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Intergenerational Similarity in Callous-Unemotional Traits: Contributions of Hostile Parenting and Household Chaos during Adolescence

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Abstract

Extant research has examined both genetic and environmental risk involved in the transmission of callous-unemotional traits in youth populations, yet no study has examined the intergenerational similarity of these traits between parents and their offspring. The current study examined whether the association between parent callous-unemotional traits and child callous-unemotional traits was mediated by parenting behavior and whether this association was moderated by household environment. Participants included 115 dyads of adolescents (48% female; Mean age = 13.97) and their primary caregivers (87% female; Mean age = 42.54). Measures of callous-unemotional traits, hostile parenting, and household chaos were collected from both adolescents and parents. A two group structural equation modeling revealed that hostile parenting serves as a mediating process in the association between parent and adolescent callous-unemotional traits, but only in the context of high household chaos. Our findings suggest that hostile parenting practices are a mediating process that may explain intergenerational similarity in callous-unemotional traits. Additionally, household chaos may exacerbate the effects of hostile parenting on callous-unemotional traits within adolescents, resulting in heightened vulnerability to intergenerational transmission of callous-unemotional traits.

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Conflicts of Interest
None

Keywords

Callous-unemotional traits; parenting; household chaos; intergenerational similarity; adolescence

1. Introduction

Callous-unemotional (CU) traits refer to affective features (e.g., lack of empathy/remorse, shallow affect, callousness) that are commonly studied in youth populations as a downward extension of psychopathy (Frick, 2009). Similar to psychopathic traits, CU traits mark a pathway to antisocial behavior that is characterized by higher stability and severity of violence or aggression (for review see Frick, et al., 2014). Thus, the most recent revision of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013) has integrated this construct into the diagnostic criteria for Conduct Disorder. Specifically, the specifier ‘with Limited Prosocial Emotions’ designates youth with serious conduct problems who also show elevated rates of CU traits. Given the integration of this construct into the wider arena of mental health, more research is needed to understand the potential familial and environmental risk factors involved in the development of CU traits. One important focus for research is to examine intergenerational continuity or similarity in CU traits between parents and their children.

Prior research has studied the transmission of CU traits by examining the genetic and environmental contributions to the growth and stability of these traits in youth. Findings from twin studies support moderate heritability for CU traits (Viding et al., 2005); however, other research indicates early contextual or environmental factors also influence the development of CU traits. More specifically, parent child interactions seem to be connected to growth and stability of CU traits in children and adolescents (for review see Waller et al., 2013). For example, harsh parenting practices that occur during childhood predict higher levels of CU traits in adolescence (Barker et al., 2011; Waller et al., 2012). In contrast, parental warmth and child-reported positive parenting are associated with decreases in CU traits over time (Frick et al., 2003; Pardini et al., 2007).

Household chaos (e.g., high noise, lack of predictability or routine, crowding) is another relevant contextual factor that has also been linked with a trajectory of high or increasing levels of CU traits during adolescence (Fontaine et al., 2010). The level of chaos in the home is part of the broader construct of the home environment, and is a particularly important aspect of family dynamics that interferes with optimal parenting practices and could subsequently impact developmental outcomes (Deater-Deckard et al., 2012; Evans et al., 2005). Among the myriad of ways that chaotic home environments can affect development, they can create a sense of helplessness or incompetence both in the ability to manage or regulate affect and behavior in both children and parents (Evans et al., 2005). For example, household chaos is associated with lower parental executive functioning or effortful control (Bridgett et al., 2013; Deater-Deckard et al., 2012; Valiente et al., 2007) as well as poorer cognitive functioning in children (Deater-Deckard et al., 2009). In turn, poor self-regulation abilities among parents are linked to less adaptive parenting practices (for review see Bridgett et al., 2015) and parent reports of harsh and inconsistent discipline and associated

children's externalizing problems have been directly linked to chaos in the home (Dumas et al., 2005). Together, the evidence suggests that chaotic home environments can have a detrimental effect on healthy parenting practices and disrupt optimal child development.

