Differences in Attachment and CU Behavioral Dimensions Between Primary and Secondary CU Traits.

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Abstract

This study explores the differences between primary (genetically mediated) and secondary (acquired) callous-unemotional (CU) traits in relation to attachment patterns and CU behavioral dimensions. A convenience sample of 93 University of Groningen students (aged 18 – 27) completed questionnaires on anxiety, attachment anxiety/avoidance, and CU traits. Using a median-split approach, participants were divided into 4 groups based on their CU and anxiety scores, which were compared in terms of the subscales of the Inventory of Callous-Unemotional Trats (ICU), and the attachment dimensions (attachment and anxiety). Results showed no significant differences in the CU behavioral dimensions. However, young adults categorized as having secondary CU traits had higher levels of attachment avoidance and attachment anxiety compared to the group without CU traits and anxiety, and higher levels of attachment avoidance than those categorized as having primary CU traits. These findings suggest that primary and secondary CU traits are associated with unique attachment patterns, emphasizing the importance of differentiating between primary and secondary CU traits in both research and clinical contexts.

Keywords: callous-unemotional traits, Inventory of Callous-Unemotional Traits, attachment, primary CU traits, secondary CU traits

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Differences in attachment and CU behavioral dimensions between primary and secondary CU traits

Introduction

Callous-Unemotional (CU) traits in childhood and adolescence have been the focus of growing interest in recent decades (Larstone et al., 2018). These traits generally develop in early childhood and are defined by a lack of prosocial emotions, such as empathy, guilt, and shame (Ivanova-Serokhvostova et al., 2024). CU traits can be measured through 3 behavioral subdimensions: callousness (e.g., “I do not care who I hurt to get what I want”), unemotional (e.g., “I do not show my emotions to others”) and uncaring (e.g., “I work hard on everything I do” reversed scored) (Byrd et al., 2013; Inventory of Callous-Unemotional Traits, 2004). These dimensions reflect varying aspects of emotional detachment and insensitivity.

CU traits are closely linked to serious behavioral problems during childhood and adolescence (Frick et al., 2014). Research has shown that youth with conduct disorder who also display CU traits tend to exhibit more severe behavioral issues than those with conduct disorder alone (Perlstein et al., 2023). CU traits in childhood or adolescence also increase the likelihood of developing persistent antisocial traits and psychopathy in adulthood (Frick et al., 2014), which pose risks to societal well-being and lead to negative life outcomes for both the individual and those around them (Goldstein et al., 2008; Black et al., 2010).

Because of the strong relation with problematic behavior, CU traits are often studied in clinical contexts, where behavioral problems or antisocial personality disorder are relatively common (Pardini, 2011; Roşan et al., 2015), even though CU traits may also exist without the presence of these behaviors. Community based studies have provided valuable insights into CU traits as a separate construct (Huang et al., 2020; Lee & Lee, 2024), but research in this area is still limited. Therefore, more research is needed on CU traits outside clinical contexts to better understand these traits when they occur without accompanying behavioral problems.

Considerable evidence shows that the development of CU traits starts in early childhood, with genetic factors playing an important role (Waller & Wagner, 2019). More specifically, the Sensitivity to Threat and Affiliative Reward (STAR) model suggests that genetic predispositions that lead to experiencing low affiliative reward, increase the risk of developing CU traits (Waller & Wagner, 2019). Affiliative reward refers to deriving pleasure from close interpersonal bonds, a key factor in early attachment to caregivers. From a young age, children are highly sensitive to affiliative inputs such as smiling and affectionate touch, which are essential for forming these bonds (Waller & Wagner, 2019). When children have reduced sensitivity to these inputs, they may fail to experience the associated affiliative reward, impairing empathy development and diminishing the enjoyment of social closeness, both of which are characteristics of CU traits (Foulkes et al., 2017).

