



ARTICLE

Larger comfortable interpersonal distances in adults exposed to child maltreatment: The role of depressive symptoms and social anxiety

Lara-Lynn Hautle^{1,2}  | Jennifer Kurath^{1,2} | Lena Jellestad^{1,2} |
 Antonia M. Lüönd^{1,2} | Tanja S. H. Wingenbach^{1,2,3} |
 Billy Jansson⁴ | Monique C. Pfaltz^{1,2,4} 

¹Medical Faculty, University of Zurich, Zürich, Switzerland

²Department of Consultation-Liaison Psychiatry and Psychosomatic Medicine, University Hospital Zurich, Zürich, Switzerland

³School of Human Sciences, Faculty of Education, Health, and Human Sciences, University of Greenwich, London, UK

⁴Department of Psychology and Social Work, Mid Sweden University, Östersund, Sweden

Correspondence

Monique C. Pfaltz, Department of Psychology and Social Work, Mid Sweden University, Kungskapens väg 1, Östersund, Sweden.
 Email: monique.pfaltz@miun.se

Abstract

Previous studies report a preference for larger comfortable interpersonal distance (CIPD) in individuals with child maltreatment (CM) when being approached by others. Yet, research on approaching others, as opposed to being approached, as well as on potential effects of social anxiety and depression is lacking. We investigated if CM and depressive symptoms influence CIPD and if social anxiety mediates the possible association of CM and CIPD when approaching a female stranger. One hundred ten participants with CM (CM) and 58 participants without CM (non-CM) experiences performed the stop-distance paradigm and stopped first when feeling uncomfortable (D1) and again when feeling very uncomfortable (D2). CM experiences were associated with a preference for larger CIPD, independent of depressive symptoms. All CM subtypes were associated with a larger D2. The relationship between CM and CIPD was partially mediated by social anxiety. These novel findings can help to develop interventions strengthening socially relevant skills and processes in those affected by CM, targeting alterations in social anxiety and depression.

KEYWORDS

child maltreatment, depressive symptoms, interpersonal distance, maltreatment subtypes, social anxiety

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Child maltreatment (CM) is highly prevalent in the global population (Stoltenborgh et al., 2015) and is defined by the World Health Organization as abuse (sexual, physical or emotional) and/or neglect (physical or emotional) of children younger than 18 years of age that occurs within a relationship of responsibility, trust or power (World Health Organisation, 2020). CM has previously been linked to an increased risk for several health conditions (e.g., obesity, cancer, cardiovascular diseases) (Clemens et al., 2018) and psychological illnesses (e.g., post-traumatic stress disorder, affective disorders, substance abuse) (Brietzke et al., 2012; Fergusson et al., 2008). Additionally, CM is strongly associated with serious difficulties within interpersonal relationships (Paradis & Boucher, 2010; Reyome, 2010) and with lower relationship quality (Pfaltz et al., 2022; Zamir, 2021). Impairments in interpersonal relationships can pose a substantial risk for decreased mental health. Negative interpersonal relationships are related to lower levels of resilience with lower levels of resilience, in turn, being associated with more depressive symptoms in adolescence (Lee et al., 2021). Thus, positive relationships are important protective factors for positive mental health.

One central factor that modulates relationships is the regulation of closeness and distance (Estlein & Lavee, 2021). The physical distance we prefer to maintain towards others (i.e., comfortable interpersonal distance (CIPD)) serves as an important communication cue (Hayduk, 1978; Perry et al., 2016). Hayduk (1978) described CIPD as the area individuals maintain around themselves into which others cannot intrude without arousing discomfort, which evolves and matures early in life through interactions with primary caregivers (Bar-Haim et al., 2002). Growing up in a relationship of abusive or neglecting nature may therefore impact the development of CIPD. In previous research, CM has been linked to a preference for larger CIPD in adults (Lüönd et al., 2022; Maier et al., 2020), as measured by the stop-distance paradigm, in which the study participant either approaches an experimenter, or is approached by an experimenter, and the approaching person stops when the proximity begins to make the participant say he/she feels uncomfortable (Greenberg et al., 1980). In a study by Maier et al. (2020), participants with high levels of CM preferred larger CIPD than individuals without CM experiences. Lüönd et al. (2022) demonstrated that CIPD is particularly large when individuals report both experiences of CM and current depressive symptoms with different CM subtypes being linked to larger CIPD in the presence of depressive symptoms. Emotional abuse only was related to larger CIPD, both in the absence and in the presence of depressive symptoms (Lüönd et al., 2022). Hence, understanding the role of depressive symptoms when studying the relationship between CM and CIPD seems to be important to gain a more nuanced understanding of a possible influence of depression on CM and CIPD. Failing to account for the effect of depressive symptoms could lead to incomplete or misleading conclusions, since research has shown that the development of depression is strongly influenced by the quality of social relationships (Teo et al., 2013). Furthermore, emotional support as well as perceived instrumental support, and large, diverse social networks are significant protective effects for the development of depression (Santini et al., 2015).

Another recent large transcultural project (Haim-Nachum, under review) investigated CIPD in various countries with a computerized stop-distance task. The authors found a link between a preference for larger CIPD and higher levels of physical and sexual abuse as well as of physical and emotional neglect. In contrast to Lüönd et al. (2022), emotional abuse was not a significant predictor of preferred distance. To our knowledge, the study by Lüönd et al. (2022) was the first to investigate CM subtype-specific effects on CIPD as part of a real interaction (rather than using an online, non-interactive measure of CIPD). Lüönd et al. (2022) used a stop-distance paradigm with a female member of the study team approaching the participants frontally. However, as shown in studies with non-clinical samples, CIPD depends on whether one is approaching someone or is being approached, with being approached being linked to larger CIPD (Saporta et al., 2021). Previous studies on CIPD in CM samples have used different forms of the stop-distance method. In some studies, the experimenter approached the participant (Lüönd et al., 2022; Vranic, 2003), while other studies used an online measure of CIPD (Haim-Nachum, under review). It is thus unknown whether results of previous research can be replicated when participants actively approach instead of being approached, in a face-to-face interaction.

