

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

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**ABSTRACT**

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

**Objective:** Based on previous research on adults with borderline personality disorder (BPD), this preregistered study assessed 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, it was explored whether level of depression, severity of CM, social anxiety, social support, and rejection sensitivity have an influence on ratings.

**Methods:** Forty 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) and 17 raters after first-acquaintance (short conversation).

**Results:** 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 effects could be attributed to an 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. Moreover, aspects such as the presence of mental disorders (e.g., BPD or post-traumatic stress disorder), might have a stronger impact than CM per se. Future research should thus 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.

**Keywords:**

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

## 1 **1. Background**

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

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

28 might thus affect how one is perceived by others, which in turn may also account for difficulties in  
29 establishing close and satisfying relationships.

30 To date, studies investigating alterations in facial emotion expression in individuals with a  
31 history of CM are scarce. However, populations with a high prevalence of CM (such as post-traumatic  
32 stress disorder (PTSD) (24) or BPD; (12)) have been found to show alterations in emotion expression.  
33 For example, in a study by Kirsch and Brunnhuber (2007) (25), PTSD patients displayed more  
34 expressions of anger during a psychodynamic interview while a healthy control group more frequently  
35 displayed happy facial expressions. Similarly, Hepp, Storkel, Kieslich, Schmahl, and Niedtfeld (2018)  
36 videotaped individuals with and without BPD while answering questions about personal preferences.  
37 The authors found that individuals with BPD were rated to display significantly more negative and  
38 significantly less positive affect in comparison to those without BPD. In a second study, the authors  
39 showed that negative evaluations of individuals with BPD were mediated by less positive and more  
40 negative facial emotional display (26).

41 Alterations in facial emotion expression in individuals with a history of CM are to date poorly  
42 understood. Thus, the goal of the current study was to examine whether possible negative evaluations  
43 of adults with CM carried out by independent raters naïve to their trauma history at zero- (without  
44 interaction) and first- (after a short interaction) acquaintance would be mediated by altered facial  
45 emotion expressions. Based on the results of Hepp and colleagues (2019), we selected negative affect  
46 (NA; sad, angry, scared, disgusted) and positive affect (PA; happy) display as potential mediators in  
47 the relationship between CM and ratings of likeability, trustworthiness, and cooperativeness.  
48 Specifically, and in line with prior research (26), we hypothesized that adults with a history of CM  
49 would facially express more NA and less PA compared to individuals without CM experiences and  
50 that these differences in NA and PA display would mediate the association between CM experiences  
51 and negative evaluations on the traits likeability, trustworthiness, and cooperativeness. In line with  
52 findings by Hepp and colleagues (2018), we expected individuals with CM experiences not to differ  
53 in objective cooperativeness, measured with an economic game (27). In exploratory analyses, we  
54 explored whether the level of depression, severity of CM, social anxiety, social support, and rejection  
55 sensitivity have a negative impact on ratings, in addition to CM and facial expression. We

56 hypothesized that higher levels on each scale would negatively influence likeability, trustworthiness,  
57 as well as cooperativeness. The aims, hypotheses, design, and analyses for this study were pre-  
58 registered at *aspredicted.org* prior to data collection under the title “Negative Evaluation of  
59 individuals with a history of child maltreatment” (#83676). The pdf is available from  
60 <https://aspredicted.org/b7mn5.pdf>.

## 61 **2. Materials and Methods**

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

### 70 **2.1. Participants**

71 Participants of step 1 (individuals with and without self-reported history of CM = target  
72 participants) were recruited via online social media platforms, flyers, mailing lists, from a study pool,  
73 and in collaboration with out-patient clinics in the area of (blinded to keep anonymity). Individuals  
74 aged 18–65 years with normal or corrected-to-normal vision that are native German speakers (or  
75 equivalent) were included. Individuals were assigned to the CM+ group (participants with CM  
76 experiences) based on the Childhood Trauma Questionnaire short form (CTQ-SF; (28) for further  
77 description see section 2.2.). For this study, individuals were classified into the CM+ group when  
78 meeting the cut-off values of “none / minimal” in at least one of the subscales according to Bernstein  
79 and colleagues (2003). Individuals scoring below these cut-offs in all subscales were assigned to the  
80 CM- group (participants without CM experiences). Exclusion criteria were antipsychotic,  
81 benzodiazepine, or tricyclic antidepressant medication, acute suicidality, lifetime psychotic  
82 symptoms, substance abuse or dependency (past 12 months), pregnancy, and physical health problems  
83 affecting psychophysiological measurements (these measurements were conducted as part of the

