Childhood Maltreatment, Educational Attainment, and IQ

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Childhood Maltreatment, Educational Attainment, and IQ: Findings From a Multicentric Case-control Study of First-episode Psychosis (EU-GEI)

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Background and hypothesis: **Evidence suggests that childhood maltreatment (ie, childhood abuse and childhood neglect) affects educational attainment and cognition. However, the association between childhood maltreatment and Intelligence Quotient (IQ) seems stronger among controls compared to people with psychosis. We hypothesised that: the association between childhood maltreatment and poor cognition would be stronger among community controls than among people with first-episode of psychosis (FEP); compared to abuse, neglect would show stronger associations with educational attainment and cognition; the association between childhood maltreatment and IQ would be partially accounted for by other risk factors; and the association between childhood maltreatment, educational attainment, and IQ would be stronger among patients with affective psychoses compared to those with nonaffective psychoses.** ***Study Design:*** **829 patients with FEP and 1283 community controls from 16 EU-GEI sites were assessed for child maltreatment, education attainment, and IQ.** ***Study Results:*** **In both the FEP and control group, childhood maltreatment was associated with lower educational attainment. The association between childhood maltreatment and lower IQ was robust to adjustment for confounders only among controls. Whereas childhood neglect was consistently associated with lower attainment and IQ in both groups, childhood abuse was associated with IQ only in controls. Among both patients with affective and nonaffective psychoses, negative associations between childhood maltreatment and educational attainment were observed, but the crude association with IQ was only evident in affective psychoses.** ***Conclusions:*** **Our findings underscore the role of childhood maltreatment in shaping academic outcomes and cognition of people with FEP as well as controls.**

Key words: IQ/psychosis/schizophrenia/childhood abuse/childhood neglect

Introduction

Accumulating evidence suggests that the burden of child maltreatment is not limited to the detrimental effect on mental health[1] Childhood maltreatment can have long lasting effects on cognitive development and the capacity to achieve expected educational outcomes[2,3] Notably, childhood maltreatment can deviate the typical neurodevelopment of the individual,[4] as it might produce multiple alterations in information processing and emotion regulation,[5,6] and the underlying brain structures, circuits, and processes.[7,8] Furthermore, childhood maltreatment has been linked to long-term changes of the hypothalamic–pituitary–adrenal axis which may affect brain regions rich in glucocorticoids receptors, such as the hippocampus and the prefrontal cortex, contributing to cognitive impairment[8–10]

The effect of childhood maltreatment on cognition may be part of the developmental pathway for psychosis, especially for schizophrenia, as the disorder has been consistently associated with lower intelligence quotient (IQ).[11,12] Cognitive impairment is already present several years prior to the first episode of psychosis (FEP)[13,14] and significantly affects community functioning[15,16] Cognitive impairment may also influence academic outcomes[17]; yet, longitudinal studies on school performance have led to inconsistent findings, with a few studies reporting poor academic achievement predicting psychosis onset, but also some nonsignificant findings[18,19]

Meta-analytic findings suggest that children exposed to maltreatment show poorer cognitive performance than unexposed children, even in the absence of posttraumatic stress disorder[20] More recently, a meta-analysis on adults with and without psychotic disorders found a modest negative correlation between childhood maltreatment and overall cognition. Subgroup analysis revealed that the association between early adversities and cognition was stronger amongst healthy controls than amongst people with psychosis, and it was suggested that the difference might be partially explained by concurrent risk factors affecting the cognitive development and cognitive performance of people with psychosis[3] These potential confounders include socio-economic disadvantage,[21,22] poor premorbid adjustment,[23–25] and psychotic experiences.[26,27] Since all these factors have been associated with both childhood adversities and cognition, they might reduce the association between early adversities and cognition. Moreover, among people with psychosis, cannabis use has been related to a higher IQ,[28] suggesting that the association between childhood maltreatment and cognition might be weaker among cannabis users with FEP.

