

Variants of Callous-Unemotional Traits in Childhood: Investigation of Attachment Profile and Hostile Attribution Bias

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Abstract

There is increasing evidence of interest in describing two variants of Callous-Unemotional (CU) traits based on high (secondary variant) or low (primary variant) levels of anxiety. However, studies are limited in childhood. The present study aimed to further the understanding of the variants, specifically in association with hostile attribution bias (HAB) and attachment. In a community sample of children aged 4 to 9 ($N = 70$), the study examined whether anxiety moderated the association of CU traits with HAB, secure and disorganized attachment representations. Hierarchical regression analyses revealed that CU traits were positively associated with disorganized attachment, regardless of the anxiety level. In contrast, CU traits were not associated with secure attachment. A significant interaction revealed that CU traits were positively associated with HAB only at high levels of anxiety. Implications for understanding the variants of CU traits and hypotheses regarding their developmental trajectories are discussed.

Keywords : callous-unemotional traits, variants, secure attachment, disorganized attachment, hostile attribution bias, childhood

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Introduction

Callous-Unemotional (CU) traits - corresponding to the affective features of adult psychopathy - enable the identification of a subgroup of children with conduct problems who are at higher risk of developing adult psychopathy (Burke et al., 2007). In the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V; American Psychiatric Association, 2013), CU traits are included as a specifier named “with Limited Prosocial Emotions” (LPE) for conduct disorder, characterized by lack of guilt, lack of empathy, unconcern about performance, and shallow or deficient affect. While contemporary research has considered youth with CU traits as a homogeneous group, a growing body of literature suggests the existence of two variants of CU traits (Craig & Moretti, 2019; Goulter et al., 2017; Kahn et al., 2013): a primary variant believed to be primarily influenced by genetics and a secondary variant believed to be predominantly influenced by environmental factors (Karpman, 1941; Porter, 1996). However, limited research is available on these two variants. This study aims to enhance understanding of these variants in childhood, particularly in relation to hostile attribution bias (HAB) and attachment profile.

The assumption of two distinct variants of CU traits originated from adult literature. Specifically, Karpman (1941) distinguished two variants of psychopathy. The primary variant is believed to stem from an innate emotional processing deficit, while the secondary variant is seen as an adaptive response to adverse environments characterized by maltreatment or trauma (Karpman, 1941, Porter, 1996). Recent studies in children with CU traits have supported this theory by distinguishing two groups with distinct characteristics (Fanti &

Kimonis, 2017; Huang et al., 2020; Humayun et al., 2014). These groups are predominantly differentiated by low (primary variant) or high (secondary variant) levels of trait anxiety¹ in addition to elevated CU traits (for a review, see Craig et al., 2020). Indeed, high levels of CU traits and anxiety are consistently associated with maltreatment or trauma (Bennett & Kerig, 2014; Cecil et al., 2018; Craig & Moretti, 2019).

Research suggests that children within the primary variant are characterized by hypoarousal of affect, including lower physiological activity, and by lower emotional dysregulation. In contrast, children within the secondary variant are characterized by hyperarousal of affect, affect dysregulation, and impulsivity (Ezpeleta et al., 2017; Fanti et al., 2018; Goulter et al., 2017).

These specificities in emotional arousal and regulation interact with social information processing (Lemerise & Arsenio, 2000; Gross et al., 1998) in children with the two variants, although this area has received limited attention thus far. Some previous studies have indicated differences between the two variants in sensitivity to distress stimuli and facial recognition accuracy (for a review, see Craig et al., 2020). Specifically, findings suggest that youth with the primary variant exhibit reduced engagement towards distressing stimuli and deficits in recognition accuracy, while youth with the secondary variant display hypervigilance towards distress stimuli without facial recognition deficits (Bennett & Kerig, 2014; Dadds et al., 2018; Kimonis et al., 2012).

No study to date has investigated the interpretation of social stimuli in relation to the variants. However, the impairments that might occur during this stage, and particularly HAB, could differ between the variants. HAB refers to the tendency to attribute hostile intent to others in ambiguous social situations, with negative consequences for the individual (Nasby et

¹ The majority of studies have employed scales assessing general trait anxiety to differentiate between the two variants.

al., 1980). While all young children initially exhibit a hostile attribution style due to limited emotional and cognitive understanding of others' perspectives, they typically learn to correct this bias during the preschool period. However, some children fail to develop these benign attributions as they grow, continuing to infer hostile intent in ambiguous social situations (Dodge, 2006). Negative early experiences, such as maltreatment (Price & Glad, 2003) and/or insecure attachment (Crick & Dodge, 1994; Zaccagnino et al., 2013), may partially explain this failure. HAB plays a crucial role in understanding the development and persistence of behavior problems over time, as children with HAB are more likely to exhibit aggressive behaviour (Orobio de Castro et al., 2002; Verhoef et al., 2019). A systematic review (Martinelli et al., 2018) found that HAB was more consistently associated with reactive² rather than proactive aggression. Therefore, examining how the two variants interpret social cues might shed light on the specific pathways leading to aggressive behavior. Among studies having examined the association between HAB and broad CU traits³, findings have been inconsistent (Cima et al., 2014; Frick et al., 2003; Hartmann et al., 2020; Helseth et al., 2015). These inconsistencies might be explained by the lack of distinction between the two variants.

Attachment is another underexplored variable in relation to the variants. According to Bowlby (1969), attachment is a biologically based regulatory system that fosters closeness between the child and the adult caregiver, who provides comfort, support, nurturing and protection. Through repeated interactions, children develop internal mental representations (Internal Working Models, IWMs) of how their caregiver will respond to their needs. Secure IWMs develop when children perceive their parents as responsive and trustworthy, enabling them to explore the world with confidence. However, suboptimal parental responsiveness can

² Reactive aggression is an emotional, impulsive aggressive response to a perceived threat, provocation or frustration aimed at defending oneself or retaliation. In contrast, proactive aggression is defined as coldblooded, planned aggressive behavior aimed at instrumental, material, or social personal gain (Crick & Dodge, 1996)

³ The term « broad CU traits » is used to talk about CU traits without making the distinction between the two variants.

lead to insecure IWMs (Ainsworth et al., 1978; Main & Solomon, 1986), and in extreme cases, to disorganized attachment and IWMs with contradictory/controlling behaviors. Attachment security is considered a protective factor for child development (Cooke et al., 2019), while attachment insecurity, particularly disorganization, is a significant risk factor for psychopathology, including externalizing and internalizing behaviors (Fearon et al., 2010; Madigan et al., 2013). Additionally, insecurely attached children may perceive the world as hostile and process social information with a negative bias (Dykas & Cassidy, 2011).

Given the shared impairments observed in children with insecure/disorganized attachment and those with CU traits, such as a lack of conscience (Kochanska et al., 2004), and the crucial role of attachment in child development (Fearon & Roisman, 2017; Groh et al., 2014), it is highly relevant to investigate the associations between these variables.

