

The Effect of Childhood Trauma on Personality in Unaffected First-Degree Relatives of Major Depressive Disorder

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1 **THE EFFECT OF CHILDHOOD TRAUMA ON PERSONALITY IN**
2 **UNAFFECTED FIRST-DEGREE RELATIVES OF MAJOR**
3 **DEPRESSIVE DISORDER**

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14 **Declaration:**

15 **Ethics approval and consent to participate:** the protocol was approved by the ethics
16 committee (IRB) of Beijing Anding Hospital, Capital Medical University. We confirm
17 that all methods were performed in accordance with the relevant guidelines and
18 regulations.

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31 conception of the study; Qijing Bo, Zhen Mao, Feng Li, Fan He, Fang Dong performed
32 the experiment; Wenpeng Hou contributed significantly to analysis and manuscript
33 preparation; Yujie Wen, Qijing Bo performed the data analyses and wrote the
34 manuscript; Yilang Tang helped perform the analysis with constructive discussions.

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57 **Running title:** The effect of CT on personality in unaffected FDR

58 **Significant Outcomes:** In FDRs, CT was associated with a higher score on neuroticism,
59 psychoticism and lie, with the association with neuroticism the strongest. Besides, in
60 terms of subtype, emotional neglect was the one to be found to have the strongest
61 association with neuroticism.

62 **Limitations:** Data on CT were obtained using the childhood trauma Questionnaire-
63 Short Form (CTQ-SF), which was a retrospective self-report questionnaire without
64 independent authentication. Accordingly, the validity of reports might be affected by
65 possible memory biases of the patients or excessive sensitivities to some CT
66 experiences. Second, only a few risk factors were included, and the generalizability of

67 the regression analyses should be considered with cautions. Finally, due to the small
68 sample size of FDRs of patients with MDD, findings should be considered to be the
69 preliminary.

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89 **Abstract:**

90 **Objectives:** This study is aimed to examine the potential association between childhood
91 trauma (CT) and personality traits among unaffected first-degree relatives (FDR,
92 children or siblings of patients) of patients with major depressive disorder (MDD).

93 **Methods:** The study consists of three groups: total 85 patients with MDD, 35 FDRs
94 and 89 healthy control individuals (HC). The Childhood Trauma Questionnaire (CTQ)
95 was used to assess childhood trauma and the Eysenck Personality Questionnaire used
96 to assess personality traits.

97 **Results:** By comparison made in personality traits, MDD patients exhibits some
98 significant disparities to FDR and HC ($p < 0.05$ for extraversion, neuroticism and
99 psychoticism). Nevertheless, no significant difference was found between HC and FDR.

100 In FDR group, patients with CT scored noticeably higher for neuroticism (N) compared
101 with those without CT ($F = 3.246$, $p = 0.046$). CT was associated with N, psychoticism (P)
102 and Lie (L), and it was associated with N more closely ($r = 0.290-0.452$, $p < 0.05$ for all).

103 Significantly positive correlations were found between N and sexual abuse (SA),
104 emotional neglect (EN), physical neglect (PN), and CTQ total ($r = 0.344-0.452$, $p < 0.05$);
105 P and CTQ ($r = 0.336$, $p < 0.05$); and significant negative correlations between L and EN,

106 CTQ ($r = -0.446-0.375$, $p < 0.05$). EN contributed to a probability of N, P ($R^2 = 0.155-$
107 0.214 , $F = 6.066-9.010$, $p = 0.005-0.019$) as well as a probability of L ($R^2 = 0.199$, $F = 8.211$,
108 $p = 0.007$).

109 **Conclusion:** CT was associated with N, P and L, with a closer relation to N in
110 unaffected FDR. Besides, the type of CT, the most relevant to N, was discovered to be
111 EN. Thus, FDR of MDD who experienced CT should be prioritized.