Another issue to account for when examining the association between childhood maltreatment and cognition in patients with FEP is the different impact on cognition exerted by specific types of childhood adversities. A recent literature review[29] found that early deprivation was strongly associated with cognitive impairment among institutionalized children. However, study findings on noninstitutionalized children were less robust, and only a few of them explored the differential effects of childhood abuse and neglect, with mixed findings.[29] Evidence regarding a specific effect of childhood adversities on adult cognitive impairment is also limited,[30] but preliminary findings indicate that academic failure may be more strongly related with neglect, institutionalization, and multiple maltreatment, compared to abuse.[2,31] It was proposed that childhood neglect, in combination or not with childhood abuse, might be related with inadequate stimulation during critical periods of brain development, insecure attachment, emotion dysregulation, and impaired sense of agency, which in turn affect cognitive development and academic success.[2,5]

Another important factor is the heterogeneity of psychosis syndromes.[32,33] Accumulating evidence suggests that individuals who will develop nonaffective psychoses

have a premorbid IQ lower than controls, while evidence about affective psychoses is mixed.[34–36] At the first onset of psychosis and in the long-term course of these disorders, cognitive impairments appear more severe amongst those with nonaffective psychoses than in those with affective psychoses.[26,37] This may suggest that childhood adversities are less relevant for understanding impaired cognitive functioning among patients with nonaffective psychoses.[38]

In light of such findings, the current study aimed to better understand the association between childhood maltreatment and educational attainment and cognitive functioning in a large multicentric sample of people with FEP and community controls. We hypothesised that: (*a*) the association between childhood maltreatment and poor cognition would be stronger among community controls than among people with FEP; (*b*) compared to childhood abuse, childhood neglect would show stronger associations with educational attainment and cognition; (*c*) the association between childhood maltreatment and IQ would be partially accounted for by other risk factors potentially affecting cognitive functioning; and (*d*) the association between childhood maltreatment, educational attainment, and IQ would be stronger among patients with affective psychoses compared to those with nonaffective psychoses.

Methods

Participants and Procedure

Study participants were recruited from May 2010 to April 2015 within the EU-GEI study, a multi-centre case-control study involving 16 study centres across five European countries and Brazil. The Internal Review Boards of the study centres approved the study and participants provided written informed consent to be interviewed and let their data be stored and analysed anonymously.[39]

Patients were recruited among incident cases of psychosis, aged 18–64 and resident in the study catchment areas, approaching mental health services for the first time during the study period for a diagnosis of psychotic disorder (ICD-10 diagnoses: F20–F33), neither secondary to acute intoxication (ICD-10: F1X.5) nor to medical condition (ICD-10: F09), and not previously treated with antipsychotics. Diagnoses of FEP were made according to ICD-10 criteria[40] on the basis of the Operational Criteria Checklist algorithm, OPCRIT[41] administered by trained researchers (interrater reliability: $k = .7$).[42] Clinical diagnoses were used only when OPCRIT assessment was not possible (12.1%). Diagnoses were combined to form a group of nonaffective (ICD-10 codes F20-F29) and affective (ICD-10 codes F30-F33) psychoses.

Community controls were recruited among people aged 18-64, resident in the same catchment areas as patients, never referred or treated for psychotic disorders. Random and quota sampling (population stratification by age, sex, and ethnicity) were used to ensure representativeness of the same population as the patients.[42,43] Controls were excluded if they had ever received a diagnosis or treatment for psychotic disorders.

Measures

Childhood maltreatment was assessed using the Childhood Trauma Questionnaire (CTQ),[44] a 28-item self-report tool assessing the frequency of five types of childhood adversity (physical, sexual, and emotional abuse, and physical and emotional neglect) on a 5-point Likert scale (from 1 [never] to 5 [very often]). Consistent with previous studies suggesting a differential effect of childhood abuse and neglect[29,31] on education and cognition, an overall "childhood maltreatment" score, and separate "childhood abuse" and "childhood neglect" scores were calculated on the basis of the mean score of the respective items. A second-order confirmatory factor analysis (DWLS estimation) supported the two-factor structure of CTQ, comprising neglect and abuse factors (see Supplementary data 1). Although evidence suggests the relevance of using continuous measures of childhood maltreatment,[45] in this study childhood maltreatment was operationalized as a dichotomous variable, because assumptions of homoscedasticity for linear regression were not met and in order to highlight the presence of severe instances of childhood maltreatment. Therefore, three dichotomous variables for childhood maltreatment, abuse, and neglect were calculated using the 80th percentile of the control group as a cut-off value, according to the procedure used in a previous study.[38] The CTQ considered exposure to experiences of abuse and neglect prior to age 18.

Cognition was estimated from overall Intelligence Quotient (IQ) assessed using an abbreviated Wechsler Adult Intelligence Scale (WAIS-III).[46] The administration and scoring procedure of the abbreviated version have been previously described and psychometrically validated.[21,47]

Educational attainment was assessed using a modified version of the MRC sociodemographic questionnaire[48] and defined as the highest level of education fully completed, on a scale from 1 (no education) to 6 (postgraduate education).