As early as 1944, Bowlby hypothesized, based on his work with youth thieves exhibiting callous-unemotional traits - whom he labeled as "affectionless psychopaths" - that disruptions in attachment relationships, particularly the absence of parental warmth, rejection, and disrupted caregiving during childhood, could impact moral development and lead to increased child aggression.

Since Bowlby's pioneering work, several studies have investigated the associations between broad CU traits and attachment during childhood. An association between CU traits and disorganized attachment was found in several studies in toddlers (Kohlhoff et al., 2020), in early and middle childhood (Bohlin et al., 2012; Pasalich et al., 2012; Rehder et al., 2021). However, conflicting findings emerged from two other studies that did not find such associations in early childhood (Willoughby et al., 2014; Wright et al., 2018). These mixed results may be at least partly explained by the use of different research methodologies (attachment measure, characteristics of the sample), but also by the lack of distinction between the two variants. Indeed, Cecil et al. (2018) discovered that in a high-risk sample of

youth aged 16 to 24, the secondary variant was predominantly characterized by disorganized attachment. In contrast, the primary variant group was predominantly characterized by secure attachment. Nevertheless, no previous study has investigated attachment in relation to the variants during childhood.

In conclusion, while there is a growing body of research highlighting the heterogeneity of CU traits as two variants based on levels of anxiety, with distinct developmental trajectories and characteristics, the distinction between the two remains insufficiently addressed in the literature, particularly in preschool and school-age samples. Moreover, a significant proportion of previous studies predominantly focused on male youths involved in the justice system (Craig et al., 2020). Future research needs to consider the distinction between variants in mixed-gender and community samples to enhance the generalizability of findings. Furthermore, no study has attempted to clarify the associations between the two variants of CU traits and attachment representations and HAB in childhood. A comprehensive understanding of the associations between the variants of CU traits and these variables could inform targeted prevention and intervention strategies tailored to the unique characteristics and needs of children in each variant.

Present study

The present study aimed to expand current knowledge on the two variants of CU traits in a community sample of children aged 4 to 9. Specifically, we sought to understand the associations between the variants of CU traits on one hand, and attachment representations as well as HAB on the other hand. Examining CU traits in the general population offers a valuable opportunity to gain a comprehensive understanding of these traits beyond clinical populations, and enables the examination of the entire continuum of CU traits. Anxiety was included in the current study as it is the variable most often used to determine the two variants (Craig et al., 2020).

Based on theory, the attribution of intent style might differ between the variant. The secondary variant might be associated with HAB, as both this variant and HAB have been associated with maltreatment, abuse or trauma (Craig et al., 2020) and with reactive aggression (Fanti et al., 2013; Kimonis et al., 2011; Metcalf et al., 2021). Conversely, the primary variant, characterized by reduced engagement towards emotional stimuli (Fanti et al., 2018; Kimonis et al., 2012) and low levels of emotional and behavioural dysregulation (Kahn et al., 2013), might not exhibit high levels of HAB. Therefore, our first hypothesis proposed that anxiety would moderate the association between CU traits and HAB, with a stronger association at high levels of anxiety.

Secondly, in line with the results of Cecil et al. (2018), we hypothesized that anxiety would moderate the relationship between CU traits and disorganized attachment. We expected stronger associations between CU traits and disorganized attachment at high levels of anxiety. Additionally, we hypothesize a moderation of anxiety in the association between CU traits and secure attachment, where CU traits would be more negatively associated with secure attachment at high levels of anxiety.

Lastly, an important variable to consider when investigating the associations between CU traits (with high or low levels of anxiety) and variables such as attachment profiles or HAB is externalizing behaviors (EB). Although CU traits were initially integrated into the CD diagnosis, evidence indicates that they could also be associated with Oppositional Defiant Disorder (ODD; Ezpeleta et al., 2017) or subclinical EB (Rowe et al., 2010). Specifically, the findings of a meta-analysis (Longman et al., 2016) revealed a moderate effect size association ($r = .39, p < .001$) between broad CU traits and EB. Furthermore, EB have been extensively associated to disorganized attachment (for reviews, see Fearon et al., 2010; van Ijzendoorn et al., 1999) and HAB (for reviews, see Orobio de Castro et al., 2002; Verhoef et al., 2019) in the existing literature. Therefore, it is essential to account for this variable to ensure that the

associations between CU traits and the outcomes are not influenced by a confounding effect due to shared variance with EB.

Materials and Methods

Procedure

Parents of children aged 4 to 9 from the French-speaking region of Belgium were recruited from a wider group of parents in the general population who had previously answered an online questionnaire about their child ($N = 260$; $M_{\text{age}} = 6.44$; $SD = 1.56$; 54.6% boys). After completing the questionnaire, parents were invited to participate in an additional phase involving a test for their child. The participating children and their parents were then scheduled for meetings either at home or the university in the weeks or months following their online answers to the questionnaire. Attachment and hostile attribution bias were assessed with the child, and parents answered questionnaires assessing callous-unemotional traits and externalizing/internalizing behaviors. Children with autism, developmental delay, or intellectual disability were excluded from the study. The study design was approved by the Ethical Committee of Psychology of the University and participants provided their consent.

Participants

The participants were 70 children aged 4 to 9 ($M = 6.79$; $SD = 1.5$) [Figure 1 near here] of which 55.3% were boys. The informants were principally mothers (92.9% of the sample) and 94.3% of them had, at least, completed secondary education. 81.4% of the parents lived with the other parent of the child. Participants who only answered the online questionnaire and those who participated in the additional phase did not differ based on the gender of the informant ($\chi^2(1) = .58$, $p = .45$); SES of the family ($t(258) = -1.41$, $p = .16$); gender ($\chi^2(1) = .12$, $p = .73$), age ($\chi^2(1) = 247.29$, $p = .39$), levels of CU traits ($t(258) = -0.21$, $p = .98$), levels of anxiety (preschoolers: $t(105) = .43$, $p = .66$; school-age children: $t(151) =$

.62, $p = .53$) and levels of oppositional defiant problems (preschoolers: $t(105) = -1.49$, $p = .14$; school-age children: $t(151) = .70$, $p = .49$) of the child.

Measures

CU traits

CU traits were assessed using the *Inventory of Callous Unemotional traits* (ICU; Frick, 2004). The parent-reported preschool and school-age French versions were used. A previous study (Payot et al., 2022) in a Belgian community sample validated an 18-item second order model with three first order factors based on LPE specifier criteria (Lack of Conscience encompassing the criteria lack of guilt and lack of empathy, Unconcern about performance, Lack of emotional expression), a second order latent factor (General dimension of CU traits) and a methodological factor encompassing negatively-worded items. As this model demonstrated a good fit, external validity and measurement invariance across age and gender of the child, the total score (range: 0 – 54) was used in the current study. The internal consistency was good ($\alpha = .85$). The CU traits score ranged from 0 to 27 in the current sample, which is relatively low but in accordance with what is expected in community samples (e.g., Bansal et al., 2020; Rehder et al., 2021).