Additionally, research has suggested that gender of the stranger may play a role in CIPD (Gifford, 1987). Gifford (1987) found that people tend to maintain a greater distance from strangers of the opposite sex compared to strangers of the same sex. A more recent study by Sorokowska et al. (2017) found that women tend to prefer a greater CIPD from male strangers compared to female strangers, potentially due to safety concerns. Therefore, to minimize the variance caused by the influence of gender and for ethical considerations (i.e., to avoid inducing threat responses, particularly in female individuals with a history of CM), it can be appropriate to use a female-approaching person when assessing CIPD. Furthermore, assessing approaching strangers – rather than familiar people – is important as it allows for a nuanced understanding of the impact of CM on trust and safety perceptions in novel social situations. Attachment theory posits that early experiences shape interpersonal expectations (Bowlby, 1982), and individuals exposed to CM may exhibit distinct distance preferences as a protective mechanism when interacting with strangers due to heightened vulnerability and apprehension (Cicchetti & Toth, 2016). Thus, examining responses to strangers can contribute to our understanding of generalizability and the potential extension of attachment-related challenges beyond familiar relationships, contributing to the development of interventions that facilitate positive social interactions with unfamiliar individuals and address the broader goal of social rehabilitation for individuals with a history of CM (Berliner & Elliott, 2002).

Furthermore, factors explaining the relationship between CM and larger CIPD have not yet been determined. Given the adverse social experiences with their caregivers, individuals affected by CM may have learned to show generalized negative responses to social stimuli such as facial expressions (Berube et al., 2021; Hautle et al., 2023) or fast touch (Maier et al., 2020), with avoidance of interpersonal sensory stimulation – and thus of small CIPD – as a means to reduce emotional distress (Maier et al., 2020). In line with this assumption, Ponizovsky et al. (2013) suggest that keeping distance from threat-related figures by individuals exposed to CM reduces fear (and, in turn, enhances a sense of safety) in stressful situations. Furthermore, there is evidence for increased attention towards negative social stimuli (e.g., facial expressions) in individuals exposed to CM (Jaffee, 2017), which was also proposed to contribute to the development of anxiety disorders (Jaffee, 2017), which is particularly pronounced in adults exposed to CM (Gardner et al., 2019). Social anxiety and CIPD have been closely linked as individuals with social anxiety tend to feel uncomfortable and anxious in social situations, potentially contributing to a preferred larger CIPD from others (Givon-Benjio & Okon-Singer, 2020). In addition, Givon-Benjio and Okon-Singer (2020) found a distance estimation bias in socially anxious individuals, suggesting a role for distorted distance estimation in avoidance behaviour. However, the relationship between social anxiety and CIPD may depend on contextual factors. For example, the social context, familiarity with a person, and cultural norms can influence an individual's preferred CIPD, while individuals with social anxiety may be particularly sensitive to these contextual factors (Givon-Benjio & Okon-Singer, 2020; Panayiotou et al., 2015). Social anxiety might thus play a mediating role in the relationship between CM and the preference for larger CIPD, which has, however, not yet been investigated. Thus, studying CIPD in adults with CM experiences is important for understanding the impact of such experiences on informing interventions, and developing a more nuanced understanding of trauma's broader impact on social behaviour. It can help us understand how experiences of CM influence social behaviour, inform our support strategies, and develop more effective trauma-informed care.

Hence, the aims of the current study were threefold: first, to investigate whether previous findings on increased CIPD in adults with CM (Haim-Nachum, under review; Lüönd et al., 2022; Maier et al., 2020) replicate when participants actively approach an unfamiliar woman using a real-life stop-distance method and if effects would be found when accounting for depressive symptoms. Second, due to inconsistent previous findings, we aimed to examine whether specific CM subtypes (based on the childhood trauma questionnaire (CTQ; Bader et al., 2009; Bernstein et al., 2003): emotional neglect, physical neglect, emotional abuse, physical abuse, sexual abuse) have different effects on CIPD independent of depressive symptoms. Third, we aimed to investigate whether social anxiety mediates the predicted positive relationship between CM and CIPD. We hypothesized that exposure to CM and current depressive symptoms would both be significantly associated with a preference for larger CIPD.

In addition, due to inconsistent previous findings (Haim-Nachum, under review; Lüönd et al., 2022), we had no directed hypotheses regarding the specific subtypes of CM with CIPD. Finally, we hypothesized that individuals exposed to CM would show higher levels of social anxiety compared to unexposed individuals and that higher levels of social anxiety would mediate the relationship between CM and CIPD. Neither hypotheses nor analyses were pre-registered.

Studying the link between CM and CIPD is crucial for several reasons. First, important insights into long-term psychological and emotional impacts of early adversities on social interactions can be gained. Approaching other persons is part of humans' everyday life. Using an elevator or public transportation, meeting a new colleague at work, ordering a drink at the bar, asking someone for directions, or sitting down in a waiting room are only few examples of situations that require physical proximity. Alterations in CIPD and corresponding discomfort related to physical proximity will thus likely broadly impact the everyday lives of those exposed to CM. Second, understanding alterations in CIPD is essential for tailoring therapeutic interventions, aiming to improve social functioning and thus, indirectly, also mental well-being (Pfaltz et al., 2022). For example, coping mechanisms such as the maintenance of specific distances to minimize perceived risks (Cicchetti & Toth, 2016) can be uncovered and addressed by supporting a client to feel safe while around other persons. Overall, investigating CIPD serves as a valuable avenue for comprehensively addressing the social consequences of CM and designing targeted interventions for individuals with such backgrounds (Berliner & Elliott, 2002).

