	13.41	9.03	7.45	15.17	10.16	8.14	15.12	8.71	4.44	5.47	6.68	4.37	3.46	2.38	2.78
Range	16-80	8-40	8-40	16-80	8-40	8-40	25-110	10-50	5-25	5-25	10-50	5-25	5-25	5-25	0-15

Note. [a] CD = Conduct Disorder; Zero order correlation between Callous-unemotional traits and Total CD Symptoms is moderate ($r = .40$, $p < .001$).

*$p < .05$, **$p \leq .01$, ***$p \leq .001$.

Table 2

Associations Between Singular Environmental Features and Callous-Unemotional Traits

Unadjusted and Adjusted for Number of Conduct Disorder Symptoms

	Callous-Unemotional traits	
	Unadjusted for Number of CD Symptoms	Adjusted For Number of CD Symptoms [a]
	β	β
Singular parenting features		
Total Harsh parenting	**.27*****	**.20*****
Harsh paternal parenting	**.20****	**.13***
Harsh maternal parenting	**.24*****	**.20*****
Total Warm parenting	**-.16****	**-.11***
Warm paternal parenting	**-.13***	-.11
Warm maternal parenting	**-.13***	-.08
Singular maltreatment features		
Maltreatment total	**.16***	.08
Emotional maltreatment	.12	.05
Emotional abuse	.11	.03
Emotional neglect	.10	.06
Physical maltreatment	**.20****	**.12***
Physical abuse	**.17****	.11
Physical neglect	**.17****	.09
Sexual abuse	.01	.00

Note. CD = conduct disorder; β = standardized beta; significant associations are in bold.

[a] Regression coefficients that express the association between parenting and maltreatment features and the number of CD symptoms (unadjusted and adjusted for callous-unemotional traits) can be retrieved from Supplementary Table 1.

p < .05, **p* ≤ .01, ***p* ≤ .001.

Table 3

Unadjusted and Adjusted Associations between Parenting Models & CU Traits

	CU traits	
	Unadjusted **for Number of Conduct Disorder** **Symptoms**	**Adjusted** **for Number of Conduct Disorder** **Symptoms**
	β	β
Model 1		
Total harsh parenting	**.25***	**.19**
Total warm parenting	-.04	-.03
Model 2		
Paternal harsh parenting	**.13***	.08
Maternal harsh parenting	**.20***	**.17**
Model 3		
Paternal warm parenting	-.10	-.09
Maternal warm parenting	-.09	-.05
Model 4		
Paternal harsh parenting	.10	.03
Maternal harsh parenting	**.22**	**.21**
Paternal warm parenting	-.08	-.10
Maternal warm parenting	.07	.07

Note. CU = Callous Unemotional; CD = Conduct Disorder; β = standardized beta; significant associations are in bold.

*p < .05, **p ≤ .01, ***p ≤ .001.

Table 4

Unadjusted and Adjusted Associations between Multiple Environmental Factors and

Callous-Unemotional Traits

	Callous-Unemotional Traits	
	Unadjusted for Number of Conduct Disorder Symptoms	Adjusted for number of Conduct Disorder Symptoms [a]
	β	B
Model 1		
Total Harsh parenting	**.26***	**.21***
Total Warm parenting	-.05	-.06
Total maltreatment	-.02	-.07
Model 2		
Total Harsh parenting	**.23**	**.20**
Total Warm parenting	-.07	-.08
Emotional maltreatment	-.14	-.14
Physical maltreatment	.14	.07
Sexual abuse	-.02	-.01
Model 3		
Harsh paternal parenting	.08	.03
Harsh maternal parenting	**.22**	**.22***
Warm paternal parenting	-.10	-.12
Warm maternal parenting	.03	-04
Emotional maltreatment	-.15	-.15
Physical maltreatment	.15	.08
Sexual abuse	-.02	-.01

Note. β =standardized beta; significant associations are in bold. Model 1 simultaneously includes three predictors, Model 2, five predictors and Model 3, seven predictors.
*p- < .05, **$p \leq .01$, ***$p \leq .001$.

