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The effect of childhood trauma and Five-Factor Model personality traits on exposure to adult life events in patients with psychotic disorders

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ABSTRACT

Introduction: Recent life events are associated with transition to and outcome in psychosis. Childhood trauma and personality characteristics play a role in proneness to adult life events. However, little is known about the relative contribution and interrelatedness of these characteristics in psychotic disorders. Therefore, we investigated whether Five-Factor Model (FFM) personality traits and childhood trauma (abuse and neglect) predict adult life events, and whether the effect of childhood trauma on life events is mediated by personality traits.

Method: One hundred and sixty-three patients with psychotic disorders were assessed at baseline on history of childhood maltreatment and FFM personality traits, and on recent life events at 3-year follow-up.

Results: Childhood abuse is associated with negative life events, and part of the effect of childhood abuse on negative life events is mediated by openness to experience. Openness to experience and extraversion are associated with more positive and negative life events. Childhood neglect and lower extraversion are related to experiencing less positive events.

Conclusion: The association between childhood trauma and recent life events is partly mediated by personality. Future research could focus on mechanisms leading to positive life events, as positive life events may buffer against development of mental health problems.

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Introduction

Exposure to recent life events is associated with an increased risk of experiencing a first psychotic episode (Beards et al., 2013; Day et al., 1987). Additionally, in patients with psychotic disorders, evidence accumulates that recent life events are associated with psychotic relapse although findings are equivocal, partly due to methodological differences in life events studies (Fallon, 2008). Concerning clinical outcome, one longitudinal study found an increase in psychotic symptoms in schizophrenia patients with high trait reactivity that experienced life events. These events were independent from the behaviour of the patients, thereby minimising the potential effect of illness processes (Docherty, St-Hilaire, Aakre, & Seghers, 2009). Tentative evidence also suggests that cumulative life events are associated with resistance to antipsychotic medication in schizophrenia patients (Hassan & De Luca, 2015). Also, suicide in schizophrenia patients seems to be preceded by stressful life events (Tousignant et al., 2011).

Therefore, it is of added value to clarify which factors, besides illness characteristics, may predispose to experiencing adult life events in patients with psychotic disorders. Research suggests that childhood trauma is associated with a higher incidence of negative adult life events in the general population (Carlson & Shafer, 2010; Maunder, Peladeau, Savage, & Lancee, 2010). Findings also suggest that personality characteristics such as antisocial behaviour, neuroticism and openness to experiences predispose to a higher incidence of stressful interpersonal life events in adulthood, possibly indicating selection of a certain environment by the individual (person–environment correlation) (Headey & Wearing, 1989; Kandler, Bleidorn, Riemann, Angleitner, & Spinath, 2012; van Os, Park, & Jones, 2001).

Another potential mechanism linking childhood trauma to proneness to adult life events is the (enduring) effects of trauma on neurobiological functioning. These effects are thought to occur on different levels, from hormonal (e.g., hypothalamic–pituitary–adrenal axis) to structural and functional levels. Brain structures that are impacted by trauma include the hippocampus, amygdala and cerebellum. The hippocampus plays a role in behavioural inhibition. In line, both the cerebellum and the amygdala play a role in controlling aggressive behaviour. Aggression and disinhibition may increase likelihood of experiencing life events. Also, brain plasticity as well as development of the left hemisphere seem stunted in people who experienced childhood trauma. Yet, they both play a crucial role in developing cognitive skills such as analytical thought and long-term planning strategies which may help the individual in creating a more benign environment in later life (Ehlert, 2013; Teicher et al., 2003). The impact of stress as experienced in the context of childhood trauma depends on the level of stress-sensitivity of an individual. Stress-sensitivity differs markedly between individuals, and genetic factors explain part of the variance found in sensitivity to stress (Hankin, Badanes, Smolen, & Young, 2015; Jang, Taylor, Stein, & Yamagata, 2007).