The level of chaos in the home, has also functioned as a moderator in the link between parenting and children's conduct problems, exacerbating the effect of poor parenting practices on children's externalizing problems (Asbury et al., 2003; Coldwell et al., 2006). For example, previous research has found that in the context of high household chaos, the association between negativity within a parent-child relationship (including harsh discipline and conflict) and children's behavior problems, including conduct problems, is accentuated (Coldwell et al., 2006). Supporting research also demonstrates that household chaos moderates the association between classroom environment and conduct problems, such that lower satisfaction with classroom environment is more strongly associated with teacher reported conduct problems when the child is also from a disorganized or chaotic home (Oliver et al., 2008). Taken together, extant research supports the notion that living in chaotic home environments may enhance the risk associated with negative environments, such as poor home or classroom environments.

Despite research indicating a link between contextual factors such as parenting practices or household chaos and the emergence or continuity of CU traits, research has yet to examine how these factors may serve as mediating or moderating processes that explain the association between CU traits in parents and their children. However, there is initial evidence to suggest continuity in CU traits from parents to their offspring via environmental influences. Recently, Waller and colleagues (2015) examined whether parental empathy, a related but distinct construct to CU traits, is indirectly associated with their children's CU traits through parenting practices. Findings demonstrated that lower levels of maternal empathic concern during early childhood did not directly predict their offspring's CU traits at age 20, but was mediated by parental warmth and early childhood levels of CU traits (Waller et al., 2015).

Finally, although there has been no direct examination of the intergenerational similarity of CU traits, two studies have examined the intergenerational continuity or transmission of psychopathic traits, a broader personality construct that includes interpersonal and behavioral qualities such as narcissism and irresponsible or antisocial behavior. For example, Loney and colleagues (2007) examined the intergenerational continuity of psychopathic features between adolescents and their mothers. They found parental hostility and dysfunction mediated the association between psychopathic traits in the parent and child. More recent research using a prospective longitudinal design examined the intergenerational transmission of psychopathy via fathers to their offspring and found that poor parental supervision served as a mediator in the transmission of psychopathic traits between fathers and their offspring (Auty et al., 2015). Collectively, initial evidence supports intergenerational similarity of psychopathic traits in parents and their children that occurs in part due to parenting processes. Yet no study has examined the transmission of the behavioral phenotype of CU traits between parents and their children apart from the broader construct of psychopathy.

In the current study, we examined whether parent CU traits are related to adolescent CU traits indirectly through hostile parenting practices and whether household chaos may moderate this mediated association. We hypothesized that higher levels of parental CU traits would predict higher levels of adolescent CU traits indirectly through higher levels of hostile parenting practices. We further examined how parenting behaviors may transact with household environment to contribute to the intergenerational transmission of CU. Specifically, we hypothesized that the adverse effects of high levels of parental CU traits via increased hostile parenting practices would be amplified for those dyads exposed to higher levels of household chaos compared to lower levels of household chaos.

2. Method

2.1. Participants

Participants included 115 dyads of adolescents (48% female; Mean age = 13.97, SD = 0.80) and their primary caregivers (87% female; Mean age = 42.54, SD = 6.38). The majority of participants (82%) identified as Caucasian and the median income was \$35,000 – \$49,999.

2.2. Measures

CU traits were assessed using the Inventory of Callous Unemotional Traits (ICU; Frick, 2004), a self-report scale designed to assess callous unemotional traits. The current study utilized the shortened 10-item version of the total ICU score (Ray et al., 2016). Items are rated on a 4-point scale ranging from 0 (*not at all true*) to 3 (*definitely true*). The internal consistency in the current sample for the ICU total score was $\alpha = .82$ and $\alpha = .77$ for parent and adolescent report respectively.