84 overarching project). The initial sample of step 1 consisted of almost twice as many target participants  
 85 in the CM+ group (n = 70) than the CM- group (n = 40), possibly due to the specific mentioning of  
 86 “child maltreatment experiences” in the recruitment announcements. To match the two groups (i.e., to  
 87 enable comparability between groups regarding gender, age, and education level), a random selection  
 88 by matched subgroups was applied, resulting in a final sample of 40 target participants (26 female) in  
 89 the CM+ and 40 target participants (25 female) in the CM- group. Target participant’s characteristics  
 90 are visualised in Table 1.

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92 Table 1. Summary statistics of the Target participants’ characteristics

	CM+ (n = 40)		CM- (n = 40)		Group comparison
	<i>n</i>	%	<i>n</i>	%	
Female gender	26	65.0	25	62.5	ns
Anxiety disorders <sup>a</sup>	10	25.0	4	10.0	ns
Obsessive-compulsive disorder <sup>a</sup>	4	10.0	1	2.5	ns
Affective disorders <sup>a</sup>	6	15.0	1	2.5	ns
Eating disorders <sup>a</sup>	0	0.0	1	2.5	ns
Sleeping disorders <sup>a</sup>	6	15.0	0	0.0	$\chi^2 [1] = 6.49^*$
SSRI medication	6	15.0	1	2.5	ns
Other antidepressant medication	4	10.0	0	0.0	ns
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Age (years)	33.00	13.69	32.85	12.46	ns
Educational group	2.46	0.82	2.4	0.78	ns
BDI-2	10.75	9.43	3.45	3.62	CM+ > CM-; <i>U</i> = 353.0 ***
MSI-BDI	3.98	2.59	0.88	1.34	CM+ > CM-; <i>U</i> = 260.0 ***
CTQ emotional neglect	16.37	5.11	6.53	1.39	CM+ > CM-; <i>U</i> = 060.5 ***
CTQ physical neglect	8.35	3.06	5.18	0.39	CM+ > CM-; <i>U</i> = 225.5 ***
CTQ emotional abuse	12.00	5.34	5.50	0.85	CM+ > CM-; <i>U</i> = 164.0 ***
CTQ physical abuse	8.13	4.28	5.13	0.34	CM+ > CM-; <i>U</i> = 435.0 ***
CTQ sexual abuse	8.53	6.13	5.00	0.00	CM+ > CM-; <i>U</i> = 460.0 ***
PDS	2.28	2.11	0.98	1.27	CM+ > CM-; <i>U</i> = 680.0 ***

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Note. 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, \* =  $p < .05$ , \*\*\* =  $p < .001$ , <sup>a</sup> assessed with Mini-DIPS, MSI-BPD = dimensional Borderline Personality Disorder score, SSRI = Selective Serotonin Reuptake Inhibitor, BDI-2 = Beck Depression Inventory 2, CTQ = Childhood Trauma Questionnaire, PDS = Post-Traumatic Stress Diagnostic Scale

100 The final sample of the confederates of step 1 consisted of 17 psychology student raters (11  
101 female), with a mean age of 25.9 years, and a mean education level of 2.22 (representing the (blinded  
102 to keep anonymity) schooling system, see further description in section 2.2).

103 Participants (raters) of step 2 of the study were recruited via online social media platforms,  
104 mailing lists, and from a pool of former study participants. Individuals aged 18–65 years with normal  
105 or corrected-to-normal vision that are native German speakers (or equivalent) were included. The  
106 final sample consisted of 100 raters (67 female). Raters had a mean age of 28.8 years and a mean  
107 education level of 2.53 (representing the (blinded to keep anonymity) schooling system, see further  
108 description in section 2.2.)

## 109 **2.2. Psychometric Assessment**

110 CM was measured with the *German version of the Childhood Trauma Questionnaire, short*  
111 *form (CTQ-SF; 28)*, German translation and validation of Bader et al., 2009 (29) to categorize target  
112 participants into CM+ and CM- group in step 1. Internal consistency for the subscores is high ( $\alpha$   
113  $>.81$ ), except for the physical neglect subscale ( $\alpha = 0.49$ ). Nevertheless, the CTQ-SF is a widely used  
114 measurement (30).

