Childhood trauma is associated with poorer social functioning in severe mental disorders both during an active illness phase and in remission

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A B S T R A C T

Background: Impaired social functioning is a core feature of schizophrenia spectrum (SZS) and bipolar spectrum disorders (BDS). Childhood traumatic events are more frequent in SZS and BDS than in healthy individuals (HC), and could represent a cumulative risk for reduced social functioning beyond experiencing ongoing clinical symptoms.

Methods: The study comprised 1039 individuals (SZS [n = 348]; BDS [n = 262], and HC [n = 429]). Childhood trauma and level of social functioning was assessed by the Childhood Trauma Questionnaire (CTQ) and the Social Functioning Scale (SFS), respectively. Diagnosis was obtained by the Structured Clinical Interview (SCID) for the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV).

Results: Patients had poorer social functioning (F = 819.18, p < 0.001, Cohen’s d = 0.44) and reported more childhood trauma experiences than HC (X² = 289.0, p < .001) than HC. Patients with at least one moderate to severe trauma had poorer social functioning than patients without childhood trauma (F = 81.6, p = .004, Cohen’s d = 0.17). Within the patients, a cumulative relationship was observed in that more severe childhood trauma was associated with lower social functioning (F = 2.65, p = .02, Cohen’s d = 0.20). No significant associations were observed for having at least one moderate to severe trauma or cumulative traumas on social functioning in the HC. Follow-up analysis showed that patients in remission childhood trauma also had poorer social functioning.

Conclusion: Patients who reported childhood trauma experiences had poorer social functioning both during an active illness phase and in remission.

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1. Introduction

Impaired social functioning is an important feature of schizophrenia spectrum (SZS) and bipolar spectrum disorder (BDS) (Bellido-Zanin, Perez-San-Gregorio, Martin-Rodriguez, & Vazquez-Morejon, 2015). However, the underlying mechanisms of this impairment are unknown. Social functioning is a global term encompassing occupational, relational and recreational functioning (Birchwood, Smith, Cochrane, Wetton, & Copestake, 1990), and social functioning in psychosis correlates with pre-morbid childhood or adolescent functioning (Stain et al., 2014).

Poor family relationships may contribute to impairments in emotional and social development in childhood (Engels, Finkenauer, & Meeus, 2001). A recent large prospective study found that cumulative childhood trauma exposure increases the risk of developing psychopathology in adulthood as well as poor social functioning (Copeland et al., 2018). However, SZS or BDS patients were not included. It has been suggested that childhood trauma could be a predictor of poor social functioning in adults with psychosis (Palmier-Claus et al., 2016; Stain et al., 2014). However, studies investigating the role of cumulative trauma experiences, or current symptoms on this association are still lacking.

Environmental stressors influence brain development (McEwen, 2011), and inadequate (e.g. neglect/deprivation) and harmful stimuli (e.g. abuse/trauma) may distinctively influence brain development (Humphreys & Zeanah, 2015; Teicher et al., 2018). Childhood trauma appears to be associated with abnormal neurodevelopment (Aas et al., 2016, De Bellis, Spratt, & Hooper, 2011), and is associated with brain-related abnormalities and disorders (Andersen & Teicher, 2008). Previous research suggests that emotional trauma may be more linked to social development than other types of trauma (Taillieu, Brownridge, Sareen, & Affifi, 2016). However, studies investigating subtypes of trauma and social functioning across SZS and BDS are lacking.

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In the current study we investigated the relationship between childhood trauma and social functioning in adulthood across diagnostic groups of SZS, BDS and healthy controls (HC) in a large sample \( N = 1039 \). We aimed to determine if childhood trauma experiences (both specific subtypes and cumulative levels) are associated with social functioning in adulthood across diagnostic groups of SZS and BDS. We investigated (1) if childhood trauma experiences are associated with impaired social functioning independent of diagnosis, and (2) if there is a cumulative association between number of childhood trauma experiences and social impairment in SCH and BDS. Importantly, since both cumulative childhood trauma experiences (Aas et al., 2016) and social functioning (Bellido-Zanin et al., 2015) are associated with more severe current symptomatology, we did follow-up assessment of patients in remission to test the potential confounding factor of being in an active disease phase.