Hostile parenting was assessed with the conflict subscale of the Parent-Child Relationship Scale (PCR; Hetherington and Clingempeel, 1992). This scale was designed to assess parents' negative, coercive and conflictual behaviors towards their children. This is a 6-item scale and items are rated on a 5-point scale ranging from 1 (*extremely*) to 5 (*not at all*). Participants rated statements about the parent that participated in the research study with them and example questions include, "How often does this person get into disagreements or fights with you?" and "How much does this person criticize you?". Parent and adolescent reports ($r = .31, p < .001$) were averaged to create a composite. Internal consistency was $\alpha = .62$ and $\alpha = .78$ for parent and adolescent report respectively.

Parents and adolescents completed the short version of the Confusion, Hubbub, and Order Scale (CHAOS; Matheny et al., 1995) that was designed to measure the level of confusion and disorganization in the home. The scale consists of 6 items asking about level of environmental chaos in the home (Pike et al., 2006) and items are rated on a 5-point scale ranging from 1 (*definitely untrue*) to 5 (*definitely true*). Examples of items on this scale are "You can't hear yourself think in our home" and "I have a regular morning routine (reverse scored)." This self-report scale correlates well with observed home environment conditions (Matheny et al., 1995). A composite CHAOS score was generated by averaging parent and adolescent reports ($r = .27, p < .01$). Internal consistency was $\alpha = .54$ and $\alpha = .65$ for parent

and adolescent report respectively, which is similar to figures found in past research (Coldwell et al., 2006; Pike et al., 2006).

2.3. Procedures

Participants were recruited from small cities, towns, and rural areas by diverse advertisement methods including flyers, recruitment letters, and e-mail distributions. Research assistants described the nature of the study to the interested individuals over the telephone and invited them to participate. Parental consent and adolescent assent were obtained in person and data collection took place at the university's offices where adolescents and their primary caregivers were interviewed by trained research assistants and received monetary compensation for participating. All procedures were approved by the institutional review board of the university.

2.4. Analytic Strategy

Descriptive analyses were conducted with all study variables to determine normality of distributions and univariate and multivariate outliers. Skewness and kurtosis were examined for all variable distributions with acceptable levels of skewness to be less than 3 and acceptable levels of kurtosis less than 10 (Kline, 2011). In addition, GLM was used to identify any multivariate predictors of the endogenous variables among the demographic variables and any variables with significant Wilk's Lambda coefficients were used as covariates. A two group mediation model was estimated and analyzed with structural equation modeling (SEM) using AMOS version 23 (Arbuckle, 2014; Byrne, 2010). Overall model fit indices were determined by χ^2 value, degrees of freedom, corresponding *p*-value, Root Mean Square Error of Approximation (RMSEA), and Confirmatory Fit Index (CFI). An RMSEA value less than .06 and a CFI value equal to or greater than .95 were considered a good fit (Hu and Bentler, 1999). A series of models were tested comparing low and high CHAOS groups to determine the moderating effects of CHAOS in the link between parent CU traits and adolescent CU traits.

We formed low CHAOS (below median of the CHAOS scores, $n = 53$) versus high CHAOS (above median, $n = 62$) groups based on each individual's CHAOS composites averaged between adolescent self-reported and parent-reported scores. The low/high CHAOS groups were formed for testing moderating effects of *quantitative* differences in CHAOS using a multiple group SEM; they may not represent clinically meaningful or *qualitatively* different subgroups.