An individual may also be further sensitised by environmental exposure (stress-sensitisation) (Harkness, Hayden, & Lopez-Duran, 2015). Stress-sensitivity manifests itself in higher stress-reactivity in adult life (Ehlert, 2013; Glaser, van Os, Portegijs, & Myin-Germeyns, 2006; Hulme, 2011; Jang et al., 2007). Childhood trauma was found to be associated with stress-sensitivity in the general population, as well as in people at high risk for developing psychotic disorders (Ehlert, 2013; Hankin et al., 2015; Hulme, 2011; Jang et al., 2007; Javier, 2012; Loewy, 2012; Loewy et al., 2014; Teicher et al., 2003). The personality traits neuroticism

(van Os et al., 2001) and openness to experience have been linked to tendencies towards stress-reactivity (Headey & Wearing, 1989; Komulainen et al., 2014). In addition, people who experienced childhood trauma reported higher levels of neuroticism and openness to experiences in adulthood (Allen & Lauterbach, 2007). Therefore, experiencing childhood trauma may shape the development of personality traits by affecting stress-sensitivity and -reactivity, which in turn may raise the odds of experiencing life events. Tentative evidence for this hypothesis was found by Mc Elroy and Hevey (2014) who demonstrated associations between both early childhood adversity and adult levels of personality traits, as well as between personality traits and recent life events. Consequently, the relation between childhood trauma and adult life events may be mediated by personality traits linked to stress-sensitivity.

Furthermore, a less favourable developmental environment may contribute to the relation between early trauma and adult psychosis. For instance, the effect of separation from a parent in childhood (early trauma) on risk of psychosis is found to be partially mediated through subsequent poor educational attainment and adult social disadvantage, likely by means of gene–environment interaction (Morgan et al., 2008; Morgan et al., 2014) which may, in addition, also increase stress-sensitivity.

The personality trait extraversion on the other hand, is found to predispose towards experiencing positive life events (Magnus, Diener, Fujita, & Pavot, 1993). This is relevant for patients with psychosis as positive life events may serve as a resilience factor for mental problems (Davidson, Shahar, Lawless, Sells, & Tondora, 2006). Knowledge about pathways to and characteristics associated with both positive and negative adult life events in patients with psychotic disorders may provide information relevant for relapse prevention programmes and treatment.

Therefore, the aim of the current study was to investigate whether childhood trauma and FFM personality traits predispose to experiencing adult life events in patients with psychotic disorders. We expected a positive relation between childhood trauma and negative life events as well as between childhood trauma and the FFM traits neuroticism and openness to experiences. Second, we expected that the pathway from childhood trauma to adult life events might be (partly) mediated by neuroticism and openness to experience, as they are potential mechanisms that may explain how traumatic childhood experiences may be related to recent life events. We also suspected that openness and extraversion might predispose to experiencing more positive life events.

Methods

Participants

The present study is an add-on study of the Genetic Risk and Outcome of Psychosis (GROUP) research project, a naturalistic, longitudinal cohort study designed to study risk and protective factors in psychosis (Korver, Quee, Boos, Simons, & de Haan, 2012). The Comprehensive Assessment of Symptoms and History (Andreasen, Flaum, & Arndt, 1992) was completed by trained psychologists or psychiatrists to assess symptom history, yielding schizophrenia spectrum—and affective diagnoses according to the *Diagnostic and statistical manual of mental disorders*, Fourth Edition (DSM-IV) criteria that were cross-referenced with clinicians involved with the patients. Baseline inclusion criteria for the GROUP study for patients were (a) age between 16 and 50

years; (b) a diagnosis of a non-affective psychotic disorder (schizophrenia, schizophreniform psychotic disorder, schizoaffective disorder, delusional disorder or psychotic disorder NOS) according to the DSM-IV (APA, 2000); (c) good command of the Dutch language and (d) being able and willing to give written informed consent. All potential patients who declined to participate or otherwise did not participate were eligible for treatment (if applicable) and were not disadvantaged in any way in case of non-participation. The study protocol was approved by the Ethical Review Board of the University Medical Centre Utrecht.

Data were used from GROUP waves 1, 2 and 3. Each wave was separated by three years. Information on life events was assessed at wave 3 and encompassed events experienced in the three years before assessment (between waves 2 and 3). We used data on the NEO as assessed at wave 2. As the NEO was administered at assessment periods 1 and 2, missing values on assessment period 2 on the NEO were supplemented with assessment period 1 data, given relative stability of Five-Factor Model (FFM) personality traits over a three-year period (Boyette et al., 2015). Childhood trauma was assessed at wave 2 and encompassed trauma as experienced before the age of 16. Data were extracted from database release version 4.00.