METHODS

Participants

As part of a larger study on socio-emotional consequences of CM, participants were recruited via online social media platforms, flyers, mailing lists, postings, from a pool of former study participants, from patients of the University Hospital Zurich, and via external mental health professionals between 2020 and 2022. Inclusion criteria were age between 18 and 66 years. Exclusion criteria were: reduced vision (if not corrected), insufficient understanding of German (as indicated by the investigator), lifetime psychotic symptoms, substance abuse or dependency during past 12 months, insufficient verbal intelligence (as indicated by the investigator), and acute suicidality. Furthermore, medical conditions and medication intake affecting measurement of electrodermal activity (e.g., neuroleptics, benzodiazepines) and pregnancy were also defined as exclusion criteria as part of the overarching project. This resulted in a total sample of 110 adults (81 female) with and 58 adults (35 female) without self-reported history of CM, based on participant's CTQ scores (Bader et al., 2009; Bernstein et al., 2003). According to the classification of Bernstein et al. (2003), participants who reported at least low to moderate scores in one of the subscales of the CTQ (i.e., ≥ 10 for emotional neglect, ≥ 8 for physical neglect, ≥ 9 for emotional abuse, ≥ 8 for physical abuse and ≥ 6 for sexual abuse) were assigned to the CM group. Sample characteristics can be found in Table 1. The effect of age on CIPD was explored, since the groups differed therein. Age did not result in a significant effect on CIPD and was therefore not included in subsequent analyses. Participants in the CM group suffered from a higher number of mental disorders, had a higher mean BDI (Beck Depression Inventory) score, and reported having experienced more traumatic events other than CM compared to participants in the non-CM group.

Procedures and psychometric measures

The current study was approved by the local ethics committee (Kantonale Ethikkommission Zürich). As COVID-19 protection measures were applied throughout all study visits, participants as well as study members of the study team and the to-be-approached person always wore a face mask while together in one room.

TABLE 1 Sample characteristics.

	Non-CM (<i>n</i> =58)	CM (<i>n</i> =110)	U-statistics	<i>p</i> (<i>r</i>)
Age (years)	26.00 ± 12.45	30.50 ± 14.08	-2.69	.007 (-.21)
Females (<i>n</i>)	35 (60.3%)	81 (73.6%)	-1.77	.077 (-.14)
Education	2.00 ± .68	2.00 ± .87	-0.797	.426 (-.06)
Total CTQ score	27.00 ± 2.10	54.00 ± 16.65	-10.49	<.001 (-.81)
Emotional neglect	6.00 ± 1.54	17.00 ± 4.59	-10.23	<.001 (-.79)
Physical neglect	5.00 ± .47	8.00 ± 2.85	-9.08	<.001 (-.70)
Emotional abuse	5.00 ± .87	11.00 ± 5.49	-8.55	<.001 (-.66)
Physical abuse	5.00 ± .28	6.50 ± 4.57	-6.52	<.001 (-.50)
Sexual abuse	5.00 ± .00	5.00 ± 6.16	-5.96	<.001 (-.46)
BDI score	2.00 ± 4.69	8.00 ± 8.57	-5.59	<.001 (-.43)
Traumatic experiences other than CM (<i>n</i>)	32 (54.4%)	92 (83.64%)	16.19	<.001 (-.31)
One or more ^a				
Affective disorders ^b (<i>n</i>)	7 (10.5%)	67 (60.90%)	36.09	<.001 (-.46)
Anxiety disorders ^b (<i>n</i>)	9 (14.0%)	50 (45.45%)	14.62	<.001 (-.29)
Eating disorders ^b (<i>n</i>)	2 (3.5%)	16 (14.54%)	4.81	.029 (-.17)

Note: Values for metric variables are given as median ± standard error, values for non-metric variables as numbers and percentages. For metric variables, independent samples Mann–Whitney U test and for non-metric variables, Pearson's chi-squared test was used to compare study groups. *p*-values are derived from one-tailed testing. BDI scores <14 represent the absence of depressive symptoms (Beck et al., 1996).

Abbreviations: CM, individuals with child maltreatment experiences, non-CM, individuals without CM experiences.

^a Measured with the PDS checklist, presented as number of participants with a lifetime history of such.

^b Measured with the Mini-DIPS, presented as number of participants with a lifetime history of such.

The current study was part of an overarching project, comprising two visits to our laboratory. During visit 1, all participants gave written informed consent. Thereafter, CM, trauma history and current mental disorders were assessed using the CTQ-short version (Bernstein et al., 2003, in German translation of Bader et al., 2009), the trauma checklist of the Posttraumatic Diagnostic Scale (PDS; McCarthy, 2008) and the mini diagnostic interview for mental disorders (Mini-DIPS; Margraf et al., 2017). Furthermore, the Beck Depression Inventory 2 (BDI-II; Herzberg et al., 2008) and the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) were completed. Additionally, participants filled out other questionnaires, not included in the present analyses.

During visit 2, an adapted version of the stop-distance method (Kaitz et al., 2004) was used to assess CIPD. In the current study, participants were told that they would perform the stop-distance method, where they would slowly approach a female member of the study team. Participants were instructed to stop walking once they started feeling slightly uncomfortable (distance 1, D1) and very uncomfortable (distance 2, D2). 10 cm was defined as the minimum distance to be held between both. CIPD was measured in cm between the toes of the approaching participant and the member of the study team. Participants who did not stop voluntarily until they reached the 10 cm distance line were stopped by the experimenter (which was a different person than the person to be approached by the participant) and asked whether they would have tolerated physical contact. If they answered yes, CIPD was set to 0 cm. If they answered no, their CIPD was set to 10 cm. All participants knew that the person they were approaching was a member of the study team but were not introduced to her until completion of the paradigm. Members of the study team were instructed to direct their gaze at the left shoulder of participants. Appendix 1 outlines the specific instructions both in the English and in the original German language the members of the study team received to explain and perform the stop-distance method with the participants, to ensure standardization.

Statistical analyses

All statistical analyses were calculated in IBM SPSS Statistics (Version 26) predictive analytics software and R version 4.0.5 (2021-02-15).

Impact of CM and depressive symptoms on CIPD

Two separate regression analyses via `lm` function using the `dplyr` package (Wickham et al., 2017) in Rstudio (R Core Team, 2020) were conducted to assess the effect of CM experiences (dimensional predictor) and BDI-scores (dimensional predictor) on D1 and (through a separate regression analysis) on D2. For the two regression analyses, the main effects of CM and the BDI-score, and the CM BDI-score interaction were tested. All variables were centred via `scale` function (Becker et al., 1988) for direct comparison.

