Individuals with and without child maltreatment experiences are evaluated similarly and do not differ in facial affect display at zero-and first-acquaintance

Lara-Lynn Hautle  
University of Zurich

Jennifer Kurath  
University of Zurich

Lena Jellestad  
University of Zurich

Antonia M. Lüönd  
University of Zurich

Tanja S. H. Wingenbach  
University of Greenwich

Sascha Frühholz  
University of Zurich

Billy Jansson  
Mid Sweden University

Inga Niedtfeld  
Central Institute of Mental Health, Heidelberg University

Monique C. Pfaltz (✉️ monique.pfaltz@miun.se)  
Mid Sweden University

Research Article

Keywords: Child maltreatment, Zero-acquaintance, First-acquaintance, Facial emotion expression

Posted Date: November 8th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-2205552/v1

License:  ☑️ This work is licensed under a Creative Commons Attribution 4.0 International License. 
Read Full License
Abstract

Background

Individuals with child maltreatment (CM) experiences are more often disliked, rejected and victimized compared to individuals without such experiences. However, contributing factors for negative evaluations are so far unknown.

Objective

The purpose of this preregistered study, based on previous research on adults with borderline personality disorder (BPD), was to test whether negative evaluations of adults with CM experiences, in comparison to unexposed controls, are mediated by more negative and less positive facial affect display. Additionally, we explored whether level of depression, severity of CM, social anxiety, social support, and rejection sensitivity have an influence on ratings.

Methods

40 adults with CM experiences (CM+) and 40 non-maltreated (CM-) adults were filmed for measurement of affect display and rated in likeability, trustworthiness, and cooperativeness by 100 independent raters after zero-acquaintance (no interaction).

Results

Unexpectedly, the CM + and the CM- group were neither evaluated significantly different, nor showed significant differences in affect display. Contrasting previous research, higher levels of BPD symptoms predicted higher likeability ratings ($p = .046$), while complex post-traumatic stress disorder symptoms had no influence on ratings.

Conclusions

The non-significant effect could be attributed to insufficient number of participants, as our sample size allowed us to detect effects with medium effect sizes ($f^2 = .16$ for evaluation; $f^2 = .17$ for affect display) with a power of .95. Future research should further explore conditions (e.g., presence of specific mental disorders) under which individuals with CM are affected by negative evaluations as well as factors that contribute to negative evaluations and problems in social relationships.

1. Background
Child maltreatment (CM) is a global concern that has been linked to severe mental health problems (1). CM is defined as abuse and neglect that occurs to children under the age of 18. It includes all types of physical and/or emotional ill-treatment, sexual abuse, neglect, negligence and commercial or other types of exploitation, resulting in actual or potential harm to the child’s health, survival, development, or dignity in the context of a relationship of responsibility, trust or power (2). Due to stress likely caused by CM, victims are at increased risk to develop behavioural, physical, and mental health problems (2–5). Furthermore, studies demonstrated that children and adults affected by CM suffer from a broad range of social problems (6, 7). For example, individuals with CM are more often disliked, rejected and victimized by their peers and teachers compared to individuals without CM experiences (8–11). Similarly, patients with borderline personality disorder (BPD), a population with a high prevalence of CM experiences (12), have in a previous study been evaluated as less trustworthy, less likeable, and less cooperative compared to healthy controls by raters who were left blind to their disorder (13). Such negative evaluations and experiences of peer rejection likely reinforce poor relationship satisfaction, which is common in individuals with CM (e.g., (14–16)). This is alarming, given that close relationships can protect from negative consequences of stress and increase well-being (17). To support survivors of CM in establishing and maintaining close, healthy and satisfying relationships, it is important to identify the factors underlying negative evaluations through others.

One aspect that may add to the abovementioned negative evaluations is emotion expression. The facial expression of emotions, as a key component of communication in social interaction (18), is stimulated by interactions with significant others during childhood (19). Consequently, emotionally unavailable or abusive primary caregivers may alter the development of emotion expression, as has been shown in a previous study where women with sexual abuse experiences expressed fewer emotions in the face while watching emotion-eliciting film stimuli (20). Expressing facial emotions is not only essential for the communication of emotions but also for social connectedness (21). Generally, the tendency to approach and interact with someone displaying a positive facial expression is higher compared to when a negative emotion is expressed (22, 23). Facial emotion expression might thus affect how one is perceived by others, which in turn may also account for difficulties in establishing close and satisfying relationships.