Although genetic factors have traditionally been the focus in research on CU traits, more recent studies have proposed a distinction between two variants: primary CU traits, rooted in genetics, and secondary CU traits, which are believed to arise from environmental factors and are commonly distinguished from the primary variant by elevated anxiety levels (Huang et al., 2020). Kimonis et al. (2013) found that primary CU traits are associated with higher scores on the unemotional subscale of the ICU (Inventory of Callous-Unemotional traits; Frick, 2004) compared to secondary CU traits, suggesting that primary CU traits are linked to greater deficits in empathic responding. However, no significant differences were found across the callous and uncaring subscales of the ICU, and research into their specific roles within CU traits is still limited.

Youth with secondary CU traits report more trauma and abuse compared to youth with primary CU traits (Craig et al., 2021; Cecil et al., 2018). It is thought that when children experience extreme emotional distress, they may resort to numbing their emotions as a coping mechanism, particularly when there is no escape from the trauma, such as abuse by caregivers

(Larstone et al. 2018). While this can help them manage overwhelming feelings in the short term, it can also lead to difficulties in emotional expression, disrupted emotion regulation, and a diminished ability to experience prosocial emotions like empathy. Over time, this numbing effect, originally intended to protect, may hinder social and moral development and lead to the development of CU traits (Larstone et al., 2018).

Attachment

A closely related area of research is the development of attachment, as attachment is thought to be related to CU traits (Larstone et al., 2018). According to attachment theory, early experiences with caregivers in the first few years of life are crucial for healthy emotional and moral development (Bowlby, 1982). Essentially, infants need the warmth, love and protection from a primary caregiver for their survival, requiring parents to be responsive to the (emotional and physical) needs of their children and provide them with comfort and security. These early experiences form the foundation for future relationships and emotional well-being. Attachment can be measured using two attachment dimensions: attachment anxiety and attachment avoidance (Brennan et al., 1998; Fraley et al., 2000), which combine to form four attachment styles: secure (with healthy and balanced relationships), anxious (characterized by a high fear of rejection), avoidant (prioritizing independence and avoiding emotional intimacy), or disorganized (showing high levels of both avoidance and anxiety, and oscillating between seeking closeness and pushing others away) (Cooke et al., 2019; Shemmings & Shemmings, 2011). Insecure attachment styles (avoidant, anxious and disorganized) develop as a result of inconsistent, dismissive or abusive parenting. Attachment styles act as a blueprint for how individuals engage in personal relationships and are stable throughout life (Bowlby, 1982).

Larstone et al. (2018) have suggested that these abusive or dismissive responses from caregivers can negatively influence a child's moral and emotional development, which may

contribute to the development of CU traits. In support of this theory, CU traits have been associated with insecure and disorganized attachment (Craig et al., 2024). Furthermore, attachment avoidance has been found to be a positive predictor for CU traits in adults, whereas attachment anxiety is a negative predictor for CU traits (Kyranides et al., 2021). In other studies that included adults, CU traits have been associated with attachment avoidance but not attachment anxiety (Craig et al., 2024).

Different pathways to insecure attachment have been proposed for individuals with primary and secondary CU traits (Larstone et al., 2018). In the case of primary CU traits, it is thought that the deficits in the detection and identification of emotional cues associated with primary CU traits in young children (as explained by the STAR model; Waller & Wagner, 2019) disrupt the communication between parent and child, hindering attachment development (Larstone et al., 2018). More specifically, children with primary CU traits may experience low emotional arousal and/or difficulty expressing their emotions. In turn, their parents may become less responsive to the needs of the child, which hinders the development of a secure attachment system, as the child will become less likely to turn to their parent for support.

Regarding secondary CU traits, it has been suggested that while children do express their emotional and physical needs, dismissive or punitive responses from parents leave these needs unmet (Larstone et al., 2018). Children may then resort to emotional avoidance as a coping mechanism, as they have no one to turn to for emotional support (Larstone et al., 2018). Eventually, they may cease to seek closeness in personal relationships, which can result in both attachment anxiety and attachment avoidance (Larstone et al., 2018).