115 During step 1, the target sample underwent the following additional assessments: 1)  
116 Depressive symptoms were measured using the German version of the *Beck's Depression Inventory 2*  
117 *(BDI-II; 31)*. It is a self-report measure for the assessment of the severity of depressive symptoms  
118 over the past week and comprises 21 items, which can be added up to a sum score of 0-63, with a  
119 good validity and reliability (32). 2) Current mental disorders (affective disorders, obsessive-  
120 compulsive disorders, anxiety disorders, eating disorders, sleeping disorders) were assessed using the  
121 diagnostic interview for mental disorders *Mini Diagnostisches Interview bei psychischen Störungen*  
122 *(Mini-DIPS; 33)*. The Mini-DIPS is a short, semi-structured clinical interview to assess the most  
123 common mental disorders (excluding personality disorders) according to the DSM-5. 3) The number  
124 of experienced trauma types was assessed using the trauma checklist of the *Posttraumatic Diagnostic*  
125 *Scale (PDS; 34)*. This section of the instrument corresponds to stressor criterion A of the DSM-5 for  
126 PTSD and demonstrates excellent internal consistency and test–retest reliability, and good convergent

127 validity with the PTSD Checklist - Specific Version and the PTSD Symptom Scale - Interview  
128 Version for DSM-5 (35). If a participant had one or more traumatic experience, they completed the  
129 *International Trauma Questionnaire – German Version (ITQ; 36)*. The ITQ is a short questionnaire  
130 aiming to assess PTSD and complex PTSD symptoms following simple diagnostic rules (36). 4) For  
131 the assessment of BPD, the *McLean screening instrument for borderline personality disorder (MSI-*  
132 *BPD; 37, 38)* was used. This self-report measure is a screening instrument based on a subset of the  
133 questions that comprise the borderline module of the Diagnostic Interview for DSM-IV personality  
134 disorders, yielding both good sensitivity and specificity for the diagnosis of DSM-IV BPD (37). 5)  
135 Social interaction anxiety was measured with the *Social Interaction Anxiety Scale (SIAS; 39)*, a self-  
136 report questionnaire assessing social interaction anxiety defined as “distress when meeting and talking  
137 with other people” and includes 20 items on a 5-point Likertscale. It shows good reliability (retest-  
138 reliability:  $>.90$ ; Cronbach’s  $\alpha = .86$ ) (39). 6) Social support was measured using the *Fragebogen*  
139 *zur sozialen Unterstützung (F-SozU K22; 40)*. This self-report questionnaire assesses social support  
140 with 22 items and shows good reliability (Cronbach’s  $\alpha = .81-.93$ ) (40). 7) Rejection sensitivity  
141 was assessed with the *Rejection Sensitivity Questionnaire (RSQ; 41, 42)*, which is a self-report  
142 questionnaire assessing trait rejection sensitivity with 18 items. It shows good reliability and validity  
143 (41).

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

## 148 **2.3. Material**

### 149 *2.3.1. Production of Stimulus Material and Zero-Acquaintance (Thin Slices) Paradigm*

150 The stimulus material comprised videos of 40 target participants of the CM+ group and 40  
151 target participants of the CM- group. All target participants performed the thin slices paradigm (TSP)  
152 (13, 43) while being filmed. In this paradigm, target participants were asked about their favourite  
153 meal, colour, hobby, book, movie, animal, past vacation, and holiday destination, while sitting in front  
154 of a white wall. Targets could freely decide whether they wanted to just name their answer to each



155 category or provide further explanation. After the videos had been collected, sound and video track  
156 were separated from each other, and videos were cut at 30 seconds. In part 2, videos were presented to  
157 the independent raters without audio trace to exclude potential effects of speech content or prosody,  
158 based on the procedure by Hepp and colleagues (2018).

