

Intergenerational Stability of Callous–Unemotional Traits

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Abstract This study investigated the stability of callous and unemotional (CU) traits across generations by assessing self-report assessments of psychopathy factors in parents and their relationship to children’s CU traits in a clinical sample: 223 boys (M age = 7.65) and 83 girls (M = 7.35) referred for treatment of disruptive behavior disorders. First, we expanded previous findings showing a positive relationship between maternal psychopathy scores and CU traits in boys. Second, we tested whether parental psychopathy scores predicted CU traits in children over and above general indicators of mental health risk: parental psychopathology, parental warmth, and harsh parenting. Fathers’ psychopathy factor 1 was uniquely related to CU traits. In contrast, the relationship between mothers’ psychopathy factor 2 and children’s CU traits disappeared when maternal warmth was included. Gender differences suggested these results are most applicable to boys. These findings support the intergenerational stability of psychopathy factor 1 between children and their fathers.

Keywords Callous and unemotional traits · Externalizing disorders · Psychopathy · Intergenerational transmission · Disruptive behaviour disorders

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Introduction

Callous and unemotional (CU) traits refer to a cluster of deficits including lack of empathy and concern for others, guilt, and emotionality. These traits can be measured from early childhood onwards and are thought to represent the developmental antecedents of adult psychopathy. Studies examining the emergence and stability of CU traits over time have found CU traits to be reliably assessed from 3 years of age onwards [1–3] and to remain stable throughout time [4–6]. These traits are important indicators of early pathways into aggressive, antisocial behavior, yet little is known about the stability of these traits across generations within families. Quantitative twin studies have shown CU traits to have a high heritability coefficient, 0.81 [7, 8], suggesting substantial genetic risk for the transmission of these traits. In light of this, we set out to study the stability of CU characteristics at the phenotypic or “trait” level, as this allows us to investigate two important questions: firstly, is risk conferred in equal measure by both parents; and secondly, is the presence of psychopathic features in parents a specific risk factor for the development of CU traits in the child, or can general risk factors—such as parental warmth or psychopathology—lead to the emergence of CU traits (as would be expected from the equifinality principle). Therefore, this study focused on the role of parents in the intergenerational stability of CU traits.

CU traits in children are defined by four intercorrelated features: (a) callous lack of empathy, (b) reduced feelings of guilt, (c) shallow affect, and (d) a lack of concern about their own performance [9, 10]. Notably, all of these features are derived from the adult psychopathy literature, under the umbrella of characteristics constituting Karpman’s [11, 12] psychopathy factor 1, associated with manipulative, callous and selfish individuals—generally associated with

genetic predisposition to these traits. Factor 2 scores were instead associated with exposure to adverse environments, such as violence, crime, abuse, and associating with deviant peers—this factor is more likely to represent emotionally disturbed individuals, showing some anxiety and impulsivity, who behave antisocially. The distinction between these two factors is featured in modern measures of psychopathy, such as Hare's Psychopathy Checklist-Revised (PCL-R) [13, 14], and Levenson's Self-Report Psychopathy Scale [15]. Throughout this paper the terms "factor 1" and "factor 2" are used in reference to the constructs derived from the PCL-R, LSPS, and related tools [16].

Improving our knowledge of the early development of CU traits is critical to progress in early identification and intervention for children showing early onset problems. While both genetic and psychological processes are known to influence early pathways, it is surprising that little research has looked at the stability of CU traits across generations of parents and children, particularly as other studies have associated parenting dimensions with prospective CU traits [17, 18]. Previous studies have suggested that the CU construct may even differ between age groups, for example studies using adolescents attributed around 42% of the variance in CU traits to genetic factors [19, 20], while studies in early childhood produced estimates as low as 25% [21]. Waller et al. [22] conducted a recent investigation on the heritability of fearlessness and affiliative behaviors in a sample of adopted children. They found that fearlessness and affiliative behaviors from biological mothers were significant predictors of the children's CU traits at 27 months. These influences were partly mitigated by high levels of positive parenting from adoptive mothers. Adoptive fathers' positive parenting did not mitigate the biological influences. As seen in the studies above, different parental traits can influence the development of CU traits, therefore, we sought to investigate whether psychopathy traits in parents would be particularly strong predictors of CU behaviors.

Two studies have looked at the intergenerational stability of either CU traits or psychopathy scores in isolation. Kahn et al. [23] used a community sample consisting of 115 parent-child dyads, in which most parents surveyed were mothers (87%). This study found that parent and adolescent CU scores were not significantly correlated. However, mediation modelling indicated parental CU traits were a significant predictor of adolescent CU traits [23]. These models also revealed that hostile parenting—under conditions of high household chaos—mediated the relationship between parental CU traits and adolescent CU traits. Auty et al. [24] similarly investigated the continuity of psychopathic traits, using 419 father-child dyads from a longitudinal study spanning two generations [24]. They found that paternal scores for both factor 1 and factor 2 were associated with their offspring's factor scores, such that high

factor 1 scores in fathers predicted high factor 1 scores in both sons and daughters. Importantly, the direct effect of the father's factor 1 scores on their male son's factor 1 scores was greater than the indirect effect (variables included in a mediation analysis did not account for a large part of the effect). This was not true for females, for whom their father's factor 1 scores exerted a stronger indirect effect (the mediation model including parental psychosocial risk-factors was stronger). These findings were reversed for factor 2 scores, such that the indirect effects were strongest for male offspring, while the direct effects were somewhat stronger for females. Taken together, these studies indicate that factor 1 scores are important for intergenerational stability of CU traits, albeit it is unclear whether this relationship would be maintained in the presence of psychosocial risk factors like harsh parenting or paternal drug use. These studies investigated either CU traits or psychopathy traits in isolation, but not the relationship between the two.