To account for the confounding effect of concurrent and early conditions potentially affecting cognitive functioning, the following conditions were also assessed: (*a*) lifetime cannabis use was assessed using a modified version of the Cannabis Experience Questionnaire (CEQmv)[49]; (*b*) lifetime psychotic experiences were assessed using the mean score of the Community Assessment of Psychic Experiences (CAPE)[50]; (*c*) premorbid social adjustment in childhood and adolescence was assessed using the mean score of the Premorbid Adjustment Scale (PAS)[51]; (*d*) social disadvantage was estimated by proxy from the main

family social class during upbringing, assessed on a four-level scale (from long-term unemployment to salariat), using the MRC sociodemographic questionnaire.[48]

Analyses

Patients and controls were compared according to the prevalence of childhood maltreatment, educational attainment, and IQ using odds ratios (OR) and t-tests. The level of educational attainment and IQ were compared between patients and controls exposed and not exposed to maltreatment using t-tests. The associations between childhood maltreatment, abuse, and neglect (independent categorical variables, IVs) and IQ and educational attainment (dependent continuous variables, DVs) were assessed separately for patients and controls using general linear regression models (model 1). The crude association (model 1) was adjusted for: study country, sex, age, ethnicity (White vs non-White), and education (only the child maltreatment-IQ association) or IQ (only the child maltreatment-education attainment association) (model 2). Also, analyses were additionally adjusted for lifetime cannabis use and lifetime psychotic experiences (model 3); premorbid social adjustment and family social disadvantage (model 4); and current use of antipsychotics (none vs one vs more than one) (model 5). All categorical confounders were included as fixed factors, except country which was included as a random factor. Given the number of predictors and the limited sample size ($N < 50$ in 56% of the study sites), analyses were not controlled for study site which is consistent with previous studies on the same sample.[21,28]

Assumptions of normality and homoscedasticity of IQ and educational attainment between groups (ie, exposed vs unexposed cases, and exposed vs unexposed controls), and lack of notable multicollinearity among childhood maltreatment and covariates were verified (see Supplementary data 2). Interactions between case-control status and childhood maltreatment, childhood abuse, and childhood neglect were assessed using generalized linear models. Subgroup analysis was carried out to investigate the specific associations between childhood maltreatment and education/IQ among FEP patients with affective and nonaffective psychosis.

Associations between childhood maltreatment and education attainment or IQ were reported as regression coefficients (B) (see Tables 3 and 4). In order to estimate effect sizes, analyses were repeated using standardized IVs and DVs. Resulting β values .1–.3,.3–.5, and >.5 were considered to represent small, medium, and large effect sizes (ES), respectively. β values were compared across models in order to assess the strength of the associations between different types of maltreatment and education or IQ.[52] Only study participants with complete measures of childhood maltreatment, cognition, and educational status were included in the analyses. Study participants with missing data in one or more of the confounders were included only in the crude analyses (see Tables 3 and 4). Analyses were run using the Statistical Package for the Social Sciences (SPSS) program version 27.0.

Results

Participants

Eight hundred and twenty-nine patients with FEP and 1283 community controls with complete measures of childhood maltreatment, cognition, and educational status (ie, 73.4% and 85.7% of eligible FEP and controls, respectively) were included in the analyses. Those with incomplete information were more often of non-White ethnicity ($\chi^2(1) = 13.05$, $P < .001$), less frequently graduated ($\chi^2(5) = 23.62$, $P < .001$), and from a lower social class ($\chi^2(3) = 8.71$, $P = .033$).

Compared to community controls, patients with FEP were more often males, younger, of non-White ethnicity, and from a lower social class (all P's ≤ .001, see Supplementary Table 1). Compared to controls, patients were about three times as likely to have been exposed to childhood maltreatment (OR = 3.39, 95%CI = 2.78,4.12), abuse (OR = 3.17, 95%CI = 2.60,3.87), and neglect (OR = 3.24, 95%CI = 2.66,3.93). On average, the highest educational attainment of patients was one level below the highest attainment of controls ($t(2110) = 14.12$, $P < .001$). Patients' average IQ was about 18 points lower than controls ($t(2110) = 22.55$, $P < .001$) (Table 1).

Childhood Maltreatment, Educational Attainment, and IQ Among Community Controls

Controls exposed to childhood maltreatment had lower education attainment compared to those who were unexposed (Table 2). In the unadjusted model, both childhood abuse and childhood neglect (Table 3, Supplementary Table 3, model 1) were associated with lower educational attainment, with a small ES (β = −.07 and β = −.12, respectively), but in the fully adjusted model only neglect (model 4, β = −.08) contributed to lower academic attainment.