112 **Key words:** childhood trauma; personality; major depressive disorder; first-degree
113 relatives

114 **Introduction**

115 Numerous studies have supported the correlation between personality and the
116 presence of major depressive disorder (MDD) [1, 2]. Compared with non-affected
117 controls, patients with MDD often have higher scores on neuroticism [3], and the score
118 tend to decrease when patients show improvement of achieve remission [4]. Besides, a
119 higher score on neuroticism has been found to be predictive of poorer outcome in
120 patients with MDD [5-7]. Population-based twin studies showed that the association
121 between neuroticism and MDD may be in part due to shared genetic factors, and they
122 found the genetic correlation with neuroticism was 0.46-0.47 based on their study of
123 20,692 same-sex twin pairs in Sweden [8]. Personality traits appear to be vital for the
124 onset and course of depression in many ways [9, 10]. However, the findings on whether
125 first-degree relatives (FDR) exhibited different personality traits than unaffected
126 controls are inconsistent [11, 12].

127 Studies have found personality traits, especially maladaptive traits of adults are
128 associated with CT, including emotional abuse (EA), physical abuse (PA), sexual abuse
129 (SA), emotional neglect (EN) and physical neglect (PN) in the general population [13-
130 15]. Childhood trauma (CT) has been confirmed as a risk factor for major depressive
131 disorder. CT has been found to be associated with the severity in patients with MDD
132 [16]. A meta-analysis of prospective cohort studies found that CT was significantly
133 associated with risk of depression in adults [17]. Moreover, CT has also been found to
134 be poorer clinical course, earlier age of onset [18, 19], episode persistence and
135 recurrence [20] in patients with MDD. Recent studies found personality may mediate
136 the effects of childhood abuse on severity of depressive symptoms in patients with
137 MDD [21, 22] as well as the general population [23-26]. Neuroticism, extraversion,

138 hopelessness and external locus of control have been reported to mediate the
139 relationship between CT and 4-year remission of depressive and anxiety disorders [27].

140 These studies all suggest that there is a complex association between CT,
141 personality, severity of depressive symptoms in the general adults and patients with
142 MDD. However, no studies have examined the association between CT and personality
143 traits in FDR of patients with MDD. Therefore, this study was designed to answer the
144 questions above. The Childhood Trauma Questionnaire-Short Form (CTQ-SF) was
145 used to assess the characteristic of childhood trauma and the Eysenck Personality
146 Questionnaire (EPQ) was used to assess personality traits. We started an assessment of
147 the potential association between CT and personality traits in FDR of patients with
148 MDD. The hypotheses were: (1) FDRs have more prominent maladaptive personality
149 traits comparing with HC, (2) CT is associated with certain personality traits in FDR.

150 **Methods**

151 **Participants**

152 This was a cross-sectional study conducted at Beijing Anding Hospital, Capital
153 Medical University, Beijing, China. The protocol was approved by the ethics committee
154 (IRB) of Beijing Anding Hospital, Capital Medical University.

155 All participants were recruited from September 2014 to September 2016. The study
156 sample consisted of three groups: patients with MDD (n=85); FDRs of MDD (n=35);
157 and healthy control (HC, n=89). The Structured Clinical Interview for DSM-IV Axis I
158 disorders-Patient Edition (SCID-I/P) was used for diagnosis and the diagnosis of MDD
159 was made according to the Diagnostic and Statistical Manual of Mental Disorders,
160 Fourth Edition (DSM-IV) [28]. The FDR and HC recruited here had no current Axis I
161 diagnose of psychiatric or cognitive disorders.

162 The inclusion criteria for the study were as follows: (1) aged between 16 and 55;
163 (2) received more than 9 years of formal education; (3) was able to understand and
164 willing to sign an informed consent. Participants with any of the following were
165 excluded: (1) with current diagnosis of substance abuse or dependence (did not
166 including nicotine); (2) with an unstable, major chronic medical or neurological
167 condition; (3) had received electric convulsive therapy in the recent 3 months.

168 Based on the results of Childhood Trauma Questionnaire-Short Form (CTQ-SF):
169 The CT positive subgroup consisted of individuals who had one or more scaled scores
170 reaching moderate or severe levels of trauma on the CTQ-SF, participants in three
171 groups (HC, FDR and MDD) were divided into 2 independent subgroups (CT positive
172 subgroup and CT negative subgroup). The CT negative subgroup consisted of
173 individuals who either scored in the low or no category on the CTQ-SF.