To date, studies investigating alterations in facial emotion expression in individuals with a history of CM are scarce. However, populations with a high prevalence of CM (such as post-traumatic stress disorder (PTSD) (24) or BPD; (12)) have been found to show alterations in emotion expression. For example, in the study by Kirsch and Brunnhuber (2007) (25), PTSD patients displayed more expressions of anger during a psychodynamic interview while a healthy control group more frequently displayed happy facial expressions. Similarly, Hepp, Storkel, Kieslich, Schmahl, and Niedtfeld (2018) videotaped individuals with and without BPD while answering questions about personal preferences. The authors found that individuals with BPD were rated to display significantly more negative and significantly less positive affect in comparison to those without BPD. In a second study, the authors could show that negative evaluations of individuals with BPD were mediated by less positive and more negative facial emotional display (26).
Alterations in facial emotion expression in individuals with a history of CM are to date poorly understood. Thus, the goal of the current study was to examine whether possible negative evaluations of adults with CM carried out by independent raters naïve to their trauma history at zero- (without interaction) and first- (after a short interaction) acquaintance would be mediated by altered facial emotion expressions. Based on the results of Hepp and colleagues. (2019), we selected negative affect (NA) and positive affect (PA) display as potential mediators in the relationship between CM and ratings of likeability, trustworthiness, and cooperativeness. Specifically, and in line with prior research (26), we hypothesized that adults with a history of CM would facially express more NA and less PA compared to individuals without CM experiences and that these differences in NA and PA display would mediate the association between CM experiences and negative evaluations on the traits likeability, trustworthiness, and cooperativeness. As Hepp and colleagues (2018), we expected individuals with CM experiences not to differ in objective cooperativeness, measured with an economic game (27). In exploratory analyses, we explored whether the level of depression, severity of CM, social anxiety, social support, and rejection sensitivity have a negative impact on ratings, in addition to CM and facial expression. We hypothesized that higher levels on each scale would negatively influence likeability, trustworthiness, as well as cooperativeness. The aims, hypotheses, design, and analyses for this study were pre-registered at aspredicted.org prior to data collection under the title “Negative Evaluation of individuals with a history of child maltreatment” (#83676). The pdf is available from https://aspredicted.org/b7mn5.pdf.

2. Materials And Methods

The study was approved by the local ethics committee (blinded to keep anonymity) and conducted as part of an overarching project on socio-emotional consequences of CM. The study was conducted in two steps: 1) creation of stimulus material (video recordings of target participants with and without a history of CM) and evaluation by confederates (members of the study team) during a first-acquaintance paradigm (FAP), involving an interaction between target participants and confederates; 2) evaluation of video recordings by independent raters (zero-acquaintance paradigm), involving no interaction between target participants and raters. All participants from both step 1 and step 2 gave written informed consent prior to participation.

2.1. Participants

Participants of step 1 (individuals with and without self-reported history of CM = target participants) were recruited via online social media platforms, flyers, mailing lists, from a study pool, and in collaboration with out-patient clinics in the area of (blinded to keep anonymity). Individuals aged 18–65 years with normal or corrected-to-normal vision that are native German speakers (or equivalent) were included. Exclusion criteria were antipsychotic, benzodiazepine, or tricyclic antidepressant medication, acute suicidality, lifetime psychotic symptoms, substance abuse or dependency (past 12 months), pregnancy, and physical health problems affecting psychophysiological measurements (that were conducted as part of the overarching project). The initial sample of step 1 consisted of almost twice as many target participants with CM (CM+) (n = 70) as without CM (CM-) experiences, as recruited through the main
project. To match the two groups (i.e., to enable comparability between groups regarding gender, age, and education level), a random selection by matched subgroups was applied which resulted in a final sample of 40 target participants (26 female) in the CM+ and 40 target participants (25 female) in the CM- group. Target participant's characteristics are visualised in Table 1.
Table 1
Target's Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>CM+ (n = 40)</th>
<th>CM- (n = 40)</th>
<th>Group comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Female gender</td>
<td>26</td>
<td>65.0</td>
<td>25</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>10</td>
<td>25.0</td>
<td>4</td>
</tr>
<tr>
<td>Obsessive-compulsive disorder c</td>
<td>4</td>
<td>10.0</td>
<td>1</td>
</tr>
<tr>
<td>Affective disorders c</td>
<td>6</td>
<td>15.0</td>
<td>1</td>
</tr>
<tr>
<td>Eating disorders c</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
</tr>
<tr>
<td>Sleeping disorders c</td>
<td>6</td>
<td>15.0</td>
<td>0</td>
</tr>
<tr>
<td>BPD</td>
<td>6</td>
<td>15.0</td>
<td>0</td>
</tr>
<tr>
<td>SSRI medication</td>
<td>6</td>
<td>15.0</td>
<td>1</td>
</tr>
<tr>
<td>Other antidepressant medication</td>
<td>4</td>
<td>10.0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Age (years)</td>
<td>33.00</td>
<td>13.69</td>
<td>32.85</td>
</tr>
<tr>
<td>Educational group</td>
<td>2.46</td>
<td>0.82</td>
<td>2.4</td>
</tr>
<tr>
<td>BDI-2</td>
<td>10.75</td>
<td>9.43</td>
<td>3.45</td>
</tr>
<tr>
<td>CTQ emotional neglect</td>
<td>16.37</td>
<td>5.11</td>
<td>6.53</td>
</tr>
<tr>
<td>CTQ physical neglect</td>
<td>8.35</td>
<td>3.06</td>
<td>5.18</td>
</tr>
<tr>
<td>CTQ emotional abuse</td>
<td>12.00</td>
<td>5.34</td>
<td>5.50</td>
</tr>
<tr>
<td>CTQ physical abuse</td>
<td>8.13</td>
<td>4.28</td>
<td>5.13</td>
</tr>
<tr>
<td>CTQ sexual abuse</td>
<td>8.53</td>
<td>6.13</td>
<td>5.00</td>
</tr>
</tbody>
</table>