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Table 5

Unadjusted and Adjusted Associations with Interaction Terms between Parenting, Total Maltreatment and Callous-Unemotional Traits

	Callous-Unemotional Traits	
	Unadjusted **Model for Number of Conduct** **Disorder Symptoms**	**Adjusted** **Model for Number of Conduct** **Disorder Symptoms**
	β	β
Model 1		
Total harsh parenting	.29***	.25***
Total maltreatment	.08	.03
Harsh total × total maltreatment	**-.19***	**-.18****
Model 2		
Paternal harsh parenting	.22**	.17*
Total maltreatment	.15*	.10
Harsh paternal × total maltreatment	**-.23***	**-.21****
Model 3		
Maternal harsh parenting	.26***	.25***
Total maltreatment	.09	.03
Harsh maternal ×- total maltreatment	**-.14***	**-.13****
Model 4		
Total warm parenting	-.11	-.11
Total maltreatment	.19*	.10
Warm total × total maltreatment	**.20****	**.16****
Model 5		
Paternal warm parenting	-.10	-.10
Total maltreatment	.19**	.10
Warm paternal × total maltreatment	**.21***	**.16****
Model 6		
Maternal warm parenting	-.10	-.09
Total maltreatment	.15*	.08
Warm maternal × total maltreatment	.12	.11

Note. β =standardized beta; significant associations are in bold.
*p < .05, **p ≤ .01, ***p ≤ .001.