Only a few studies have directly made a distinction between primary and secondary variants. In children aged 4-9, primary and secondary CU traits have both been linked to disorganized attachment (Payot et al., 2023), supporting the theory of Larstone et al. (2018).

In contrast, another study found that adolescents with secondary CU traits had predominantly avoidant and disorganized attachment styles, but adolescents with primary CU traits had mostly secure attachment styles (Cecil et al., 2018). Given these inconsistent results, it remains unclear whether primary and secondary CU traits are differentially associated with attachment styles. Further research is needed to explain the differences in study findings and provide a clearer understanding of the relationship between CU traits and attachment.

The current study

Despite growing research, little is known about how primary and secondary CU traits distinctly relate to attachment and the ICU subscales. By examining a community sample of young adults who are not (yet) in clinical contexts, this study focuses on understanding how individuals with primary and secondary CU traits differ in terms of the attachment dimensions (avoidance and anxiety) and the CU behavioral subdimensions (callousness, uncaring and unemotional).

Participants were split into groups that varied in anxiety and CU levels, and were compared in terms of the ICU subscales (measured using the ICU; Frick, 2004) and the attachment dimensions (measured using the ECR-R; Fraley et al., 2000). In line with a previous study (Cecil et al., 2018) we adopted a median-split approach. It was expected that young adults with primary CU traits would score higher on the unemotional subscale than secondary CU traits. For the other two subscales there were no specific expectations due to lack of research in this area. With regard to the attachment dimensions, no specific predictions were made due to lack of and conflicting preliminary research, as well as the non-clinical nature of the sample.

Methods and Materials

Participants

The participants in the current study included 93 first-year psychology students (73.3% female, mean age 20.2 years) from the Dutch and the international track from Rijksuniversiteit Groningen. Participants were recruited by convenience sampling. One participant decided to withdraw their informed consent after debriefing about the research goals. After reading a general study description participants could voluntarily sign up to participate in the current study to receive course credit points, which was part of a mandatory first year course.

Procedure

After signing up for the study, participants gave informed consent before filling out several questionnaires, which took a total of 25 minutes to complete. Beforehand, participants were told that the study was about personality traits, and after completing the questionnaires, they were debriefed on the actual focus of the study: callous-unemotional traits. After debriefing about the research goals, all participants were given the opportunity to withdraw their informed consent. Ethical Approval was obtained from Ethics Committee of the Faculty of Behavioural and Social Sciences of the RUG.

Materials

CU traits. The Inventory of Callous-unemotional traits (ICU; Frick, 2004) was used to measure the behavioral dimensions of CU traits. The ICU consists of 24 items that are rated on a 4-point Likert scale ranging from 0 (not at all true) to 3 (definitely true). The items cluster in three subscales: “callousness” (11 items, $\alpha = .80$ in this sample), “uncaring” (8 items, $\alpha = .71$ in this sample) and “unemotional” (5 items, $\alpha = .83$ in this sample) and a total score ($\alpha = .80$ in this sample). Both the subscales and the total score demonstrated acceptable to good internal consistency ($\alpha > .70$ to $\alpha > .80$), as recommended by Ursachi et al. (2015).

Attachment dimensions. To measure the attachment dimensions, the Experiences in Close Relationships – Revised (ECR-R; Fraley et al., 2000). This questionnaire has two subscales with both 18 items: attachment anxiety (α = .94 in this sample) and attachment avoidance (α = .94 in this sample) that are rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Both outcome measures had good (α > .80) internal consistency, as recommended by Ursachi et al. (2015).

Anxiety. The anxiety subscale of the Depression and Anxiety Questionnaire (DASS-21; Lovibond & Lovibond, 1995, α = .88 in this sample) was used to measure anxiety levels,. This subscale contains 7 items that are rated on a 4-point Likert scale, ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). It had good internal consistency (α > .80), as recommended by Ursachi et al. (2015).