A 5-point mean difference was observed between the IQ of controls exposed to childhood maltreatment and the IQ of those unexposed (Table 2). The small associations between abuse and IQ, as well as between neglect and IQ (Table 4, Supplementary Table 4, model 1; β = −.13, β = −.12), were both attenuated in the fully adjusted model (model 4, β = −.05; β = −.05).

Childhood Maltreatment, Educational Attainment, and IQ Among Patients With FEP

Patients exposed to childhood maltreatment less frequently achieved higher academic qualifications (Table 2). The crude association between abuse and educational attainment (Table 3, Supplementary table 3, model 1;

Table 1. Childhood Maltreatment, IQ and Educational Attainment of Included FEP Patients and Controls

Variable	Total $N = 2112$	Patients $N = 829$	Controls $N = 1283$	t/χ^2(df)	P	OR (95%CI)	P
CTQ mean score, range 1–4							
Childhood maltreatment, *M* (*SD*)	1.50 (0.51)	1.67 (0.57)	1.37 (0.43)	−14.27 (2110)	<.001	0.84 (0.82; 0.86	<.001
Abuse, *M* (*SD*)	1.35 (0.51)	1.50 (0.60)	1.26 (0.42)	−11.19 (2110)	<.001	0.87 (0.82; 0.92	<.001
Neglect, *M* (*SD*)	1.71 (0.68)	1.96 (0.74)	1.55 (0.58)	−14.02 (2110)	<.001	0.85 (0.80; 0.90)	<.001
Maltreatment exposure[a]							
Childhood maltreatment, *n* (%)	605 (28.6)	364 (43.9)	241 (18.8)	155.52 (1)	<.001	3.39 (2.78; 4.12)	<.001
Abuse, *n* (%)	565 (26.8)	337 (40.7)	228 (17.8)	134.55 (1)	<.001	3.17 (2.60; 3.87)	<.001
Neglect, *n* (%)	608 (28.8)	361 (43.5)	247 (19.3)	144.99 (1)	<.001	3.24 (2.66; 3.93)	<.001
IQ (*N*)							
Full score, *M* (*SD*)	95.93 (19.88)	85.04 (18.18)	102.97 (17.63)	22.55 (2110)	<.001	0.99 (0.99; 0.99)	<.001
Digit symbol, *M* (*SD*)	8.98 (3.46)	6.72 (2.91)	10.45 (2.96)	28.46 (2110)	<.001	0.92 (0.91; 0.93)	<.001
Arithmetic, *M* (*SD*)	9.32 (3.61)	7.89 (3.45)	10.25 (3.40)	15.51 (2110)	<.001	0.94 (0.93; 0.94)	<.001
Block design, *M* (*SD*)	9.19 (3.76)	7.70 (3.54)	10.15 (3.58)	15.43 (2110)	<.001	0.93 (0.93; 0.94	<.001
Information, *M* (*SD*)	9.96 (3.82)	8.78 (3.80)	10.72 (3.64)	11.73 (2110)	<.001	0.95 (0.94; 0.95)	<.001
Education				206.13 (5)	<.001		
No qualification, *n* (%)	189 (8.9)	131 (15.8)	58 (4.5)			1	
Compulsory, *n* (%)	387 (18.3)	216 (26.1)	171 (13.3)			1.26 (1.03; 1.54)	.022
Tertiary, *n* (%)	542 (25.7)	199 (23.9)	344 (26.8)			0.58 (0.48; 0.69)	<.001
Job related, *n* (%)	359 (17.0)	148 (17.9)	211 (16.4)			0.70 (0.57; 0.87)	.001
University, *n* (%)	405 (19.2)	97 (11.7)	308 (24.0)			0.31 (0.25; 0.40)	<.001
Post-degree, *n* (%)	230 (10.9)	39 (4.7)	191 (14.9)			0.20 (0.14; 0.28)	<.001
Mean education, range 1–6 *M* (*SD*)	3.52 (1.48)	2.98 (1.40)	3.87 (1.42)	14.12 (2110)	<.001	0.84 (0.82; 0.86)	<.001

Note: CI, confidence intervals; CTQ, Childhood Trauma Questionnaire; df, degrees of freedom; FEP, first-episode psychosis; IQ, intelligence quotient; M, Mean; OR, odds ratio; SD, Standard Deviation.
[a]Defined as mean CTQ > 80th percentile of the control group.