To our knowledge, only two studies to date have used measures of parental psychopathy as predictors of children's CU traits. Loney et al. [25] used a sample of children recruited from a school district (representative of the variability of conduct problems in the district) and their mothers to assess which maternal dimensions of psychopathy were predictive of the children's CU traits [25]. They found maternal psychopathy factor 1 to be significantly associated with the children's CU traits. However, this relationship was fully mediated by the mother's parenting behaviors (dysfunction and hostility), such that when parenting behaviors were taken into account the association between the mother's psychopathy factors and the child's CU traits ceased to be significant. Loney et al. [25] is an important initial examination of the transmission of these traits, however, it suffers from a relatively small sample size ($n=83$), which included fewer boys (38) than girls (45) and only evaluated maternal traits.

The second study, Hyde et al. [26] investigated the influence of biological and adoptive mothers on the development of CU behaviors [26]. Hyde et al. [26] used a sample of 561 families who formed part of a prospective adoption study, collecting data on both adoptive mother's positive parenting and biological mother's antisocial behaviors. This study produced two important findings: first, both the biological mothers' antisocial behaviors as well as the adoptive mothers' positive strategies were related to the child's CU behaviors. Secondly, the interaction between these was significant, such that biological mothers' antisocial behavior was predictive of CU behaviors only under conditions of low maternal positive parenting. Indeed, when the adoptive mothers' positive reinforcement strategies were high, biological mothers' antisocial behaviors were no longer predictive of CU traits. As with Loney et al.'s [25] study, Hyde et al. [26] only investigated maternal traits. In order to make stronger inferences a number of methodological issues must be considered.

First, the use of gender-specific samples [15–17] or gender-biased samples [23]—curtails our ability to draw gender-based inferences, which may be important in understanding the role of mediating factors. For example, Auty et al. [24] found differences depending on the gender of the children of psychopathic parents. Some studies have found females are less likely to express CU traits [27, 28], and males have a stronger association between genetic influences and CU traits [28]. Silverthorn and Frick [29] argue that females might have a delayed onset of antisocial behaviors due, in part, to a higher susceptibility to environmental (family) dysfunction [29]. Research investigating the relationship between eye-gaze deficits, fear recognition, and CU traits, found that fathers, but not mothers, showed a similar impairment to their high CU children [30]. It is also likely that family interactions are influenced by gender, as shown previously by Fredricks and Eccles [31] study on sport motivation [31], and McHale et al. regarding gender development [32]. Altogether, these differences suggest it is important to test for different pathways in male and female participants when seeking to understand the role of parental psychopathy in the development of CU traits.

Second, although the studies mentioned above applied mediation analyses [14–16], the variables included were not theoretically exhaustive, and captured only certain aspects of psychosocial risk (e.g. parenting dysfunction or drug use), while excluding others (e.g. warmth or mental health) known to be of interest. Warmth in particular appears to be important in the maintenance and development of CU traits [3, 33–37]. Maladaptive parenting practices or parental mental health, both of which are associated with the development of negative mental health outcomes, were not assessed in all studies assessing intergenerational stability of CU traits [38–40].

The aim of this study was to investigate intergenerational stability between parental psychopathy and children's CU traits. To do this, we analyzed associations between psychopathy scores in parents and levels of CU traits in children, for families attending a clinic for child behavior problems. This study tested three main hypotheses. First, we expected the presence of psychopathic features in parents to confer a general risk for their children's development of CU traits. Second, we expected that parental psychopathy will confer specific risk for child CU traits, and will not be merely an index of general risk. That is, we expect the parent's psychopathy scores to explain a significant amount of the variance in children's CU trait scores, over and above the three general risk factors mentioned above (parental psychopathology, warmth, and harsh parenting behaviors). Given previous findings it was expected that this relationship will be strongest for parents' psychopathy factor 1, and more so for fathers relative to mothers. Third, we expected these pathways to vary by gender, as the literature suggests

these groups differ in their etiological pathways [28, 29]. We expected the strongest association would be between fathers' psychopathy factor 1 and boys' CU traits.

Methods

Participants

The main inclusion criterion was referral to the Child Behavior Research Clinic at the University of New South Wales or Royal Far West child health center (Sydney, Australia), for disruptive behavior disorders. The CBRC specializes in the treatment of disruptive behavior disorders associated with a DSM-IV diagnosis of oppositional defiant disorder, conduct disorder, ADHD, or autism spectrum disorder (ASD) through parent-management training. All participating children were assessed using DSM-IV criteria [41], and children with significant ASD symptoms or children with a major neurological/physical illness or a developmental disability were excluded from the study. The clinical profile includes the following primary diagnoses: 42.0% (41.3% in boys, 42.7% in girls) conduct problems (oppositional-defiant disorder and/or conduct disorder), 19.5% ADHD (20.6% in boys and 18.3% in girls), and 2.2% anxiety or depression (3.2% in boys and 1.2% in girls), with the rest of the participants meeting partial but not full diagnoses. Additionally, another 15.1% of the sample had a secondary diagnosis of conduct problems (15.6% for boys and 14.6% for girls). The final sample had a total size of 306 children (223 boys, 83 girls), with an age range of 3–15yrs, and a mean age of $M = 7.65$ ($SD = 2.912$) for boys and $M = 7.35$ ($SD = 3.202$) for girls. Self-report questionnaires were collected from participating families (300 maternal responses; 226 paternal responses).

Measures

All measures were collected prior to the family's commencement of treatment. Note that all scores were standardized for the third and fourth parts of the analysis, as described in the analytic plan below.