Statistical analysis

Data cleaning. Prior to starting analyses, cases with missing questionnaire scores (6.52% of all cases) were removed from the sample. The statistical analysis was performed with n=86.

Group formation. First, four groups were created using a median-split approach, based on the anxiety and the total CU scores (see Figure 1). Participants who scored above the median on anxiety were classified as “high” anxiety, while those scoring below the median were classified as “low”. The same method was applied to the total CU scores. These scores were combined to form four groups: an ANX group (scoring high on anxiety and low on CU), a CU+ANX group (scoring high on both CU and anxiety), a CU group (scoring high on CU and low on anxiety) and a control group (scoring low on both CU and anxiety).

Figure 1

Groups Created for Analysis

		CU traits	
		Low	**High**
Anxiety	**High**	ANX (n=17, 20%)	CU+ANX (n=25, 29%)
	Low	Low (n=29, 34%)	CU (n=15, 17%)

Note. Adapted from Cecil et al. (2018).

Hypothesis testing. After verifying the assumptions of univariate and multivariate normality and homogeneity of variances and covariance matrices, the ICU subscale scores were compared between the CU and CU+ANX groups (representing primary and secondary CU traits) using a one-way MANOVA. Following this, the same assumption checks were applied to examine the levels of attachment anxiety and attachment avoidance across all four groups, which were compared using a one-way MANOVA. Post hoc analyses were then conducted with Bonferroni correction to account for multiple comparisons. η_p^2 was used as a measure of effect size, where .01 is considered small, .06 is considered medium and .14 is considered large (Adams & Conway, 2014).

Results

Descriptives

For the means and standard deviations of all dependent variables, see Table 1.

Table 1.

Means (and Standard Deviations) of Dependent Variables Across Groups (N=86)

	Overall sample	Low	ANX	CU	CU+ANX
Anxiety	7.38 (4.97)	3.31 (1.75)	11.82 (3.40)	3.20 (2.04)	11.60 (3.23)
Total ICU	21.20 (7.86)	15.21 (3.77)	16.35 (2.69)	27.47 (6.99)	27.68 (6.35)
Attachment anxiety	3.54 (1.28)	2.69 (.21)	4.08 (.27)	3.37 (.29)	4.27 (.22)
Attachment avoidance	3.04 (1.09)	2.29 (.17)	3.26 (.22)	2.96 (.24)	3.82 (.18)
Unemotional	7.14 (3.38)	5.10 (3.05)	7.12 (2.55)	8.73 (.84)	8.56 (.65)
Uncaring	7.98 (3.63)	6.45 (3.02)	5.41 (1.91)	11.33 (.84)	9.48 (.65)
callousness	6.08 (4.60)	3.66 (1.91)	3.82 (1.74)	7.40 (1.36)	9.64 (1.05)

Attachment dimensions

Assumption verification. Boxplots showed no extreme univariate outliers for any of the dependent variables (see Appendix A). The Shapiro-Wilk test showed evidence for non-normality for both attachment avoidance ($W = .07$, $p = .03$) and attachment anxiety ($W = .09$, $p = .04$). There was one case with a Mahalanobis Distance value of 13.80 that was above the critical Chi Square value of 9.21 at $df = 2$, violating the assumption of multivariate normality. Levene's test for (univariate) equality of variances was nonsignificant for attachment anxiety ($F(3, 82) = 1.52$, $p = .22$), but was significant for attachment avoidance, ($F(3, 82) = 3.33$, $p = .02$), indicating unequal variances across groups. The Box's M (quality of covariance) value of 25.62 was nonsignificant at an alpha level of .001, indicating homogeneity of covariance matrices across groups ($F(9, 36326) = 2.71$, $p = .004$). Despite violations of the assumptions

of normality and homogeneity, MANOVA was continued because of a relatively large sample size ($N = 86$), and because according to the Central Limit theorem, the means of a population are always normally distributed. Because of its robustness against violations of assumptions, Pillai's Trace was reported.