Table 2. IQ and Educational Attainment Across Group as a Function of Childhood Maltreatment Exposure[a]

Maltreatment Exposure	Unexposed *M* (*SD*)	Exposed *M* (*SD*)	*t* (*df*)	*P*
IQ				
Controls ($N = 1283$)				
Childhood maltreatment (1042 vs 241)	103.96 (17.44)	98.69 (17.86)	4.21 (1281)	<.001
Abuse (1055 vs 228)	104.05 (17.65)	98.01 (16.72)	4.73 (1281)	<.001
Neglect (1036 vs 247)	103.97 (17.29)	98.80 (18.49)	4.17 (1281)	<.001
FEP patients ($N = 829$)				
Childhood maltreatment (465 vs 364)	86.34 (18.47)	83.37 (17.69)	2.35 (827)	.019
Abuse (492 vs 337)	85.33 (18.32)	84.61 (17.99)	0.56 (827)	.578
Neglect (468 vs 361)	86.21 (18.54)	83.52 (17.62)	2.11 (827)	.035
EDUCATIONAL ATTAINMENT				
Controls ($N = 1283$)				
Childhood maltreatment (1042 vs 241)	3.93 (1.42)	3.59 (1.42)	3.38 (1281)	.001
Abuse (1055 vs 228)	3.92 (1.42)	3.64 (1.45)	2.66 (1281)	.008
Neglect (1036 vs 247)	3.95 (1.41)	3.52 (1.42)	4.32 (1281)	<.001
FEP patients ($N = 829$)				
Childhood maltreatment (465 vs 364)	3.12 (1.41)	2.80 (1.37)	3.25 (827)	.001
Abuse (492 vs 337)	3.08 (1.38)	2.82 (1.42)	2.60 (827)	.010
Neglect (468 vs 361)	3.13 (1.45)	2.78 (1.35)	3.61 (827)	<.001

Note: df, degrees of freedom; FEP, first-episode psychosis; IQ, intelligence quotient; M, Mean; SD, Standard Deviation.
[a]Defined as mean Childhood Trauma Questionnaire score > 80th percentile of the control group.

$\beta = -.09$) was no longer evident after controlling for psychotic experiences and cannabis use (model 3), whereas the small size association with neglect was still evident in the fully adjusted model (model 5, $\beta = -.11$).

A 3-point mean difference was observed between the IQ of FEP patients exposed to childhood maltreatment and the IQ of those unexposed (Table 2). In the unadjusted model, only neglect was weakly associated with lower IQ

Table 3. Associations Between Childhood Maltreatment and Educational Attainment

Childhood Maltreatment Exposure	Model 1			Model 2			Model 3			Model 4			Model 5		
	B	95% CI	*P*	B [a]	95% CI	*P*	B[a + b]	95% CI	*P*	B[a + b + c]	95% CI	*P*	B[a + b + c + d]	95% CI	*P*
Controls	*N* = 1283			*N* = 1280			*N* = 1268			*N* = 1145			*N* = 1145		
Maltreatment	**−0.34**	**−0.54;−0.14**	**.001**	**−0.22**	**−0.40;−0.04**	**.019**	−0.18	−0.37; 0.01	058	−0.19	−0.39; 0.00	.055			
Abuse	**−0.28**	**−0.48;−0.07**	**.008**	−0.11	−0.29; 0.08	.263	−0.05	−0.25; 0.14	.603	−0.10	−0.30; 0.11	.354			
Neglect	**−0.43**	**−0.63;−0.24**	**<.001**	**−0.29**	**−0.47; −0.11**	**.002**	**−0.27**	**−0.45; −0.08**	**.004**	**−0.26**	**−0.45; −0.07**	**.006**			
FEP patients	*N* = 829			*N* = 829			*N* = 695			*N* = 599			*N* = 561		
Maltreatment	**−0.32**	**−0.51; −0.13**	**.001**	**−0.26** **−0.22**	**−0.44; −0.09**	**.003**	**−0.28**	**−0.47; −0.08**	**.006**	**−0.22**	**−0.44; −0.01**	**.041**	**−0.23**	**−0.45; −0.01**	**.040**
Abuse	**−0.26**	**−0.45; −0.06**	**.010**	**−0.28** **−0.26** **−0.22**	**−0.40; −0.05**	**.012**	−0.16	−0.35; 0.04	.127	−0.17	−0.38; 0.05	.128	−0.14	−0.36; 0.08	.208
Neglect	**−0.35**	**−0.54; −0.16**	**<.001**	**−0.28** **−0.26** **−0.22**	**−0.46; −0.11**	**.001**	**−0.31**	**−0.12; −0.26**	**.001**	**−0.29**	**−0.50; −0.08**	**.006**	**−0.30**	**−0.51; −0.08**	**.006**
				−0.28											

Note: CI, confidence intervals; FEP, first-episode psychosis.
[a]Adjusted for sex, age, ethnicity, intelligence quotient (IQ), and study country.
[b]Adjusted for psychotic experiences and lifetime cannabis use.
[c]Adjusted for social disadvantage and premorbid social functioning.
[d]Adjusted for antipsychotic treatment; significant associations ($P < .05$) are shown in bold type.