Notes: For count data comparison chi-square test and Fisher’s exact test were used. Educational groups consisted of 4 levels: 1 = 11 years of education, 2 = 14–15 years of education, 3 = 19–22 years of education and 4 = 24–26 years of education. All p-values were computed two-sided. CM+ = child maltreatment group, CM- = non child maltreatment group, ns = non-significant, a * = p < .05, b *** = p < .001, c assessed with Mini-DIPS, BPD = Borderline Personality Disorder, SSRI = Selective Serotonin Reuptake Inhibitor, BDI-2 = Beck Depression Inventory 2, CTQ = Childhood Trauma Questionnaire, PDS = Post-Traumatic Stress Diagnostic Scale.
## 2.2 Psychometric Assessment

CM was measured with the *German version of the Childhood Trauma Questionnaire, short form (CTQ-SF; 28)*, German translation and validation of Bader et al., 2009 (29) to categorize target participants into CM+ and CM- group in step 1. Internal consistency for the subscores is high ($\alpha > .81$), except for the physical neglect subscale ($\alpha = 0.49$). Nevertheless, the CTQ is a widely used measurement (30). In the current study, CM was rated as existent if a CTQ value was higher than “none / minimal” in at least one of the subscales according to Bernstein and colleagues (2003). The CM- group comprised individuals with a CTQ value of “none / minimal” on all subscales.

The following additional assessments of the target sample were conducted in step 1: 1) Depressive symptoms were measured using the German version of the *Beck’s Depression Inventory 2 (BDI-II; 31)*. It is a self-report measure for the assessment of the severity of depressive symptoms over the past week and comprises 21 items, which can be added up to a sum score of 0–63, with a good validity and reliability (32). 2) Current mental disorders (affective disorders, obsessive-compulsive disorders, anxiety disorders, eating disorders, sleeping disorders) were assessed using the diagnostic interview for mental disorders *Mini Diagnostisches Interview bei psychischen Störungen (Mini-DIPS; 33)*. The Mini-DIPS is a short, semi-structured clinical interview to assess the most common mental disorders (excluding personality disorders) according to the DSM-5. 3) The number of experienced trauma types was assessed using the trauma checklist of the *Post-Traumatic Stress Diagnostic Scale (PDS; 34)*. This section of the instrument corresponds to stressor criterion A of the DSM-5 for PTSD and demonstrates excellent internal validity.
consistency and test–retest reliability, and good convergent validity with the PTSD Checklist - Specific Version and the PTSD Symptom Scale - Interview Version for DSM-5 (35). 4) For the assessment of BPD, the McLean screening instrument for borderline personality disorder (MIS-BPD; 36, 37) was utilized. This self-report measure is a screening instrument based on a subset of the questions that comprise the borderline module of the Diagnostic Interview for DSM-IV personality disorders, yielding both good sensitivity and specificity for the diagnosis of DSM-IV BPD (36). 5) Social interaction anxiety was measured with the Social Interaction Anxiety Scale (sias; 38), a self-report questionnaire assessing social interaction anxiety defined as “distress when meeting and talking with other people” and includes 20 items on a 5-point Likert-scale. It shows good reliability (retest-reliability: >.90; Cronbach’s alpha = .86) (38). 6) Social support was measured using the Fragebogen zur sozialen Unterstützung (F-SozU K22; 39). This self-report questionnaire assesses social support with 22 items and shows good reliability (Cronbach’s alpha = .81-.93) (39). 7) Rejection sensitivity was assessed with the Rejection Sensitivity Questionnaire (rsq; 40, 41), which is a self-report questionnaire assessing trait rejection sensitivity with 18 items with good reliability and validity (40).