Figure 1

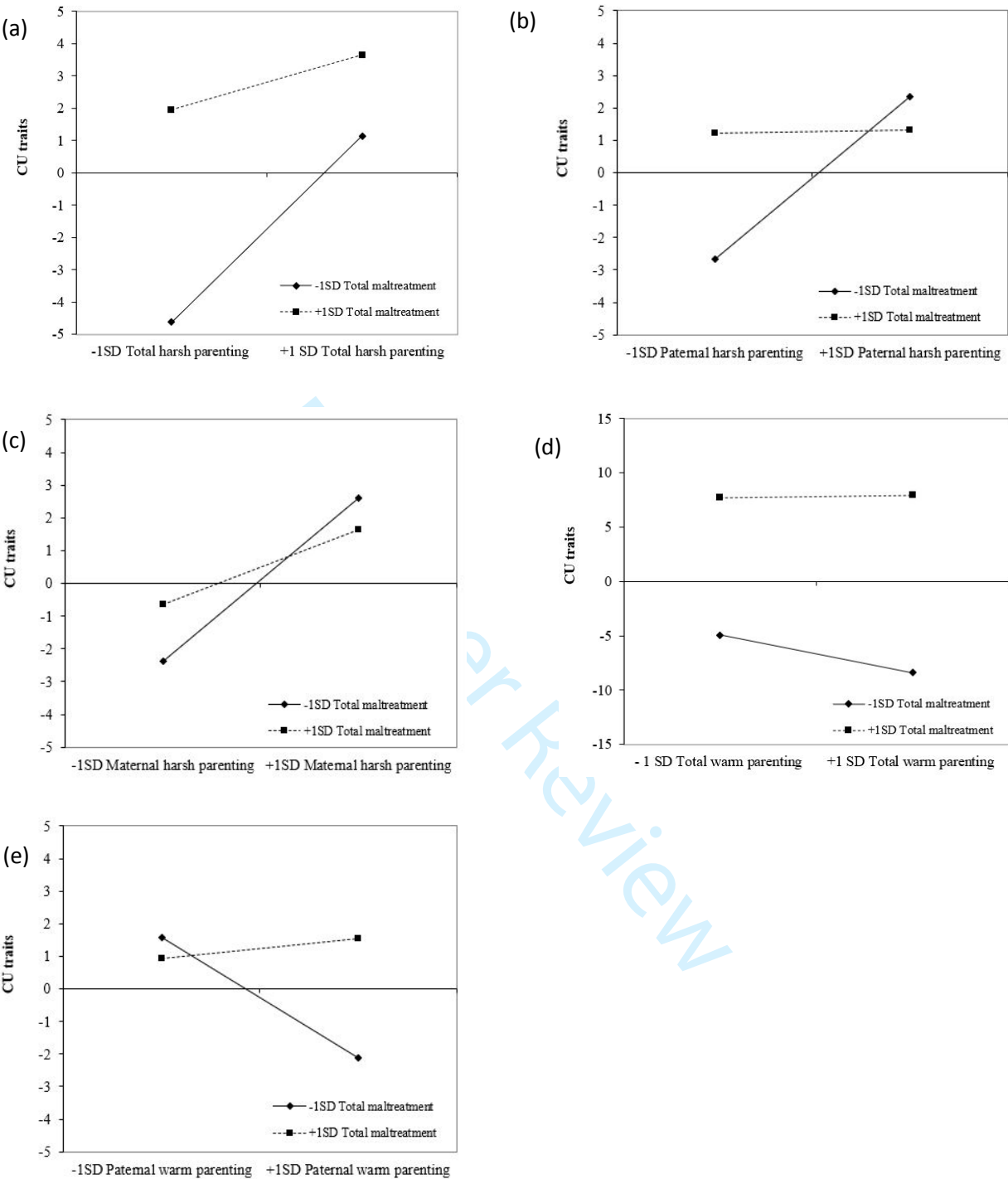Simple Slopes of the Associations between CU Traits and Parental Harshness and Warmth and between CU Traits and Maltreatment
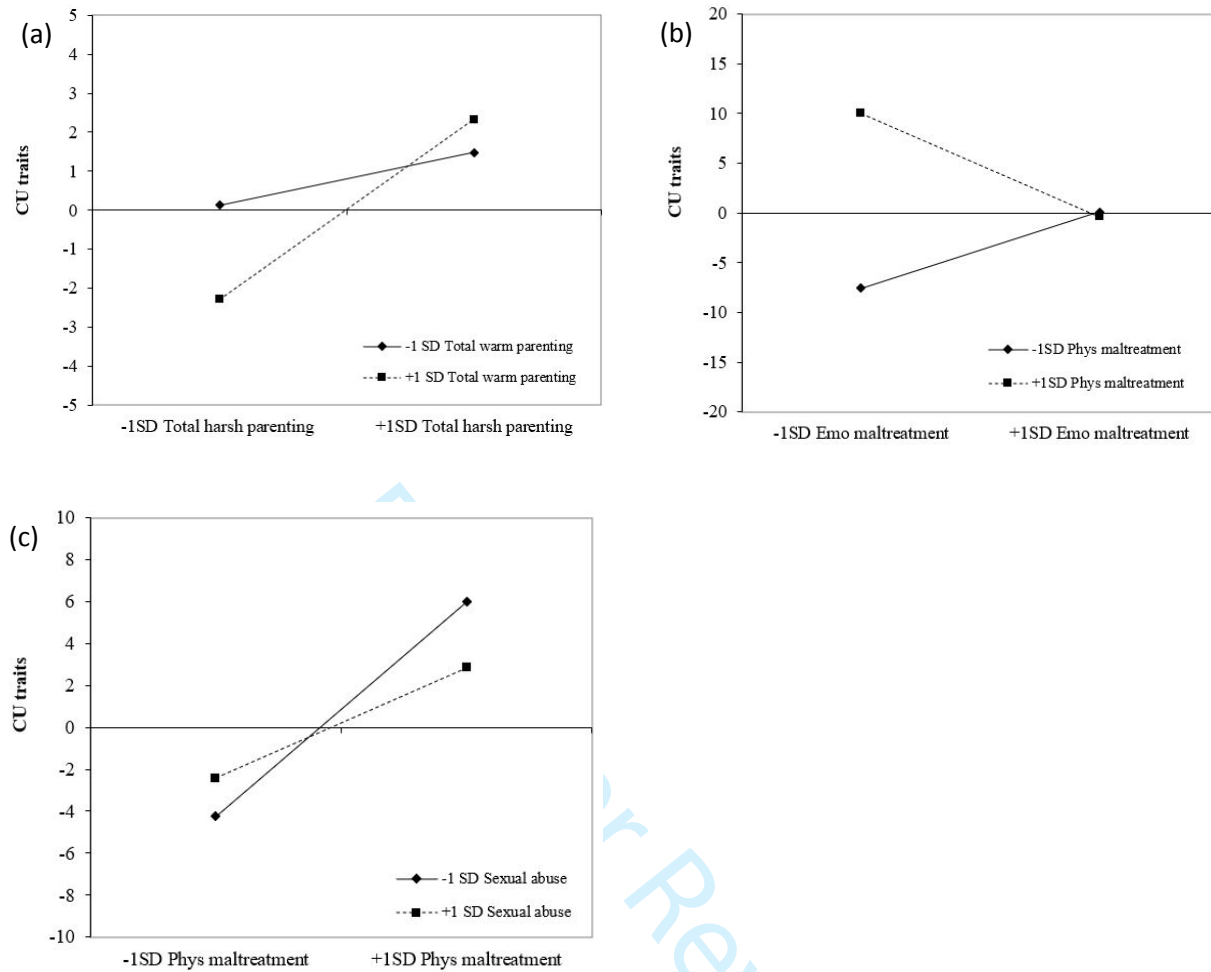
Note: Emo = Emotional; Phys = physical; CU = Callous Unemotional; SD = Standard Deviation