Parental psychopathic traits were measured using Levenson's Self-Report Psychopathy Scale (LSRP; [15]), a 26-item measure scored on a 4-point scale ranging from "Disagree Strongly" to "Agree Strongly". Example items include: "I feel bad if my words or actions cause someone else to feel emotional pain" and "Love is overrated". This measure, meant for use in non-criminal populations, can be divided into psychopathy factors 1 and 2, the first scale consists of 16 items and the second of 10. Items 3, 9, 12, 14, 15, 19, and 22 were reversed scored and the mean score was calculated for each subscale. Cronbach's alpha for the general

scale in mothers was 0.85 (0.82 for the factor 1 subscale and 0.65 for the factor 2 subscale); in fathers, the general scale had a reliability of 0.84 (0.83 for the factor 1 subscale and 0.67 for the factor 2 subscale).

Parenting behaviors were measured using the short form of the Alabama Parenting Questionnaire, a 15-item questionnaire on a five-point endorsement scale ranging from “Never” to “Always” [42, 43]. An example item is: “You threaten to punish your child and then do not actually punish him/her”. The APQ has five-subcales: positive parenting, inconsistent discipline, parental supervision, parental involvement, and corporal punishment. Items from positive scales were reversed and all four scales were summed to form a general “negative parenting” factor, a procedure followed in similar studies [15]. The final scale was therefore composed of 15 items, and had a reliability of 0.72 for mothers and 0.72 for fathers.

Parental psychopathology was assessed using the Brief Symptom Inventory [44], a 53-item measure assessing three global indices of psychological distress: a Global Severity Index, Positive Symptom Distress Index, and Positive Symptom Total. For purposes of this study, only the Global Severity Index was calculated, which combines all 53 items into a single score. BSI items are rated on a five-point scale ranging from “Not at all” (1) to “Extremely” (5). Participants are also allowed to “Refuse to answer” to any of the question, which is scored as an 8. This general measure of psychopathology takes into account symptom dimensions such as: depression, anxiety, psychoticism, and somatization symptoms occurring during the past week. Example items include “Feeling easily annoyed or irritated”, “Feeling that most people cannot be trusted”, and “Feeling blue”. Reliability estimates (standardized Cronbach alphas) were 0.96 for both mothers ($n = 288$), and fathers ($n = 214$).

Parental warmth was assessed using the “Parental Feelings” questionnaire [45, 46], a seven-item measure graded on a five-point scale ranging from “Definitely True” to “Definitely Untrue”. Items include statements such as “I usually feel close to him/her”, and “Sometimes I feel very impatient with him/her”. The scale had a standardized Cronbach alpha of 0.77 for mothers and 0.80 for fathers.

Children’s CU traits were assessed by parent and teacher responses to the Antisocial Process Screening Device [9] CU subscale, the APSD is a 20-item measure graded on a 3-point scale ranging from “Not at all true” to “Definitely true”. Example items include: “Lies easily and skillfully” and “Feels bad or guilty when he/she does something wrong”. The APSD was previously used in Loney et al.’ study [25], which to our knowledge is the most similar investigation into inter-generational stability of CU traits. The APSD includes three subscales: narcissism, impulsivity, and CU traits, only the CU subscale was used in this study, which is comprised of the sum of 6 items. Reliability

estimates (standardized alphas) for each informant category of the CU subscale were: 0.61 for mothers, 0.60 for fathers, and 0.66 for teachers.

Analytic Plan

Given the study includes multiple-informants, sample size varied depending on the number of measures that had been completed by families. Missing-data analysis, included as Supplementary Materials, revealed no differences in DV scores between groups with/without missing data. Moreover, differences in household structure were not related to CU traits. Given there were three different CU measures for each child (mother-, father- and teacher-rated APSD CU scores) we conducted separate analyses for mothers and fathers. Differences between maternal and paternal demographic variables are presented below.

The analysis was carried out in three stages. First, we sought to replicate the findings of Loney et al. [25], indicating a positive relationship between factor 1 of the mother’s LSRP scale, and children’s CU traits (APSD). This was accomplished through partial correlations, controlling for age. These results were extended by the addition of paternal LSRP scores, as well as the inclusion of girls in the analysis. Second, we used four regression models to test hypothesis 1 and 2; whether parental psychopathy factors predicted children’s CU traits, and whether these variables continued to explain unique variance in CU scores over and above that explained by common psychopathological factors. This was achieved using blocked regression models, the first block of which tested the relationship between parental LSRP scores and CU traits (as rated by both parents), and the second of which included parenting behaviors, parental psychopathology, and warmth. Third, to test our third hypothesis we ran regression models which included only the significant predictors from the analysis above, in addition to interaction terms between gender and these predictors. To do this we standardized all main study variables (children’s CU traits, parental psychopathy factors 1 and 2, parental feelings (warmth), harsh parenting, and parental psychopathology), and recoded gender as ($-1 =$ boys, $1 =$ girls). To disentangle the interactions uncovered by the models described above we split the sample by gender and investigated whether the influence of parental psychopathy varied for boys as compared to girls.

Results

Table 1 presents descriptive statistics for the main variables, as well as statistical differences between mothers and fathers. There was only one statistically significant difference between boys and girls, with fathers reporting higher