Manova. Results of the one-way MANOVA showed a statistically significant difference between the four groups (Low, ANX, CU-ANX and CU+ANX) on the combined dependent attachment variables, $F(6, 164) = 6.68$, $p < .001$; Pillai's Trace = .39, $\eta_p^2 = .20$. Since $\eta^2 > .14$, the effect size was considered large.

Post-hoc analyses. Bonferroni-corrected post-hoc comparisons showed that the Low group scored significantly lower than both the CU+ANX group and the ANX on attachment anxiety and attachment avoidance, and the CU group and the CU+ANX group significantly differed in attachment avoidance (see Table 2).

Table 2.

Bonferroni-corrected pairwise comparisons with 95% confidence intervals

	Contrast (I – J)				
	Low - ANX	Low - CU+ANX	CU+ANX - CU	CU - Low	CU+ANX - ANX
Attachment anxiety	-1.58 [-2.30, -.47]	-.68 [-2.40, -.77]	-	-	-
Attachment avoidance	-.97 [-1.72, -.22]	-1.53 [-2.2, -.86]	.85 [.05, 1.66]	-	-

Note. Only significant contrasts at an α level of .05 were reported.

CU behavioral dimensions

Assumption verification. Boxplots showed one univariate outlier for the unemotional

subscale, but none for the uncaring and callousness subscales (see Appendix B). The Shapiro-Wilk test showed evidence for non-normality for the callousness subscale (W = .90, p = 002), but not for the unemotional (W = .98, p = .71) and uncaring (W = .97, p = .37) subscales. The Mahalanobis Distance value of 10.49 was below the critical Chi Square value of 11.35 at df = 3, supporting the assumption of multivariate normality. The Box's M (quality of covariance) value of 14.84 nonsignificant at an alpha level of .001, indicating homogeneity of covariance matrices across groups (F(6, 5695) = 2.24, p = .037). Levene's test for (univariate) equality of variances did not show evidence for unequal variances in the callousness, F(1,38) = 3.60, p = .066; uncaring, F(1,38) = .08, p = .786; and unemotional subscales, F(1,38) = .501, p = .484. The Box's M (quality of covariance) value of 14.84 indicated that the homogeneity of covariance matrices across groups was assumed (F(6, 5695) = 2.24, p = .037). Despite violations of the assumptions of normality and homogeneity, MANOVA was continued because of a relatively large sample size, and according to the central limit theorem, the means of a population are always normally distributed.

Manova. Results of the one-way MANOVA showed no statistically significant difference between the CU and CU+ANX groups in the ICU subscales, F(3, 36) = 1.45, p = .25; Pillai's Trace = .11, ηp2 = .11. Given the results of the assumption checks, Pillai's Trace is reported because of its robustness against violations of assumptions.

Discussion

The goal of the current study was to compare CU behavioral dimensions and attachment dimensions between young adults with (non-clinical) primary and secondary CU traits, and two control groups with low levels of CU traits and varying levels of anxiety. While no differences were found for the ICU subscales, the 4 groups did differ in both attachment anxiety and attachment avoidance. Specifically, both attachment anxiety and attachment avoidance were both found to be higher in the anxious group and the group high in

CU traits and anxiety (indicating secondary CU traits), compared to the Low group. Additionally, attachment avoidance was higher in the group high in CU traits and anxiety compared to the CU group.