Figure 2

Simple slopes of the associations between CU traits and environmental factors

Note: CU = Callous Unemotional; SD = Standard Deviation

Supplement 1: Parenting Questionnaire and Confirmatory Factor Analysis

Table 1
Parenting Questionnaire Items with Sources

Item	Question
1	When you did something wrong, how often did your mother hit you, give you a slap or kick, or grab you? (original item is item 18 from the Parenting scale; Arnold et al., 1993)
2	When you refused to do what your mother wanted, how often did your mother hit you, give you a slap or kick, or grab you? (original item is item 6 from the Parenting Styles and Dimensions Questionnaire (PSDQ); Robinson et al., 2001)
3	My mother often criticizes me. (original item is item 1 from the Parent-Environment Questionnaire -Child Conflict Scale; Burt et al., 2003)
4	When you did something wrong, how often did your mother yell or curse at you? (original item is item 39 from the Alabama Parenting Questionnaire (APQ))(Frick, 1991)
5	When you refused to do what your mother wanted, how often did your mother yell or curse at you? (original item is item 13 from the PSDQ; Robinson et al., 2001)
6	How often did your mother explode in anger towards you? (original item is item 32 from the PSDQ; Robinson et al., 2001)
7	When you did something wrong, how often did your mother punish you by threatening you (without explaining what you did wrong)? (original item is item 54 from the PSDQ; Robinson et al., 2001)
8	When you did something wrong, how often did your mother punish you by taking away things from you? (original item is item 36 from the APQ; Frick, 1991)
9	When you're in trouble, could you tell this to your mother? (the original item has been reported in Barker et al, (2011) The impact of prenatal maternal risk, fearless temperament and early parenting on adolescent callous-unemotional traits: a 14-year longitudinal investigation. *J Child Psychol Psychiatry.*)
10	How often could you rely on your mother when you needed help (for example, with homework, a ride to sports club, etc.)? (original item is item 4 from the APQ; Frick, 1991)
11	How often did your mother comfort you when you were hurt or sad?