Additionally, all participants’ educational levels were evaluated. Four categories were used; 1 = up to 13 years of education (mandatory school years), 2 = up to 18 years of education (high school degree), 3 = up to 23 years of education (university degree; Bachelor or higher) and 4 = more than 23 years of education (university degree; PhD or higher).

2.3. Material

2.3.1 Production of Video-Material and Zero-Acquaintance (Thin Slices) Paradigm

The video material comprised videos of 40 target participants of the CM + group and 40 target participants of the CM- group. All target participants performed the thin slices paradigm (TSP) (13, 42) while being filmed. In this paradigm, target participants were asked about their favourite meal, colour, hobby, book, movie, animal, past vacation, and holiday destination, while sitting in front of a white wall. Targets could freely decide whether they wanted to just name their answer to each category or provide further explanation. After the videos had been collected, sound and video track were separated from each other and videos cut at 30 seconds. In part 2, videos were presented to the independent raters without audio trace to exclude potential effects of speech content or prosody, based on the procedure by Hepp and colleagues (2018).

2.3.2 First-Acquaintance Paradigm

During the FAP, target participants held a short three-minute conversation with a same sex confederate via skype for business. The online interaction (rather than an in-person interaction) was chosen due to regulatory aspects (mandatory use of facemasks, which might have critically hampered the interpretation of facial emotion expression) of the Covid-19 pandemic. The three-minute interaction consisted of a standardized small-talk conversation. Target participants were told that the interaction partner was
another study participant in order to create a close to real-life condition. Confederates had a set of questions and answers (e.g., “have you participated in a study before?”, “yes, this is my second participation”, “do you live in (blinded to keep anonymity)?” etc.) which they went through sequentially. If all questions had been asked, confederates initiated no more conversation. After three minutes, the experimenter broke off the dialogue. Directly after the interaction, we debriefed the target participants.

2.3.3 Trustworthiness, Likeability, and Cooperativeness Ratings

Raters of step 2 saw all 80 target videos and rated targets on likeability, trustworthiness, and cooperativeness on a 7-point Likert-scale. Similarity ratings were also collected on a 7-point Likert-scale. In an identical manner, confederates of the FAP rated the target participants.

To measure the target participant’s objective cooperativeness, the dictator game (DG; 27) was used. The dictator game is an economic game to assess cooperative behaviour. A fixed amount of money (here: 20 (blinded to keep anonymity) in 1 (blinded to keep anonymity) coins) can be divided between oneself and an unknown third person. Both parties are anonymous. The money is taken in private and participants are informed that someone unknown to them (i.e., not the person who serves as their experimenter) will open the envelope at the end of the participation.

2.3.4 FaceReader™

Objective measure of PA and NA display was assessed with the software FaceReader™ version 8 (43). For PA and NA display, the average percentage of positive or negative emotion detection (happy% + sad% + angry% + disgusted% + fearful%) during the TSP was assessed. Each video was calibrated manually and the sample rate was set to every second as suggested by the FaceReader™ manual 8 (44). The FaceReader™ is a valid measurement tool for emotional facial expressions, with 88% accuracy (43).

2.4. Procedure

The overarching project comprised two laboratory appointments. First, eligible targets were screened via telephone for inclusion and exclusion criteria and then scheduled an appointment for a first assessment in the laboratory, during which graduate psychology students trained and supervised by an experienced licensed psychotherapist (last author), assigned the questionnaires (sias, F-SozU K22, rsq) and conducted clinical interviews (CTQ-SF, BDI-II, MIS-BPD, Mini-Dips, PDS checklist). Target participants received a written study information and signed an informed consent form. The second laboratory visit comprised several emotion recognition paradigms (part of the overarching project not assessed for the current study), a personal space paradigm (not assessed for the current study; for further description see (blinded to keep anonymity) (under review), as well as the above described TSP, DG, and FAP conducted for part 1 of the current study. At the end of the second visit, we debriefed participants. They were reimbursed with 20 (blinded to keep anonymity) per hour for their participation in each study visit.
For part 2, eligible raters scheduled an appointment for the assessment in our laboratory. Each rater completed an informed consent form and then rated all 80 target videos, collected in step 1. At the end of the visit, participants received either course credits (1 credit per hour) or monetary compensation (20 (blinded to keep anonymity) per hour) for their participation.