### 159 2.3.2. *First-Acquaintance Paradigm*

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

### 171 2.3.3. *Trustworthiness, Likeability, and Cooperativeness Ratings*

172 Raters of step 2 watched all 80 target videos (presented electronically using E-Prime 3.0  
173 software (Psychology Software Tools, Pittsburgh, PA) (44)) and rated targets on likeability,  
174 trustworthiness, and cooperativeness on a 7-point Likert scale. Similarity ratings were also collected  
175 on a 7-point Likert scale. After rating 40 of the videos, there was a 10-minute break in which the  
176 participants were allowed to step outside and walk around but were asked to refrain from using their  
177 mobile phone in order to prevent any exposure to potential emotional content. Confederates of the  
178 FAP rated the target participants identically on likeability, trustworthiness, cooperativeness, as well as  
179 similarity on a 7-point Likert scale.

180 To measure the target participant’s objective cooperativeness, they took part in the *dictator*  
181 *game* (DG; 27). The dictator game is an economic game to assess cooperative behaviour. A fixed  
182 amount of money (here: 20 (blinded to keep anonymity) in 1 (blinded to keep anonymity) coins) has

183 to be divided between oneself and an unknown third person. Participants distribute the money in  
184 private and are informed that someone unknown to them (i.e., not the person who serves as their  
185 experimenter) will open the envelope at the end of the participation. They are furthermore notified  
186 that the allocated amount will remain anonymous to both the experimenter and the recipient.

#### 187 *2.3.4. FaceReader™*

188 Objective measure of PA and NA display was assessed with the software FaceReader™  
189 version 8 (45). To determine the overall intensity of each emotion detected, FaceReader™ provided  
190 us with a “detailed log” where, with a continuous scale measure, the intensity of different emotions at  
191 every given time are recorded. The mean% (average intensity) of each emotion over the 30 seconds  
192 period was then calculated. Each video was calibrated manually, and the sample rate was set to every  
193 second frame as suggested by the FaceReader™ manual 8 (45). The FaceReader™ is a valid  
194 measurement tool for emotional facial expressions, with 88% accuracy (45).

#### 195 *2.4. Procedure*

196 The overarching project comprised two laboratory appointments. First, eligible targets were  
197 screened via telephone for inclusion and exclusion criteria and then scheduled an appointment for a  
198 first assessment in the laboratory, during which graduate psychology students trained and supervised  
199 by an experienced licensed psychotherapist (last author), assigned the questionnaires (SIAS, F-SozU  
200 K22, RSQ, BDI-II, MSI-BPD, ITQ) and conducted clinical interviews (CTQ-SF, Mini-Dips, PDS  
201 checklist). Target participants received a written study information and signed an informed consent  
202 form. The second laboratory visit comprised several emotion recognition paradigms (part of the  
203 overarching project not assessed for the current study), a personal space paradigm (not assessed for  
204 the current study; for further description see (blinded to keep anonymity) (under review), as well as  
205 the above described TSP, DG, and FAP conducted for part 1 of the current study. At the end of the  
206 second visit, we debriefed participants. They were reimbursed with 20 (blinded to keep anonymity)  
207 per hour for their participation in each study visit.

208 For part 2, eligible raters scheduled an appointment for the assessment in our laboratory. Each  
209 rater completed an informed consent form and then rated all 80 target videos, collected in step 1. At

210 the end of the visit, participants received either course credits (1 credit per hour) or monetary  
211 compensation (20 (blinded to keep anonymity) per hour) for their participation.

## 212 *2.5. Planned Statistical Analyses*

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

227 To test Hypothesis 3 (individuals with CM experiences express less PA and more NA  
228 compared to unexposed controls), five separate regression analyses via lm function for the influence  
229 of group (predictor variable) on each emotion display (criterion variables; happy, sad, angry, scared,  
230 disgusted) were intended to be conducted.

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

236 Finally, the planned (according to pre-registration) mediation models between ratings and  
237 group, as well as overall levels of emotion expression, were not conducted, as no significant

238 differences between study groups in ratings or affect display were found (see section *results*). Instead,  
239 exploratory (non-preregistered) analyses were conducted to better understand the unexpected findings  
240 and their deviation from previous research (8, 25, 26). More specifically, a possible influence of BPD  
241 (dimensional predictor) and complex PTSD symptoms (dimensional predictor) on each of the three  
242 rating dimensions (criterion variables), were assessed via lm function.