174 **Instruments**

175 ***Childhood Trauma Questionnaire-Short Form (CTQ-SF)***

176 The CTQ-SF is a 28-item self-report retrospective inventory intended to measure
177 abuse and neglect of children ages 12 and older [29, 30]. The Chinese version used has
178 been tested and shown with good reliability and validity in the general population [31,
179 32]. It is a 5-point Likert scale ranging from “Never true” to “Very often true”. The
180 CTQ-SF contains five subscales, which measure three types of abuse and two types of
181 neglect: namely emotional abuse (EA), physical abuse (PA), sexual abuse (SA),
182 emotional neglect (EN) and physical neglect (PN). The score for each scale is a sum of
183 scores of specific items, and the total score of the CTQ-SF is a sum of scores on all
184 scales. Severity of each trauma category based on cut-off scores was quantified as “none
185 (or minimal)”, “low (to moderate)”, “moderate (to severe)” and “severe (to extreme)”.
186 In this study, cut-off scores for “moderate (to severe)” was employed to classify study

187 participants as positive for history of specific trauma category. The CTQ cut-off scores
188 for “moderate (to severe)” are as follows: EA \geq 13, PA \geq 10, SA \geq 8, EN \geq 15, and PN \geq 10.

189 ***Eysenck Personality Questionnaire (EPQ)***

190 The EPQ is a self-report questionnaire for measuring personality dimensions
191 (traits), including a junior version (for 7-15 years old) and an adult version (for 16 years
192 and older) [33]. The validated Chinese version of EPQ for adults has 88 questions and
193 it has been tested to show good reliability and validity [34]. The EPQ consists of 4
194 personality dimensions (traits), namely extraversion/introversion (E), with a higher
195 score meaning greater extroversion); neuroticism/stability (N), with a higher score
196 meaning less stable emotions; psychoticism/socialization (P), with a higher score
197 meaning higher psychoticism; lie/social desirability (L), with a higher score meaning
198 higher tendency for dissimulation and fake on the responses. The score for each
199 dimension is a sum of the responses (“*agreement*” scored 1, “*disagreement*” scored 0)
200 to specific questions.

201 ***Health Questionnaire (PHQ-9)***

202 Health Questionnaire (PHQ-9), a nine-item instrument, was purposed primarily for
203 the application in primary care [35]. It was developed by referencing the diagnostic
204 standard applied for the assessment of depression-induced disorder, as cited from the
205 4th edition of Diagnostic and Statistical Manual [36]. The involved items are subjected
206 to ratings ranging from not at all to almost every day for the most recent two weeks
207 with a four-point scale for duration. The PHQ-9 has been used widely for screening,
208 diagnosis, monitoring treatment response.

209 **Statistical analysis**

210 Statistical analyses were conducted using the SPSS (version 19.0). All differences
211 were considered statistically significant when $p < 0.05$ for both directions. The

212 continuity-adjusted χ^2 test and the Fisher's exact test were used to compare the
213 distribution of categorical variables among the three groups and between groups with
214 and without CT. The Kruskal-Wallis test was performed to compare age and education
215 level of the three groups. The t-test and the Mann-Whitney test were performed to
216 compare age, education level, E, N, P, L scores between three groups with and without
217 CT. Pearson's correlation, spearman's correlation and multiple linear regression analysis
218 were adopted to assess the association between personality traits and types of CT in
219 FDR and other two groups.

220 **Results**

221 **Sociodemographic characteristics**

222 There were no significant differences in sex, age and education level between the
223 three groups (Table 1). There was a significant difference in age ($P=0.02$) between those
224 with and without CT in FDRs (based on the cut-off), but no significant differences in
225 other aspects (Table 2).