Impact of CM subtypes and depressive symptoms on CIPD

Five separate regression analyses via `lm` function using the `dplyr` package in Rstudio were conducted to assess the effect of each CM subtype (dimensional predictor) and BDI-scores (dimensional predictor) on D1 and (through five additional regression analyses) on D2. For all regression analyses, the main effects of CM subtype, the BDI-score, and the CM subtype BDI-score interaction were tested. All variables were centred via `scale` function (Becker et al., 1988) for direct comparison.

Impact of social anxiety on CIPD

Mediation analyses were performed to assess the mediating role of social anxiety (dimensional SIAS score) on the relationship between CM and CIPD (D1 and, in a separate analysis, D2). Mediation analyses were performed using the `lavaan` package (Rosseel, 2012) in Rstudio.

RESULTS

Impact of CM and depressive symptoms on CIPD

The model testing if CM experiences or depressive symptoms are significantly associated with D1, was significant, $R^2 = .14$, $F(3, 164) = 9.85$, $p < .001$. CM experiences were significantly associated with D1 ($\beta = 18.12$, $p = .002$), but neither BDI score ($\beta = 11.44$, $p = .062$) nor the $CM \times BDI$ score interaction ($\beta = 2.69$, $p = .586$) were significant predictors. That is, more pronounced CM experiences were associated with a larger CIPD for D1.

The model testing if CM experiences or depressive symptoms are significantly associated with D2 was significant, $R^2 = .22$, $F(3, 164) = 17.08$, $p < .001$. Both CM experiences ($\beta = 10.97$, $p < .001$) and BDI score ($\beta = 5.04$, $p = .048$) were significantly associated with D2, which was not the case for the $CM \times BDI$ score interaction ($\beta = 1.43$, $p = .488$). That is, more pronounced CM experiences and higher BDI scores were associated with a larger CIPD for D2, with a stronger impact of CM experiences than of BDI score.

The two regression models were separately tested for collinearity between CM and BDI score using the R package 'olsrr' (Hebbali & Hebbali, 2017). None of the variance inflation factors exceeded 4, indicating no collinearity of predictors, which was therefore not investigated further. The results are displayed in scatter plots in Figures 1–4.

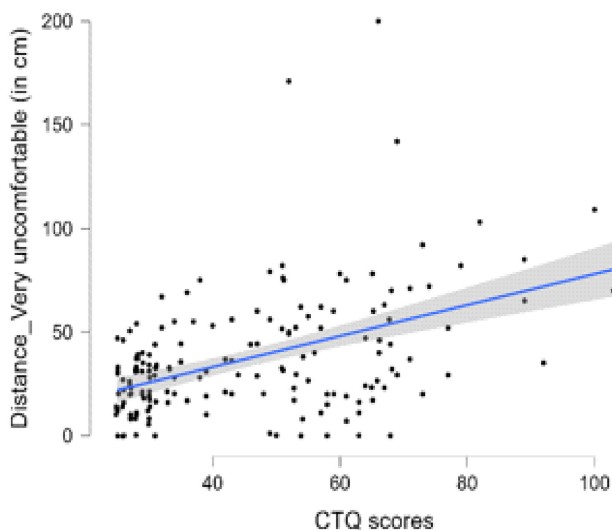


FIGURE 1 Association between the participants' preferred stop-distance (very uncomfortable) and scores on the Childhood Trauma Questionnaire (CTQ).

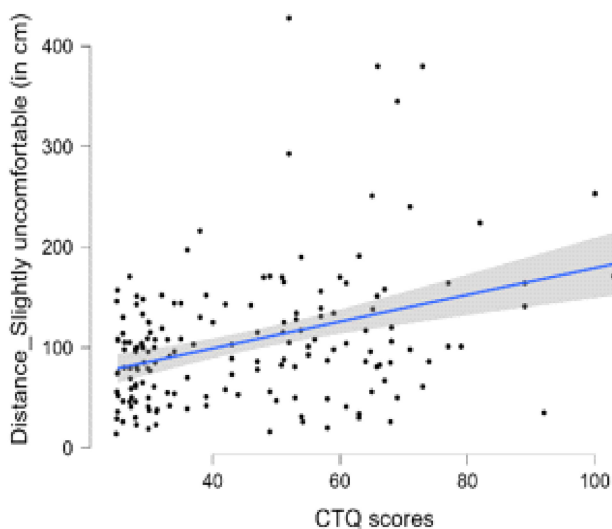


FIGURE 2 Association between the participants' preferred stop-distance (slightly uncomfortable) and scores on Childhood Trauma Questionnaire.

Impact of CM subtypes and depressive symptoms on CIPD

Emotional neglect

The testing if depressive symptoms or emotional neglect are significantly associated with D1 was significant, $R^2 = .15$, $F(3, 164) = 10.45$, $p < .001$. Emotional neglect was significantly associated with D1 ($\beta = 19.81$, $p < .001$), but neither were BDI score ($\beta = 9.81$, $p = .123$) nor the BDI score \times emotional neglect interaction ($\beta = 5.33$, $p = .348$).

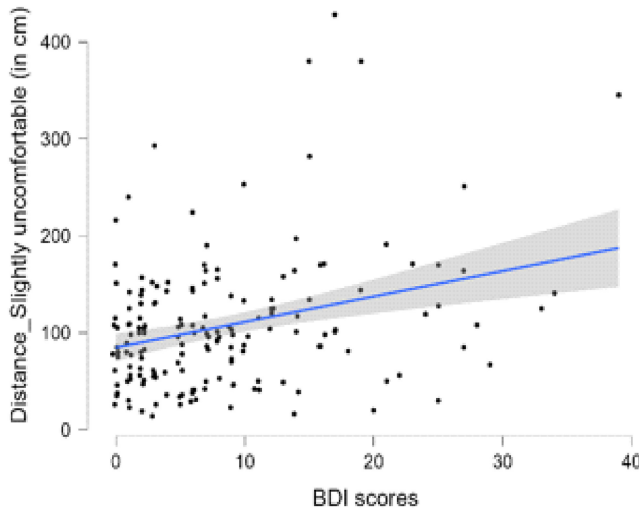


FIGURE 3 Association between the participants' preferred stop-distance (slightly uncomfortable) and scores on Beck's Depression Inventory (BDI).