Anxiety symptoms and externalizing behaviors

The preschool and the school-age versions of the *Child Behavior Checklist* (Achenbach & Rescorla, 2000, 2001) were answered by the parents. The DSM-V Anxiety and DSM-V Oppositional Defiant Problems (ODP) subscales were used for the analyses. The ODP subscale was used as a measure of externalizing behaviors. The scores were dichotomized according to the cut-off scores of each version as these scales are not equivalent between the preschool and school age versions. Thus, a score of 0 was considered as non-clinical, corresponding to a score below the 93% percentile of the normative sample. A score

of 1 was considered as clinical as it corresponded to scores above the 93% percentile. In the current sample, 14.5% and 24.3% of the children were considered as having clinical scores of ODP symptoms and anxiety, respectively. Cronbach α was between .69 and .80 for the two scales.

Attachment representations of the child

Attachment representations were assessed with the *Attachment Story Completion Task* (ASCT; Bretherton et al., 1990). It consists of a series of story stems which are designed to activate attachment representations by means of play and narrative. For school-age children, several modifications proposed and validated by Granot and Mayseless (2001) were made to the stories in order to enhance the activation of attachment-related feelings in middle childhood. For example, the monster in the “Monster in the bedroom” story stem was changed to “something frightening”, and the period of separation was extended to three days instead of one in the Departure story.

A Q-sort questionnaire, *Cartes pour le Complément d'Histoires* (CCH; Miljkovitch et al., 2003), was used to analyze the narratives. 65 items describing observed behaviors during play were sorted by the coder according to the degree to which the item was characteristic of the child. This analysis provided four Q-correlations by comparing the children's individual Q-set description with the criterion sort provided by experts for a prototypical child using the four attachment patterns (Miljkovitch et al., 2003). These Q-correlations are continuous scores ranging from +1.00 to -1.00, with a higher positive score indicating greater security, avoidance, ambivalence or disorganization. Construct validity has been supported (Miljkovitch et al., 2004). In the current study, only continuous secure (range: -.35 – .70) and disorganized (range: -.67 – .52) scores were used in the analyses. Indeed, the modest sample size implied to limit to the statistical analyses. As disorganized attachment and secure attachment were the profiles most predominantly associated with the two variants and broad

CU traits in the current literature, it seemed relevant to only consider these two profiles. The narratives were coded by two experts. 14% of the video-recorded ASCT were coded separately by the two coders. Intraclass correlations estimates were calculated based on a single rating, absolute agreement, 2-way mixed-effects model, and was .77 for security and .89 for disorganization.

Hostile attribution bias

HAB was assessed using the *Intention Attribution Test for Children* (IAC; Vanwalleghem et al., 2020). It comprises 16 cartoon strips presenting situations in which one character (either a child or an adult) causes harm to another child, either intentionally, accidentally (non-intentional) or without his or her intention being clear (ambiguous). The child is asked to identify himself or herself as the victim and to describe what is happening in these pictures, continuing until his or her response allows the experimenter to determine whether they perceive the action as intentional or non-intentional. A score of 0 is given when the intention attributed is non-hostile, and a score of 1 when the intention attributed is hostile. The score of HAB, corresponding to the sum of scores obtained on the eight ambiguous and the four non-intentional items and ranging from 0 to 12, was used in the current study. The validation study (Vanwalleghem et al., 2020) found good internal consistency for the total score of HAB, construct validity based on strong correlations with social competence and convergent validity with the Social Perception Task (Suess et al., 1992).

Statistical Analyses

All analyses were conducted in SPSS, Version 28.0. Associations between study variables were examined with bivariate correlations.

In the current literature, several approaches have been used to investigate the two variants. One of them consists of including CU traits and anxiety as continuous variables in

moderated regressions, and examining if levels of anxiety moderate the associations between CU traits and outcomes, such as attachment profiles or HAB in this study. This methodology, used by several studies in the field (for a review; Craig et al., 2020), enables an examination of the combination of high levels of CU traits and anxiety as a proxy for secondary CU traits, and the combination of high levels of CU traits and low levels of anxiety as a proxy for primary CU traits. It could be particularly relevant in community samples as it follows a dimensional approach. Thus, we chose to use this approach in the current study.

Hierarchical multiple regression analyses were conducted to test hypotheses regarding the moderating role of anxiety in the associations between on the one hand, CU traits, and on the other hand, secure and disorganized attachment profiles and HAB. Control variables, including ODP symptoms, child age and/or gender (if significantly correlated with the attachment and HAB measures), were entered in the first step of the multiple regression analyses. Controlling ODP symptoms ensured that the associations between CU traits and the other variables were not due to shared variance with externalizing behaviour. In the second step, CU traits and anxiety were entered. Finally, a multiplicative interaction term composed of CU traits and anxiety was entered in the third step to assess its incremental contribution to the variance. If the interaction was significant, separate analyses were conducted to examine the associations between the dependant variables and CU traits at clinical and non-clinical levels of anxiety.

Results

Descriptive statistics and correlations among study variables are provided in Table 1 [Table 1 near here]. First, as expected from past research, CU traits were significantly correlated with ODP symptoms ($r = .46, p < .001$), and with disorganized attachment ($r = .27, p = .02$). However, they were not significantly associated with secure attachment ($r = -.08, p = .52$), HAB ($r = .08, p = .51$), or anxiety ($r = .22, p = .07$). Consistent with theory, HAB was

negatively associated with age ($r = -.31, p = .01$) and with secure attachment ($r = -.28, p = .02$). However, this bias was neither associated with disorganized attachment ($r = .17, p = .15$) nor ODP symptoms ($r = -.10, p = .43$), contrary to previous studies (Verhoef et al., 2019; Zaccagnino et al., 2013). The association between these variables might be stronger in clinical samples (Verhoef et al., 2019). As age was significantly correlated with secure attachment and HAB, it was entered as a control variable in the hierarchical regression analyses.

The results of hierarchical regression analyses regarding secure attachment, disorganized attachment and HAB are reported in Table 2 [Table 2 near here].

Regarding HAB, results showed a significant interaction between CU traits and anxiety (std. $b = .37, p = .02$). When the interaction term was added to the model, there was a significant .08 change in R^2 . As reported in Fig. 2 [Figure 2 near here], CU traits and HAB were non-significantly associated at non-clinical levels of anxiety (std. $b = -.11, p = .55$) but were positively associated at clinical levels of anxiety (std. $b = .57, p = .02$).

For secure attachment, there was no significant main effect for either CU traits or anxiety and the interaction between these two variables was non-significant. A significant main effect for age (std. $b = .37, p = .01$) was found.

For disorganized attachment, the complete model only showed a marginal significant main effect for CU traits (std. $b = .31, p = .09$). When the non-significant interaction was deleted from the model there was a significant main effect for CU traits (std. $b = .29, p = .04$). In other words, the higher the CU traits, the more disorganized the attachment profile, regardless of the level of anxiety. The other variables were all non-significant.