Table 1 Descriptive statistics

	Mothers		Fathers		t
	Mean	SD	Mean	SD	
All children					
Parenting (APQ)	28.26	5.08	29.64	5.30	-3.60***
Psychopathology (BSI)	30.95	28.00	27.22	23.75	1.79
Feelings (PFQ)	22.51	4.65	20.12	5.36	5.75***
Factor 1 psychopathy (LSRP)	22.59	5.86	25.74	6.75	-6.28***
Factor 2 psychopathy (LSRP)	18.69	4.48	19.13	5.18	-1.04
CU Traits (APSD)	5.29	2.20	5.25	2.19	0.31
Age	7.57	2.99			
Boys					
Parenting (APQ)	28.33	5.26	29.92	5.31	-3.51***
Psychopathology (BSI)	34.31	29.93	29.64	26.55	1.28
Feelings (PFQ)	22.07	4.62	20.49	5.25	3.59***
Factor 1 psychopathy (LSRP)	22.87	5.87	26.04	7.00	-5.48***
Factor 2 psychopathy (LSRP)	19.14	4.45	19.76	6.15	-1.18
CU Traits (APSD)	5.20	2.18	5.33	2.15	-0.20
Age	7.65	2.91			
Girls					
Parenting (APQ)	28.09	4.63	28.96	5.24	-1.19
Psychopathology (BSI)	29.12	26.36	22.85	19.04	1.31
Feelings (PFQ)	22.87	4.80	19.45	5.55	4.75***
Factor 1 psychopathy (LSRP)	23.56	6.50	25.08	5.72	-3.18**
Factor 2 psychopathy (LSRP)	18.56	4.04	18.07	4.13	0.04
CU traits (APSD)	5.17	2.26	5.03	2.29	0.39
Age	7.35	3.20			

Mean and standard deviations with results from paired sample t-tests comparing Mother and Father variables in the adjacent column

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

factor 2 psychopathy among boys [$M_{\text{boys}} = 19.76$, $M_{\text{girls}} = 18.07$, $t(225) = 2.014$, $p = .034$].

Part 1. Relationship Between Psychopathy Scores in Parents and CU Traits in Children

Our attempt to replicate Loney et al.' [25] results suggesting a positive relationship between maternal LSRP scores and children's CU traits (as determined by the mother's APSD ratings) was successful in a combined sample including both boys and girls ($n = 220$). Their mother's LSRP total score was positively related to maternal reports of CU traits in the child ($r = .18$, $p = .018$). This relationship was significant for both factor 1 ($r = .15$, $p = .025$) and factor 2 ($r = .15$, $p = .026$) scales of the LSRP.

These analyses were then performed substituting maternal APSD ratings of CU traits for those of the child's father and teacher. This was not replicated for the father's ratings of CU traits and the mother's total LSRP score ($n = 220$, $r = .10$, $p = .135$), or either factor (1: $r = .07$, $p = .308$; 2: $r = .09$, $p = .206$). Similarly, there was no significant relationship between maternal LSRP and teacher-reported CU traits ($n = 228$), for neither the full scale or factors 1 ($r = .05$, $p = .488$), and 2 ($r = .09$, $p = .199$).

We then extended Loney's [25] analysis by investigating the relationship between fathers' LSRP scores and children's CU traits (as determined by the father's APSD ratings). This relationship was not significant for the total scale ($n = 221$, $r = .12$, $p = .077$), or factor 2 scores ($r = .05$, $p = .438$), but was significant for factor 1 ($r = .14$, $p = .037$). When substituting father's ratings of CU traits for those of mothers and teachers the father's factor 1 of the LSRP had a significant positive relationship with maternal reports of CU traits ($n = 219$, $r = .18$, $p = .006$). This relationship was not significant for factor 2 ($r = .003$, $p = .961$). The father's factor 1 ($r = .09$, $p = .222$) and factor 2 ($r = -.03$, $p = .719$) scales were not related to teacher reports ($n = 184$) of CU traits. The results of these analyses are displayed in Table 2 below.

Part 2. Specificity of Psychopathy Factors as Predictors of CU Traits

Our second hypothesis was concerned with whether parental LSRP scales continued to predict unique variance in children's CU traits beyond the influence of other risk variables. Blocked regression models using CU traits (APSD) as the dependent variable (DV) and age, negative parenting (APQ), warmth (parental negative feelings; PFQ), parental psychopathology (BSI), and parental psychopathy (LSRP) as the independent variables (IVs) resulted in a total of four models: using either maternal or paternal variables (APQ, PFQ, BSI) as the IVs, and either father or mother ratings of CU traits as the DVs. Table 3 displays results pertaining to models using parental variables (warmth, harsh parenting, and parental psychopathology) as predictors.

Mother Variables as Predictors

The first two models used the mother's psychopathy factors to predict maternal ratings of CU traits ($n = 296$); as well as paternal ratings of CU traits ($n = 220$). The full results of these models can be seen in the top half of Table 3. In the first block the mother's psychopathy factor 2 was a significant predictor of CU traits ($B = 0.15$, $SE = 0.03$, $p = .025$), but only when using the mother's CU ratings as the DV. The second block included the mother's warmth (negative feelings), harsh parenting, psychopathology, and age. After the inclusion of these variables only the mother's warmth was

Table 2 Partial correlations between main study variables, controlling for age

Measure	1	2	3	4	5	6	7	8	9
1. Mother-rated CU traits	–								
2. Father-rated CU traits	.45***	–							
3. Teacher-rated CU traits	.31***	.10	–						
4. Mother's factor 1 psychopathy	.15*	.07	.05	–					
5. Mother's factor 2 psychopathy	.15*	.09	.09	.54***	–				
6. Father's factor 1 psychopathy	.18**	.14*	.09	.31***	.17*	–			
7. Father's factor 2 psychopathy	.003	.05	–.03	.07	.15*	.43***	–		
8. Mother's APQ	.17*	.15*	–.04	.24***	.22***	.15*	.09	–	
9. Father's APQ	.14	.04	.12	.19**	.12	.32***	.20**	.34***	–

Bold items indicate significance

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

a significant predictors of CU traits ($B = 0.25$, $SE = 0.03$, $p < .001$). As before, this occurred only when using mother-rated CU traits, and not when using father-rated CU traits.