A configural invariance model (Horn and McArdle, 1992) was fit first, in which all parameters were freely estimated across the two groups (configural invariance model) and used in comparisons to the subsequent models. In subsequent models, we imposed equality constraints hierarchically to test numeric invariance between the low and high CHAOS groups. First we tested whether the direct effect of parent CU traits on adolescent CU traits was comparable between the two groups by imposing equality constraints on the regression path from parent CU traits to adolescent CU traits in each group (equal direct effect model). Next, we tested whether the effects of parent CU traits on hostile parenting were comparable between the two groups by adding equality constraints on the regression path from parent

CU traits to hostile parenting (equal parent CU effect model). Finally, we tested whether the effects of hostile parenting on adolescent CU traits were comparable between the two groups by adding equality constraints on the regression path from hostile parenting to adolescent CU traits (equal hostile parenting effect model). The adequacy of the equality constraints were tested using nested chi-square difference tests (Bollen, 1989). An α level of .05 was used for all statistical tests and significance of indirect effects was tested using bias-corrected bootstrap confidence intervals (Cheung and Lau, 2007; Preacher and Hayes, 2008) which has been shown to have more power than the often-used Delta method particularly in smaller sample sizes (Preacher and Hayes, 2008). This method of testing for significant indirect effects is a more contemporary approach that replaces previous procedures that required a direct effect between the independent and dependent variable when testing mediation (Kenny et al., 1998; Shrout and Bolger, 2002). The k^2 statistic (Preacher and Kelley, 2011) was used to measure effect size for the mediation.

3. Results

Correlations for all study variables appear in Table 1 and descriptive statistics are provided separately for high and low CHAOS groups. Multivariate general linear modeling analyses with potential demographic covariates (age, sex, race for adolescent and parent, and family income) predicting the adolescent CU outcome variable revealed adolescent sex ($p = .001$) was the only variable significantly associated with adolescent CU traits. Thus, adolescent sex was included in the path analysis as a covariate. One univariate outlier (> 3 SD) for adolescent report of CHAOS was identified and removed from the analysis.

In order to test the two group mediation model, a series of models were tested and model fit comparisons are presented in Table 2. For the baseline model (configural invariance model), model fit was good. When we imposed an equality constraint between the low and high CHAOS groups with respect to the direct effect of parent CU traits on adolescent CU traits (the equal direct effect model), it did not significantly degrade model fit, indicating that the direct effects of parent CU traits were comparable between the high vs. low CHAOS groups. Next, further imposing an equality constraint between the low and high CHAOS groups with respect to the effects of parent CU traits on hostile parenting (the equal parent CU traits effect model) between high and low CHAOS groups did not significantly degrade model fit. Thus, the findings indicated that the association between parent CU traits and hostile parenting were comparable between the high vs. low CHAOS groups. That is, although parent CU traits were associated with more hostile parenting, this was not significantly different for high vs. low CHAOS groups. For the last model (equal hostile parenting effect model), we imposed an additional equality constraint between the low and high CHAOS groups with respect to the effects of hostile parenting on adolescent CU traits. Imposing this equality constraint for the effects of hostile parenting on adolescent CU traits significantly degraded model fit, suggesting that the magnitude of the association between hostile parenting and adolescent CU traits differed significantly between the high vs. low CHAOS groups. Put another way, the association between hostile parenting and child CU traits was significantly different between high vs. low CHAOS groups. Thus, the parent CU traits equal effect model was chosen as the best-fitting model. To test the robustness of our model, we also ran the same model fit comparisons but included a measure of adolescent

externalizing problems as measured by the Youth Self Report (YSR; Achenbach and Rescorla, 2003) as a covariate. The direct and indirect effects remained unchanged; however, the addition of the covariate degraded model fit, and thus we interpreted the original model that did not include externalizing problems. Detailed model fit estimates for the model containing adolescent externalizing problems are available online as supplemental content.

Figure 1 shows standardized estimates for the final (best-fitting) model. For both high and low CHAOS groups, higher parent CU traits was associated with higher hostile parenting ($b = .07$, $SE = .02$, $p < .01$), but the direct effects of parent CU traits on adolescent CU traits were not significant ($b = -.01$, $SE = .09$, $p = .88$). Significant group differences indicated that higher hostile parenting was related to higher levels of adolescent CU traits for the high CHAOS group ($b = 1.82$, $SE = .46$, $p < .001$), whereas there was no association between hostile parenting and adolescent CU traits for the low CHAOS group ($b = .04$, $SE = .56$, $p = .94$). Mediation effect test using bias corrected bootstrapping indicated that the estimated indirect effect of parent CU traits on adolescent CU traits via the intermediate effect on hostile parenting was significant for the high CHAOS group, 95% CI [.057 to .248], but not significant for the low CHAOS group, 95% CI [-.206 to .209]. The effect size for the mediation was $k^2 = .16$ which can be interpreted as medium in size according to guidelines set out by Preacher and Kelley (2011).