Table 4. Association Between Childhood Maltreatment and IQ

Childhood Maltreatment Exposure	Model 1			Model 2			Model 3			Model 4			Model 5		
	B	95% CI	*P*	B [a]	95% CI	*P*	B[a + b]	95% CI	*P*	B[a + b + c]	95% CI	*P*	B[a + b + c + d]	95% CI	*P*
Controls	*N* = 1283			*N* = 1280			*N* = 1268			*N* = 1145			*N* = 1145		
Maltreatment	**−5.28**	**−7.73; −2.82**	**<.001**	**−2.35**	**−4.50; −0.19**	**.033**	**−2.62**	**−4.85; −0.39**	**.022**	−2.13	−4.48; 0.21	.075			
Abuse	**−6.05**	**−8.55; −3.54**	**<.001**	**−2.93**	**−5.12; −0.75**	**.009**	**−3.23**	**−5.52; −0.93**	**.006**	**−2.54**	**−4.99; −0.09**	**.042**			
Neglect	**−5.17**	**−7.61; −2.74**	**<.001**	**−2.95**	**−5.09; −0.81**	**.007**	**−3.05**	**−5.22; −0.89**	**.006**	**−2.36**	**−4.64; −0.09**	**.042**			
FEP Patients	*N* = 829			*N* = 829			*N* = 695			*N* = 599			*N* = 561		
Maltreatment	**−2.98**	**−5.47; −0.49**	**.019**	−1.02	−3.22; 1.19	.368	−1.43	−3.91; 1.06	.261	−0.59	−3.25; 2.08	.666	−0.72	−3.52; 2.06	.610
Abuse	−0.72	−3.24; 1.81	.578	1.07	−1.16; 3.29	.347	0.35	−2.17; 2.86	.787	0.98	−1.68; 3.64	.470	1.10	−1.67; 3.87	.436
Neglect	**−2.68**	**−5.18; −0.19**	**.035**	−0.96	−3.16; 1.24	.391	−0.79	−3.21; 1.63	.522	−0.45	−3.02; 2.13	.734	−0.65	−3.34; 2.04	.635

Note: CI, confidence intervals; FEP, first-episode psychosis; IQ, intelligence quotient.
[a]Adjusted for sex, age, ethnicity, education, and study country.
[b]Adjusted for psychotic experiences and lifetime cannabis use.
[c]Adjusted for social disadvantage and premorbid social functioning.
[d]Adjusted for antipsychotic treatment; significant associations ($P < .05$) are shown in bold type.

(Table 4, Supplementary Table 4, model 1, β = −.07), but the association was no longer evident after controlling for sociodemographic variables and education (model 2).

Despite the association between neglect and education was more robust to adjustment for confounders than the association between abuse and education, both in the control and the case group, the overlapping 95%CI suggested that there was no evidence of a stronger effect of one type of maltreatment over the other. The same was the case for the association between childhood abuse, childhood neglect, and IQ. Furthermore, nonsignificant differences between β values suggested similar ES of the two types of maltreatment (all *P*s > .05).

When we formally tested whether the association between childhood maltreatment and education or IQ differed between cases and controls, we found no evidence to suggest that this was the case for childhood neglect or abuse and education, or neglect and IQ. We did observe a statistically significant interaction (Wald $\chi^2 = 11.06$, $P = .001$) between childhood abuse and case-control status on IQ, such that the association between abuse and IQ was evident in controls (Wald $\chi^2 = 4.33$, $P = .037$), but not in cases (Wald $\chi^2 = 0.46$, $P = .461$).

Potential Confounders of the Association Between Childhood Maltreatment, Educational Attainment, and IQ

Only among controls, socio-demographic factors and IQ reduced the association between childhood abuse and educational attainment to nonsignificance (Table 3, model 2). Furthermore, controls who achieved lower qualifications, reported greater frequency of psychotic experiences, and more often belonged to the lower and the intermediate social classes (see Supplementary data 3).

In both groups, IQ scores were related to male sex, age, non-White ethnicity, education, and country (see Supplementary data 3). Furthermore, social disadvantage was associated with lower IQ and slightly attenuated the association with childhood maltreatment in the control group (Table 4, model 4). Specifically, both the lower and the intermediate social classes were associated with lower IQ compared to those of higher social class. Only among patients was lifetime cannabis use associated with higher IQ (see Supplementary data 3).