Father Variables as Predictors

We then repeated the blocked design using the fathers' variables to predict CU traits as rated by mothers ($n = 296$) and fathers ($n = 221$). The full results of these models can be seen in the lower half of Table 3. In the first block the father's psychopathy factor 1 significantly predicted CU ratings made by both mothers ($B = 0.25$, $SE = 0.02$, $p < .001$) and fathers ($B = 0.15$, $SE = 0.02$, $p = .046$). The other paternal variables were then added in the second block. The father's psychopathy factor 1 remained a significant predictor of both mother ($B = 0.24$, $SE = 0.02$, $p = .002$) and father ($B = 0.15$, $SE = 0.02$, $p = .041$) ratings of CU traits. Additionally, the father's warmth (negative feelings) was a significant predictor of father-rated CU traits ($B = 0.25$, $SE = 0.03$, $p = .001$), but not mother-rated CU traits. Fathers' factor 2 psychopathy was a significant predictor of mother, but not father, rated CU traits ($B = -0.18$, $SE = 0.03$, $p = .037$).

Part 3. Testing Gender Effects on the Main Predictors of CU Traits

Our third hypotheses postulated different pathways to the development of CU traits in boys and girls. In order to test this hypothesis we used a second group of models including only the significant predictors from the second phase of the analysis, as well as interactions between these and gender, displayed in Table 4. These models used different variables for mothers and fathers, as per the results above. Maternal variables included factor 2 psychopathy and warmth, with gender and the interaction of factor 2 psychopathy and warmth with gender entered as a second block. Paternal variables included both factor 1 and 2, as well as warmth;

as before, gender, and the interaction of all variables with gender, were entered as a second block (Table 4).

Mother Variables as Predictors

Maternal factor 2 psychopathy and warmth (negative feelings) were both strong predictors of mother-rated CU traits, with only warmth reaching significance (warmth: $B = 0.24$, $SE = 0.06$, $p < .001$; factor 2: $B = 0.10$, $SE = 0.06$, $p = .074$). These associations were not replicated when using father-rated CU traits. In the second block, the interaction between factor 2 and gender was strongly associated with mother-rated CU traits ($B = -0.13$, $SE = 0.07$, $p = .056$), as was maternal warmth ($B = 0.21$, $SE = 0.06$, $p = .001$). In contrast, the mother's factor 2 psychopathy was no longer predictive of CU traits. These associations were not replicated in father-rated CU traits.

Father Variables as Predictors

Paternal factor 1 psychopathy and warmth were both strong predictors of both mother-rated CU traits (factor 1: $B = 0.21$, $SE = 0.07$, $p = .004$; warmth: $B = 0.14$, $SE = 0.07$, $p = .047$) and father-rated CU traits (factor 1: $B = 0.14$, $SE = 0.07$, $p = .057$, which trended in the same direction, but was not significant; and warmth: $B = 0.27$, $SE = 0.07$, $p < .001$). After the inclusion of gender interactions factor 1 was no longer associated with neither mother- nor father-rated CU traits. In contrast, warmth was significant across both parents. The interaction between factor 1 and gender was significant in predicting father-rated CU traits ($B = -0.19$, $SE = 0.09$, $p = .046$).

Disentangling Gender Effects

To investigate these effects we split the sample by gender and used a regression model with a single predictor (Table 5). In mothers, the interaction between factor 2 psychopathy and

Table 3 Blocked regression models predicting mother- and father-rated CU traits using parental variables

	Mother-rated CU traits			Father-rated CU traits		
	B (std. error)	t	p	B (std. error)	t	p
Mother variables						
1						
Constant	–	5.91	<.001	–	6.29	<.001
Factor 1 psychopathy	0.02 (0.02)	0.28	.777	0.03 (0.03)	0.33	.738
Factor 2 psychopathy	0.15 (0.03)	2.26	.025	0.08 (0.04)	1.01	.313
2						
Constant	–	1.38	.168	–	2.43	.016
Factor 1 psychopathy	0.07 (0.02)	1.00	.316	0.02 (0.03)	0.29	.772
Factor 2 psychopathy	0.07 (0.04)	0.88	.382	0.02 (0.04)	0.17	.863
Negative parenting	0.01 (0.03)	0.10	.921	0.11 (0.03)	1.49	.137
Warmth (negative feelings)	0.25 (0.03)	3.99	<.001	0.02 (0.04)	0.30	.766
Psychopathology	0.00 (0.01)	–0.01	.995	0.06 (0.01)	0.72	.475
Age (years)	0.02 (0.04)	0.35	.730	0.09 (0.05)	1.34	.183
Father variables						
1						
Constant	–	6.19	<.001	–	6.28	<.001
Factor 1 psychopathy	0.25 (0.02)	3.41	.001	0.15 (0.02)	2.01	.046
Factor 2 psychopathy	–0.10 (0.03)	–1.38	.170	–0.01 (0.03)	–0.07	.943
2						
Constant	–	2.98	<.001	–	2.76	.006
Factor 1 psychopathy	0.24 (0.02)	3.14	.002	0.15 (0.02)	2.06	.041
Factor 2 psychopathy	–0.18 (0.03)	–2.10	.037	–0.13 (0.03)	–1.61	.109
Negative parenting	0.05 (0.03)	0.63	.533	–0.02 (0.02)	–0.33	.741
Warmth (negative feelings)	0.11 (0.03)	1.44	.152	0.25 (0.03)	3.36	.001
Psychopathology	0.08 (0.01)	1.07	.287	0.11 (0.01)	1.48	.141
Age (years)	0.01 (0.05)	0.11	.910	0.06 (0.05)	0.85	.399

DV: Mother-rated CU traits: Both models using mother variables were significant [Model 1: $F(2,294)=3.90$, $p=.021$, $Adj R^2=0.019$; Model 2: $F(6, 290)=4.45$, $p<.001$, $Adj R^2=0.065$]. Models using father variables were significant [Model 1: $F(2,216)=5.83$, $p=.003$, $Adj R^2=0.042$; Model 2: $F(6, 212)=2.85$, $p=.011$, $Adj R^2=0.049$]