Contrary to our expectations, we found no differences in the callous, unemotional, and uncaring subscales between the groups high in CU traits. Even though incarcerated boys with primary CU traits score higher on the unemotional subscale compared to those with secondary CU traits (Kimonis et al., 2013), no difference was observed in the current study, which focused on a non-clinical population. This discrepancy in results may be attributed to the nature of the study sample; the data from our convenience sample may have had too little variance in the ICU subscales for any differences to be detected. Additionally, what is worth noting, is that Colins et al. (2016) found that the unemotional subscale has low convergent validity. For example, the unemotional subscale is not associated with aggression and offending, as opposed to callousness and uncaring, but it is associated to agreeableness and conscientiousness (Colins et al., 2016). In this context, the inconsistency between our findings and previous research may reflect broader issues with the applicability of the unemotional subscale as a measure of CU traits.

The CU group did not show more attachment anxiety or attachment avoidance compared to the Low group. This indicates that individuals with primary (but non-clinical) CU traits do not have more insecure attachment compared to individuals with low CU traits, in line with previous findings showing that youth with primary CU traits had predominantly secure attachment styles (Cecil et al., 2018). However, this finding doesn't support the idea that primary CU traits may have a specific link to insecure attachment (Larstone et al, 2018). A possible explanation for this might be that Larstone et al. (2018) based their hypotheses on studies that made no distinction between primary and secondary CU traits. These studies may have been more representative of secondary CU traits than primary CU traits, which could

explain the observed association with attachment—an association that aligns more closely with the findings of our study. Our finding that adolescents classified as having primary CU traits did not have more attachment anxiety compared to adolescents without CU traits, also supports the idea that (primary) CU traits are only mildly influenced by environmental and developmental factors (Larstone et al., 2018).

The group that had high levels of both CU traits and anxiety (i.e. non-clinical secondary CU traits) had higher levels of both attachment anxiety and attachment avoidance compared to the Low group, indicating more insecure attachment. This finding is consistent with existing literature where secondary CU traits were linked to insecure and disorganized attachment (Cecil et al., 2018; Payot et al., 2023). However, it is not in line with studies where CU traits overall were negatively or not at all associated with attachment anxiety (Craig et al., 2024). The discrepancies between previous studies and our findings with regard to CU traits and attachment may be explained by the tendency to treat both variants as a unified construct, possibly masking differences between primary and secondary CU traits in their associations with attachment dimensions.

No difference in attachment anxiety was observed between the group indicating secondary CU traits and the group indicating primary CU traits. However, the former group showed higher attachment avoidance. When distinguishing between variants of CU traits, attachment avoidance appears to be a stronger indicator of secondary CU traits than attachment anxiety. This is in line with earlier findings indicating that youth with secondary CU traits are characterized by disorganized and avoidant, but not anxious attachment styles (Cecil et al., 2018).

An additional finding that was not related to our study goals, was that the group that had high levels of anxiety paired with low levels of CU traits (the anxious group) had higher levels of both attachment avoidance and attachment anxiety compared to the Low group (with

low levels of both anxiety and CU traits) as well as the CU group. They did not differ from the CU+ANX group. Thus, in the current study, the anxious group showed similar attachment insecurity compared to the group that was classified as having secondary CU traits. These similarities between anxious individuals and individuals with secondary CU traits have also been found in previous studies (Cecil et al., 2018).

This study is not without limitations. First, the research population in this study existed of a convenience sample with non-clinical levels of CU traits and anxiety. This could render the research less relevant for individuals who do show clinical levels of CU traits and/or anxiety, as the results of this study may not be applicable to this population. It is possible that the individuals that were assigned to the CU+ANX group still had very low CU levels, making it more difficult to draw any conclusions about this group, as this group may be very similar to the ANX group. A future research suggestion would be to apply this research design to a more clinically relevant population, like youth with behavioral problems or antisocial tendencies, for the results to be more clinically relevant.