### 243 **3. Results**

244 Univariate analyses used to explore the relationships between the main variables of zero- and  
245 first-acquaintance ratings, as well as for emotion display revealed that there was no significant effect  
246 of group on our dependent variables (see Table 2). Thus, further multivariate regression analyses that  
247 involve the inclusion of the covariates (similarity and attractiveness) were not warranted (and thereby  
248 deviating from our analysis plan). For objective measurement of emotion display, FaceReader™  
249 analyses accurately detected emotional facial expressions, with a total of only 5% not recognized  
250 expressions, as labelled “unknown” by FaceReader™.

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252 Table 2. Descriptive Statistics, *p*-values (and Cohen's *d*) for Zero-, First-Acquaintance and Affect

Variables	CM+ (n = 40)		CM- (n = 40)		Group comparison
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>p</i> ( <i>d</i> )
<b>Zero-acquaintance</b>					
likeability	4.37	0.64	4.15	0.67	.14 (.34)
trustworthiness	4.62	0.51	4.49	0.56	.28 (.24)
cooperativeness	4.59	0.58	4.46	0.55	.31 (.23)
similarity	2.92	0.51	2.81	0.57	.37 (.20)
<b>First-acquaintance</b>					
likeability	5.08	1.21	5.46	1.14	.15 (-.32)
trustworthiness	5.32	1.06	5.56	0.97	.29 (-.24)
cooperativeness	5.32	0.97	5.51	0.94	.38 (-.19)
similarity	4.51	1.26	4.38	1.55	.68 (.09)
attractiveness	4.51	1.37	4.51	1.50	.99 (.00)
<b>Emotion display</b>					
happy <sup>a</sup>	11.55	0.13	9.00	0.09	.48 (2.36)
sad <sup>a</sup>	1.56	0.02	2.10	0.03	.11 (.00)
angry <sup>a</sup>	1.37	0.03	2.00	0.03	.36 (-.33)
scared <sup>a</sup>	0.91	0.01	1.55	0.02	.32 (-.50)
disgusted <sup>a</sup>	1.03	0.02	0.51	0.01	.54 (.00)

253 Note. All *p*-values were computed two-sided. <sup>a</sup> average intensity (in %) per clip

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256 *Secondary and Exploratory Analyses*

257 The t-test with independent samples to test whether targets differed in their objective

258 cooperativeness was not significant ( $p_{two-tailed} = .45$ ), indicating that the CM+ and the CM- group did

259 not significantly differ in the amount of money they shared with an unknown person during the DG.

260 None of the pre-registered exploratory analyses revealed significant results, see Table 3 for a

261 summary. Similarly, none of the additional exploratory analyses (not pre-registered) were significant,

262 apart from the influence of BPD on likeability in the zero-acquaintance paradigm with the predictor

263 explaining 5% of the variance ( $R^2 = .050$ ,  $F(1, 78) = 4.13$ ,  $p = .046$ ). Unexpectedly, more BPD

264 symptoms were associated with higher likeability ratings ( $p = .046$ ,  $\beta = + .06$ ). Furthermore, as results

265 were unexpected, separate sensitivity analyses for a power of .95, .90, and .80, using a linear multiple

266 regression,  $R^2$  increase, for ratings and  $R^2$  deviation from zero for affect display, using the G\*Power  
 267 tool (47) were conducted post-hoc.

268

269 Table 3. Exploratory Analyses

	Predictor	estimated (se)			<i>p</i>	
		Intercept	Unstandardized $\beta$	<i>t</i>		
likeability	BDI-2	4.23 (0.09)	0.00 (0.00)	.47	.64	270 271 272
	CTQ	4.12 (0.19)	0.00 (0.00)	.79	.43	273 274
	SIAS	4.21 (0.16)	0.00 (0.00)	.30	.76	275 276
	SOZU	2.95 (1.25)	0.37 (0.35)	1.05	.29	277 278
	RSQ	4.31 (0.19)	-0.01 (0.04)	-.27	.79	279
	trustworthiness	BDI-2	4.56 (0.08)	-0.00 (0.00)	-.16	.88
CTQ		4.48 (0.15)	0.00 (0.00)	.51	.61	282
SIAS		4.57 (0.13)	-0.00 (0.00)	-.16	.87	283 284
SOZU		3.42 (1.01)	0.32 (0.28)	1.13	.26	285
RSQ		4.67 (0.16)	-0.03 (0.03)	-.77	.44	286 287
cooperativeness		BDI-2	4.53 (0.09)	-0.00 (0.01)	-.12	.90
	CTQ	4.46 (0.16)	0.00 (0.00)	.43	.67	289
	SIAS	4.53 (0.14)	-0.00 (0.00)	-.02	.99	290 291
	SOZU	3.42 (1.06)	0.31 (0.29)	1.04	.30	292
	RSQ	4.59 (0.17)	-0.01 (0.03)	-.44	.66	293 294