2. Methods

2.1. Sample

The participants were recruited as part of the Thematically Organized Psychosis (TOP) Study at Norwegian Centre for Mental Disorders Research (NORMENT). A total of 1639 participants (schizophrenia spectrum, SZS \( n = 348 \), bipolar spectrum, BDS \( n = 262 \)), and healthy controls, HC \( n = 429 \) were included. All participants in the TOP-Study came from the same catchment area, the Oslo region. Participants were recruited in the period between 2007 and 2017 from four major hospitals in Oslo. All groups were screened for exposure to childhood trauma. Within the schizophrenia spectrum 190 had a diagnosis of SZS, 28 schizophreniaform disorder, 50 schizoaffective disorder and 80 other psychoses. Within the bipolar spectrum, 168 had a diagnosis of BD1, 79 BDII, and 15 bipolar disorder Not Otherwise Specified (NOS). The majority of the sample (91%) was Caucasian. Inclusion criteria for the HC were age between 18 and 65 years and having no current or lifetime diagnosis of any severe mental disorder. The HC were selected from national statistical records (Statistics Norway) and invited to participate by letter. HC were screened for history of mental disorder and/or a major somatic condition. HC exclusion criteria included having a SCID-1 mental illness, neurological illness or age outside the range 18–65. Inclusion criteria for the patient groups were having a diagnosis of SZS or a BDS illness and being between 18 and 65 years of age. Exclusion criteria for the patients included having an organic psychosis, substance induced or neurological disorder, and unstable or uncontrolled medical conditions interfering with brain function, and age outside the range of 18–65 years.

All participants gave written informed consent. The Regional Committee for Medical Research Ethics and the Norwegian Data Inspectorate approved the study.

2.2. Clinical assessment

Trained physicians and psychologists performed the clinical assessments. Diagnoses were based on the Structured Clinical Interview for DSM-IV Axis I disorders (SCID-I). All clinical personnel completed a training program in diagnostics and symptom rating, which was based on the training program at University of California, Los Angeles (UCLA) (Ventura et al., 1998). The diagnostic reliability was found to be satisfactory with an overall agreement on DSM-IV diagnostic categories of 82% and an overall \( \kappa \) of 0.77 (95% Confidence Interval (CI): 0.60, 0.94). Current symptom level was assessed by the Positive and Negative Syndrome Scale (PANSS) (Kay, Fiszbein, & Opler, 1987), and the Inventory of Depressive Symptoms – Clinician rated scale (IDS-C) (Rush et al., 1986).

Disease phase of the patients (ongoing symptoms versus remission) were defined based on items from the PANSS or SCID. Remission of psychotic symptoms was defined as PANSS items below four of the following items: P1, P3, G9, P2, G5, N1, N4, and N6. Remission of affective episodes was based on the SCID definitions defined as without symptoms during the last 2 months.

2.3. Childhood Trauma Questionnaire (CTQ)

A Norwegian translation of the brief version of Childhood Trauma Questionnaire (CTQ) was used to measure childhood adversity (Bernstein et al., 1994, Bernstein et al., 2003). CTQ is a 28-item self-report retrospective inventory assessing five types of maltreatment in childhood. These are physical abuse (bodily assaults on a child by an older person that pose a risk of, or result in, injury), emotional abuse (verbal assaults on a child’s sense of worth or well-being, or any humiliating, demeaning, or threatening behavior directed toward a child by an older person), sexual abuse (conceptualized as sexual contact or conduct between a child and older person), physical neglect (failure of caregivers to provide a child’s basic physical needs, including food, shelter, safety and supervision, and health), and emotional neglect (failure of caregivers to provide a child’s basic psychological and emotional needs, such as love, encouragement, belonging, and support, (Bernstein & Fink, 1998)). The participants respond with answers ranging 1 to 5, from Never true to Very Often True. Predefined cutoffs suggested in the CTQ manual were used (Bernstein & Fink, 1998).