Measures

Personality traits were assessed with use of the Dutch version of the NEO-FFI (Hoekstra, Ormel, & Fruyt, 2007). This self-report questionnaire consists of 60 items scored on a 5-point Likert scale, and is divided into 5 factors: (1) neuroticism: the vulnerability to emotional instability and self-consciousness, (2) extraversion: the tendency to be warm and outgoing, (3) openness: the cognitive disposition to creativity and aesthetics, (4) agreeableness: the tendency to be sympathetic, trusting and altruistic and (5) conscientiousness: the tendency towards dutifulness and competence (Costa & McCrea, 1992). The NEO-FFI has demonstrated satisfactory to excellent construct validity and moderate to good internal reliability in general population samples, with slightly lower Cronbach's alphas for openness and agreeableness (Costa & McCrea, 1992). The factor structure and reliability of the FFM scales in psychiatric patients, including patients with schizophrenia, are found to be highly similar to a normative sample (Bagby et al., 1999).

Trauma: Childhood trauma was assessed with the Dutch version of the Childhood Trauma Questionnaire-Short Form (CTQ-SF) consisting of 25 items scored on a 5-point Likert scale. The CTQ-SF measures childhood physical abuse, physical neglect, emotional abuse, emotional neglect and sexual abuse (Bernstein et al., 2003). In line with earlier research in this sample, trauma was collapsed in mean scores on abuse and neglect, and dichotomised in high and low trauma, as defined as the 80th percentile scores for healthy control subjects (Heins et al., 2011).

Life events: An adapted, self-report version based on the Interview of RLES (IRLES) (Paykel, 1997) was used. Participants reported if any of 61 events had occurred in the three years before the interview and then rated the impact of the event on a 5-point Likert scale ranging from "very pleasant" to "very unpleasant". Events included a broad array of possible experiences including relational events (such as death of a child or getting married), job-related events (such as getting fired or being hired), health events (such as illness or illness in a spouse) and other interpersonal events (such as being

robbed). Congruent with earlier studies, events with a subjective appraisal as unpleasant (score 4 or 5) by the subject were included in a continuous score representing amount of negative life events (Wichers et al., 2009). To calculate a score on positive life events, those events were included that were rated as pleasant (score 1 or 2).

Data analysis

FFM personality trait raw scores were transformed to sex-normed *Z*-scores using data on general population means and SD's reported in the NEO-FFI manual (Hoekstra et al., 2007). *Z*-scores were then transformed to McCall's *T*-scores ($Z \times 10 + 50$), creating sex-normed *T*-scores for the FFM traits.

An analysis of missing values was conducted. Missing values were counteracted by means of single or multiple imputations. When data are missing completely at random and only a very small portion of data are missing (e.g., less than 5% overall), a single imputation using the expectation–maximisation (EM) algorithm provides unbiased parameter estimates and improves statistical power of analyses (Enders, 2001).

Then, Spearman correlations were calculated between all variables, using IBM SPSS 22. Main analyses were conducted with IBM SPSS 22 macro Process (Hayes, 2013) with childhood trauma as the predictor variable, life events as outcome and significantly correlated personality traits as potential mediators. As age and gender are suspected to be related to life events and personality factors (Costa & McCrea, 1992; Headey & Wearing, 1989), estimates were adjusted by including age and gender as covariates in the analyses, given significant correlations. In order to make stronger inferences about the results bias corrected and accelerated bootstrapping was performed on all analyses by means of a bootstrap sample of 10,000 samples. A significant effect was defined as $p < .05$.

Results

The sample used in the analyses was comprised of 163 patients. Sociodemographic information is given in Table 1 and clinical characteristics in Tables 2 and 3. Overall, 0.55% of items were missing from the dataset. A non-significant Little's MCAR test: $\chi^2(8) 9.46$, $p = .305$ revealed that the data were missing at random (1988). As such, we used single EM imputation to replace missing values.

Negative life events

Childhood abuse, openness to experiences and extraversion were significantly positively correlated with negative life events, and openness to experiences was significantly positively correlated with abuse. The full mediation model explained 9% of the variance in negative life events ($F = 7.97$, $p = .005$). The effect of childhood abuse on negative life events was $B = 1.39$, 95% CI (0.57–2.2). The effect of abuse on openness to experiences was $B = 3.48$, 95% CI (0.39–6.56). The effect of openness for experiences on negative life events was $B = 0.04$, 95% CI (0.002–0.08). As Figure 1 illustrates, although the direct effect of abuse on life events remained significant, $B = 1.24$, 95% CI (0.42–2.06), 11% of the effect of childhood trauma on life events was mediated by openness for experience. We tested the significance of this indirect effect using bootstrapping procedures.