Furthermore, based on the cross-sectional results of this study, no conclusions can be drawn concerning any causal effects between the two CU traits variants and the attachment dimensions. Finally, the median-split approach that was used in this study to categorize participants based on their CU traits and anxiety scores, has disadvantages compared to clinical cutoff scores. By adopting a median-split approach, participants are divided into two group based on the median value. This may not reflect clinically significant thresholds for CU traits or anxiety, as the median value does not measure symptom severity. In contrast, using clinical cutoff scores, which are based on established diagnostic criteria or clinical guidelines, would allow for a more meaningful categorization of participants and ensure that those with clinically relevant levels of CU traits and anxiety are appropriately identified. Future research

could benefit from adopting clinical cutoff scores, as this would enhance the clinical relevance of the findings.

In conclusion, the results of this study did not show differences in the ICU subscales between primary and secondary CU traits, indicating that these two variants in a non-clinical setting share behaviorally similar characteristics. More importantly, the results of the current study suggest that both attachment anxiety and avoidance are more prevalent in individuals with secondary CU traits, compared to individuals without CU traits and anxiety. This is an indication that individuals with secondary CU traits likely face unique and complex interpersonal challenges. A key finding of this study is that attachment avoidance differed between adolescents with secondary and primary CU traits. This implies that primary and secondary CU traits characterize distinct groups of individuals with different attachment patterns, who may also need different kinds of treatment. Our study demonstrates that these variants should be considered separately, as the differences in attachment anxiety and avoidance highlight distinct patterns that warrant consideration. It is vital to recognize that secondary CU traits need specific attention when it comes to attachment avoidance, and future research should focus on the relationship between these two constructs. Eventually, by understanding these mechanisms, more targeted interventions can be developed for primary and secondary CU traits so that both can be treated more effectively.

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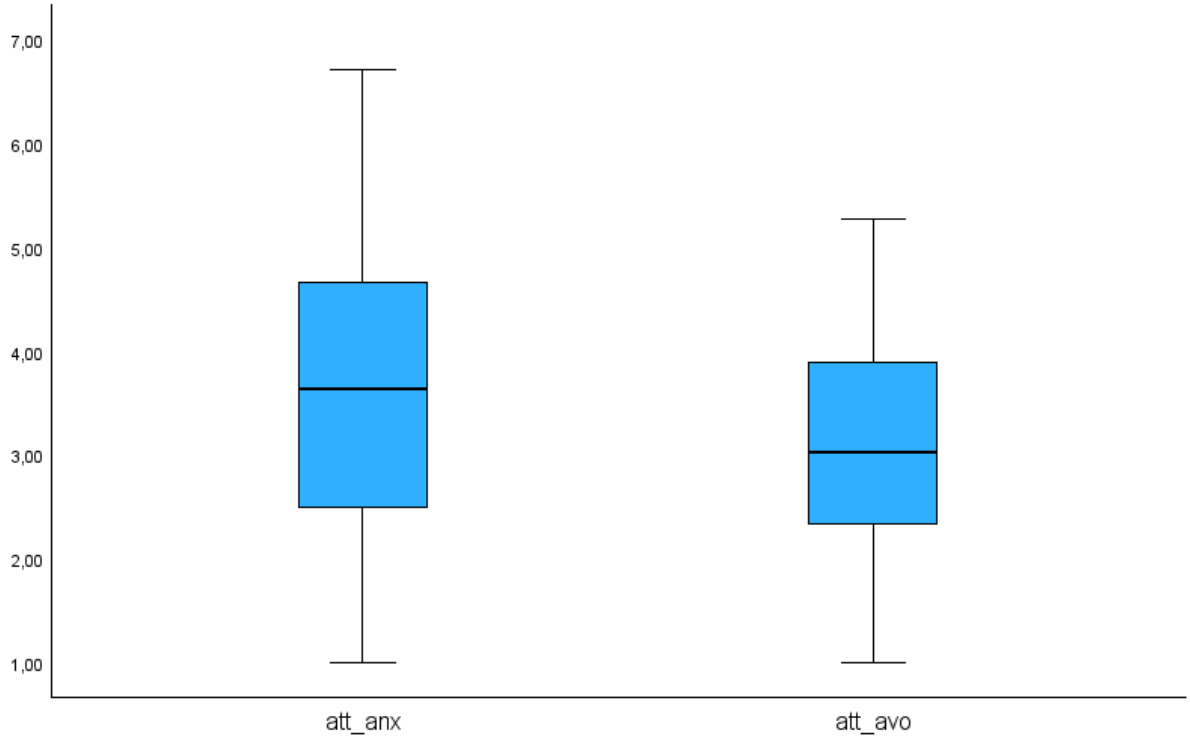
Appendices