The reliability and validity of the CTQ has been demonstrated elsewhere (Aas et al., 2014, Bernstein et al., 1994). CTQ is reported to be an appropriate screening instrument for maltreatment in both clinical and non-clinical groups (Bernstein et al., 2003). For the descriptive analyses, the childhood trauma data were divided into “non”, “low” or “moderate to severe levels” following the procedures by Bernstein and Fink (1998). For the main analyses a cutoff score of moderate to severe levels were applied as a definition of trauma (Etain et al., 2013; Aas et al., 2013), and cumulative levels of trauma were analyzed as number of trauma subtypes reaching moderate to severe levels (Etain et al., 2013). We have previously reported CTQ values from partly overlapping samples (Aas et al., 2012, Aas, Etain, et al., 2014, Aas et al., 2013, Aas et al., 2014, Aas et al., 2017, Aas et al., 2016, Aas et al., 2012), however this is the first study to investigate the role of childhood trauma on social functioning.

2.4. Social Functioning Scale (SFS)

The Social Functioning Scale (SFS) is a self-administered questionnaire, designed to assess social functioning in in individuals with SZS. The SFS covers different aspects of daily living, including the ability to work, interact with others, form relationships, and engage in recreational activities with others (Birchwood et al., 1999). The SFS consists of 76 items across 7 subscales (mean score: 100, Standard deviation: 15). The subscales are Withdrawal (time spent alone, initiation of conversations, social avoidance), Interpersonal communication (number of friends, having a partner, quality of communication), Prosocial activities (engagement in a range of common social activities), Recreation (engagement in a range of common hobbies, interests), Independence-Competence (ability to perform skills necessary for independent living), Independence-Performance (the actual performance of the same skills necessary for independent living), and Employment (engagement in productive employment or structured program of daily activity). A high score indicates a higher frequency of a skill or a certain behavior, which indicates better social functioning (Birchwood et al., 1999).

The SFS is found to be a reliable and valid measure (Birchwood, 1990). The SFS was originally designed to capture social impairments in SZS (Birchwood et al., 1990), but has also been validated in BDS (Hellvin et al., 2010). In the current study, the Norwegian version of the SFS is implemented (Hellvin et al., 2010). This version has good psychometric properties and is appropriate also for patients with BDS (Hellvin et al., 2010).
2.5. Statistical analysis

The Statistical Package for the Social Sciences (SPSS, version 25) was used to perform the statistical analyses. Descriptive statistics provided information about the sample including level of social functioning and rates of exposure to childhood trauma divided into “no”, “low” or “moderate to severe” childhood trauma groups (Bernstein & Fink, 1998). Childhood trauma is usually considered to influence clinical characteristics in severe mental disorders, if it reaches moderate to severe levels (Etain et al., 2013). Hence, the cumulative levels of trauma were analyzed as number of trauma subtypes (emotional abuse, sexual abuse, physical abuse, emotional neglect, or physical neglect) reaching moderate to severe levels (Etain et al., 2013; Aas et al., 2013), giving a maximum of six groups, ranging from no trauma to five types of trauma. Since previous studies have shown that patients with Szs and Bds with childhood trauma have more severe current symptoms (Aas, Kauppi, et al., 2016-b), and as higher current symptom load is associated with lower social functioning (Bellido-Zanin et al., 2015), a follow-up ANOVA was conducted in patients in remission only (N = 379) to rule out that higher symptom severity in patients with childhood trauma would confound the relationship between childhood trauma and adult social functioning. We then performed an interaction analysis of remission status (current symptoms versus remission status) × trauma on social functioning. Moreover, one follow-up analysis with diagnostic group (Szs versus Bds) as an additional independent variable was undertaken, in order to test for diagnostic differences in adult social functioning, and whether the effect of childhood trauma on adult social functioning depended upon diagnostic group membership (Szs/Bds), i.e. the trauma × diagnostic group interaction effect. Lastly, trauma × sex analysis was run to test for sex effects on this relationship and a three-way interaction analysis (sex × trauma × group status) was performed to investigate if the relationship between sex and trauma on social functioning varied across diagnostic group (Szs, Bds). For all analyses Sfs was entered as the dependent variable and childhood trauma as fixed factor with build in posthoc Bonferroni adjustment.