2.5. Planned Statistical Analyses

Statistical analyses were calculated in R, version 4.2.1 (R Core Team, 20122). As pre-registered, it was planned to add similarity ratings to all models as a control variable. The first set of models to test Hypothesis 1 (individuals with CM experiences are evaluated as less likeable, trustworthy, and cooperative by independent raters at zero-acquaintance, compared to unexposed controls) comprised three separate regression analyses via lm function using the stats package for the influence of group allocation (CM + vs. CM-; predictor variable) on each criterion variable, i.e. average likeability, trustworthiness, and cooperativeness ratings by independent raters from part 2. The second set of models were related to Hypothesis 2 (individuals with CM experiences are evaluated as less likeable, trustworthy, and cooperative by confederates at first-acquaintance, compared to unexposed controls), planned to be tested by three separate regression analyses, with the ratings by confederates as criterion variables. As confederate ratings were missing for four participants (two of the CM- and two of the CM + group), a total of 76 ratings were collected. Attractiveness ratings were planned to be additionally added to models of confederate ratings as a control variable.

To test Hypothesis 3 (individuals with CM experiences express less PA and more NA compared to unexposed controls), two separate regression analyses via lm function for the influence of group (predictor variable) on PA and NA display (criterion variables) were intended to be conducted.

For exploratory analyses, a t-test with independent samples was conducted to test whether targets differed in their objective cooperativeness (as assessed with the dictator game). Furthermore, fifteen regression analyses were conducted to test whether the three rating dimensions (criterion variables) were related to self-reported levels of depressive symptoms, severity of CM, social anxiety, social support, and rejection sensitivity (all dimensional predictors).

Finally, the planned (according to pre-registration) mediation models between ratings and group, as well as overall levels of emotion expression, were not conducted, as no significant differences between study groups in ratings or affect display were found (see section results). Instead, exploratory (non-preregistered) analyses were conducted to better understand the unexpected findings and their deviation from previous research (8, 25, 26). More specifically, a possible influence of BPD (dimensional predictor) and complex PTSD symptoms (dimensional predictor) on each of the three rating dimensions (criterion variables), were assessed via lm function.

3. Results
Zero-order correlations to explore the relationships between the main variables of zero- and first-acquaintance ratings, as well as for emotion display revealed that there was no significant effect of group on our dependent variables (see Table 2). Thus, further regression analyses that involve the inclusion of covariates were not warranted. For objective measurement of emotion display, FaceReader™ analyses accurately detected emotional facial expressions, with a total of only 5% not recognized expressions, as labelled “unknown” by FaceReader™.

### Table 2
Descriptive Statistics Zero-, First-Acquaintance and Affect Display

<table>
<thead>
<tr>
<th>Variables</th>
<th>CM+ (n = 40)</th>
<th>CM- (n = 40)</th>
<th>Group comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zero-acquaintance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>likeability</td>
<td>4.37 0.64</td>
<td>4.15 0.67</td>
<td>ns</td>
</tr>
<tr>
<td>trustworthiness</td>
<td>4.62 0.51</td>
<td>4.49 0.56</td>
<td>ns</td>
</tr>
<tr>
<td>cooperativeness</td>
<td>4.59 0.78</td>
<td>5.68 0.55</td>
<td>ns</td>
</tr>
<tr>
<td><strong>First-acquaintance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>likeability</td>
<td>5.08 1.21</td>
<td>5.46 1.14</td>
<td>ns</td>
</tr>
<tr>
<td>trustworthiness</td>
<td>5.32 1.06</td>
<td>5.56 0.97</td>
<td>ns</td>
</tr>
<tr>
<td>cooperativeness</td>
<td>5.32 0.97</td>
<td>5.51 0.94</td>
<td>ns</td>
</tr>
<tr>
<td><strong>Emotion display</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>positive a</td>
<td>7.36 9.68</td>
<td>4.07 5.57</td>
<td>ns</td>
</tr>
<tr>
<td>negative a</td>
<td>0.77 1.58</td>
<td>1.54 2.69</td>
<td>ns</td>
</tr>
</tbody>
</table>

**Notes** For count data comparison chi-square test and Fisher's exact test were used. All p-values were computed two-sided. a measured in seconds

Secondary and Exploratory Analyses

The t-test with independent samples to test whether targets differed in their objective cooperativeness was not significant ($p_{two-tailed} = .45$), indicating that the CM+ and the CM- group did not significantly differ in the amount of money they shared with an unknown person during the DG.