Discussion

The present study has contributed to extant research on variants of CU traits in childhood. Specifically, the aim of the current study was to investigate the moderating effect

of anxiety in associations between CU traits and hostile attribution bias, as well as attachment representations in a community sample of children aged 4 to 9. Indeed, the combination of high CU traits with low or high levels of anxiety could be used as a proxy for primary and secondary variants (Craig et al., 2020). Anxiety is the variable the most frequently employed to distinguish between the two variants, consistently enabling the identification of two distinct variants of CU traits with different characteristics (for a review, see Craig et al., 2020).

First, the results revealed that anxiety moderated the association between CU traits and HAB, such that CU traits were only associated with HAB at high levels of anxiety. If we extend these results and talk in terms of variants (at the end of the continuum of CU traits), this would mean that only the secondary variant was characterized by a HAB, while the primary variant was not. These results might explain why past studies that have investigated the associations between broad CU traits and HAB found mixed results (Cima et al., 2014; Hartmann et al., 2020; Helseth et al., 2015). Regarding the secondary variant, the results are relevant with studies showing that this variant is associated with maltreatment, hyperarousal, emotional regulation, as well as reactive aggression (Craig et al., 2020), these four variables having also been associated with HAB (Colton et al., 2023; Lemerise & Arsenio, 2000; Martinelli et al., 2018; Nelson & Perry, 2015; Zhu et al., 2020). This is also consistent with the fact that the secondary variant presents a hypersensitivity to threatening cues (Kimonis et al., 2008, 2012), which might influence, and be influenced by, the interpretation of these cues (Hartmann et al., 2020). Children from this variant might focus their attention on cues signalling danger (for example, cues signalling the parent's anger) and therefore might be less able to consider other cues signalling that the intention is not hostile (Price & Glad, 2003).

The findings of the current study, which indicate that the primary variant was not associated with HAB, align with previous research demonstrating reduced engagement towards emotional stimuli (Fanti et al., 2018; Kimonis et al., 2012), lower emotional recognition (Dadds

et al., 2018), and better emotional regulation (Craig & Moretti, 2019) compared to the secondary variant. These characteristics could make the children with this variant less likely to interpret the intentions of others as hostile. These findings represent a significant advancement in our understanding of the distinct social information processing of the two variants of CU traits during childhood.

Second, the current results indicated an association between CU traits and disorganized attachment, rather than attachment security, regardless of anxiety levels. In other words, both variants would be associated with disorganized attachment. These findings align with numerous studies that have linked broad CU traits to disorganized attachment during childhood (Bohlin et al., 2012; Kohlhoff et al., 2020; Pasalich et al., 2012; Rehder et al., 2021). Regarding the secondary variant, the results are consistent with those of Cecil et al. (2018), who found that youths from this variant were predominantly characterized by a disorganized profile. However, in contrast to our results, their primary variant group was predominantly characterized by secure attachment. In addition to differences in sample characteristics (age, type of sample, etc.), methodological differences, such as the use of continuous versus categorical approaches, or self-report measures versus a story-stem procedure, may account for this divergence in results. In the study of Cecil et al. (2018), the answers of youths might reflect social desirability, manipulation or limited ability to feel, identify or communicate their own feelings due to hypoarousal, rather than reflecting secure attachment representations.

Although the association between the primary variant and disorganized attachment is inconsistent with the results of Cecil et al. (2018), it aligns with the known theory. Early characteristics associated with the primary variant, such as reduced sensitivity and experience of emotional stimuli and/or difficulties in communicating emotions related to fear and distress (Bennett & Kerig, 2014; Fanti et al., 2020; Kimonis et al., 2012, 2017), as well as deficits in reciprocal eye gazing towards the attachment figures (Dadds et al., 2011), may disrupt

emotional reciprocity between children and their caregivers. Consequently, parents may be less responsive or less synchronous with the child's affective states and needs (Larstone et al., 2018). Furthermore, given the assumed genetic influences in the primary variant (Karpman, 1941), the parents of these children might also present characteristics of CU traits, further impairing their ability to detect and respond to the child's needs. Thus, these interactions between the child and the parent could impact the development of organized attachment representations over time.

Disruptions to the attachment system may occur differently for the secondary variant. In this variant, the caregivers are thought to respond to the child's affective states and needs in a way that is not sensitive, or even punishing (Larstone et al., 2018), which may impact attachment quality. Additionally, exposure to maltreatment, parental rejection or developmental trauma are associated with disorganized attachment (Breidenstine et al., 2011; Cyr et al., 2010). Given that the secondary variant has been found to develop as a result of maltreatment or trauma, it is possible that disorganized attachment also plays a role in the development of characteristics of the secondary variant. Indeed, disorganized attachment strategies resemble features associated with the secondary variant, such as the alternation between emotional dysregulation with intense negative affects and moments of emotional numbing or dissociation to cope with affective distress (Craig et al., 2020; Craig & Moretti, 2019; Larstone et al., 2018).

These results need to be interpreted in light of several limitations. First, the cross-sectional design of this study prevented us from determining the direction of the associations between attachment, HAB and the two variants. While we formulated hypotheses, our results did not imply that one precedes or causes the other. Future studies should promote longitudinal designs in order to investigate the developmental trajectories of the two variants in association with attachment representations and hostile attribution bias. A deeper

understanding of the developmental trajectories of children within the two variants could inform the development of preventive and intervention strategies.

Secondly, our sample, composed of children aged 4 to 9, spanned the preschool and school-age periods. However, these developmental periods exhibit distinct behavioural characteristics. For instance, while HAB is still part of typical child development in preschoolers, it begins to become atypical towards the end of the preschool and the beginning of the school-age period (Dodge, 2006). Treating the sample as a whole might have hidden some specificities and additional information about each developmental period, even if age was controlled in the analyses. Thirdly, our levels of CU traits may not represent the entire range of these traits, the higher scores being relatively low. The variability of CU traits is therefore limited, which can affect the precision and statistical power of the analyses. Moreover, it limits the generalizability of the findings to clinical samples with higher CU scores. Replication in samples with levels of CU traits across the entire continuum could increase the generalization of the current results.

Conclusion

In conclusion, our data suggest that children aged 4 to 9 with CU traits would be associated with disorganized, regardless of the level of anxiety, and thus for both variants. As such, attachment may represent an important target for treatment and prevention of CU traits. An intervention program based on fostering the quality of the parent-child relationship with adaptations for the characteristics of broad CU traits (Parent-Child Interaction Therapy for CU-type conduct problems) has shown promising results in reducing broad CU traits (Kimonis et al., 2019). Further studies would benefit from an investigation of the effects of such interventions while making the distinction between the two variants.

Finally, our study also suggests that only children within the secondary variant would show a hostile attribution bias, in contrast to children within the primary variant who would have succeeded in developing a benign attribution style. Studies investigating the specificities of the variants regarding social information processing are needed to gain a better understanding of the links between the variants and aggression, and to focus interventions on the problematic components specific to each variant.