Effect size was calculated by Cohen’s d. The threshold for statistical significance was set at p < 0.05 after Posthoc Bonferroni corrections. A number of different confounders (e.g. demographics) were kept if statistically significant differences between the groups were observed (see descriptive overview, Table 1).

3. Results

3.1. Sample characteristics

Table 1 presents an overview of the demographics of the sample. More females had a diagnosis of Bds, compared to Szs, and Hcs. Patients with Szs were younger than patients with a Bd and Hc. Furthermore, Caucasian ethnicity was more frequent in the Hc group than in the patients. Hc were also more likely to be working or being a fulltime student compared to the patient group, and Hc reported more years of education compared to the patients. Patients had poorer social functioning (F = 819.18, p < 0.001, Cohen’s d = 0.44) and reported more childhood trauma experiences than Hc (χ² = 289.0, p < 0.001). No significant differences in childhood trauma scores were observed between Szs and Bds.

Patients with a Szs diagnosis had more severe current symptoms from the PANSS and IDS-C compared to patients with a Bds diagnosis. Patients with at least one type of trauma reaching moderate to severe level had more severe current symptoms from the PANSS and from the IDS-C (F = 7.53, p = .006: F = 23.47, p < .001, respectively). Sixty-two percent (N = 379) of the patients were currently in remission, and 55% (N = 210) of patients in remission reported at least one type of trauma reaching moderate to severe level.

3.2. Childhood trauma and social functioning

A statistically significant difference in social functioning was observed in patients depending on childhood trauma experiences (F = 4.88, p < .008). Posthoc Bonferroni adjusted analysis revealed that patients with a history of moderate to severe childhood trauma had lower social functioning than patients without childhood trauma (F = 8.16, p = .004, Cohen’s d = 0.17, see Fig. 1), with no difference in social function in patients with low trauma compared to patients without childhood trauma (p > 0.1). No other significant differences were observed. No significant association was observed for childhood trauma and social functioning in Hc (see Fig. 1), and no case-control trauma interaction on social functioning was observed (p > 1). Within the patients, a cumulative relationship was observed for number of childhood trauma experiences and lower social functioning (F = 2.65, p = 0.02, Cohen’s d = 0.20, see Fig. 2). Patients with several types of childhood trauma still performed poorer on social functioning after adjusting for potential confounders, such as years of education, sex, diagnostic group (Szs/Bds) and age (F = 2.44, p = 0.03, Cohen’s d = 0.20). No significant cumulative relationship of trauma on social functioning was observed in the Hc. (See Fig. 3.)

3.3. Follow-up analyses of subtypes of childhood trauma, remission status and diagnosis

The strongest association between childhood trauma and social functioning was observed for emotional abuse and emotional neglect (see Table 2). Posthoc tests revealed that patients with moderate to severe emotional abuse or emotional neglect had poorer social functioning compared to patients without trauma. In addition, patients with low levels of emotional neglect had poorer social functioning compared to patients with no emotional neglect. Patients with low physical abuse also had poorer social functioning than patients with no physical abuse.