None of the pre-registered exploratory analyses revealed significant results, see Table 3 for a summary. Similarly, none of the additional exploratory analyses (not pre-registered) were significant, apart from the
influence of BPD on likeability in the zero-acquaintance paradigm with the predictor explaining 5% of the variance ($R^2 = .050, F(1, 78) = 4.13, p = .046$). Unexpectedly, more BPD symptoms were associated with higher likeability ratings ($p = .046, \beta = + .06$). Furthermore, as results were unexpected, separate sensitivity analyses for a power of .95, .90, and .80, using a linear multiple regression, $R^2$ increase, for ratings and $R^2$ deviation from zero for affect display, using the G*Power tool (45) were conducted post-hoc.

Sensitivity power analyses for the ratings showed that our sample size allowed us to detect effect sizes of $f^2 = .16$ with a power of .95, an effect size of $f^2 = .13$ with a power of .90, and an effect size of $f^2 = .09$ with a power of .80. For affect display, sensitivity power analyses showed that our sample size allowed us to detect effect sizes of $f^2 = .17$ with a power of .95, an effect size of $f^2 = .13$ with a power of .90, and an effect size of $f^2 = .10$ with a power of .80.

Table 3
Exploratory Analyses

<table>
<thead>
<tr>
<th></th>
<th>estimated (se)</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>predictor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>likeability</td>
<td>BDI-2</td>
<td>4.23 (0.09)</td>
<td>0.47 0.64</td>
</tr>
<tr>
<td></td>
<td>CTQ</td>
<td>4.12 (0.19)</td>
<td>0.79 0.43</td>
</tr>
<tr>
<td></td>
<td>SIAS</td>
<td>4.21 (0.16)</td>
<td>0.3 0.76</td>
</tr>
<tr>
<td></td>
<td>SOZU</td>
<td>2.95 (1.25)</td>
<td>1.05 0.29</td>
</tr>
<tr>
<td></td>
<td>RSQ</td>
<td>4.31 (0.19)</td>
<td>-0.27 0.79</td>
</tr>
<tr>
<td>trustworthiness</td>
<td>BDI-2</td>
<td>4.56 (0.08)</td>
<td>-0.16 0.88</td>
</tr>
<tr>
<td></td>
<td>CTQ</td>
<td>4.48 (0.15)</td>
<td>0.51 0.61</td>
</tr>
<tr>
<td></td>
<td>SIAS</td>
<td>4.57 (0.13)</td>
<td>-0.16 0.87</td>
</tr>
<tr>
<td></td>
<td>SOZU</td>
<td>3.42 (1.01)</td>
<td>1.13 0.26</td>
</tr>
<tr>
<td></td>
<td>RSQ</td>
<td>4.67 (0.16)</td>
<td>-0.77 0.44</td>
</tr>
<tr>
<td>cooperativeness</td>
<td>BDI-2</td>
<td>4.53 (0.09)</td>
<td>-0.12 0.90</td>
</tr>
<tr>
<td></td>
<td>CTQ</td>
<td>4.46 (0.16)</td>
<td>0.43 0.67</td>
</tr>
<tr>
<td></td>
<td>SIAS</td>
<td>4.53 (0.14)</td>
<td>-0.02 0.99</td>
</tr>
<tr>
<td></td>
<td>SOZU</td>
<td>3.42 (1.06)</td>
<td>1.04 0.30</td>
</tr>
<tr>
<td></td>
<td>RSQ</td>
<td>4.59 (0.17)</td>
<td>-0.44 0.66</td>
</tr>
</tbody>
</table>
4. Discussion

The aim of the current study was to assess if potentially more negative evaluations of individuals with CM experiences compared to unexposed individuals, would be mediated by less positive and more negative affect display in a zero- and first acquaintance paradigm. Unexpectedly, none of our hypotheses were confirmed. No strong evidence was detected for differences in evaluation, nor for differences in affect display between the CM+ and the CM- group. Additional exploratory analyses revealed that higher BPD symptoms were correlated with higher scores in likeability solemnly at zero-acquaintance.

4.1 Ratings

Post-hoc sensitivity power analyses for ratings revealed that effects that are at least medium could be detected with the given sample of raters in the current study, and a substantially larger sample size is needed in order to detect small effects. Nevertheless, even though our analyses of group differences were not significant, there was a tendency for the CM+ group to display more positive and less negative affect, and to be rated higher in likeability, trustworthiness and cooperativeness than the CM- group at zero-acquaintance. This (although small) tendency is in line with results by Hepp and colleagues (2019) who demonstrated that affect display is linked to how individuals are perceived by others. However, in their study, results were statistically significant. BPD were rated as showing less PA and more NA, and PA mediated the association between BPD and likeability as well as trustworthiness, while NA mediated the association between BPD and trustworthiness (26).