DV: Father-rated CU traits. Neither model using mother variables was significant [Model 1: $F(2,218)=1.01$, $p=.367$, $Adj R^2=0.00$; Model 2: $F(6, 214)=1.45$, $p=.196$, $Adj R^2=0.012$]. The second model using father variables was significant [Model 1: $F(2,219)=2.36$, $p=.097$, $Adj R^2=0.012$; Model 2: $F(6, 215)=4.04$, $p=.001$, $Adj R^2=0.076$]

B are standardized coefficients. All variables (psychopathy, negative parenting, negative feelings, and psychopathology) relate to the mother in the first half of the table, and to the father on the second half

Bold items indicate statistical significance ($p < .05$)

gender was associated with CU traits, therefore we examined the role of factor 2 psychopathy separately for boys and girls. In boys, factor 2 psychopathy was significantly associated with mother-ratings of CU traits ($n=218$, $B=0.23$, $SE=0.06$, $p=.001$) and marginally associated with father-ratings of CU traits ($n=158$, $B=0.15$, $SE=0.07$, $p=.062$). In neither model was factor 2 psychopathy associated with girls' CU ratings, albeit their sample size was smaller ($n=81$, $n=63$).

In fathers, the interaction between factor 1 psychopathy and gender was associated with CU traits. For boys, psychopathy factor 1 was significantly associated with both mother-ratings of CU traits ($n=158$, $B=0.27$, $SE=0.07$,

$p=.001$) and father-ratings of CU traits ($n=160$, $B=0.23$, $SE=0.07$, $p=.003$). As before, neither of these relationships was replicated across the smaller sample of girls ($n=62$).

Discussion

We tested intergenerational associations between psychopathy factors in parents and CU traits in their children, first by looking at correlations, then whether these associations survived competing explanations (risk variables). The first hypothesis, that the presence of psychopathic traits in parents

Table 4 Regression models testing gender interactions with standardized variables

	Mother-rated CU traits			Father-rated CU traits		
	B (std. error)	t	p	B (std. error)	t	p
Mother variables						
1						
Constant	–	–0.27	.789	–	0.30	.761
Factor 2 psychopathy	0.10 (0.06)	1.79	.074	0.08 (0.07)	1.13	.259
Warmth (negative feelings)	0.24 (0.06)	4.18	< .001	0.05 (0.07)	0.78	.439
2						
Constant	–	–0.57	.567	–	–0.38	.702
Factor 2 psychopathy	0.03 (0.07)	0.43	.669	0.01 (0.08)	0.16	.871
Warmth (negative feelings)	0.21 (0.06)	3.33	.001	0.05 (0.08)	0.64	.522
Gender	–0.04 (0.06)	–0.64	.525	–0.08 (0.08)	–1.19	.236
Factor 2 × gender	–0.13 (0.07)	–1.92	.056	–0.11 (0.08)	–1.32	.190
Warmth × gender	–0.06 (0.06)	–0.96	.339	–0.01 (0.08)	–0.17	.868
Father variables						
1						
Constant	–	0.48	.630	–	–0.48	.629
Factor 1 psychopathy	0.21 (0.07)	2.94	.004	0.14 (0.07)	1.91	.057
Factor 2 psychopathy	–0.12 (0.07)	–1.65	.101	–0.08 (0.07)	–1.11	.268
Warmth (negative feelings)	0.14 (0.07)	2.00	.047	0.27 (0.07)	4.06	< .001
2						
Constant	–	0.09	.932	–	–1.02	.311
Factor 1 psychopathy	0.12 (0.10)	1.27	.204	0.02 (0.09)	0.22	.823
Factor 2 psychopathy	–0.14 (0.11)	–1.29	.199	–0.09 (0.11)	–0.80	.422
Warmth (negative feelings)	0.15 (0.07)	1.97	.050	0.27 (0.07)	3.82	< .001
Gender	–0.03 (0.08)	–0.41	.680	–0.06 (0.07)	–0.96	.339
Factor 1 × gender	–0.15 (0.10)	–1.56	.120	–0.19 (0.09)	–2.01	.046
Factor 2 × gender	–0.04 (0.11)	–0.33	.740	–0.01 (0.11)	–0.09	.931
Warmth × gender	0.02 (0.08)	0.27	.789	–0.00 (0.07)	–0.04	.971

DV: Mother-rated CU traits: Both models using mother variables were significant [Model 1: $F(2,295)=12.82, p<.001, \text{Adj } R^2=0.074$; Model 2: $F(5, 292)=6.27, p<.001, \text{Adj } R^2=0.082$]. Models using father variables were significant [Model 1: $F(3,218)=4.38, p=.005, \text{Adj } R^2=0.044$; Model 2: $F(7, 214)=2.49, p=.018, \text{Adj } R^2=0.045$]

DV: Father-rated CU traits. Neither model using mother variables was significant [Model 1: $F(2,219)=1.26, p=.287, \text{Adj } R^2=0.002$; Model 2: $F(5, 216)=1.09, p=.368, \text{Adj } R^2=0.002$]. Both models using father variables were significant [Model 1: $F(3,220)=7.13, p<.001, \text{Adj } R^2=0.076$; Model 2: $F(7, 216)=4.02, p<.001, \text{Adj } R^2=0.087$]

B are standardized coefficients. All variables (Psychopathy, and Negative Feelings) relate to the mother in the first half of the table, and to the father on the second half

Bold items indicate statistical significance ($p < .05$)

was associated with CU traits in children was confirmed, as the presence of psychopathic features in parents was associated with children's CU traits. In our sample both maternal psychopathy factors (1 and 2), as well as fathers' factor 1, were associated with CU traits as rated by the mother. Our results therefore agree with Loney et al. [25], who found an association between maternal factor 1 psychopathy and children's CU traits. Moreover, the association between the fathers' factor 1 scores and children's CU traits was replicated when using father-rated CU traits as the dependent variable. Neither relationship was able to be replicated when

using teacher-reported CU traits, which had a lower correlation with parental scores, as displayed in Table 2.