	(original item is item 9 from the PSDQ; Robinson et al., 2001)
12	How often did your mother give you a hug for no reason?
	(original item is item 35 from the PSDQ; Robinson et al., 2001)
13	How often did your mother show you with words or gestures (for example, a wink, smile, pat on the shoulder) that she loved you?
	(the original item has been reported in Barker et al, (2011) The impact of prenatal maternal risk, fearless temperament and early parenting on adolescent callous-unemotional traits: a 14-year longitudinal investigation. *J Child Psychol Psychiatry.*)
14	How often did your mother express her love for you with words?
	(the original item has been reported in Barker et al, (2011) The impact of prenatal maternal risk, fearless temperament and early parenting on adolescent callous-unemotional traits: a 14-year longitudinal investigation. *J Child Psychol Psychiatry.*)
15	I always felt loved by my mother – even when I didn't behave well.
	(original item is item 26 from the Parent-Child Relationship Schema Scale (PCRSS); Dixson et al., 2014)
16	How often did you do fun things together with your mother (for example, just talking with each other, visiting places, playing games together)?
	(original item is item 7 from the APQ; Frick, 1991)

Note: all 16 questions were repeated and adjusted for the father figure. Specific adjustments from original source can be obtained upon request.

Confirmatory Factor Analysis for Harsh and Warm Paternal and Maternal Parenting

Notwithstanding that the Mean Interitem Correlation (MIC) has been considered to be an appropriate statistic for gauging unidimensionality of an item pool, confirmatory factor analysis (CFA) is a more stringent examination of a scale's unidimensionality (e.g. Neumann et al., 2013). Therefore, we conducted CFA in Mplus 8 using the mean and variance adjusted weighted least squares (WLSMV) estimator appropriate for use with ordinal items (Flora & Curran, 2004). The indexes used to interpret model fit were the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), the comparative fit index (CFI), and the Tucker–Lewis index (TLI). The guidelines suggested by Hu and Bentler (1998) are that RMSEA and SRMR values close to .06 or below should be considered as good fit, .07–.08 as moderate fit, .08–.10 as marginal fit, and >.10 as poor fit. For the CFI and TLI,

values close to .95 or above indicate good fit, and values close to .90 and .95 indicate acceptable fit. Fit indices for a first-order factor model in which eight items loaded on harsh maternal parenting and eight items loaded on warm maternal parenting were: RMSEA = .09; SRMR = .05; CFI = .96; and TLI = .95. Factor loadings ranged from .44 to .94 (harsh maternal parenting) and from .57 to .91 (warm maternal parenting). When running the same first-order CFA model for the eight items that load on harsh paternal parenting and the eight items that load on warm paternal parenting, the fit indices were: RMSEA = .10; SRMR = .05; CFI = .98; and TLI = .97. Factor loadings ranged from .78 to .95 (harsh paternal parenting) and from .59 to .92 (warm paternal parenting). Thus, findings from CFA showed that the unidimensionality for harsh parenting and warm parenting scores, overall, was good to excellent.

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Supplement 2: Supplementary Tables

Supplementary Table 1

Unadjusted and Adjusted Associations between Singular Environmental Factors and Number of Conduct Disorder Symptoms

	Number of Conduct Disorder Symptoms
	Adjusted[a] for Callous-Unemotional Traits
	β
Singular parenting factors	
Total Harsh parenting	.08
Total Warm parenting	-.05
Harsh paternal parenting	.10
Harsh maternal parenting	.03
Warm paternal parenting	-.02
Warm maternal parenting	-.07
Singular maltreatment factors	
Maltreatment total	**.13***
Emotional maltreatment	**.12***
Emotional abuse	**.15****
Emotional neglect	.06
Physical maltreatment	**.15***
Physical abuse	.10
Physical neglect	**.15****
Sexual abuse	.02

Note. [a]: for Unadjusted Models, see Table 1; β = standardized beta; significant associations are in bold.
*$p < .05$, **$p \leq .01$, ***$p \leq .001$.