The model testing if depressive symptoms or emotional neglect are significantly associated with D2 was significant, $R^2 = .21$, $F(3, 164) = 15.75$, $p < .001$. It was found that emotional neglect was significantly associated with D2 ($\beta = 10.39$, $p < .001$), but neither were BDI score ($\beta = 4.98$, $p = .064$) nor the BDI score \times emotional neglect interaction ($\beta = 2.62$, $p = .274$). That is, more pronounced emotional neglect was associated with a larger CIPD for both, D1 and D2.

Physical neglect

The model testing if depressive symptoms or physical neglect are significantly associated with D1 was significant, $R^2 = .14$, $F(3, 164) = 10.24$, $p < .001$. Physical neglect ($\beta = 18.69$, $p < .001$) and higher BDI scores ($\beta = 15.43$, $p = .005$) were significantly associated with D1, which was not the case for the BDI score \times physical neglect interaction ($\beta = -3.15$, $p = .564$).

The model testing if depressive symptoms or physical neglect are significantly associated with D2 was significant, $R^2 = .24$, $F(3, 164) = 18.29$, $p < .001$. Physical neglect ($\beta = 11.29$, $p < .001$) and higher BDI scores ($\beta = 6.99$, $p = .002$) were significantly associated with D2, which was not the case for the BDI score \times physical neglect interaction ($\beta = -0.584$, $p = .795$). That is, a more pronounced physical neglect and higher BDI scores were associated with a larger CIPD for both, D1 and D2, with a stronger impact of physical neglect than of BDI score.

Emotional abuse

The model testing if depressive symptoms or emotional abuse are significantly associated with D1 was significant, $R^2 = .10$, $F(3, 164) = 7.47$, $p < .001$. Higher BDI scores ($\beta = 14.59$, $p = .020$) were significantly associated with D1, but emotional abuse ($\beta = 11.11$, $p = .056$) and the BDI score \times emotional abuse interaction ($\beta = 2.71$, $p = .563$) were not significant.

The model testing if depressive symptoms or emotional abuse are significantly associated with D2 was significant, $R^2 = .15$, $F(3, 164) = 11.07$, $p < .001$. Emotional abuse ($\beta = 6.39$, $p = .011$) and higher BDI scores ($\beta = 7.67$, $p = .004$) were significantly associated with D2, but the BDI score \times emotional abuse interaction ($\beta = 0.49$, $p = .804$) was not. That is, a more pronounced emotional abuse and higher BDI scores were associated with larger CIPD for both D1 and D2, with a stronger impact for BDI in D1 and D2.

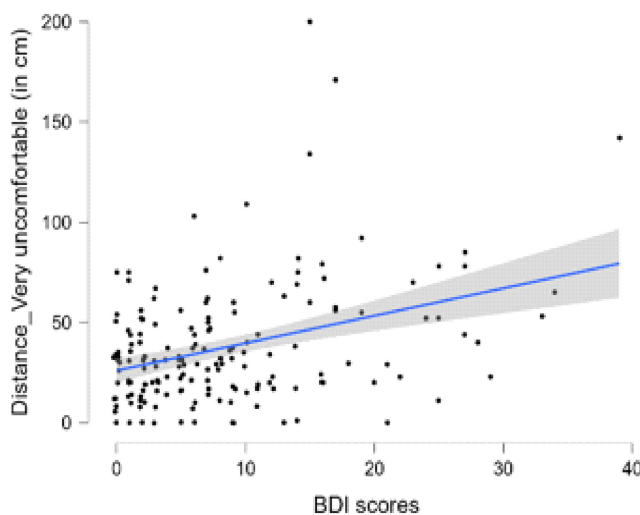


FIGURE 4 Association between the participants' preferred stop-distance (very uncomfortable) and scores on Beck's Depression Inventory (BDI).

Physical abuse

The model testing if depressive symptoms or physical abuse are significantly associated with D1 was significant, $R^2 = .10$, $F(3, 164) = 7.26$, $p < .001$. Higher BDI scores ($\beta = 16.67$, $p = .004$) were significantly associated with D1, but neither physical abuse ($\beta = 7.92$, $p = .200$) nor the BDI score x physical abuse interaction ($\beta = 3.68$, $p = .463$) were significant.

The model testing if depressive symptoms or physical abuse are significantly associated with D2 was significant, $R^2 = .16$, $F(3, 164) = 11.83$, $p < .001$. Both physical abuse ($\beta = 6.61$, $p = .012$) and higher BDI scores ($\beta = 8.08$, $p = .001$) were significantly associated with D2, but the BDI score x physical abuse interaction ($\beta = 0.65$, $p = 0.758$) was not. That is, higher BDI scores were associated with a larger D1. More pronounced physical abuse and higher BDI scores were associated with a larger D2, with a stronger impact of depressive symptomatology.

Sexual abuse

The model testing if depressive symptoms or sexual abuse are significantly associated with D1 was significant, $R^2 = .09$, $F(3, 164) = 7.14$, $p < .001$. Higher BDI scores ($\beta = 19.99$, $p < .001$) were significantly associated with D1, but neither sexual abuse ($\beta = 9.74$, $p = .065$) nor the BDI score x sexual abuse interaction ($\beta = -1.80$, $p = .698$) were significant predictors.

The model testing if depressive symptoms or sexual abuse are significantly associated with D2 was significant, $R^2 = .16$, $F(3, 164) = 11.99$, $p < .001$. Both sexual abuse ($\beta = 6.69$, $p = .003$) and higher BDI scores ($\beta = 9.87$, $p < .001$) were significantly associated with D2, but the BDI score x sexual abuse interaction ($\beta = -0.18$, $p = 0.926$) was not. That is, more depressive symptomatology was associated with a larger D1. More pronounced sexual abuse and higher BDI scores were associated with a larger D2, with a stronger impact of depressive symptomatology.