These findings are broadly consistent with those of Loney et al. [25] and Hyde et al. [26], who found maternal psychopathy to be associated with CU traits, and this relationship to be mediated by parenting. Loney et al. [25] found a relationship between mothers' psychopathy factor 1 and CU traits in a mixed-gender sample of children. We replicated this relationship in the combined sample for both maternal psychopathy factors, albeit only when mothers themselves rated children's CU traits. Unlike these studies [25, 26], our

Table 5 Investigating gender interactions by investigating boys and girls separately

		Mother-rated CU traits			FATHER-RATED CU TRAITS		
		B (std. error)	t	p	B (std. error)	t	p
Mother							
Factor 2 × gender							
Boys	Constant	–	–0.06	.951	–	0.82	.415
	Factor 2 Psychopathy	0.23 (0.06)	3.51	.001	0.15 (0.07)	1.88	.062
Girls	Constant	–	–0.12	.905	–	–0.76	.452
	Factor 2 Psychopathy	–0.06 (0.12)	–0.49	.625	–0.07 (0.14)	–0.56	.576
Father							
Factor 1 × gender							
Boys	Constant	–	0.49	.628	–	0.12	.903
	Factor 1 Psychopathy	0.27 (0.07)	3.53	.001	0.23 (0.07)	2.98	.003
Girls	Constant	–	–0.11	.915	–	–1.22	.228
	Factor 1 psychopathy	–0.07 (0.16)	–0.51	.612	–0.13 (0.15)	–1.04	.302

Mother Factor 2 × gender: When using mother-rated CU traits as the DV, Factor 2 was significant only for boys [Model 1: $F(1,217)=12.30$, $p=.001$, $Adj R^2=0.049$; Model 2: $F(1, 80)=0.24$, $p=.625$, $Adj R^2=0.003$]. When using father-rated CU traits as the DV, Factor 2 trended towards significance for boys, but not girls [Model 1: $F(1,157)=3.54$, $p=.062$, $Adj R^2=0.016$; Model 2: $F(1, 62)=0.32$, $p=.576$, $Adj R^2=-0.011$]

Father Factor 1 × gender: When using mother-rated CU traits as the DV, Factor 1 was significant only for boys [Model 1: $F(1,157)=12.45$, $p=.001$, $Adj R^2=0.068$; Model 2: $F(1, 61)=0.26$, $p=.612$, $Adj R^2=-0.012$]. When using father-rated CU traits as the DV, Factor 1 was significant only for boys [Model 1: $F(1,159)=8.88$, $p=.003$, $Adj R^2=0.047$; Model 2: $F(1, 61)=1.08$, $p=.302$, $Adj R^2=0.001$]

B are standardized coefficients. Factor 2 Psychopathy refers to the mother's scores, whereas Factor 1 scores refer to the father's scores. Note that only these interactions were tested as these came up as significant in the analysis demonstrated in Table 4

Bold items indicate statistical significance ($p < .05$)

results also suggested an important association between paternal psychopathy scores and their children's CU traits, as the relationship between the fathers' factor 1 score and CU traits was replicated across informants.

Next, we sought to investigate whether these associations conferred specific risk for CU traits, or whether they indexed general risk, in the same way other risk factors might be expected to. This relationship was tested with blocked regression models: first, by analyzing whether parental psychopathy factors were significant predictors of CU traits, and later whether these effects remained after the inclusion of other risk variables (warmth, harsh parenting, and general parental psychopathology). The first part of this analysis showed that both the father's factor 1 and the mother's factor 2 significantly predicted CU traits, albeit the mother's factors 2 only predicted CU traits as rated by the mother, and not the father. In contrast, the father's factor 1 predicted CU traits as indexed by both mother and father reports.

We then included other parental risk variables in the regression model, which had different effects for each parent. For mothers, the effect of factor 2 scores on CU traits in children disappeared, and maternal warmth became the main predictor of CU traits. Father's psychopathy factor 1 remained a significant predictor of CU traits in children for both mother and father-reported CU traits. Two other

variables significantly predicted CU traits, albeit not across both parents. The father's warmth predicted father-rated CU traits (but not mother-ratings), in a relationship that mirrored that of the mother. That is, when the warmth and CU traits were rated by the same parent, warmth appeared to be a significant predictor of CU traits. The father's psychopathy factor 1 score was significantly associated with mother-rated CU traits.

Overall, our results suggest important roles for parental warmth (across both parents) in the prediction of CU traits; as well as parent-specific associations between psychopathy factors and CU traits. In mothers, only the mother's secondary factor was significantly associated with CU traits in our regression models, and this relationship disappeared when including other parenting components (notably warmth). This is consistent with the notion that maternal warmth mediates the relationship between the mother's psychopathic behaviors and the emergence of CU traits in children. Loney et al. [25] had reported a similar mediation in which the mother's harsh parenting mediated the relationship between her psychopathic traits and the child's CU. In this study we did not find the mother's harsh parenting to be a significant predictor of CU traits, but rather her warmth. However, it is important to note that mediation was not directly tested in this paper as all variables were collected at the same point in

time. Factor 2 scores, similar to that of Hare's PCL-R [47], capture current antisocial behavior rather than childhood conduct problems preceding psychopathy [48]. In this sense, it is not surprising that there is some overlap between factor 2 scores and harsh parenting (measured with the APQ), as both capture some impulsivity and negativity in the parent. Like Loney et al. [25], we found other maternal risk factors better accounted for the relationship between psychopathy factor 2 and mother-rated CU traits, suggesting future studies should investigate a mediation between these variables. It is possible that positive parental feelings protect children from experiencing their mother's maladaptive behavior; likewise, negative parental feelings may exacerbate harsh parenting and expose the child to behaviors consistent with an antisocial presentation. This association is supported by prior literature describing the effects of stress on parenting [49, 50], which suggests that heightened stress may lead to increasingly maladjusted parenting practices [51]. Therefore, it is sensible to suggest that while the mother's behavior is likely to be associated with the emergence of CU traits, this behavior may not necessarily be limited to "psychopathic" behavior, and indeed looking towards other domains such as warmth is likely to yield promising results [34].