Supplementary Table 2

Unadjusted and Adjusted Associations between Multiple Environmental

Factors and Number of Conduct Disorder Symptoms

	Number of Conduct Disorder symptoms	
	Unadjusted for Callous-Unemotional Traits	**Adjusted for Callous-Unemotional Traits**
	β	β
Model 1		
Total Harsh parenting	.12	.02
Total Warm parenting	.03	.05
Total Maltreatment	.14	**.15***
Model 2		
Total Harsh parenting	.09	.01
Total Warm parenting	.02	.05
Emotional maltreatment	-.00	.05
Physical maltreatment	**.18***	.13
Sexual abuse	-.03	-.02
Model 3		
Harsh paternal parenting	.12	.09
Harsh maternal parenting	-.01	-.09
Warm paternal parenting	.05	09
Warm maternal parenting	-.04	-.05
Emotional maltreatment	-.00	.06
Physical maltreatment	.18	.12
Sexual abuse	-.03	-.02
Model 4		
Harsh paternal parenting	.11	.06
Harsh maternal parenting	.00	-.05
Warm paternal parenting	.04	-.09
Warm maternal parenting	-.03	.08
Emotional abuse	.08	.15
Emotional neglect	-.08	-.07
Physical abuse	.01	-.02
Physical neglect	**.19***	.13
Sexual abuse	-.04	-.03

Note. β = standardized beta; significant associations are in bold;
p < .05, ***p* ≤ .01, ****p* ≤ .001.

Supplementary Table 3

Unadjusted and Adjusted Associations between Environmental Factors and Number of Conduct Disorder Symptoms with Interaction Terms.

	Number of Conduct Disorder Symptoms	
	Unadjusted for Callous-Unemotional Traits	Adjusted for Callous-Unemotional Traits
	β	β
Model 1		
Total harsh parenting	.12	.00
maltreatment total	.14	.11
Harsh total × maltreatment total	-.03	.04
Model 2		
Paternal harsh parenting	.12	.04
maltreatment total	.16*	.10
Harsh × maltreatment total	-.05	.03
Model 3		
Maternal harsh parenting	.05	-.05
maltreatment total	.18*	.14*
Harsh × maltreatment total	-.02	.03
Model 4		
Total warm parenting	.00	.04
Maltreatment total	.24**	.17*
Warm total × maltreatment total	.10	.02
Model 5		
Paternal warm parenting	.01	.05
Maltreatment total	.24***	.17**
Warm × maltreatment total	.12	.04
Model 6		
Maternal warm parenting	-.03	.01
Maltreatment total	.19*	.13
Warm × maltreatment total	.03	-.01

Note. β = standardized beta; significant associations are in bold;

*$p < .05$, **$p \leq .01$, ***$p \leq .001$.

Supplementary Table 4

Unadjusted and Adjusted Associations between Environmental Factors, Interactions and Number of Conduct Disorder Symptoms and Callous-Unemotional Traits

	CU traits		Number of CD Symptoms	
	Unadjusted Model for Number of CD Symptoms	**Adjusted Model for Number of CD Symptoms**	**Unadjusted Model for CU traits**	**Adjusted Model for CU traits**
	β	β	β	β
Parenting models				
1 Total harsh parenting	.26***	.20**	.17*	.07
Total warm parenting	-.07	-.05	-.04	-.01
Total harsh × Total warm	**.15***	**.14***	.03	-.03
2 Harsh paternal parenting	.13*	.08	.14*	.09
Harsh maternal parenting	.20***	.18**	.06	-.01
Harsh paternal × harsh maternal	-.01	-.04	.08	.08
3 Warm paternal parenting	-.10	-.09	-.03	.01
Warm maternal parenting	-.11	-.06	-.12	-.08
Warm paternal × warm maternal	-.11	-.08	-.09	-.04
4 Harsh paternal parenting	.19**	.13*	.16**	.09
Warm maternal parenting	-.11	-.08	-.10	-.05
Harsh paternal × warm maternal	**.12***	.11	.05	-.00
5 Harsh maternal parenting	.23***	.19***	.12	.02
Warm paternal parenting	-.12*	-.10	-.05	-.01
Harsh maternal × warm paternal	.08	.09	-.01	-.05
Maltreatment models				
1 Emotional maltreatment	-.03	-.03	.01	.03
Physical maltreatment	.32***	.23**	.25***	.13
Emotional × physical maltreatment	-.17	**-.15***	-.07	-.01
2 Physical maltreatment	.31***	.21**	.27***	.15*
Sexual Abuse	-.03	-.02	-.03	-.02
Phys maltreatment × sexual abuse	**-.17***	**-.15***	-.07	-.00
3 Emotional maltreatment	.12*	.06	.16**	.11*
Sexual Abuse	-.02	.03	-.10	-.10
Emo maltreatment × sexual abuse	-01	-.06	.13	.14