226 **Personality dimensions in individuals with and without CT**

227 There were no significant differences in personality traits between FDRs and HC.
228 Compared with FDR and HC, patients with MDD displayed significantly higher scores
229 on E, N and P ($P<0.001$ for E, N; $P=0.016$ for P). A higher severity of CT was also found
230 in MDD group than that in FDR and HC ($P<0.001$), as well as a higher severity in 4
231 subtypes of CT: EA, PA, EN and PN ($P<0.001$ for EA, PA and EN; $P=0.017$ for PN).
232 Details please see Table 1.

233 Factors that failed to match up were included as co-variates in subsequent
234 comparisons. People with CT had significantly higher N scores than those without CT
235 in FDRs ($F=3.246$, $p=0.046$). The same was found in HC ($t=-2.387$, $p<0.05$);

236 Individuals with CT showed significantly lower L score than those without CT in MDD
237 ($t=2.331$, $p<0.05$) (Table 2).

238 **Association between CT subtypes and personality dimensions**

239 In FDR, significantly positive correlations were found between N and SA, EN, PN
240 and CTQ total ($r=0.344 - 0.452$, $p<0.05$), and between P and CTQ ($r=0.336$, $p<0.05$).
241 Significantly negative correlations were found between L and EN, CTQ ($r=-0.446 - -$
242 0.375 , $p<0.05$) (Table 3).

243 In HC, significantly positive correlations were found between N and SA, as well
244 as CTQ ($r=0.290 - 0.368$, $p<0.05$); and between P and EA, PN, and CTQ ($r=0.292 -$
245 0.303 , $p<0.05$). Significantly negative correlations were found between L and EA, SA,
246 EN, PN, and CTQ ($r=-0.286 - -0.248$, $p<0.05$). In MDD, positive correlations were
247 found between N and EA, PA, CTQ ($r=0.223 - 0.333$, $p<0.05$); P and EA, SA, CTQ
248 ($r=0.240 - 0.356$, $p<0.05$). Significant negative correlations were found between E and
249 EA, EN, PN, CTQ ($r=-0.397 - -0.246$, $p<0.05$); L and EA, CTQ ($r=-0.266 - -0.245$,
250 $p<0.05$) (Appendix 1).

251 **Multiple linear regression analyses of abuse and neglect scores on the EPQ** 252 **subscale**

253 A multiple linear regression model was used to adjust for co-variates. In FDR, EN
254 contributed to a greater probability of N and P ($R^2 = 0.155 - 0.214$, $F = 6.066 - 9.010$,
255 $p=0.005 - 0.019$); EN was associated with a lower probability of L ($R^2 = 0.199$, $F =$
256 8.211 , $p=0.007$) (Table 4).

257 In HC, SA and EA contributed to a greater probability of N ($R^2 = 0.184$, $F = 9.683$,
258 $p<0.001$); EA and PN were associated with a greater probability of P ($R^2 = 0.140$, $F =$
259 6.979 , $p=0.002$); EA was associated with a lower probability of L ($R^2 = 0.113$, $F =$
260 11.109 , $p=0.001$). In MDD, significant negative associations were found between E and

261 EA ($R^2=0.158$, $F = 15.549$, $p<0.001$); N and EA, EN ($R^2 = 0.162$, $F = 7.950$, $p=0.001$);
262 P and EA, SA ($R^2 = 0.199$, $F = 10.201$, $p<0.001$); L and EA ($R^2 =0.071$, $F = 6.319$,
263 $p=0.014$) (Appendix 2).

264 **Discussions**

265 This study was the first to verify the association between CT and personality traits
266 in unaffected FDRs of patients with MDD. We found no significant differences between
267 FDR and HC in personality traits. In FDRs, CT was associated with a higher score on
268 neuroticism, psychoticism and lie, with the association with neuroticism the strongest.
269 Besides, in terms of subtype, emotional neglect was the one to be found to have the
270 strongest association with neuroticism.

271 Many previous studies have demonstrated that a high proportion of patients with
272 severe depression have maladaptive personality traits. Studies have also shown that
273 personality disorders at baseline in patients with MDD were robust predictors of a slow
274 remission [37], and even after they achieved remission, personality disorders were a
275 strong predictor of prospectively of accelerated relapse [37].