| Table 1 Sample demographics. |
|-----------------------------|
|                      | HC (N = 429) | BD (N = 262) | SZ (N = 348) | Statistics | Posthoc |
| Gender (male) N (%)        | 241 (56.2%)  | 112 (42.7%)  | 207 (59.5%)  | X² = 18.4, p < .001 | BD, HC, SZ |
| Ethnicity, Caucasian N (%)| 422 (98.4%)  | 235 (89.7%)  | 296 (85.1%)  | X² = 67.2, p < .001 | HC-BD, SZ |
| Years of education, Mean ± SD | 14.5 ± 2.2   | 13.4 ± 2.4   | 12.2 ± 2.4   | F = 88.3, p < .001 | HC-BD, BD, SZ |
| Sfs total score, Mean ± SD | 156.4 ± 15.6 | 125.0 ± 23.8 | 111.1 ± 24.5 | F = 467.2, p < .001 | HC-BD, BD, SZ |
| Age, Mean ± SD             | 31.2 ± 7.6   | 32.9 ± 11.7  | 28.7 ± 9.4   | F = 15.4, p < .001 | HC-SZ, BD, SZ |
| PANSS total score, Mean ± SD| -             | 44.8 ± 9.5   | 63.2 ± 16.6  | F = 128.0, p < .001 | BD, SZ |
| Idss, Mean ± SD            | -             | 16.6 ± 10.7  | 19.2 ± 11.8  | F = 3.6, p < .03 | HC-SZ, BD, SZ |

| Trauma                     | 287 (66.9%)  | 56 (21.4%)   | 62 (17.8%)   | X² = 289.0, p < .001 | HC-BD, SZ |
| Low trauma N (%)           | 109 (25.4%)  | 77 (29.4%)   | 108 (31%)    |                                  |
| Moderate to severe trauma N (%)| 33 (7.7%)    | 129 (49.2%)  | 178 (51.1%)  |                                  |
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Fig. 1. Childhood trauma and social functioning divided into patients and controls. ANOVA, F = 3.22, p = .04. Posthoc Bonferroni adjusted analysis revealed that patients with a history of moderate to severe childhood trauma had lower social functioning than patients without childhood trauma (F = 8.16, p = .004, Cohen’s d = 0.17). No interaction between trauma and group on SFS levels, F = 1.02, p = .36. Patients: “No trauma”, N = 117, “Low trauma”, N = 185, “Moderate to severe trauma”, N = 305. Controls: “No trauma”, N = 285 “Low trauma”, N = 107, “Moderate to severe trauma”, N = 33. SFS = Social Functioning Scale. Trauma cutoff score were derived from Bernstein and Fink (1998).

Analysis of patients in remission confirmed a relationship of having a history of childhood trauma and lower social functioning (F = 4.28, p = .04, Cohen’s d = 0.20). In the full sample, the trauma × remission status interaction effect on social functioning was non-significant (F = 0.67, p = .42). Lastly, follow-up analyses dividing into SZS and BDS, showed a stronger association for reduced social functioning and childhood trauma in BDS (F = 5.29, p = .02, Cohen’s d = 0.20), compared to SZS (F = 3.13, p = .078, Cohen’s d = 0.09), but no interaction (SZS/BDS×trauma) was present (F = 0.31, p = .73). Results remained the same when education, sex, and age were added to the models (F = 4.29, p = .039, Cohen’s d = 0.17 and F = 1.86, p = .17, Cohen’s d = 0.05, respectively). Lastly, a significant sex × trauma interaction effect was observed (F = 4.90, p = .027, Cohen’s d = 0.10), with poorer social functioning in males with childhood trauma compared to females, see Fig. 4. Lastly, a three-way interaction (sex × trauma × group status) revealed that the relationship between sex and trauma on social functioning did not vary across diagnostic group status (F = 0.41, p = .66).

4. Discussion

In this large cross-sectional study patients with severe mental disorder reporting childhood trauma experiences had poorer social functioning in adulthood compared to patients without trauma. Impairment in social functioning is a significant problem for individuals suffering from severe mental illness, such as SZS and BDS (Bellido-Zanin et al., 2015). Our study demonstrates a cumulative relationship of higher number of trauma experiences with poorer social function both during an active disease phase and in remission in patients with SZS or BDS. We also found a significant interaction between trauma and sex on social functioning with poorer social functioning in males with trauma compared to females, indicating that males may be more vulnerable for the long-term negative effect of trauma on social functioning than females.