Note. ΔR² was significant for the significant interaction terms; significant interactions are in bold; CTQ Emotional maltreatment of Emotional abuse and neglect scale; CTQ Physical maltreatment of Physical abuse and neglect; CU = Callous Unemotional; CD: conduct disorder; Emo = emotional; Phys = physical.

p < .05, **p* ≤ .01, ***p* ≤ .001.

Supplementary Table 5

Interaction Models between Parenting, Maltreatment and Number of Conduct Disorder Symptoms using Measured Callous-Unemotional Traits as Moderator.

	Number of Conduct Disorder Symptoms	
	β	ΔR2
Model 1		
Harsh total parenting	.13	
CU traits	.40*	
Harsh total × CU traits	-.06	.003
Model 2		
Warm total parenting	.29	
CU traits	.68***	
Warm total × CU traits	-.41	.003
Model 3		
Harsh paternal parenting	.10	
CU traits	.38***	
Harsh paternal × CU traits	.00	<.001
Model 4		
Harsh maternal parenting	.09	
CU traits	.43**	
Harsh maternal × CU traits	-.09	<.001
Model 5		
Warm paternal parenting	.22	
CU traits	.53**	
Warm paternal × CU traits	-.26	.004
Model 6		
Warm maternal parenting	.22	
CU traits	.65***	
Warm maternal × CU traits	-.37	.004

Note. CD = conduct disorder; CU = Callous Unemotional; significant interaction term are in bold.

*p < .05, **p ≤ .01, ***p ≤ .001.

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Supplementary Table 6

Interaction Models between Parenting, Maltreatment and number of Conduct Disorder Symptoms using Measured Callous-Unemotional Traits as Moderator.

	Number of Conduct Disorder Symptoms	
	β	ΔR2
Model 1		
CTQ Maltreatment total	.13*	
CU traits	.38***	
Total maltreatment × CU traits	.06	.003
Model 2		
CTQ Emotional maltreatment	.12*	
CU traits	.39***	
Emo maltreatment × CU traits	.02	.001
Model 3		
CTQ Physical maltreatment	.14*	
CU traits	.36***	
Phys maltreatment × CU traits	.08	.003
Model 4		
Emotional abuse	.15**	
CU traits	.38***	
Emotional abuse × CU traits	.01	<.001
Model 5		
Emotional neglect	.06	
CU traits	.40***	
Emotional neglect × CU traits	.03	<.001
Model 6		
Physical abuse	.10	
CU traits	.38***	
Physical abuse × CU traits	.07	.005
Model 7		
Physical neglect	.14*	
CU traits	.38***	
Physical neglect × CU traits	.06	.003
Model 8		
Sexual abuse	.01	
CU traits	.40***	
Sexual abuse × CU traits	.03	.001

Note. CTQ Maltreatment total is the sum of all 5 CTQ scales; CTQ Emotional maltreatment of Emotional abuse and neglect scale; CTQ Physical maltreatment of Physical abuse and neglect; CU = Callous Unemotional; CD: conduct disorder; significant interaction terms are in bold.

*p < .05, **p ≤ .01, ***p ≤ .001.

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