Each regression model was separately tested for collinearity between each CTQ subscale and BDI score using the R package 'olsrr' (Hebbali & Hebbali, 2017). None of the variance inflation factors exceeded 4, indicating no collinearity of predictors, which was therefore not investigated further.

The role of social anxiety

CM was significantly correlated with SIAS, $r = .48, p < .001$, and SIAS was significantly correlated with D1, $r = .39, p < .001$. Results of the mediation analysis revealed a significant direct effect of CM on D1 ($\beta = 0.84, SE = .29, Z = 2.90, p = .004$) and a significant indirect effect of CM on D1 through SIAS score ($\beta = 0.49, SE = .16, Z = 3.1, p = .002$). This suggests that the effect of CM on D1 was partially mediated by social anxiety. Furthermore, as SIAS and BDI were rather strongly correlated, $r = .57, p < .001$, the above mediation analyses were repeated using BDI as a covariate in the model. While the significant direct effect of CM on D1 remained similar in magnitude ($\beta = 0.79, SE = .30, Z = 2.59, p = .010$), the significant indirect effect of CM on D1 through SIAS score was slightly weaker as a function of the inclusion of BDI in the model ($\beta = 0.24, SE = .11, Z = 2.29, p = .022$). Results are displayed in Figure 5.

Again, SIAS was significantly correlated with D2, $r = .46, p < .001$. Results of the mediation analysis for D2 demonstrated similar results with a significant direct effect of CM on D2 ($\beta = 0.50, SE = .12, Z = 4.20, p < .001$) and a significant indirect effect of CM on D2 through SIAS score ($\beta = 0.25, SE = .07, Z = .70, p < .001$). This suggests that the effect of CM on D2 was partially mediated by social anxiety. When the mediation analyses were repeated using BDI as a covariate in the model, while the significant direct effect of CM on D2 remained similar in magnitude ($\beta = 0.48, SE = .12, Z = 3.85, p < .001$), the significant indirect effect of CM on D2 through SIAS score was slightly weaker as a function of the inclusion of BDI in the model ($\beta = 0.13, SE = .05, Z = 2.60, p = .009$). Results are displayed in Figure 6.

DISCUSSION

As expected, CM was linked to a preference for larger CIPD also when approaching a female stranger. Furthermore, CM was associated with a preference for larger CIPD both at D1 and D2, independent of current depressive symptoms. In addition, we found that all CM subtypes were associated with CIPD preference and that social anxiety played a mediating role in the relationship between CM and CIPD.

Impact of CM and depressive symptoms on CIPD

Our results demonstrate that adults who experienced higher levels of CM prefer larger CIPD than adults with lower levels of CM, even when actively approaching another person. This was found for both D1 and D2 and is thus in line with previous evidence (Lüönd et al., 2022). Likewise, the current study replicated previous findings of a link between larger CIPD and CM experiences (Lüönd et al., 2022) independent of depressive symptoms. CM experiences are linked to depressive symptoms in adulthood (Humphreys et al., 2020) and links between CM and maladaptive interpersonal functioning (Pfaltz et al., 2022) might moderate the course of depression (Brakemeier et al., 2018). In fact, there may be essential differences in the aetiology and pathogenesis of depression in individuals with and without history of early trauma (Nemeroff et al., 2003). Additionally, depressed individuals often nonverbally

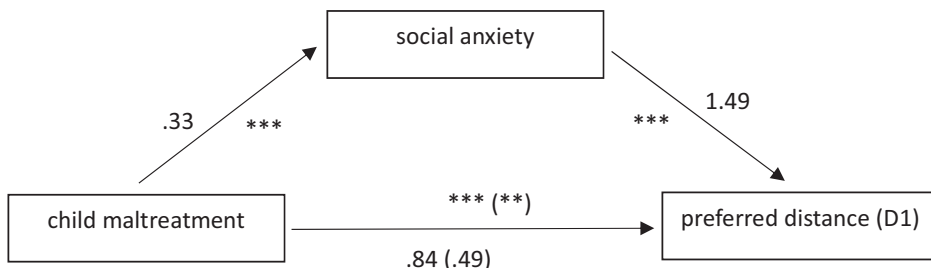


FIGURE 5 Mediation analysis for D1. Note: *** <0.001 , ** <0.01 , indirect effect indicated in brackets.

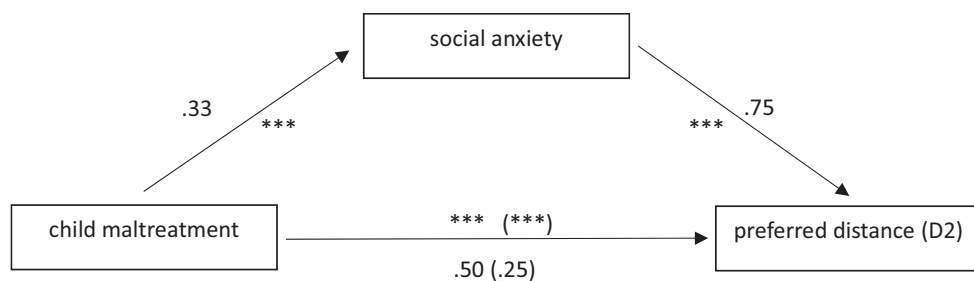


FIGURE 6 Mediation analysis for D2. Note: ***<math><0.001</math>, indirect effect indicated in brackets.

signal the intention to avoid or minimize social connection, which may contribute to the persistence of depression. Depression, in turn, may discourage social interaction and support, which, however, is crucial to recovery (Girard et al., 2014). Given that positive social relationships play a protective role on both mental and physical health outcomes of CM and can buffer the effects of chronic stress, being able to successfully interact socially is eminent (Pfaltz et al., 2022). It thus seems of particular importance to support individuals with CM experiences and depressive symptoms in building and maintaining positive social relationships, considering their specific needs for regulating closeness and distance. Findings of the current study might thus be of therapeutic relevance in terms of communication and boundary-setting. Therapists working with individuals who have experienced CM may need to be mindful of their clients' need for personal space and may need to adjust their own behaviour accordingly. By respecting their clients' boundaries and allowing them to choose the set-up of therapeutic interactions (including a distance towards their therapist that feels safe), therapists may be better able to establish a trusting and supportive therapeutic relationship.