Declaration of interest statement

No potential conflict of interest was reported by the authors.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

References

- Achenbach, T. M., & Rescorla, L. A. (2000). *Manual for the ASEBA preschool forms & profiles*. University of Vermont, Research Center for Children, Youth & Families.
- Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA school-age forms & profiles : Child behavior checklist for ages 6-18, teacher's report form, youth self-report : an integrated system of multi-informant assessment*. University of Vermont, Research Center for Children, Youth & Families.
- Ainsworth, M. D. S., Blehar, M., Waters, E., & Wall, S. (1978). *Patterns of attachment : A psychological study of the strange situation*. Lawrence Erlbaum Associates.

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders : DSM-5*. (5th ed.). American Psychiatric Publishing.
- Bansal, P. S., Babinski, D. E., Waxmonsky, J. G., & Waschbusch, D. A. (2020). Psychometric properties of parent ratings on the Inventory of Callous–Unemotional Traits in a nationally representative sample of 5- to 12-year-olds. *Assessment, 29*(2), 242-256. <https://doi.org/10.1177/1073191120964562>
- Bennett, D. C., & Kerig, P. K. (2014). Investigating the construct of trauma-related acquired callousness among delinquent youth : Differences in emotion processing. *Journal of Traumatic Stress, 27*(4), 415-422. <https://doi.org/10.1002/jts.21931>
- Bohlin, G., Eninger, L., Brocki, K. C., & Thorell, L. B. (2012). Disorganized attachment and inhibitory capacity : Predicting externalizing problem behaviors. *Journal of Abnormal Child Psychology, 40*(3), 449-458. <https://doi.org/10.1007/s10802-011-9574-7>
- Bowlby, J. (1969). *Attachment and loss : Attachment*. Basic Books.
- Breidenstine, A. S., Bailey, L. O., Zeanah, C. H., & Larrieu, J. A. (2011). Attachment and trauma in early childhood : A review. *Journal of Child & Adolescent Trauma, 4*(4), 274-290. <https://doi.org/10.1080/19361521.2011.609155>
- Bretherton, I., Ridgeway, D., & Cassidy, J. (1990). Assessing internal working models of the attachment relationship : An attachment story completion task for 3-year-olds. In M. T. Greenberg, D. Cicchetti, & E. M. Cummings (Éds.), *Attachment in the preschool years : Theory, research, and intervention* (p. 273-308). The University of Chicago Press.
- Burke, J. D., Loeber, R., & Lahey, B. B. (2007). Adolescent conduct disorder and interpersonal callousness as predictors of psychopathy in young adults. *Journal of*

Clinical Child & Adolescent Psychology, 36(3), 334-346.

<https://doi.org/10.1080/15374410701444223>

Cecil, C. A. M., McCrory, E. J., Barker, E. D., Guiney, J., & Viding, E. (2018).

Characterising youth with callous–unemotional traits and concurrent anxiety :

Evidence for a high-risk clinical group. *European Child & Adolescent Psychiatry*,

1-14. <https://doi.org/10.1007/s00787-017-1086-8>

Cima, K., Maaïke, Vancleef, L. M. G., Lobbestael, J., Meesters, C., & Korebrits, A. (2014).

Don't you dare look at me, or else : Negative and aggressive interpretation bias,

callous unemotional traits and type of aggression. *Journal of Child and Adolescent*

Behavior, 2(2). <https://doi.org/10.4172/2375-4494.1000128>

Colton, K. C., Godleski, S. A., & Crane, C. A. (2023). Applying a bifactor model to the

functions of relational aggression : Associations with hostile attribution biases and

difficulties with emotion regulation. *Aggressive Behavior*, 49(1), 58-67.

<https://doi.org/10.1002/ab.22053>

Cooke, J. E., Kochendorfer, L. B., Stuart-Parrigon, K. L., Koehn, A. J., & Kerns, K. A.

(2019). Parent–child attachment and children's experience and regulation of emotion :

A meta-analytic review. *Emotion*, 19(6), 1103-1126.

<https://doi.org/10.1037/emo0000504>

Craig, S. G., Goulter, N., & Moretti, M. M. (2020). A systematic review of primary and

secondary callous-unemotional traits and psychopathy variants in youth. *Clinical*

Child and Family Psychology Review. <https://doi.org/10.1007/s10567-020-00329-x>

Craig, S. G., & Moretti, M. M. (2019). Profiles of primary and secondary callous-unemotional

features in youth : The role of emotion regulation. *Development and Psychopathology*,

31(4), 1489-1500. <https://doi.org/10.1017/S0954579418001062>

- Crick, N. R., & Dodge, K. A. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin*, *115*(1), 74-101. <https://doi.org/10.1037/0033-2909.115.1.74>
- Crick, N. R., & Dodge, K. A. (1996). Social information-processing mechanisms in reactive and proactive aggression. *Child Development*, *67*(3), 993-1002.
<https://doi.org/10.2307/1131875>
- Cyr, C., Euser, E. M., Bakermans-Kranenburg, M. J., & van Ijzendoorn, M. H. (2010). Attachment security and disorganization in maltreating and high-risk families : A series of meta-analyses. *Development and Psychopathology*, *22*(1), 87-108.
<https://doi.org/10.1017/S0954579409990289>
- Dadds, M. R., Jambrak, J., Pasalich, D., Hawes, D. J., & Brennan, J. (2011). Impaired attention to the eyes of attachment figures and the developmental origins of psychopathy. *Journal of Child Psychology and Psychiatry*, *52*(3), 238-245.
<https://doi.org/10.1111/j.1469-7610.2010.02323.x>
- Dadds, M. R., Kimonis, E. R., Schollar-Root, O., Moul, C., & Hawes, D. J. (2018). Are impairments in emotion recognition a core feature of callous–unemotional traits? Testing the primary versus secondary variants model in children. *Development and Psychopathology*, *30*(1), 67-77. <https://doi.org/10.1017/S0954579417000475>
- Dodge, K. A. (2006). Translational science in action : Hostile attributional style and the development of aggressive behavior problems. *Development and psychopathology*, *18*(3), 791-814. <https://doi.org/10.1017/S0954579406060391>
- Dykas, M. J., & Cassidy, J. (2011). Attachment and the processing of social information across the life span : Theory and evidence. *Psychological Bulletin*, *137*(1), 19-46.
<https://doi.org/10.1037/a0021367>