Appendix A

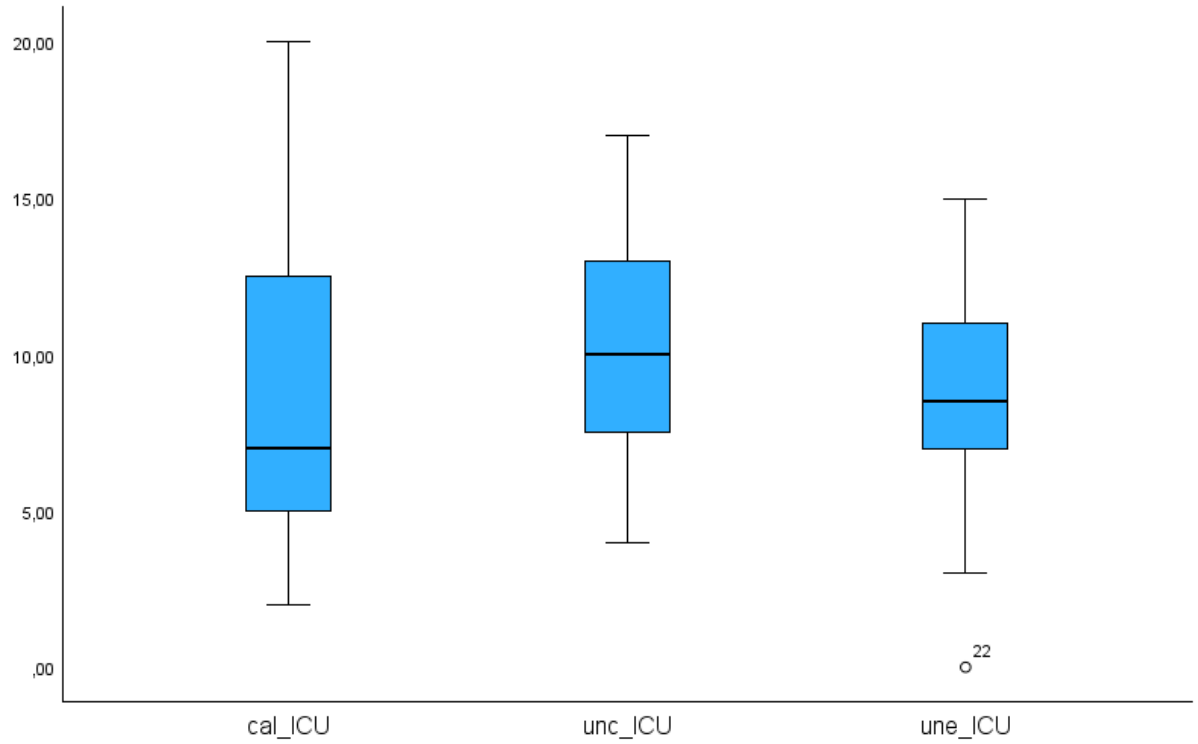
Boxplots of the attachment dimensions



Note. Att_anx represents attachment anxiety and att_avo represents attachment avoidance.

Appendix B

Boxplots of the ICU subscales



Note. Cal_ICU represents the callousness subscale, unc_ICU represents the uncaring subscale and une_ICU represents the unemotional subscale.