In fathers, there was a strong relationship between psychopathy factor 1 scores and children's CU traits across informants, which remained significant after the inclusion of other risk variables. A similar relationship had previously been reported in adult men with regards to psychopathy profiles, and not CU traits [24]. However Auty et al. [24] found the father's factor 2 scores to be the most reliable indicator of a psychopathic profile, whereas this relationship was only replicated when using mother-rated CU traits (and after accounting for other variables) in our analysis. Rather, our findings suggest fathers' factor 1 scores are the strongest predictor of children's CU traits. This supports the notion that there are shared characteristics between fathers and their children which are not shared by the mother. Previous findings in naturalistic settings had found that fathers, but not mothers, of children with CU traits showed similar impairments in the amount of eye-contact they made with their children [30]. Likewise, the amount of eye-contact made by CU children during an "expression of love" task was found to be related to the father's levels of psychopathy, but not the mothers [52].

Lastly, we tested for gender-effects with a third set of models, including interactions between significant predictors and gender (for mothers: factor 2 psychopathy and warmth; for fathers: both factors and warmth). Two interactions between gender and parenting variables approached significance: the mother's factor 2 psychopathy score and the father's factor 1 psychopathy score. We decided to investigate these two interactions further by splitting the sample by gender and looking at these effects

separately for boys and girls. As displayed in Table 4., the mothers' factor 2 scores were associated with CU traits in boys (but not girls) across both mother- and father-rated CU traits. Similarly, the fathers' factor 1 scores were associated with boys (but not girls) across both mother- and father-rated CU traits. The replication of findings across informants is indicative of a robust relationship between parental psychopathy factors and boys' CU traits; however, as noted below, the lower sample size in girls limits our ability to draw strong inferences from their results.

Gender-specific investigations regarding the development of antisocial behavior suggest different presentations between males and females [29]. Unlike Loney et al. [25] and Hyde et al. [26] we were not able to replicate the associations between parental psychopathy and CU traits in girls. Auty et al. [24], who was able to find an association between the father's psychopathy and adult female's CU traits, also found that it was the indirect effects of the father's psychopathy which were most important in this prediction. This could suggest a greater role for environmental variables in girls' development of CU traits. For example, our findings show that parental warmth significantly predicted CU traits, (and showed no gender effects) although this association was not the focus of the current study. Instead, our results support a relationship between boys and their fathers' factor 1 psychopathy—suggesting constitutional similarities—alongside the influence of parenting variables such as warmth. This raises the prospect that boys in particular may carry familial risk associated with their fathers' phenotypic characteristics.

As noted above, there was a substantially smaller number of girls and therefore less power in these analyses. However, note that their standardized beta coefficients do not follow the same direction as those in boys, so it is unclear whether a larger sample would have resulted in the same results across genders. Another possible explanation for the gender differences could be due to the variance of CU scores. However, we found no significant gender differences in the variance of CU ratings for any specific rater. Although we believe these gender differences to be important, as all significant associations with parental psychopathy factors were driven by boys, do note that mixed-gender models found these relationships to be significant.

This study is subject to several limitations. We used cross-sectional data and all variables were assessed through self-reports. An attempt to mitigate this was carried out by using multiple informants, yet interpreting the differences between these informants can be challenging (they might reflect real differences, just as they might reflect a disparity of attribution or perception). The use of multiple informants is an important strength of the current study, as it provides a better understanding of (in)consistent behavior across varying contexts.

This study sought to replicate and expand the findings of previous studies which had found some evidence for intergenerational stability between CU traits in mothers and their children [25]. As well as related studies showing similar signs of stability [14, 15, 17]. This study expanded this previous attempt by using children and parents of both genders, and analyzing the influence of common risk variables and child gender. The findings of Loney et al. [25] were replicated in maternal reports of CU traits, with the addition of fathers' factor 1 psychopathy also being significantly associated to the study's outcome. The relationship between the mother's psychopathy and the child's CU traits disappeared when including other parenting factors, such as parental feelings and harsh parenting practices. In contrast, the relationship between the fathers' factor 1 scores and child CU traits remained significant, and was replicated across informants. These effects were stronger for boys as compared to girls. Our results suggest fruitful areas for future research, particularly the connection between father and children's CU traits, as the emergence of CU traits in girls.

Summary

This study showed that callous and unemotional (CU) traits in children are related to their parent's psychopathy factors in a clinical sample referred to a mental health clinic for the treatment of disruptive behavior disorders. First, we replicated previous findings showing a positive relationship between maternal psychopathy scores and mother-reported CU traits. We expanded these results by showing the father's psychopathy factor 1 scores were also associated with CU traits, in both mother- and father-reports. As part of our second objective we tested whether these relationships between parental psychopathy scores and CU traits in children continued to explain variance in CU traits beyond that explained by general indicators of mental health risk: parental psychopathology, parental warmth, and harsh parenting. Fathers' psychopathy factor 1 was uniquely related to CU traits. In contrast, the relationship between mothers' factor 2 scores and CU traits disappeared when maternal warmth was included. Subsequent analysis showed both relationships (between parental psychopathy and CU traits) were stronger for boys. These findings demonstrate stability between parental psychopathy and children's CU traits, highlighting the importance of including fathers in this line of research.

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