- Ezpeleta, L., Granero, R., de la Osa, N., & Domènech, J. M. (2017). Developmental trajectories of callous-unemotional traits, anxiety and oppositionality in 3–7-year-old children in the general population. *Personality and Individual Differences, 111*, 124-133. <https://doi.org/10.1016/j.paid.2017.02.005>
- Fanti, K. A., Demetriou, C. A., & Kimonis, E. R. (2013). Variants of callous-unemotional conduct problems in a community sample of adolescents. *Journal of Youth and Adolescence, 42*(7), 964-979. <https://doi.org/10.1007/s10964-013-9958-9>
- Fanti, K. A., & Kimonis, E. (2017). Heterogeneity in externalizing problems at age 3 : Association with age 15 biological and environmental outcomes. *Developmental Psychology, 53*(7), 1230-1241. <https://doi.org/10.1037/dev0000317>
- Fanti, K. A., Konikou, K., Cohn, M., Popma, A., & Brazil, I. A. (2020). Amygdala functioning during threat acquisition and extinction differentiates antisocial subtypes. *Journal of Neuropsychology, 14*(2), 226-241. <https://doi.org/10.1111/jnp.12183>
- Fanti, K. A., Kyranides, M. N., Petridou, M., Demetriou, C. A., & Georgiou, G. (2018). Neurophysiological markers associated with heterogeneity in conduct problems, callous unemotional traits, and anxiety : Comparing children to young adults. *Developmental Psychology, 54*(9), 1634-1649. <http://dx.doi.org/10.1037/dev0000505>
- Fearon, R. M. P., & Roisman, G. I. (2017). Attachment theory : Progress and future directions. *Current Opinion in Psychology, 15*, 131-136. <https://doi.org/10.1016/j.copsy.2017.03.002>
- Fearon, R. P., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H. V., Lapsley, A.-M., & Roisman, G. I. (2010). The significance of insecure attachment and disorganization in the development of children's externalizing behavior : A meta-analytic study. *Child Development, 81*(2), 435-456. <https://doi.org/10.1111/j.1467-8624.2009.01405.x>

- Frick, P. J. (2004). *The Inventory of Callous-Unemotional Traits—Unpublished rating scale*.
<http://psyc.uno.edu/Frick%20Lab/ICU.html>
- Frick, P. J., Cornell, A. H., Bodin, S. D., Dane, H. E., Barry, C. T., & Loney, B. R. (2003).
Callous-unemotional traits and developmental pathways to severe conduct problems.
Developmental Psychology, *39*(2), 246-260. <https://doi.org/10.1037//0012-1649.39.2.246>
- Goulter, N., Kimonis, E. R., Hawes, S. W., Stepp, S., & Hipwell, A. E. (2017). Identifying
stable variants of callous-unemotional traits : A longitudinal study of at-risk girls.
Developmental Psychology, *53*(12), 2364-2376. <http://dx.doi.org/10.1037/dev0000394>
- Granot, D., & Mayseless, O. (2001). Attachment security and adjustment to school in middle
childhood. *International Journal of Behavioral Development*, *25*(6), 530-541.
<https://doi.org/10.1080/01650250042000366>
- Groh, A. M., Fearon, R. P., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Steele, R.
D., & Roisman, G. I. (2014). The significance of attachment security for children's
social competence with peers : A meta-analytic study. *Attachment & Human
Development*, *16*(2), 103-136. <https://doi.org/10.1080/14616734.2014.883636>
- Hartmann, D., Ueno, K., & Schwenck, C. (2020). Attributional and attentional bias in
children with conduct problems and callous-unemotional traits : A case-control study.
Child and Adolescent Psychiatry and Mental Health, *14*, 9.
<https://doi.org/10.1186/s13034-020-00315-9>
- Helseth, S. A., Waschbusch, D. A., King, S., & Willoughby, M. T. (2015). Aggression in
children with conduct problems and callous-unemotional traits : Social information
processing and response to peer provocation. *Journal of Abnormal Child Psychology*,
43(8), 1503-1514. <https://doi.org/10.1007/s10802-015-0027-6>

- Huang, J., Fan, L., Lin, K., & Wang, Y. (2020). Variants of children with psychopathic tendencies in a community sample. *Child Psychiatry & Human Development, 51*(4), 563-571. <https://doi.org/10.1007/s10578-019-00939-9>
- Humayun, S., Kahn, R. E., Frick, P. J., & Viding, E. (2014). Callous-unemotional traits and anxiety in a community sample of 7-year-olds. *Journal of Clinical Child & Adolescent Psychology, 43*(1), 36-42. <https://doi.org/10.1080/15374416.2013.814539>
- Kahn, R. E., Frick, P. J., Youngstrom, E. A., Kogos Youngstrom, J., Feeny, N. C., & Findling, R. L. (2013). Distinguishing primary and secondary variants of callous-unemotional traits among adolescents in a clinic-referred sample. *Psychological Assessment, 25*(3), 966-978. <http://dx.doi.org/10.1037/a0032880>
- Karpman, B. (1941). On the need of separating psychopathy into two distinct clinical types : The symptomatic and the idiopathic. *Journal of Criminal Psychopathology, 3*, 112-137.
- Kimonis, E. R., Fanti, K. A., Goulter, N., & Hall, J. (2017). Affective startle potentiation differentiates primary and secondary variants of juvenile psychopathy. *Development and Psychopathology, 29*(4), 1149-1160. <https://doi.org/10.1017/S0954579416001206>
- Kimonis, E. R., Fleming, G., Briggs, N., Brouwer-French, L., Frick, P. J., Hawes, D. J., Bagner, D. M., Thomas, R., & Dadds, M. (2019). Parent-Child Interaction Therapy adapted for preschoolers with callous-unemotional traits : An open trial pilot study. *Journal of Clinical Child & Adolescent Psychology, 48:sup1*, S347-S361. <https://doi.org/10.1080/15374416.2018.1479966>
- Kimonis, E. R., Frick, P. J., Cauffman, E., Goldweber, A., & Skeem, J. (2012). Primary and secondary variants of juvenile psychopathy differ in emotional processing.

Development and Psychopathology, 24(3), 1091-1103.

<https://doi.org/10.1017/S0954579412000557>

Kimonis, E. R., Frick, P. J., Skeem, J. L., Marsee, M. A., Cruise, K., Munoz, L. C., Aucoin, K. J., & Morris, A. S. (2008). Assessing callous–unemotional traits in adolescent offenders : Validation of the Inventory of Callous–Unemotional Traits. *International Journal of Law and Psychiatry*, 31(3), 241-252.

<https://doi.org/10.1016/j.ijlp.2008.04.002>

Kimonis, E. R., Skeem, J. L., Cauffman, E., & Dmitrieva, J. (2011). Are secondary variants of juvenile psychopathy more reactively violent and less psychosocially mature than primary variants? *Law and Human Behavior*, 35(5), 381-391.

<https://doi.org/10.1007/s10979-010-9243-3>

Kochanska, G., Aksan, N., Knaack, A., & Rhines, H. M. (2004). Maternal parenting and children's conscience : Early security as moderator. *Child development*, 75(4),

1229-1242. <https://doi.org/10.1111/J.1467-8624.2004.00735.X>

Kohlhoff, J., Mahmood, D., Kimonis, E., Hawes, D. J., Morgan, S., Egan, R., Niec, L. N., & Eapen, V. (2020). Callous–unemotional traits and disorganized attachment : Links with disruptive behaviors in toddlers. *Child Psychiatry & Human Development*, 51,

399-406. <https://doi.org/10.1007/s10578-019-00951-z>

Larstone, R. M., Craig, S. G., & Moretti, M. M. (2018). An attachment perspective on callous and unemotional characteristics across development. In R. M. Larstone & W. J. Livesley (Éds.), *Handbook of Personality Disorders : Theory, Research, and Treatment* (p. 324-336). Guilford Press.