The study by Stain et al. (2014) comprised of more than two-hundred patients with a first-episode psychosis (FEP) reported that trauma predicted social functioning in adulthood, but only if the trauma happened in childhood and not in adulthood (Stain et al., 2014). This suggests that trauma during the childhood phase, is critical for brain development, and a decisive factor for social functioning in adulthood highlighting the childhood period as a sensitive time window for later functioning. However, the study by Stein and colleagues did not investigate cumulative traumas, include patients with BDS, investigate active disease phase versus remission states, or look at gender differences. Hence, our study supports and expands these previous findings in FEP by showing a transdiagnostic perspective, cumulative dose effects of trauma on social impairment and that the relationship is not simply an artifact of trauma patients being more likely to be in an active disease phase (Aas, Andreassen et al., 2016). Furthermore, our study shows that trauma experiences in males with a severe mental disorder, even more than females increases the risk of impairment in social functioning. Another recent study by Palmier-Claus et al. (2016) comprised of 20 chronic SZS patients, 20 patients with a first-episode psychosis, 14 high-risk individuals, and 120 healthy participants found that depressive symptoms, paranoia and anxious attachment mediated the effect of childhood adversity on social functioning. Our larger study support and expand on these findings showing that even patients in remission have poorer social function if exposed to childhood trauma, demonstrating impairments in social functioning following trauma to be a trait rather than a state factor. Also, a recent prospective study by Copeland et al. (2018) comprised of more than one thousand participants reported a relationship between cumulative childhood trauma

Fig. 2. Dose response of trauma and poorer social functioning in patients. ANOVA, F = 2.05, p = .02, Cohen’s d = 0.22. Patients only, 0 = “no trauma”, N = 302, 1 = one type of trauma, N = 122, 2: = “two types of trauma”, N = 78, 3: = “three types of trauma”, N = 45, 4: = “four types of trauma”, N = 37 and 5 = “five types of trauma”, N = 23. SFS = Social Functioning Scale. Trauma was defined as having at least one subtype of trauma at moderate to severe level (Etain et al., 2013).

Fig. 3. Dose response of trauma and poorer social functioning in controls. ANOVA, F = 0.17, p = .85, Cohen’s d = 0.01. Controls only, 0 = “no trauma”, N = 392, 1 = one type of trauma, N = 26, 2 = “two or more types of trauma”, N = 7. SFS = Social Functioning Scale. Trauma was defined as having at least one subtype of trauma at moderate to severe level (Etain et al., 2013).

Table 2

Social functioning and subtypes of childhood trauma in severe mental disorders.

|                    | F   | P.value | Post hoc analyses |
|--------------------|-----|---------|------------------|
| Emotional abuse    | 6.60| 0.001   | 3 < 1            |
| Physical abuse     | 4.49| 0.01    | 2 < 1            |
| Sexual abuse       | 0.21| 0.81    |                  |
| Emotional Neglect  | 10.19| <0.001 | 3 < 112 < 1      |
| Physical neglect   | 1.88| 0.15    |                  |

Trauma data were derived into three groups based on level of trauma (no trauma = 1, low trauma = 2, and moderate to severe trauma = 3) using the cutoff scores from Bernstein and Fink (1998).
experiences and having a psychiatric disorder and poorer social functioning in adulthood. However, the study by Copeland and colleagues did not include patients with a psychotic or BDS disorder (Copeland et al., 2018).

In our study, the strongest association between childhood trauma and social functioning was observed for the BDS group. This indicates that childhood trauma experiences may be more related to reduced social functioning in affective disorders, whilst social functioning in SZS could be more related to other factors such as genetic susceptibility (Gareeva & Khussnutdinova, 2018). However, there were no interaction of diagnostic group and trauma, and the direction of the data went in the same for both SZS and BDS. Thus, more studies are needed to clarify whether childhood trauma experiences are more linked to social functioning in affective than non-affective illnesses. It should be noted that both the trauma and non-trauma patients had poorer social functioning than HC demonstrating that other factors than childhood trauma influence social functioning in SZS and BDS. Poor functioning is also a diagnostic criterion, and since not all patients report childhood trauma, other factors are involved. As already mentioned, we found that patients in remission had poorer social functioning if exposed to childhood trauma, suggesting that the relationship between childhood trauma and social functioning is more trait than state dependent. Thus, social impairment in patients reporting childhood trauma cannot simply be explained by trauma patients having more current symptoms (Aas, Kauppi, et al., 2016-b), but could be an underlying long-term association of childhood trauma in vulnerable individuals. Child-focused public health efforts to ameliorate the long-term impact of childhood trauma are warranted.