3.1. Supplemental Analyses

To ensure the robustness of the results, we also tested our model with CHAOS score modeled as a continuous variable using the PROCESS macro (Hayes, 2013). Results were consistent with the SEM analyses. Specifically, parent CU traits had a significant indirect effect on child CU traits through hostile parenting evidenced by the bias-corrected bootstrap interval, 95% CI [.043, .604], that did not contain zero. Also, consistent with the SEM analyses, the interaction term between hostile parenting and CHAOS score was also significant ($b = .91$, $SE = .42$, $p < .05$, 95% CI [.077, 1.746]. Consistent with the SEM analyses, this conditional indirect effect was significant only at high levels (75th and 90th percentile) of CHAOS scores. The index of moderated mediation was also significant, index = .23; 95% CI [.036, .590]. To account for other potential moderators in the analyses, we also tested the model using income and child sex as moderators and these interactions were non-significant, $b = -.34$, $SE = .74$, $p = .64$, 95% CI [-1.805, 1.123] for child sex; and $b = -.27$, $SE = .14$, $p = .06$, 95% CI [-.549, .001] for income.

4. Discussion

The stability of CU traits during childhood and adolescence has been linked to genetic effects (e.g., Fontaine et al., 2011); however, this is the first study to specifically examine the intergenerational similarity between parental and adolescent CU traits using coordinated measures of CU traits. Our findings revealed that hostile parenting practices serve as a mediating process in the association between parent CU traits and adolescent CU traits, particularly in the context of high levels of CHAOS. That is, CU traits in parents did not directly predict levels of CU traits in children within this typically developing adolescent sample, but rather parent CU traits influenced child CU traits indirectly through hostile

parenting practices for those dyads in chaotic homes. Notably, nested model comparisons indicated that the association between parental CU traits and hostile parenting practices did not differ between high and low CHAOS groups; however, the detrimental effects of hostile parenting practices on adolescent CU traits were exacerbated among those with high CHAOS scores.

Our findings confirm an association between parental CU traits and hostile parenting practices, which was present regardless of CHAOS score. This is consistent with past research demonstrating a link between psychopathic traits in adulthood and poor parenting practices (Loney et al., 2007) or family dysfunction (Auty et al., 2015), and further highlights that the affective components of psychopathy as represented by CU traits in parents are likely to influence their interaction with offspring. Findings from the current study are also consistent with a growing body of research indicating that dimensions of parenting, such as hostile parenting practices, are associated with increased levels of CU traits among offspring across different developmental stages (Waller et al., 2013). Beyond what we know about the detrimental effects on negative parenting on their children's CU traits, our results clarify that CHAOS scores may be a determining factor of whether parent CU traits exert its effects indirectly through hostile parenting practices to influence the level of adolescent CU traits.

Our findings support the moderating role of household chaos on the association between harsh parenting and adolescent CU traits. These results build upon extant research indicating that household chaos is not only associated with increased behavior problems in youth, but may also exacerbate the detrimental effects of negative parenting behaviors (Asbury et al., 2003; Coldwell et al., 2006). Our results are also in parallel with past research examining the impact of cumulative risk, showing how exposure to each additional risk factor can increase the likelihood of experiencing mental health problems during development (e.g., Deater-Deckard et al., 1998; Rutter, 1979). What our finding uniquely suggests is that household chaos and parental hostility may interact to promote the development of adolescent's CU traits. That is, when the broader family context lacks structure and predictability, transmission of CU traits is facilitated because hostile parenting practices are more likely to impair the development of socioemotional abilities, such as empathy and emotion regulation, in youth living in this type of adverse environment. At the same time, existing evidence suggests the absence of chaos is associated with increased cognitive abilities and more desirable behavioral outcomes among youth (Deater-Deckard et al., 2009). Thus, when the distractors and stressors in a chaotic home are absent, the adolescent's regulatory abilities may operate in a more efficient manner (Macrae and Bodenhausen, 2000), and adolescents could be shielded in part from the detrimental effects hostile parenting practices may have on their emotional development.