Interestingly, at first-acquaintance results differed somewhat from zero-acquaintance findings in the current study. There was a slight (non-significant) tendency for the CM+ group to be rated lower in likeability, trustworthiness, and cooperativeness by confederates. Video analyses for affect display were conducted using videos from the TSP only and general affect display in the two different paradigms (first- and zero-acquaintance) may not have coincided. Thus, it might be possible that the CM+ group expressed more negative and less positive affect during the FAP but not during the TSP, which might have led to a tendency of less positive evaluation during the FAP by the confederates.

Contrasting previous studies (13), our exploratory analysis found that individuals with higher BPD scores, independent of group allocation were rated as significantly more likeable as individuals with lower BPD scores. This result was very surprising as individuals with BPD have previously been found to be evaluated as less likeable, less cooperative, and less trustworthy in comparison to healthy controls (13), using the TSP which we have used in the present study. This result might be due to rather low BPD scores in the MSI-BPD in our sample, with 8 being the highest score out of 10 items, which was only reached by
three participants (out of the CM + group). In contrast, participants from an inpatient and outpatient unit in the study by Hepp and colleagues (2018) demonstrated a symptom severity similar to patient samples in other studies (see (46)), which is clearly higher in comparison to our (non BPD specific) sample. Furthermore, we used a different measure for BPD than Hepp and colleagues (2018). Even though the MSI-BPD has both good sensitivity and specificity for the diagnosis of DSM-IV BPD (37), it might not have depicted the full range of BPD symptoms. Rather than indicating BPD symptoms on a Likert scale, as for example done in the Borderline Symptom List- 23 (46) used in the study by Hepp and colleagues (2018), participants in the current study rated each item in the MSI as “present” or “absent”, which may not adequately reflect the (dimensional) nature of BPD symptoms.

4.2 Facial Affect Display

As for affect display, post-hoc sensitivity power analyses revealed that effects that are at least medium could be detected with the given sample of target participants in the current study, and a substantially larger sample size is needed in order to detect small effects. Another possible explanation that we did not find differences in affect display between the two groups is that the CM- group might have been more daring in showing negative or neutral facial expressions than the CM + group, who might have suppressed their negative facial expressions. As it has been shown that emotion expressions can be intentionally manipulated through learning experiences (47), it is likely that individuals with experience of CM have learnt to adapt to their adverse environment in order to protect themselves and respond adequately when interacting with their abusive or neglecting caregivers. This notion is supported by several studies. A meta-analysis by Gruhn and Compas (2020) (48) for instance revealed that maltreatment is positively associated with emotional suppression as an emotional regulation strategy to cope with stress. One reason for this emotional strategy might lie in the fact that maltreated children expect less emotional support and practical assistance from their parents and peers in response to their emotional display especially that of sadness and anger (49–51). Though initially an adaptive strategy when growing up in a hostile family environment, suppressing one’s own emotions may not only be detrimental to future social interactions in normal environments but is also known to be predictive of higher levels of psychopathological symptoms (52). Indeed, intentional withholding of emotional responses was found to also be a relevant dimension in other traumatized populations like individuals suffering from of PTSD (53).

When it comes to the expression of positive affect, we cannot conclusively say if emotion display was genuine or potentially masked, as we did not measure Duchenne display (54). In the non-Duchenne smile, the eye muscle movement is lacking and is thus often called a non-enjoyment, false, fake, or social smile (55, 56). It is believed that non-Duchenne smiles are under far more volitional control than Duchenne smiles (55, 56). Considering that individuals with CM experience might be experienced in suppressing their feelings (48), they may also have learned to mask their emotions with expression of positive affect when actually experiencing negative affect. Indeed, it has previously been shown that non-Duchenne smile might explain the function of smiling in situations in which the expresser is actually experiencing negative affect, as when showing or masking feelings of discomfort, disliking, disappointment,
embarrassment, or anxiety (57–60). Beneficial or socially expected behaviour can be realised through deliberate expressions that can be incongruent with the actual experienced emotional state (61). Emotions can be intensified or dampened, neutralised or masked, depending on the context (62, 63). Considering that individuals during the TSP were sitting in front of a camera, knowing that they were filmed, might have caused more anxiety and embarrassment in the CM + group- feelings that they might have successfully covered.