Emotional abuse and neglect had the strongest association with social functioning, which is in line with previous findings in patients with SZS (Garcia et al., 2016; Stain et al., 2014). Our findings expand the previous literature showing that it is present not only in patients with SZS but also in BDS, supporting a transdiagnostic association of trauma on social functioning. Thus, we may speculate a possible pathway from emotional maltreatment in childhood to social dysfunction in adulthood. The pathways explaining these relationships, may be related to disruptions in the development of attachment relationships, emotion regulation, and self-concept as a consequence of abuse or neglect in childhood (Cicchetti & Valentino, 2006). Attachment relationships in early childhood are well known to constitute the basis for which later relationships are built upon (Bowlby, 1982). When these relationships are not evident or somehow disturbed, they could influence the way the individual relates to other people in adulthood. It may be challenging for individuals with a history of childhood trauma to develop close relationships and to engage in social interactions (Stain et al., 2014; Cotter, Kaess, & Yung, 2014). Our study shows that this is particularly evident if the individual also has a severe mental disorder. However, we cannot rule out other explanations to the current associations. No firm conclusions regarding causality can be made from our cross-sectional data. Although we find it likely that traumatic events in childhood impact on later social functioning, we cannot rule out another causal directionality. This can only be answered in a prospective design.

The strength of the current study is the large (N = 1039), the representative sample and thorough diagnostic evaluation. The transdiagnostic approach taken in the current study reflect a growing recognition of common etiological factors of severe mental disorders (Tesli et al., 2014). There are some limitations of the study that need to be mentioned: Childhood trauma was assessed using a retrospective design including retrospective reporting of childhood experiences and self-reporting of the outcome measures. For example, respondents may have difficulty recalling certain childhood events (Edwards, Fivush, Anda, Felitti, & Nordenberg, 2001) or may choose not to disclose certain experiences. It should be mentioned that recent studies suggest that reliance solely on retrospective assessment methods may have led to a proportion of non-exposed groups being misclassified and thus affecting the results (Newbury et al., 2018; Reuben et al., 2016). However, reassuringly, both prospective and retrospective data collection have shown to be associated with similar outcome, demonstrating convergent validity (Tajima et al., 2004). Our findings were also independent of psychotic or mood symptoms, thus current mood at time of filling out the CTQ did not influence our findings.

As this is a cross-sectional study, we cannot infer causality. Moreover, as HC reported less trauma than patients, and only seven HCs reported two or more types of childhood trauma, we did not have the same statistical power to investigate the cumulative effect of trauma on social functioning in the HCs as we had in the patients. Furthermore, HCs were recruited randomly from the Statistics Norway from the same catchment area in the Oslo region as the patients. However, we cannot rule out that a subgroup of the healthy population was more likely to take part in the study.

To conclude, our study is the first to show an association between cumulative childhood trauma experiences and social impairments amongst individuals with SZS and BDS; however, this was not significant in healthy individuals. The findings that a history of childhood trauma was associated with social impairments remained after taking into consideration the disease phase of the patients (active state versus being in remission). Together, our results suggest that early neurodevelopmental factors interact with trauma experiences in childhood and this is associated with reduced social functioning in individuals who develop a severe mental disorder.

**Contributors**

Ingrid Varvin Hjelseng, Monica Aas and Ole A Andreassen wrote the first draft of the Manuscript. All authors contributed and approved the final version of the Manuscript.

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**Declaration of competing interest**

GA has received speaker’s honorarium from Lundbeck. All other authors report no biomedical financial interests. There are no conflicts of interest.

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**Appendix A. Supplementary data**

Supplementary data to this article can be found online at https://doi.org/10.1016/j.schres.2020.03.015.
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