Impact of CM subtypes and depressive symptoms on CIPD

Contrasting the findings by Lüönd et al. (2022), who detected that CIPD was only increased for adults who had experienced emotional abuse, we found that all subtypes of CM were associated with a larger CIPD (at D2), even when accounting for depressive symptoms. Furthermore, individuals with higher scores of emotional or physical neglect preferred a larger distance at D1. Adults with emotional, physical or sexual abuse did not prefer a larger distance at D1. As for depressive symptoms, only individuals with emotional neglect preferred a larger distance at D1 and D2, independent of depressive symptoms. For all other CM subtypes, higher BDI scores, next to the respective subtype, influenced distance preferences at D1 and D2. Thus, our findings show that the regulation of closeness and distance in adults with a history of CM was at times dependent on both the CM subtype and depressive symptomatology.

Taken together, discrepancies between the current study and the study by Lüönd et al. (2022) might be explained by findings by Saporta et al. (2021), who demonstrated that actively approaching and being passively approached result in different preferences for CIPD. The authors suggested that approaching actively more strongly activates the approach/reward system, while being passively approached more strongly activates the avoidance/threat system (Saporta et al., 2021) – the first leading to a preference for smaller CIPD compared to the latter (Akbarian et al., 2020; Schiavo et al., 1977).

Our findings that physical and sexual abuse were not significantly associated with D1 might at first sight be somewhat surprising as one might expect exposed adults to prefer larger CIPD (already at D1), since they might have learned to associate physical closeness with danger. However, an opposite process could also be at play. Because caregivers act as role models, children, who grow up in an abusive environment may learn to consider crossing another persons' personal boundaries as normative behaviours (Schuster & Tomaszewska, 2021). This might lead survivors of physical and sexual abuse to tolerate higher levels of physical closeness, at least when showing initial approach behaviour (D1). However,

additional factors such as timing, chronicity, multi-subtype-abuse form, and severity of maltreatment, which were not assessed in the present study, might influence social functioning (Warmingham et al., 2019; Witt et al., 2019; Young-Southward et al., 2020).

CM subtypes strongly overlapped in our study, with 72% of participants in the CM group reporting experiences of at least two subtypes of CM. However, in line with previous findings on the co-occurrence of CM subtypes (Herrenkohl & Herrenkohl, 2009; Matsumoto et al., 2023), disentangling the effects of one specific subtype of CM is complex. While the regression analyses, we conducted, to date, account best for such complexity, future research should nevertheless address the co-occurrence and interrelation of CM subtypes more specifically. Such could possibly be achieved with regression-based heterogeneity analysis to identify an overlapping subgroup structure (Luo et al., 2022).

Impact of social anxiety on CIPD

In individuals who have experienced CM, social anxiety was found to be a mediator for their preference for a larger CIPD. Specifically, higher levels of social anxiety partially mediated the relationship between CM and CIPD at both D1 and D2 (albeit slightly weaker, a relationship that holds when BDI is included in the model). Individuals with a history of CM often experience anxiety (Gardner et al., 2019), which may be due to higher threat sensitivity (Jaffee, 2017). It has been proposed that children could become sensitized to threatening stimuli when exposed to anger and other negative emotions in families characterized by non-normative parenting (e.g., physically abusive; Pollak & Tolley-Schell, 2003). Consequently, such alterations in emotion processing might influence the regulation of closeness and distance. Support for this theory comes from a series of studies which have found that adults with CM experiences show alterations in emotion recognition (e.g., Berube et al., 2021; Hautle et al., 2023; Pfaltz et al., 2019), pointing towards long-term effects of CM on emotion processing. This previous research might thus indicate that social stimuli generally elicit negative reactions in affected individuals. Results of our study suggest an additional group of stimuli (unfamiliar people to whom personal distance should be regulated), next to facial expressions (Berube et al., 2021) and social touch (Maier et al., 2020), that may be interpreted as negative. Our findings also point to a sensitization for threat, which is consistent with results by Cole et al. (2013), who showed that adults perceive threatening stimuli, including other persons, to be closer than non-threatening or disgusting stimuli.

Moreover, the mediating role of social anxiety on CIPD suggests that addressing both clinically relevant and sub-clinical levels of social anxiety may be an important component of therapy for individuals who have experienced CM. Therapists could, for instance, focus on improving social skills and increasing the individual's comfort level with social situations, which may involve gradually exposing them to anxiety-provoking situations. It may also be helpful to explore the individual's attachment style and how it relates to their preference for larger CIPD. Attachment-based interventions, such as attachment-focused therapy or emotion-focused therapy, may be effective in addressing underlying attachment issues and promoting secure attachment relationships (Levy, 2017). In addition, therapists may consider incorporating mindfulness-based interventions to help individuals regulate their emotions and reduce symptoms of depression and anxiety. Mindfulness-based interventions have been shown to be effective in reducing symptoms of depression and anxiety in various populations, including individuals who have experienced trauma (Hofmann et al., 2010).

Limitations and conclusions

As COVID-19 regulations required the wearing of medical masks by both the subjects and study members during the interpersonal distance paradigm, it was not possible to see the complete facial expression of the study member. As humans rely on social signals, in particular facial expressions to regulate an appropriate CIPD (Welsch et al., 2020), the wearing of face masks might have influenced the CIPD of the study participants. However, our findings are in line with previous research

reporting larger CIPD in adults with CM experiences (Lüönd et al., 2022; Maier et al., 2020). Also, it might have been of advantage to be able to standardize (minimize) the impact of other social signals. A second limitation is the retrospective self-report measure of CM with the CTQ, as it has been observed that prospective and retrospective measures of CM may identify different groups of individuals (Baldwin et al., 2019). Longitudinal studies would help to combine retro- and prospective assessment of CM in the future. Third, as all participants approached a young female member of our study team, results might not be generalizable to other genders and ages of to-be-approached individuals. We suggest results to be replicated in future studies with the use of different gender and age groups. Additionally, subtype groups in the current study varied in size. Emotional neglect represented the largest group of CM type with 92.8%, while the two smallest groups, physical and sexual abuse constituted only 45% each. Future studies should thus aim to achieve larger sample sizes for these two groups to further investigate their (isolated and combined) effects on the regulation of closeness and distance.