Table 1. Descriptive statistics of demographic variables at wave 3.

Demographic variables	Mean (SD) or %
Male gender	82%
Age at wave 3 (SD)	34.4 (7.4)
Non-white ethnic minority	15.6%
Mean illness duration at wave 3 (SD)	11.1 (4.97)
DSM-IV-TR diagnoses at wave 3	
Schizophrenia, paranoid type	55.2%
Schizoaffective disorder	14.1%
Psychotic disorder NOS or spectrum disorder	14.1%
Schizophreniform, residual type, or undifferentiated	10.4%
Schizophrenia, disorganised type	6.1%
Psychotropic medication status	
Antipsychotics	29.4%
Antipsychotics + anti-depressant/mood stabiliser	22.7%
Antipsychotics + benzodiazepine	14.7%
Antipsychotics + anti-cholinergic or anti-metabolic	14.1%
Anti-depressant/mood stabiliser/other	5.4%
Highest education level	
Primary school	7.4%
Secondary school	24.6%
High school	33.8%
Vocational education	26.4%
University	8%
Marital status	
Not married	89%
Married/living together	6.7%
Divorced	3.7%

Note: No differences on demographic variables exist between the Amsterdam and Utrecht sample as measured by (multinomial) regression.

Unstandardised indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles. The bootstrapped unstandardised indirect effect was $B = 0.15$; 95% CI (0.02–0.41). Thus, the indirect effect was statistically significant.

Table 2. Descriptive statistics of variables.

Variables	Mean (SD) or %
Big Five personality traits	
Neuroticism	35.7 (8.3)
Extraversion	37.4 (6.8)
Openness to experiences	38.7 (6.1)
Agreeableness/altruism	43 (5.6)
Conscientiousness	40.8 (7.1)
High childhood trauma on CTQ-SF Cut-off based on 80% percentile scores for healthy subjects	
High abuse	30.1%
High neglect	38%
Adult life events, mean sum-score	
Negative life events	2.9 (2.5)
Positive life events	1.3 (1.8)
Adult life events, percentages	
Experienced one or more negative life event	78.5%
Experienced one or more positive life event	48.5%
Adult life events (positive and negative) * Trauma (abuse and neglect)	
Experienced no trauma or life events	6.7%
Experienced trauma	7.3%
Experienced life events	41.7%
Experienced trauma and life events	44.3%

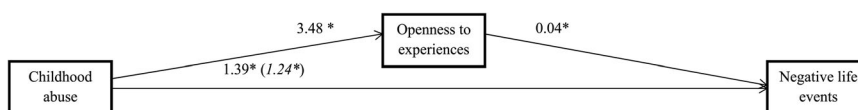
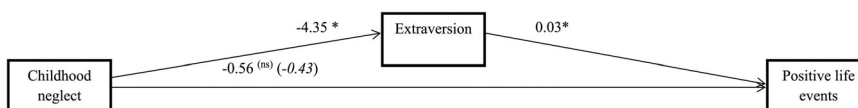
Table 3. Spearman's correlations between negative adult life events, childhood trauma and personality traits.

	Negative life events	Positive life events	Abuse	Neglect	Gender	Age
Negative life events	–	0.297**	0.245**	–0.117	0.068	–0.086
Positive life events	0.297**	–	0.100	–0.157*	0.073	–0.270**
Abuse	0.245**	0.100	–	0.230**	0.127	0.224**
Neglect	–0.117	–0.157*	0.230**	–	–0.156*	0.142
Neuroticism	0.033	–0.032	0.163*	0.013	0.038	0.028
Extraversion	0.218**	0.218**	0.013	–0.214**	0.045	–0.165*
Openness to experience	0.206**	0.189*	0.157*	–0.030	–0.004	–0.121
Agreeableness/altruism	0.088	0.043	–0.091	–0.109	0.001	–0.023
Conscientiousness	0.081	–0.017	–0.049	–0.111	0.081	0.095
Gender	0.068	0.073	0.127	–0.156*	–	0.187*
Age	–0.086	–0.270**	0.224**	0.142	0.187*	–

*Significant at $p < .05$.**Significant at $p < .01$, t -scores on FFM traits.