Subgroup Analysis: Childhood Maltreatment, Educational Attainment, and IQ Among Patients With Affective and Nonaffective FEP

A similar percentage of patients with nonaffective ($n = 575$) and affective ($n = 240$) FEP reported any form of childhood maltreatment (43.7% vs 45.0%, OR = 1.06, 95%CI = 0.78,1.43), and this was also found for abuse (39.3% vs 43.8%, OR = 1.20, 95%CI = 0.88,1.63) and neglect (44.0% vs 44.2%, OR = 1.01, 95%CI = 0.74,1.36) when considered separately. No significant difference between the two groups was found for their mean educational attainment ($t(813) = 0.64$, $P = .522$) and mean IQ ($t(825) = -1.81$, $P = .071$).

Patients with nonaffective FEP exposed to childhood abuse or childhood neglect achieved lower educational levels than those unexposed (Supplementary Tables 5 and 7, model 1; β = −.09 and β = −.08, respectively). The association with abuse was robust to adjustment for sociodemographic and clinical factors, except antipsychotic treatment (model 5, β = -.10). Furthermore, in this group no association between childhood maltreatment and IQ was found (Supplementary Table 6 and 8, model 1).

Among patients with affective FEP, childhood neglect was weakly associated with lower educational attainment, after accounting for potential confounders (Supplementary Tables 5 and 7, model 5, β = −.15). In this group, neglect was associated with a 5-point difference in IQ in the crude model, with a small ES (Supplementary Tables 6 and 8, model 1, β = −.13), but the association was reduced in the adjusted models (Supplementary Tables 6 and 8, model 2, β = −.06). However, the overlapping 95% CI and the nonsignificant difference between β values suggested that the effect of childhood neglect was similar to the effect of abuse. Furthermore, the limited sample size did not allow us to formally test the influence of potential interactions between FEP diagnosis and childhood maltreatment, abuse, or neglect, on education and IQ.

Discussion

In summary, childhood abuse and childhood neglect were associated with poorer educational attainment in both people with FEP and community controls, both with a small ES. However, the association between childhood maltreatment and IQ was more robust to adjustment for confounders in community controls, as compared with FEP patients. Furthermore, an interaction between case status and abuse was found, such that the association between abuse and IQ was only evident among controls.

Associations between childhood maltreatment, educational attainment, and IQ varied according to the FEP clinical phenotype. In the nonaffective psychosis group, childhood abuse and neglect were associated with poorer achievement, and no association between any type of childhood maltreatment and IQ was observed. In the affective psychosis group, only neglect was associated with lower educational attainment and, weakly, with lower IQ.

Associations Between Childhood Maltreatment and Education and IQ Among FEP Patients and Community Controls

Across both the clinical and community groups, childhood maltreatment, especially neglect, was associated with lower educational attainment, even when the effects

of IQ and social disadvantage were taken into account. To our knowledge, only the GROUP study previously investigated the effect of childhood maltreatment on education among people with psychosis controlling for a proxy of social disadvantage different from that used in this study (ie, parental educational level), with negative findings.[53] Inconsistency between the two studies may be due to differences in the study population (only nonaffective psychoses in the GROUP study vs both affective and nonaffective psychoses in the current study), the definition of the outcome variable (inter-generational educational difference vs participants' education level), or the effect of other variables (ie, the study countries and the characteristics of the different school systems). Therefore, further replication studies are warranted.

This study builds on existing literature regarding a different effect of childhood maltreatment on IQ among patients with FEP and community controls without psychosis. Consistent with previous literature,[3,13] the association between childhood maltreatment and IQ was much more robust in the control group than in the patient group. The findings suggest that the association between childhood maltreatment and IQ may be partially confounded by lower education, social disadvantage, and cannabis use, which are also associated with psychosis.[21,42,54] This is consistent with a recent study utilising the Dunedin and E-Risk cohorts, which found that the association between childhood maltreatment and adult cognition was attenuated after controlling for early cognitive impairment and family disadvantage.[55] Contrary to our hypotheses, we did not observe a confounding effect of premorbid social functioning. This may depend on the effect of premorbid social functioning on current IQ being partially accounted by the effect of other factors included in the model, such as education.

Association Between Specific Types of Adversities and Educational Attainment and IQ

Exploring different types of maltreatment, this study found that childhood abuse and neglect were associated with lower educational attainment in the crude models, with a small ES. Furthermore, in both samples the association with neglect was more robust to adjustment for confounders.