- Lemerise, E. A., & Arsenio, W. F. (2000). An integrated model of emotion processes and cognition in social information processing. *Child Development, 71*(1), 107-118.
<https://doi.org/10.1111/1467-8624.00124>
- Longman, T., Hawes, D. J., & Kohlhoff, J. (2016). Callous–unemotional traits as markers for conduct problem severity in early childhood : A meta-analysis. *Child Psychiatry & Human Development, 47*(2), 326-334. <https://doi.org/10.1007/s10578-015-0564-9>
- Madigan, S., Atkinson, L., Laurin, K., & Benoit, D. (2013). Attachment and internalizing behavior in early childhood : A meta-analysis. *Developmental Psychology, 49*(4), 672-689. <https://doi.org/10.1037/a0028793>
- Main, M., & Solomon, J. (1986). Discovery of an insecure-disorganized/disoriented attachment pattern. In T. B. Brazelton & M. W. Yogman (Éds.), *Affective development in infancy* (p. 95-124). Ablex Publishing.
- Martinelli, A., Ackermann, K., Bernhard, A., Freitag, C. M., & Schwenck, C. (2018). Hostile attribution bias and aggression in children and adolescents : A systematic literature review on the influence of aggression subtype and gender. *Aggression and Violent Behavior, 39*, 25-32. <https://doi.org/10.1016/j.avb.2018.01.005>
- Metcalf, S., Dickerson, K. L., Milojevich, H. M., & Quas, J. A. (2021). Primary and secondary variants of psychopathic traits in at-risk youth : Links with maltreatment, aggression, and empathy. *Child Psychiatry & Human Development, 52*(6), 1060-1070.
<https://doi.org/10.1007/s10578-020-01083-5>
- Miljkovitch, R., Pierrehumbert, B., Bretherton, I., & Halfon, O. (2004). Associations between parental and child attachment representations. *Attachment & Human Development, 6*(3), 305-325. <https://doi.org/10.1080/14616730412331281557>

- Miljkovitch, R., Pierrehumbert, B., Karmaniola, A., & Halfon, O. (2003). Les représentations d'attachement du jeune enfant. Développement d'un système de codage pour les histoires à compléter. *Devenir, 15*(2), 143-177. <https://doi.org/10.3917/dev.032.0143>
- Nasby, W., Hayden, B., & DePaulo, B. M. (1980). Attributional bias among aggressive boys to interpret unambiguous social stimuli as displays of hostility. *Journal of Abnormal Psychology, 89*(3), 459-468. <https://doi.org/10.1037//0021-843x.89.3.459>
- Nelson, J. A., & Perry, N. B. (2015). Emotional reactivity, self-control and children's hostile attributions over middle childhood. *Cognition and Emotion, 29*(4), 592-603. <https://doi.org/10.1080/02699931.2014.924906>
- Orobio de Castro, B., Veerman, J. W., Koops, W., Bosch, J. D., & Monshouwer, H. J. (2002). Hostile attribution of intent and aggressive Behavior : A meta-analysis. *Child Development, 73*(3), 916-934. <https://doi.org/10.1111/1467-8624.00447>
- Pasalich, D. S., Dadds, M. R., Hawes, D. J., & Brennan, J. (2012). Attachment and callous-unemotional traits in children with early-onset conduct problems. *Journal of Child Psychology and Psychiatry, 53*(8), 838-845. <https://doi.org/10.1111/j.1469-7610.2012.02544.x>
- Payot, M., Monseur, C., & Stievenart, M. (2022). Factorial structure of the parent-reported version of the inventory of callous-unemotional traits among Belgian children : A theory-based model. *Frontiers in Psychology, 13*. <https://doi.org/10.3389/fpsyg.2022.839785>
- Porter, S. (1996). Without conscience or without active conscience? The etiology of psychopathy revisited. *Aggression and Violent Behavior, 1*(2), 179-189. [https://doi.org/10.1016/1359-1789\(95\)00010-0](https://doi.org/10.1016/1359-1789(95)00010-0)

- Price, J. M., & Glad, K. (2003). Hostile attributional tendencies in maltreated children. *Journal of Abnormal Child Psychology*, *31*(3), 329-343.
<https://doi.org/10.1023/A:1023237731683>
- Rehder, P. D., Mills-Koonce, W. R., Wagner, N. J., Zvara, B., & Willoughby, M. T. (2021). Attachment quality assessed from children's family drawings links to child conduct problems and callous-unemotional behaviors. *Attachment & Human Development*, *23*(3), 239-256. <https://doi.org/10.1080/14616734.2020.1714676>
- Rowe, R., Maughan, B., Moran, P., Ford, T., Briskman, J., & Goodman, R. (2010). The role of callous and unemotional traits in the diagnosis of conduct disorder. *Journal of Child Psychology and Psychiatry*, *51*(6), 688-695. <https://doi.org/10.1111/j.1469-7610.2009.02199.x>
- Suess, G. J., Grossmann, K. E., & Sroufe, L. A. (1992). Effects of infant attachment to mother and father on quality of adaptation in preschool: From dyadic to individual organisation of self. *International Journal of Behavioral Development*, *15*(1), 43-65.
<https://doi.org/10.1177/016502549201500103>
- van Ijzendoorn, M. H. V., Schuengel, C., & Bakermans-Kranenburg, M. J. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology*, *11*(2), 225-249.
<https://doi.org/10.1017/s0954579499002035>
- Vanwalleghe, S., Miljkovitch, R., Counsell, A., Atkinson, L., & Vinter, A. (2020). Validation of the Intention Attribution Test for Children (IAC). *Assessment*, *27*(7), 1619-1632. <https://doi.org/10.1177/1073191119831781>

- Verhoef, R. E. J., Asem, S. C., Verhulp, E. E., & Castro, B. O. D. (2019). Hostile intent attribution and aggressive behavior in children revisited: A meta-analysis. *Child Development, 90*(5), e525-e547. <https://doi.org/10.1111/cdev.13255>
- Willoughby, M. T., Mills-Koonce, W. R., Gottfredson, N. C., & Wagner, N. J. (2014). Measuring callous unemotional behaviors in early childhood: Factor structure and the prediction of stable aggression in middle childhood. *Journal of Psychopathology and Behavioral Assessment, 36*(1), 30-42. <https://doi.org/10.1007/s10862-013-9379-9>
- Wright, N., Hill, J., Sharp, H., & Pickles, A. (2018). Maternal sensitivity to distress, attachment and the development of callous-unemotional traits in young children. *Journal of Child Psychology and Psychiatry, 59*(7), 790-800. <https://doi.org/10.1111/jcpp.12867>
- Zaccagnino, M., Cussino, M., Callerame, C., Perinetti, B., Veglia, F., & Green, J. (2013). Attachment and social understanding in young school-age children: An investigation using the Manchester Child Attachment Story Task. *Minerva Psichiatrica, 54*(1), 59-69.
- Zhu, W., Chen, Y., & Xia, L.-X. (2020). Childhood maltreatment and aggression: The mediating roles of hostile attribution bias and anger rumination. *Personality and Individual Differences, 162*, 110007. <https://doi.org/10.1016/j.paid.2020.110007>

Tables and figures

Table 1. Descriptive statistics and correlations of main study variables.