Positive life events

Openness to experiences and extraversion were significantly positively correlated with positive life events. Neglect increased the chance for experiencing less positive events. Neglect was also negatively associated with extraversion. As such we explored mediation of the effect of neglect on positive life events by extraversion. We included age as a covariate as it was significantly negatively correlated to positive life events ($r = -0.27$, $p < .01$) and extraversion ($r = -0.17$, $p < .05$), and marginally significant to neglect ($r = 0.14$, $p = 0.7$). The full mediation model explained 9% of variance in positive life events ($F = 5.44$, $p = .0014$). As can be seen from Figure 2, results indicated that the total effect of neglect on positive life events was no longer significant after age was included as covariate in the mediation analysis, $B = -0.56$; 95% CI $(-1.13-0.01)$. However, the bootstrapped confidence interval indicates that this represents a trend-significant finding, thus we explored the effects in this mediation model. The effect of neglect on extraversion was $B = -4.36$, 95% CI $(-7.67$ to $-1.05)$. The effect of extraversion on positive life events

**Figure 1.** Unstandardised regression coefficients for the relationship between childhood trauma and adult life events as mediated by openness to experiences. The coefficient for the relationship between childhood trauma and adult life events corrected for openness to experiences is in parentheses, * $p < .05$.**Figure 2.** Unstandardised regression coefficients for the relationship between childhood neglect and positive adult life events as mediated by extraversion, and corrected for age. The coefficient for the relationship between childhood neglect and positive adult life events corrected for extraversion is in parentheses, * $p < .05$.

was $B = 0.03$, 95% CI (0.004–0.06). 25% of the total effect of childhood neglect on positive life events was mediated by extraversion, and the bootstrapped unstandardised indirect effect was $B = -0.14$; 95% CI (–0.35 to –0.02). Thus, the indirect effect was statistically significant.

Discussion

The current study's aim was to explore whether childhood trauma (abuse and neglect) and FFM personality traits predispose to experiencing adult life events in patients with psychotic disorders. Second, we hypothesised that the pathway from childhood trauma to recent life events might be partly mediated by the personality traits neuroticism and openness to experience. First, contrary to expectations, we found no relation between neuroticism and negatively appraised life events. In line with an earlier study (Lataster, Myin-Germeys, Lieb, Wittchen, & van Os, 2012) we found a robust association between childhood abuse and negative life events, suggesting that childhood adversities may contribute to a propensity that a person encounters later adversities (environment–environment correlation). Alternatively, experiencing life events was found to be partly driven by genetic factors known to influence personality (Kandler et al., 2012; Plomin, Lichtenstein, Pedersen, McClearn, & Nesselroade, 1990). In line with this notion we found that positive and negative life events were positively correlated suggesting a common disposition for experiencing life events (Kandler et al., 2012), and candidate dispositions as found in our study may be extraversion and openness to experiences.

In line with earlier studies, we also found that childhood trauma was associated with higher openness to experiences (Allen & Lauterbach, 2007; Hovens, Giltay, van Hemert, & Penninx, 2016); moreover, openness partly mediated the effect between childhood abuse and negative life events. Thus, genetic factors underlying openness to experiences may explain part of the associations found between childhood trauma and negative life events. Yet, it is unclear whether an underlying factor of this trait in early childhood may impact on the chance of experiencing childhood trauma or to what extent trauma may shape openness to experiences. Our retrospective design did not permit us to make strong inferences about the predictive relationship between trauma and personality, although both measures do encompass different time frames. Enduring effects of trauma have been found on neurobiological functioning. These effects are thought to occur on different levels, from hormonal (e.g., hypothalamic–pituitary–adrenal axis) to structural and functional levels (Ehlert, 2013; Teicher et al., 2003). As personality typically evolves throughout young adulthood, future designs may try to clarify to what extent openness to experiences is shaped by childhood trauma. One likely mechanism as stated in the introduction is by raising stress-sensitivity (Harkness et al., 2015). As such, childhood trauma superimposed on a combination of these traits in childhood may result in further stress-sensitisation which in turn raises the odd of experiencing both negative life events and psychotic symptoms in people vulnerable for psychosis.