Among community controls childhood abuse and childhood neglect had a similar negative association with IQ. Among patients with FEP, only neglect was associated with IQ. Furthermore, even controlling for confounders, the association between abuse and IQ was only evident among community controls, suggesting a possible interaction.

The specific effect of different types of maltreatment on education and IQ might have been attenuated by the difficulty in disentangling childhood abuse by childhood neglect, as well as by the possible relationship with other risk factors (eg, parental loss, poor social support)[56]. However, the more consistent pattern of association between childhood neglect, education, and IQ across samples is consistent with previous studies on both community[2,31,57,58] and psychosis sample.[59–63]

Relationship Between Childhood Maltreatment, Educational Attainment, and IQ Across Diagnostic Groups

Subgroup analyses showed that childhood abuse and childhood neglect were related to poor educational outcomes in patients with nonaffective FEP with similar ES, whereas only neglect was associated with poor educational outcomes in the affective FEP patients. This suggests that different clinical phenotypes within the psychosis spectrum might be more sensitive to the effect of specific types of adversities.[64,65]

Furthermore, the association between childhood neglect and IQ was only evident among patients with affective psychoses. This is in line with preliminary findings from smaller samples[59,66] and suggests a limited or null effect of childhood adversities on cognitive functions of people with nonaffective psychotic disorders, which may be due to a preexisting cognitive impairment affected by earlier biological risk factors not assessed here (eg, obstetrical complications).[33,67,68] For instance, evidence has suggested that preterm birth is associated with early attentional and executive impairment.[68] The lack of association between neglect and IQ among people with nonaffective psychosis may also be influenced by a floor effect related to the lower IQ of people with nonaffective psychoses in comparison to the IQ of those with affective psychoses.[38,69] The lower sensitivity to social stressors by patients with nonaffective psychoses would also be compatible with the hypothesis of an affective pathways to psychosis.[32,70,71]

Strength and Limitations

This study used a large multi-centre representative sample of patients with FEP and community controls to investigate associations between childhood maltreatment and adult academic attainment and cognitive functioning. However, the findings should be considered in light of several limitations. A key limitation of this study is the cross-sectional design which prevents any conclusions being drawn about the direction of the associations found. Additionally, EU-GEI study participants with complete information about education, IQ, and childhood maltreatment were more often of white ethnicity, highly educated, and belonging to a medium-high social class. The wide age range of study sample (ie, 18–64) might have affected some participants' capacity to accurately recall childhood experiences particularly if they happened several decades ago. Also, retrospective measures of childhood abuse

have shown poor agreement with prospective measures and may be affected by recall bias.[72] Furthermore, since childhood and adolescent adversities might have a differential impact on IQ, future studies should account for the timing of childhood maltreatment, which was not available in this study. In this study, educational attainment was measured only with reference to quantitative aspects, not accounting for qualitative aspects. Furthermore, early and recent confounders were identified on the basis of the current literature and tested through multivariate model but other potential confounders not investigated here may include: (*a*) genetic liability for psychotic disorders; (*b*) developmental abnormalities (eg, preterm birth); and (*c*) psychiatric disorders other than psychosis, which might be potentially related to childhood maltreatment (eg, depression).

Clinical Implications

The findings of this study underscore the role of childhood abuse and childhood neglect in shaping the long-term academic outcomes and the cognitive functions of both patients with psychosis and unaffected controls. This suggests that adequate clinical attention should be given, in addition to severe forms of physical and sexual abuse, to less visible types of maltreatment, such as physical and emotional neglect,[4] as they may similarly impair the cognitive and affective development of children. Children who are victims of maltreatment could be screened for cognitive impairment, and cognitive rehabilitation programs could be implemented as part of a comprehensive treatment package. Furthermore, considering literature suggesting a protective role of education and intact cognitive functions in the course and outcome of psychosis,[73,74] and their relevance for later occupational, social, and economic outcomes,[22,75,76] the results of this study emphasise the relevance of cognitive rehabilitation programs, school support, and vocational interventions for people with early psychosis.[77,78]

Conclusions

This study found that, accounting for the effect of social class and IQ, childhood maltreatment was related to poorer academic outcomes among people with FEP and community controls. We also confirmed that among community controls childhood maltreatment was negatively related with adult IQ, and this association seemed relatively independent of confounders. The association with cognitive functioning was less evident among people with psychosis, particularly among those with nonaffective psychoses.

Supplementary Material

Supplementary material is available at *Schizophrenia Bulletin* online.

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