	1	2	3	4	5	6	7	Mean/%	SD/N
1. Gender	-							52.9%	37
2. Age	-.07	-						6.79	1.50
3. ICU	-.15	-.05	-					10.94	6.80
4. Anxiety	-.23 [†]	.48**	.22 [†]	-				29%	20
5. ODP	-.31**	.08	.46**	.19	-			14.5%	10
6. Secure Att.	.19	.39**	-.08	.21 [†]	-.02	-		0.28	0.27
7. Disorganized Att.	-.06	.02	.27*	.07	.09	-.18	-	-0.30	0.23
8. HAB	-.03	-.31**	.08	-.15	-.10	-.28*	.17	4.19	3.01

Note. Gender : 0 = boy, 1 = girl, percentage represents percentage of boys. ICU, Inventory of Callous Unemotional traits; Anxiety: percentage represents children with clinical levels of anxiety; ODP, Oppositional Defiant Problems; percentage of ODP represents children with clinical levels of ODP symptoms; Secure Att., Secure attachment; Disorganized Att., Disorganized attachment. ** = $p \leq .01$, * = $p \leq .05$, [†] = $p \leq .10$.

Table 2. Hierarchical regression analyses testing for the moderating role of anxiety in the association between callous-unemotional traits, and attachment profiles and hostile attributional bias.

Variables	Secure Attachment				Disorganized Attachment				HAB			
	<i>Std. b</i>	<i>R</i> ²	ΔR^2	<i>Partial r</i>	<i>Std. b</i>	<i>R</i> ²	ΔR^2	<i>Partial r</i>	<i>Std. b</i>	<i>R</i> ²	ΔR^2	<i>Partial r</i>
Stage 1												
Age	.42**			.42	-.03			-.03	-.31*			-.31
ODP	-.05			-.05	.10			.10	-.08			-.08
		.17	.17**			.01	.01			.11	.11*	
Stage 2												
Age	.40**			.34	-.01			-.01	-.29*			-.25
ODP	-.03			-.03	-.04			-.04	-.13			-.12
CU	-.05			-.05	.29*			.25	.13			.11
Anxiety	.03			.03	.02			.02	-.01			-.01
		.17	.00			.08	.07			.12	.01	
Stage 3												
Age	.38**			.32	-.01			-.01	-.34*			-.29
ODP	-.03			-.02	-.04			-.04	-.08			-.07
CU	-.12			-.08	.31†			.21	-.11			-.07
Anxiety	.03			.02	.02			.02	-.02			-.02
CU x Anxiety	.11			.08	-.03			-.02	.35*			.26
		.18	.01			.08	.00			.19	.07*	

Note. Std b = standardized beta; CU, Callous Unemotional traits; ODP, Oppositional Defiant Problems. ** = $p \leq .01$, * = $p \leq .05$, † = $p \leq .10$.

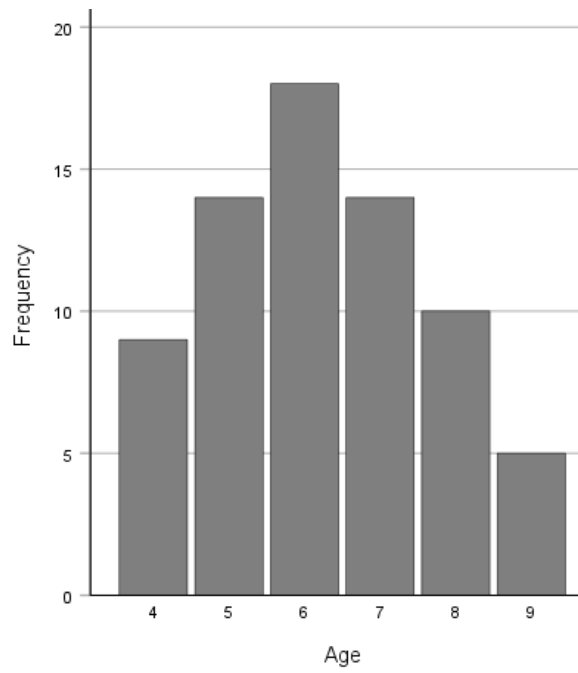


Figure 1. Age distribution of the sample.

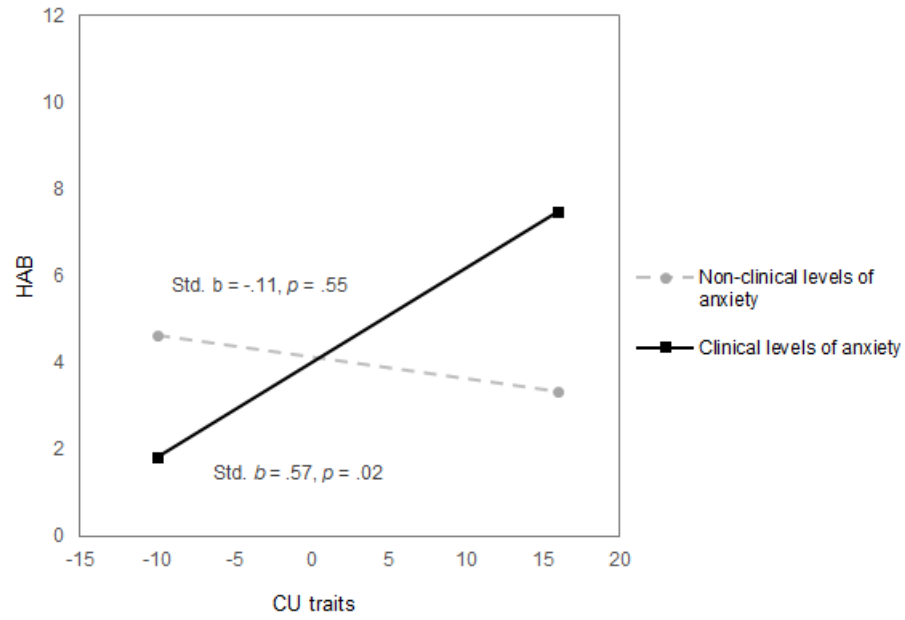


Figure 2. Interaction between centered CU Traits and HAB at clinical and non-clinical levels of anxiety.