296 *Note.* BDI-2 = Beck Depression Inventory 2, CTQ = Childhood Trauma Questionnaire dimensional score, SIAS = Social Interaction  
 297 Anxiety Scale, SOZU = F-SozU K22; Fragebogen zur sozialen Unterstützung (social support questionnaire), RSQ = Rejection Sensitivity  
 298 Questionnaire  
 299

300 Sensitivity power analyses for the ratings showed that our sample size allowed us to detect  
 301 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  
 302 size of  $f^2 = .09$  with a power of .80. For affect display, sensitivity power analyses showed that our  
 303 sample size allowed us to detect effect sizes of  $f^2 = .17$  with a power of .95, an effect size of  $f^2 = .13$   
 304 with a power of .90, and an effect size of  $f^2 = .10$  with a power of .80.

#### 305 4. Discussion

306 This study aimed to assess whether more negative evaluations of individuals with CM  
 307 experiences compared to unexposed individuals would be mediated by less positive and more  
 308 negative affect display in a zero- and first acquaintance paradigm. Unexpectedly, none of our  
 309 hypotheses were confirmed. No strong evidence was detected for differences in evaluation, nor for  
 310 differences in affect display for none of the emotions (happy, sad, angry, scared, disgusted) between

311 the CM+ and the CM- group. Additional exploratory analyses revealed that higher BPD symptoms  
312 were correlated with higher scores in likeability solely at zero-acquaintance.

#### 313 **4.1. Ratings**

314 Post-hoc sensitivity power analyses for ratings revealed that at least medium effects could be  
315 detected with the given sample of raters in the study, and a substantially larger sample size would be  
316 needed in order to detect small effects. Although analyses of group differences were not significant,  
317 descriptively, the CM+ group displayed more positive and less negative (sad, angry, and scared)  
318 affect, and was rated higher in likeability and trustworthiness, than the CM- group at zero-  
319 acquaintance. Hepp and colleagues (2019) demonstrated that affect display is linked to how  
320 individuals are perceived by others. However, in contrast to the current study, Hepp and colleagues'  
321 (2019) results were statistically significant. Individuals with BPD were rated as showing less PA and  
322 more NA, and PA mediated the association between BPD and likeability as well as trustworthiness,  
323 while NA mediated the association between BPD and trustworthiness (26).

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

331 Furthermore, results could be explained by methodological shortcomings. Videos shown to  
332 raters resulted in a rather long-lasting evaluation procedure, even though each video was only 30  
333 seconds long. The whole paradigm approximately lasted one hour (including the break). It is likely  
334 that raters started to feel bored, since it was a relatively monotonous task (48). As boredom has been  
335 proposed to be an unpleasant affective state (48), it might have impacted the ratings of target  
336 participants. This would also be in line with general rating differences found between confederate  
337 raters from the FAP and independent raters from the zero-acquaintance paradigm.

338           Contrasting previous studies (13), our exploratory analysis revealed that individuals with  
339 higher BPD scores were rated as significantly more likeable as individuals with lower BPD scores  
340 independent of group allocation. This result was very surprising as individuals with BPD have  
341 previously been found to be evaluated as less likeable, less cooperative, and less trustworthy in  
342 comparison to healthy controls in the TSP (13). However, BPD symptom scores in our sample were  
343 rather low, given that 8 out of 10 was the highest score and was only reached by three participants (of  
344 the CM+ group). In contrast, participants from an inpatient and outpatient unit in the study by Hepp  
345 and colleagues (2018) demonstrated a symptom severity similar to patient samples in other studies  
346 (see (49)), which is clearly higher in comparison to our (non-BPD specific) sample. Furthermore, we  
347 used a different measure for BPD than Hepp and colleagues (2018). Even though the MSI-BPD has  
348 both good sensitivity and specificity for the diagnosis of DSM-IV BPD (38), it might not have  
349 depicted the full range of BPD symptoms. Rather than indicating BPD symptoms on a Likert scale, as  
350 for example done in the Borderline Symptom List- 23 (49) used in the study by Hepp and colleagues  
351 (2018), participants in the current study rated each item in the MSI as “present” or “absent”, which  
352 may not adequately reflect the (dimensional) nature of BPD symptoms and thus might have impacted  
353 on the results of our exploratory analysis.