Moreover, our non-significant findings might be explained by differences in study samples and methods. One of the exclusion criteria in our current study was the use of tricyclic antidepressants. In the study by Hepp and colleagues (2018) over 80% of the target participants were using some form of antidepressants, which is representative for samples with BPD, considering the high prevalence of major depressive disorder in BPD (e.g., lifetime diagnosis of 90%; e.g., (64)). However, it has previously been shown that antidepressants can lead to emotional blunting (65). Thus, individuals of the current CM + group might have experienced less emotional blunting, as only a small amount of the study participants (n = 10) used anti-depressive medication, and hence might have expressed less negative or neutral affect. Furthermore, in the current study facial expression was measured using an objective measurement tool (FaceReader™), while Hepp and colleagues (2019) assessed PA and NA through raters. Since subjective assessments of emotion expressions seem not to match with objective assessments (66), the setting of the current study might not be comparable to previous research, where differences in affect display between clinical and control samples have been found (25, 26).

4.3. Limitations

One limitation of the current study is the potential small effect sizes that could not be detected given our sample sizes, as shown by post-hoc sensitivity power analyses. Another limitation is the retrospective self-report measurement of CM by adults, using the CTQ, as evidence has suggested that prospective and retrospective measures of CM identify different groups of individuals (67). Second, as we, like other studies (26), did not evaluate Duchenne display (54), we cannot conclusively say if the positive affect display measured by the FaceReader™ was always genuine. Future studies should thus aim to include Duchenne display in their analyses to account for genuine positive affect display. Third, we used videos from the TSP for zero-acquaintance ratings, while ratings for first-acquaintance were conducted during the FAP. Upcoming studies should use video material and ratings from the same paradigm to account for comparability.

4.4. Conclusion

In our study, we found no difference of evaluation between adults with and without CM and no mediating effect of affect displays. Possibly, other aspects such as the presence of mental disorders (e.g., BPD or PTSD (13, 25, 26)), have a stronger impact than CM per se. Indeed, recent studies were able to show that CM combined with mental disorders (e.g., depression, social anxiety) have an influence on socially relevant functions like e.g., emotion recognition and the regulation of closeness and distance (blinded to keep anonymity, under review; blinded to keep anonymity, under review). Perhaps, similar processes are at
play when it comes to emotion expression. Such would be an indication for future research to investigate the combination of CM with specific diagnoses like complex PTSD, depression or BPD (rather than using a questionnaire to measure mental disorder symptoms likely leading to subclinical samples as done in the current study) and their influence on facial affect display and evaluation. Hopefully, in doing so, contribute to better understand the conditions under which negative evaluations of individuals with CM occur as well as contributors to negative evaluations of individuals affected by CM. On the long run, such research might help to counteract experiences of rejection and victimization and to foster positive and satisfying relationships and, in turn, mental and physical well-being.

**Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM</td>
<td>Child Maltreatment</td>
</tr>
<tr>
<td>BPD</td>
<td>Borderline Personality Disorder</td>
</tr>
<tr>
<td>PTSD</td>
<td>Post-Traumatic Stress Disorder</td>
</tr>
<tr>
<td>NA</td>
<td>Negative Affect</td>
</tr>
<tr>
<td>PA</td>
<td>Positive Affect</td>
</tr>
<tr>
<td>FAP</td>
<td>First-Acquaintance Paradigm</td>
</tr>
<tr>
<td>CTQ-SF</td>
<td>Childhood Trauma Questionnaire Short-Form</td>
</tr>
<tr>
<td>BDI-II</td>
<td>Beck’s Depression Inventory 2</td>
</tr>
<tr>
<td>Mini-DIPS</td>
<td>Mini Diagnostisches Interview bei psychischen Störungen</td>
</tr>
<tr>
<td>PDS</td>
<td>Post-Traumatic Stress Diagnostic Scale</td>
</tr>
<tr>
<td>MIS-BPD</td>
<td>McLean Screening Instrument for Borderline Personality Disorder</td>
</tr>
<tr>
<td>sias</td>
<td>Social Interaction Anxiety Scale</td>
</tr>
<tr>
<td>F-SozU K22</td>
<td>Fragebogen zur sozialen Unterstützung</td>
</tr>
<tr>
<td>rsq</td>
<td>Rejection Sensitivity Questionnaire</td>
</tr>
<tr>
<td>TSP</td>
<td>Thin Slices Paradigm</td>
</tr>
<tr>
<td>DG</td>
<td>Dictator Game</td>
</tr>
</tbody>
</table>

**Declarations**
Ethical Approval and Consent to participate

This work was approved by the cantonal ethics committee Zurich (identification number: 2020 01991). All participants gave written informed consent prior to participation.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding

This project was funded by the Swiss National Science Foundation (grant number 10001C_185356, grant to Monique Pfaltz).

Authors' contributions


Acknowledgements

We thank all participants for taking part in this study.

References


44. FaceReader - Facial expression recognition software – Noldus [Internet]. Available from: https://www.noldus.com/facereader