The experience of childhood neglect was found to be a potential risk factor for experiencing less positive life events, and possibly for developing a more introverted nature as well, given the negative association with extraversion. However, these associations were rendered to trend-significance whilst including age as a covariate, although the mediation model indicates that part of the effect of childhood neglect on the experience of positive

life events is mediated by introversion. In line with earlier studies, we found that the FFM trait extraversion predisposed towards experiencing positive life events (Magnus et al., 1993). However, precise mechanisms for experiencing positive and negative experiences should be studied further, as extraversion and openness seemed to predispose to both positive and negative life events.

Future studies may explore whether cognitive impairment will moderate associations found in our study. Chronic populations may develop negative symptoms and cognitive impairment as a result of illness duration and medication use, and an earlier study found that stress-sensitivity related to life events was dampened as a result of cognitive impairment (Myin-Germeys, Krabbendam, Delespaul, & van Os, 2003). These findings are suggestive for both a cognitive and an affective pathway towards psychosis that are respectively defined by (1) a more impaired and chronic sample and (2) a stress-sensitive but higher functioning sample. It is also likely that cognitive impairment and negative symptoms may impact on novelty seeking as a facet of openness to experience, leading to fewer life events altogether for people that experience cognitive impairment. Yet, tentative results from *post hoc* analyses in the Myin-Germeys study (2003) suggest no difference in the number of experienced life events between patients with cognitive impairment and patients without impairment; as such, research on this hypothesis is needed.

There are several limitations to the current study. First, although our sample size was fair, it consisted of a sample of schizophrenia patients who were able and willing to comply with study procedures, and were not lost to follow-up. As such, our results need careful consideration and replication in another clinical population. Furthermore, symptoms in our chronic sample may have resulted in reporting bias of life events; as such, we recommend for future research that informants, such as relatives, may be contacted to assess reliability of life events. Another limitation of our study is that we were unable to divide life events in dependent or independent events with relation to (illness-related) behaviour. This may have introduced some measurement bias in our study as our hypothesis would suggest that notably dependent life events would be a result of person–environment correlation. Also, we used mean scores of childhood abuse and neglect. More detailed and theoretically valuable results could be found by investigating discrete forms of trauma, such as emotional versus physical or sexual abuse, as they may relate uniquely to psychotic symptoms and personality traits (Allen & Lauterbach, 2007; Becerra-García, García-León, Muela-Martínez, & Egan, 2013; Lobbestael, Arntz, & Bernstein, 2010; Moran et al., 2011; Talbot, Duberstein, King, Cox, & Giles, 2000). However, due to power issues, multiple testing and to follow earlier research in our sample (Heins et al., 2011), we currently chose to use a division in abuse and neglect. Also, future studies may want to incorporate detailed information concerning the age at which childhood trauma occurred as this seems to impact functional outcome (Alameda et al., 2015).

All in all, our study shows that childhood trauma and adult experiences in psychosis are related, likely by means of both selection of the environment by traits of the individual as well as the propensity for childhood trauma in further shaping personality and functional outcome, in other words, increasing the chances of re-victimisation. A final point to raise is that personality and stress-sensitivity as risk factors for life events may be difficult to directly modify. This makes them a less likely target for treatment. Yet, lifestyle tips based on personality profiles may help nonetheless. As openness to experiences may

constitute a trait related to risky behaviour, psycho-education can give information on how curiosity and sensation seeking may increase likelihood of negative events that together with stress-sensitivity may result in psychotic symptoms in vulnerable people. Thus, while stress-sensitivity is largely non-modifiable, clinicians may find it useful to educate high-risk populations on these person–environment interactions, which is already evidenced by the central part stress-sensitivity plays in psycho-education for patients with schizophrenia. With this information, as well as with learning better coping skills, patients may (try) and change their lifestyle as an alternative to modifying stress-sensitivity. In line, our results suggest that people who experienced childhood trauma may be more prone to life events or being re-victimised in the future. Therefore, we stress the importance of addressing these issues in treatment of psychosis, by means of educating patients on the adverse effects childhood trauma and recent life events may have in some individuals, as well as promoting coping strategies that are sensitive to the unique personality profile a patient may have: For instance, educating vulnerable individuals on stress management as well as adopting a resilience-based approach.

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