In sum, our results support previous findings that CM is associated with preferences of larger physical distance, even when individuals are actively approaching another person. Furthermore, under the presented conditions, all CM subtypes seem to be associated with differences in CIPD. Beyond this, we were able to show a mediating effect of social anxiety on CIPD. This novel finding may contribute to the development of tailored interventions for individuals affected by CM. Overall, therapies for adults affected by CM should be tailored to address the specific needs and challenges of each individual. Future research should take broader processes of social dysfunctioning into account when studying new intervention protocols, to specifically focus on social interactions and – potentially – a reduction of fears related to social interactions.

AUTHOR CONTRIBUTIONS

Lara-Lynn Haulte: Data curation; formal analysis; investigation; project administration; software; supervision; validation; visualization; writing – original draft; writing – review and editing. **Jennifer Kurath:** Conceptualization; data curation; funding acquisition; methodology; software; supervision. **Lena Jellestad:** Writing – review and editing. **Antonia M. Lüönd:** Writing – review and editing. **Tanja S. H. Wingenbach:** Conceptualization; methodology; resources. **Billy Jansson:** Formal analysis; validation; writing – review and editing. **Monique C. Pfaltz:** Conceptualization; funding acquisition; methodology; project administration; resources; supervision; validation; writing – review and editing.

CONFLICT OF INTEREST STATEMENT

None declared.

DATA AVAILABILITY STATEMENT

Data are available from the authors upon request.

ORCID

Lara-Lynn Haulte  <https://orcid.org/0000-0002-9381-8025>

Monique C. Pfaltz  <https://orcid.org/0000-0002-4030-4514>

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APPENDIX 1

INSTRUCTION FOR STUDY MEMBERS TO PERFORM THE STOP-DISTANCE METHOD WITH PARTICIPANTS

DUCHRFÜHRUNG DES PARADIGMAS ZUR ERFASSUNG DER GRÖSSE DES PERSÖNLICHEN RAUMS

Paradigma durchführen (im Gang vor dem Labor):

- Licht im Gang einschalten (auch wenn es draussen hell ist; so sind die Lichtverhältnisse während des Experiments immer gleich).
- Dem Probanden mitteilen, dass es sich um eine Projektmitarbeiterin handelt.
- Die Projektmitarbeiterin steht am einen Ende des Ganges (vor den Toiletten; Proband soll dabei mit den Zehen an der markierten Linie stehen).
- Der Proband steht beim Treppenabsatz. Der Proband soll langsam (15–20 cm / Sek) mit geöffneten Augen auf die Projektmitarbeiterin zugehen und anhalten, bis er sich etwas unwohl fühlt (D1). Der Proband bleibt an diesem Punkt stehen. Die Distanz zwischen der Projektmitarbeiterin und dem Studienteilnehmer (vorderes Ende des Schuhs; bzw. Distanz von Zehe Projektmitarbeiterin zu Zehe Proband) wird gemessen und aufgeschrieben.

- Nun geht der Proband weiter auf die Projektmitarbeiterin zu bis er ein erhebliches Unwohlsein empfindet (D2). Der Proband bleibt an diesem Punkt stehen. Die Distanz zwischen der Projektmitarbeiterin und dem Studienteilnehmer (vorderes Ende des Schuhs; bzw. Distanz von Zehe Projektmitarbeiterin zu Zehe Proband) wird gemessen und aufgeschrieben.
- Sollte der Proband nicht anhält: Versuchsleiter sagt 'Stopp' wenn der Proband die 10cm Linie erreicht. Dann Proband fragen, ob er sich der Projektmitarbeiterin bis zum Körperkontakt angenähert hätte. In einer weiteren Variable wird die Antwort festgehalten (0 = nein/ 1 = ja).
- Beide Distanzen und ggf. Antwort notieren.
- Die Versuchsleitung stellt nun die Projektmitarbeiterin dem Probanden vor.

Weiteres:

- Die Projektmitarbeiterin schaut während der ganzen Zeit auf die rechte Schulter des Probanden. Kein Augenkontakt!
- Auffälligkeiten bei der Messung notieren.
- Der Versuchsleiter achtet darauf, dass niemand das Paradigma unterbricht (Treppe im Auge behalten, Personen im Masterzimmer vorwarnen).

IMPLEMENTATION OF THE PARADIGM TO MEASURE INTERPERSONAL DISTANCE

Implement the paradigm (in the hallway outside the laboratory):

- Turn on the lights in the hallway (even if it is bright outside; this ensures consistent lighting conditions during the experiment).
- Inform the participant that they are interacting with a female study member.
- The study member stands at one end of the hallway (in front of the toilets), and the participant is instructed to stand with their toes on the marked line.
- The participant is asked to walk slowly (15–20 cm/s) with their eyes open towards the study member and stop when they begin to feel uncomfortable (D1). The participant is to remain at this point, and the distance between the study member and the participant (front of the shoe to front of the shoe or distance from toe of study member to toe of participant) is measured and recorded.
- The participant then continues to walk towards the study member until they feel very uncomfortable (D2). The participant is to remain at this point, and the distance between the study member and the participant (front of the shoe to front of the shoe or distance from toe of study member to toe of participant) is measured and recorded.
- If the participant does not stop, the experimenter should say 'Stop' when the participant reaches the 10cm line. Then, the participant should be asked if they would have approached the study member until they made physical contact. This response should be recorded in another variable (0 = no, 1 = yes).
- Record both distances and the participant's response if applicable.
- The experimenter now introduces the study member to the participant.

Additional instructions:

- The study member should keep their gaze on the right shoulder of the participant at all times. No eye contact should be made!
- Note any abnormalities during the measurement.
- The experimenter should ensure that no one interrupts the paradigm (keep an eye on the staircase and inform individuals in the master study room).