#### 354 ***4.2. Facial Affect Display***

355           As for affect display, post-hoc sensitivity power analyses revealed that at least medium effects  
356 could be detected with the given sample of target participants in this study, and a substantially larger  
357 sample size is needed in order to detect small effects. Another possible reason for non-significant  
358 findings in affect display between the two groups is that the CM- group might have been more daring  
359 in showing negative or neutral facial expressions than the CM+ group, who might have suppressed  
360 their negative facial expressions. As it has been shown that emotion expressions can be intentionally  
361 manipulated through learning experiences (50), it seems likely that individuals with experiences of  
362 CM have learnt to adapt to their adverse environment to protect themselves and respond adequately  
363 when interacting with their abusive or neglecting caregivers. This notion is supported by several  
364 studies. For instance, a meta-analysis by Gruhn and Compas (2020) (51) revealed that maltreatment is  
365 positively associated with emotional suppression as an emotional regulation strategy to cope with



366 stress. One reason for this emotional strategy might lie in the fact that maltreated children expect less  
367 emotional support and practical assistance from their parents and peers in response to their emotional  
368 display, especially in the case of sadness and anger (52-54). Though initially an adaptive strategy  
369 when growing up in a hostile family environment, suppressing one's own emotions may not only be  
370 detrimental to future social interactions in normal environments but is also known to be predictive of  
371 higher levels of psychopathological symptoms (55). Indeed, intentional withholding of emotional  
372 responses was found to also be a relevant dimension in other traumatized populations such as  
373 individuals suffering from PTSD (56).

374         When it comes to the expression of positive affect, we cannot conclusively say if emotion  
375 display was genuine or potentially masked, as we did not measure Duchenne display (57). In the non-  
376 Duchenne smile, the eye muscle movement is lacking and is thus often called a non-enjoyment, false,  
377 fake, or social smile (58, 59). It is believed that non-Duchenne smiles are under far more volitional  
378 control than Duchenne smiles (58, 59). Considering that individuals with CM experience might be  
379 experienced in suppressing their feelings (51), they may also have learned to mask their emotions  
380 with expression of positive affect when actually experiencing negative affect. Indeed, it has  
381 previously been shown that non-Duchenne smile might explain the function of smiling in situations in  
382 which the expresser is actually experiencing negative affect, as when showing or masking feelings of  
383 discomfort, disliking, disappointment, embarrassment, or anxiety (60-63). Beneficial or socially  
384 expected behaviour can be realised through deliberate expressions that can be incongruent with the  
385 actual experienced emotional state (64). Emotions can be intensified or dampened, neutralised, or  
386 masked, depending on the context (65, 66). During the TSP, individuals were sitting in front of a  
387 camera, knowing that they were being filmed, which might have caused more pronounced feelings  
388 such as anxiety and embarrassment in the CM+ group. At the same time, individuals with CM might  
389 have successfully covered these feelings.

390         Moreover, our non-significant findings might be explained by differences in study samples  
391 and methods. One of the exclusion criteria in our current study was the use of tricyclic  
392 antidepressants. In the study by Hepp and colleagues (2018) over 80% of the target participants were  
393 using some form of antidepressants, which is representative for individuals with BPD, considering the

394 high prevalence of major depressive disorder in BPD (e.g., lifetime diagnosis of 90%; e.g., (67)).  
395 However, it has previously been shown that antidepressants can lead to emotional blunting (68). Thus,  
396 individuals of the CM+ group might have experienced less emotional blunting, as only a small  
397 amount of study participants ( $n = 10$ ) used anti-depressive medication, and hence might have  
398 expressed less negative or neutral affect. Furthermore, facial expression was measured using an  
399 objective measurement tool (FaceReader™), while Hepp and colleagues (2019) assessed PA and NA  
400 through raters. Since subjective assessments of emotion expressions seem not to match with objective  
401 assessments (69), the setting of the current study might not be comparable to previous research, where  
402 differences in affect display between clinical and control samples have been found (25, 26).