276 However, there have been scarce studies on personality traits in first-class relatives
277 of patients with MDD and the effects of child abuse on personality traits. In contrast to
278 the prior studies [38, 39], this study showed that compared with healthy controls; there
279 were no significant differences on the EPQ scores in FDRs. Moreover, there is no
280 relevance of depression (PHQ-9) to the personalities in first-degree relatives. Genetic
281 and personality factors might be two relatively separate risk factors in the development
282 of depression.

283 Our findings are supported by a report by Wu et al. [12]. They found no familial
284 aggregation in personality traits between patients with MDD and their unaffected FDRs.
285 As suggested by the existing studies on the relationships between personality [40], a
286 definitive conclusion regarding the impact of heredity and environmental factors on
287 personality has not yet been drawn in recent studies. Some researchers suggested that
288 there was no close association between heredity and personality [41].

289 This study also found no significant differences in childhood trauma between FDRs
290 and the healthy control group. On the other hand, studies have repeatedly shown the
291 association between CT and risk of developing depression [42, 43]. Our findings may
292 suggest that CT might involve a separate mechanism from hereditary factors in causing
293 depression.

294 Furthermore, we found that among the FDRs, neuroticism, psychoticism and lie
295 were significantly higher in the group with CT than those without CT, with neuroticism
296 being the highest. In addition, CT was associated with all the four personality
297 dimensions in MDD patients. This is the first study to show a significant between
298 childhood trauma and personality dimensions in unaffected FDRs. Previous studies
299 have shown the personality traits, especially neuroticism, may mediate the effects of
300 CT on MDD [43].

301 Individuals with CT displayed significantly higher N scores than those without CT
302 in FDRs. As reported by the prior studies [44, 45], CT was associated with higher N
303 scores in both the general population and in patients with MDD. Our findings in the
304 FDRs of patients with MDD provide new knowledge. Similar to the previous studies
305 [15], our study showed personality traits were significantly associated with childhood
306 trauma in FDR. E, N, P and L were primarily associated with EN among CT. The

307 subtype of childhood trauma that were most associated with neuroticism was emotional
308 neglect. Difference from our findings, a few other studies reported emotional abuse was
309 the one with the strongest association with neuroticism in healthy controls (references
310 here); and individual with avoidant personality disorder [42, 43]. It is worth noting,
311 they also found that emotional neglect was associated with neuroticism, secondary to
312 emotional abuse. Additionally, the associations between neglect and multiple
313 personality dimensions have been reported in several prior studies in healthy controls
314 [13]. It may be related to different sample characteristics and different independent
315 variables included in the analysis.

316 Despite the absence of a full explanation of the neurobiological mechanism of
317 changes to personality in response to CT, some potential mechanisms have been
318 proposed. People who sustained trauma in childhood tend to show a lower level of
319 glucocorticoid expression, in addition to a range of distinct characteristics including
320 changed methylation status in the neuron-specific glucocorticoid receptor promoter,
321 long-lasting hypothalamic-pituitary-adrenal axis change and excessively active
322 autonomic nervous system [46, 47]. As indicated by the different cortisol levels among
323 patients suffering with trauma-induced personality disorder, the processing was
324 considered a potential cause to trigger the distinct coping mechanisms [48, 49].

325 **Limitations**

326 Several limitations of this study should be acknowledged. Data on CT were
327 obtained using the childhood trauma Questionnaire-Short Form (CTQ-SF), which was
328 a retrospective self-report questionnaire without independent authentication.
329 Accordingly, the validity of reports might be affected by possible memory biases of the
330 patients or excessive sensitivities to some CT experiences. Second, only a few risk
331 factors were included, and the generalizability of the regression analyses should be

332 considered with cautions. Finally, due to the small sample size of FDRs of patients with
333 MDD, findings should be considered to be the preliminary.

334 **Conclusions**

335 Childhood trauma is associated with neuroticism, psychoticism and lie, and
336 emotional neglect is strongly associated with neuroticism in first degree relatives of
337 patients with MDD. The findings need to be replicated in a larger samples and the
338 effects of the personality traits in first degree relatives of patients with MDD on mental
339 health should also be studied further.

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