Our results should be interpreted in the context of study limitations. First, the cross-sectional nature of our design does not allow us to infer causality and it is important for future work to test longitudinal designs examining the continuity of these associations over time. Relatedly, given the cross-sectional nature of the current design we cannot account for the transactional relationship between CU traits and parenting identified in previous research (Hawes et al., 2011) suggesting that it is also possible that youth with high levels of CU traits could drive

levels of household chaos. Thus, it would be beneficial for future research to test this association using multi-wave and even using multi-informant reports. In addition, it is important to note that both environmental and genetic factors contribute to and help explain change and stability of CU traits throughout childhood and adolescence (see Frick et al., 2014 for review). Unmeasured genetic factors likely play a role in the intergenerational similarity between parents and their offspring (i.e., parents with high CU traits pass on genes to their offspring that may increase risk for the development of CU traits) that the current study cannot address.

Second, reliability estimates were relatively low for CHAOS scores. However, low reliability has a downward bias on estimating effects (Furr and Bacharach, 2008). Thus, effects found in the current study could have been stronger, not weaker, if the CHAOS score had demonstrated higher reliability. In further examination, Cronbach alphas became more acceptable ($\alpha = .61$ and $.70$ for parent and adolescent) when one item (“we are usually able to stay on top of things”) was removed from the scale. However, the study findings were virtually identical when using a 5-item version or the full version and thus, the full version was used to keep the integrity of this widely used scale. Third, the sample was recruited from a typically developing adolescent population and thus may limit generalizability; necessitating future studies replicate these findings in high risk or detained populations and in other age groups. Relatedly, the relative homogeneity of our sample with regards to ethnicity warrants replication in other racial and ethnic groups. Finally, our primary caregivers were composed of mainly maternal figures and thus we did not have the ability to examine differential relations between maternal and paternal caregivers.

Overall, our findings provide tentative support for the existence of a pathway from parent CU traits leading to adolescent CU traits through a process by which parents with CU traits demonstrate impaired parenting practices, which in turn affects the socio-emotional development of their children, particularly within chaotic home environments. Given that CU traits are associated with increased risk of more serious and chronic patterns of aggressive and violent behavior (e.g., Frick et al., 2014), understanding environmental risk factors in the home has important implications for psychosocial interventions that aim to target the malleability of these traits. Indeed, tailored treatments that consider the differential response of youth with these traits are effective in reducing conduct problems (e.g., Hyde et al., 2013). Findings from the current study add to the growing body of evidence that stresses the importance of parenting practices in the development of CU traits, but also provide novel insight into how parental CU traits influence adolescent CU traits via these parenting practices that occur in highly chaotic homes. By identifying potential mechanisms of transmission for CU traits, we may be able to inform prevention or intervention efforts that seek to reduce the development of CU traits. In this regard, efforts could be directed in part towards reducing household chaos by educating parents and children on the importance of maintaining predictable and calm home environments (Coldwell et al., 2006).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Parenting practices and household environment play important roles in the similarity of callous-unemotional traits between parents and adolescents
- Hostile parenting mediates the association between parent and adolescent callous-unemotional traits
- Household chaos may exacerbate the effects of hostile parenting on callous-unemotional traits in adolescents.

Figure 1.