#### 403 **4.3. Limitations**

404 The study is limited by the small sample size as shown by post-hoc sensitivity power  
405 analyses. Another limitation is the retrospective self-report measurement of CM, given that it has  
406 been suggested that prospective and retrospective measures of CM identify different groups of  
407 individuals (70). Furthermore, in line with other studies (26), we did not evaluate Duchenne display  
408 (57). Therefore, we cannot conclusively say whether the positive affect display measured by the  
409 FaceReader™ was always genuine. Future studies should thus aim to include Duchenne display in  
410 their analyses to account for genuine positive affect display. Moreover, we used videos from the TSP  
411 for zero-acquaintance ratings, while ratings for first acquaintance were conducted during the FAP.  
412 Upcoming studies should use video material and ratings from the same paradigm to account for  
413 comparability. Our CM+ group also mainly comprised participants of a community sample, with  
414 lower scores of exposure to CM compared to previous studies (e.g., 71-73), potentially contributing to  
415 the absence of group differences. Thus, future studies might profit from a dimensional analyses  
416 approach (using CTQ-SF severity score) rather than conducting group analyses.

#### 417 **4.4. Conclusion**

418 This study found no difference of evaluation between adults with and without CM as well as  
419 no mediating effect of affect displays. Possibly, other aspects such as the presence of mental disorders  
420 (e.g., BPD or PTSD (13, 25, 26)), have a stronger impact on negative evaluations than CM per se.  
421 Indeed, recent studies showed that CM combined with mental disorders (e.g., depression, social

422 anxiety) have an influence on socially relevant functions such as e.g., emotion recognition and the  
423 regulation of closeness and distance (blinded to keep anonymity, under review; blinded to keep  
424 anonymity, under review). Perhaps, similar processes are at play when it comes to emotion  
425 expression. It would be important for future research to investigate the combination of CM with  
426 specific diagnoses like complex PTSD, depression or BPD (rather than measuring mental disorder  
427 symptoms likely leading to subclinical samples as done in this study) and their influence on facial  
428 affect display and evaluation. Such studies could contribute to better understand the conditions under  
429 which negative evaluations of individuals with CM occur and might identify possible contributors to  
430 negative evaluations of those affected by CM. On the long run, such research might help to counteract  
431 experiences of rejection and victimization, foster positive and satisfying relationships and thereby  
432 increase mental and physical well-being.

#### 433 **List of abbreviations**

434	CM	Child Maltreatment
435	BPD	Borderline Personality Disorder
436	PTSD	Post-Traumatic Stress Disorder
437	NA	Negative Affect
438	PA	Positive Affect
439	FAP	First-Acquaintance Paradigm
440	CTQ-SF	Childhood Trauma Questionnaire Short-Form
441	BDI-II	Beck's Depression Inventory 2
442	Mini-DIPS	Mini Diagnostisches Interview bei psychischen Störungen
443	PDS	Post-Traumatic Stress Diagnostic Scale
444	ITQ	International Trauma Questionnaire
445	MSI-BPD	McLean Screening Instrument for Borderline Personality Disorder
446	SIAS	Social Interaction Anxiety Scale
447	F-SozU K22	Fragebogen zur sozialen Unterstützung
448	RSQ	Rejection Sensitivity Questionnaire
449	TSP	Thin Slices Paradigm

450 DG Dictator Game

#### 451 **Declarations**

##### 452 Ethical Approval and Consent to participate

453 This work was approved by the cantonal ethics committee Zurich (identification number: 2020  
454 01991). All participants gave written informed consent prior to participation.

455

##### 456 Consent for publication

457 Not applicable.

458

##### 459 Availability of data and materials

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

462

##### 463 Competing interests

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

466

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470

##### 471 Authors' contributions

472 **LLH:** Writing - Original Draft, Writing, Review & Editing, Data Analysis, Visualization. **JK:**  
473 Conceptualization, Review & Editing. **LJ:** Writing - Review & Editing. **AL:** Writing. **TW:**  
474 Methodology. **SF:** Methodology. **BJ:** Data Analysis. **IN:** Conceptualization. **MP:** Conceptualisation,  
475 Supervision, Funding acquisition, Project administration.

476

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479

480

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