Moderated mediation model of intergenerational similarity of CU traits. *Note.* Standardized parameter estimates are presented; estimates listed first are for the low CHAOS group; second for high CHAOS group. For clarity of presentation, coefficients related to the adolescent sex covariate are not shown: adolescent sex $\leftrightarrow$ adolescent CU: $b^* = -.32$, $p = .01$ / $b^* = -.39$, $p < .001$. CU = callous-unemotional traits.

** $p < .01$; *** $p < .001$

Table 1

Descriptive Statistics and Correlations

	1	2	3	4	5	6	7	8	9	Low Chaos (n = 53)				High Chaos (n = 62)			
										M / %	SD / N	M / %	SD / N	M / %	SD / N	M / %	SD / N
1. Adolescent Age										13.96	.76	13.98	.76	13.98	.76	13.98	.76
2. Adolescent Sex	-.11									40%	21	55%	34	55%	34	55%	34
3. Parent Age	.05	-.01								43.38	6.11	41.82	6.57	41.82	6.57	41.82	6.57
4. Parent Sex	-.01	.11	-.35***							85%	45	89%	55	89%	55	89%	55
5. Race/Ethnicity	.07	.05	.13	-.11						87%	46	77%	48	77%	48	77%	48
6. Family Income	-.01	-.04	.37***	-.06	.28**					11.38	2.81	10.42	2.43	10.42	2.43	10.42	2.43
7. Parent CU	-.10	-.14	.11	-.16	-.22*	-.07				5.43	3.68	6.13	4.05	6.13	4.05	6.13	4.05
8. Adolescent CU	.09	-.33***	.01	-.06	-.13	-.04	.13			5.45	3.80	7.39	4.56	7.39	4.56	7.39	4.56
9. Hostile Parenting Practices	-.10	-.09	.02	.01	.10	-.06	.29***	.33***		1.86	.53	2.08	.61	2.08	.61	2.08	.61
10. CHAOS Score	-.05	.09	-.18*	-.01	.06	-.21*	.16	.32***	.33***	1.96	.25	2.79	.34	2.79	.34	2.79	.34

Note. CU = Callous unemotional traits. Sex is coded male = 0 and female = 1. Race is coded Caucasian = 1 and other = 0.

p < .001

**
p < .01

*
p < .05.

Table 2

Model Fit Comparisons for SEM Analyses Testing the Associations among Parent CU, Hostile Parenting, and Adolescent CU for High vs. Low CHAOS Groups

Model Label	χ^2	df	p(exact)	CFI	RMSEA	p(close)	χ^2	df	p(d)
1. Configural invariance model	3.81	4	.43	1.00	.00	.57			
2. Equal direct effect model	7.48	5	.19	.93	.07	.33	3.67	1	.06
3. Equal parent CU effect model	7.48	6	.28	.96	.05	.45	0.002	1	.96
4. Equal hostile parenting effect model	13.47	7	.06	.83	.09	.16	5.99	1	.01

Note. In Model 1(Configural invariance model) all parameters were freely estimated across the two groups. In Model 2 (Equal direct effect model) the direct effect of parent CU traits on adolescent CU traits was tested between the two groups by imposing equality constraints on the regression path from parent CU traits to adolescent CU traits in each group. In Model 3 (Equal parent CU effect model) the effects of parent CU traits on hostile parenting were tested between the two groups by adding equality constraints on the regression path from parent CU traits to hostile parenting. In Model 4 (equal hostile parenting effect model) the effects of hostile parenting on adolescent CU traits were tested between the two groups by adding equality constraints on the regression path from hostile parenting to adolescent CU traits. $p(\text{exact})$ = probability of an exact fit to the data; CFI = comparative -fit index; RMSEA = root mean square error of approximation; $p(\text{close})$ = probability of a close fit to the data; χ^2 = difference in likelihood ratio tests; df = difference in df ; $p(d)$ = probability of the difference tests. The best-fitting model is in bold face. CU = callous unemotional traits.