



# The impact of childhood trauma and daily life experiences on emotional and psychotic symptom intensity in psychosis: An experience sampling study

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## ABSTRACT

Adverse childhood experiences create vulnerability to psychosis through biological and cognitive changes, and that may be observed as an increased emotional and psychotic response to daily life experiences in adulthood. This study aims to examine the effects of childhood maltreatment on psychotic patients' daily stress and emotional and psychotic intensity related to various experiences throughout the day. Daily activities and events, and emotional and psychotic intensity of forty-one psychotic patients were assessed with the Experience Sampling Method. The Childhood Trauma Questionnaire (CTQ) was used to evaluate childhood adversities. Multi-level regression analyses showed that all trauma subtypes, except for sexual abuse, were associated with increased psychosis and event-stress. Emotional maltreatment was the most associated trauma type with high negative and low positive affect and increased daily stress. Patients reported the highest stress and negative affect related to internal experiences but the lowest stress related to recreational actions. Social activities were also associated with higher positive affect and lower stress and psychosis, with the high CTQ group having greater stress in those activities. Our study demonstrates the negative impact of childhood trauma, especially emotional maltreatment, on daily stress and emotional and psychotic intensity in psychotic patients via different daily experiences.

## 1. Introduction

Vulnerability stress models suggest that all individuals have varying degrees of vulnerability to psychosis, which may manifest itself with psychotic experiences under certain circumstances, resulting from the influence of genetic factors and environmental stressors such as adverse life events (Fatemi and Folsom, 2009; Nuechterlein and Dawson, 1984; Walker and Diforio, 1997; Zubin and Spring, 1977). Childhood trauma, a severe and early form of stressful life experiences, has consistently been shown to be a risk factor for psychotic disorder and to be associated with the severity of psychotic symptoms (Bailey et al., 2018; Bendall et al., 2008; Janssen et al., 2004; Read et al., 2005; Üçok and Bıkmaz, 2007; Van Winkel et al., 2013; Varese et al., 2012). Studies focusing on the impact of specific childhood adversities on psychosis have not

provided consistent evidence that any one type of trauma has a greater impact than the others while strongly supporting that all types of trauma increase the risk of psychosis. Therefore, it has been argued that the role of other variables, such as genetic and environmental factors, co-occurring of different types of trauma, and dose-response effect, might be a determinant in the development of psychotic disorders (Bentall et al., 2014; Trauelsen et al., 2015; Varese et al., 2012).

Exposure to early life adverse experiences has been suggested to cause vulnerability to psychotic disorders through neurodevelopmental changes including deterioration in the hypothalamic-pituitary-adrenal (HPA) axis, in dopamine, serotonin, and norepinephrine neurotransmission, and structural brain abnormalities such as hippocampal damage, reversed cerebral asymmetry, and cerebral atrophy (De Bellis et al., 1994; Galvin et al., 1991; Heim et al., 2000; Read et al., 2001; Tarullo

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and Gunnar, 2006), as well as through psychological processes such as distortions in cognition, emotion, and behavior that eventually affect a person's way of evaluating self, others, and the world (Bentall et al., 2014; Read et al., 2003; Van Winkel et al., 2013; Walker et al., 2008). One mechanism by which childhood trauma may cause a vulnerability to psychosis has been proposed to be stress sensitivity (Myin-Germeys and van Os, 2007; Read et al., 2005). Stress sensitivity has been defined as increased behavioral and biological responses to subsequent milder stressors after exposure to severe or repeated stressors and is observed with emotional and psychotic reactions in psychotic patients (Collip et al., 2008; Myin-Germeys and van Os, 2007). Studies using the Experience Sampling Method (ESM) with psychotic patients, first-degree relatives, and healthy individuals have demonstrated that emotional and psychotic responses to daily life stressors are greater in psychotic patients, their relatives, and high-risk groups than in controls (Myin-Germeys et al., 2001; Myin-Germeys et al., 2005a; Palmier-Claus et al., 2012; van der Steen et al., 2017). Furthermore, this reactivity has been observed to be even greater in subjects with a history of childhood trauma than in those without, both in the general population and psychotic patient samples (Glaser et al., 2006; Lardinois et al., 2011).

Daily life stressors might be considered insignificant since they are familiar and relatively less stressful than major events; however, they can be potent stress sources cumulatively considering that they trigger emotional and psychotic reactions with the activation of biological pathways throughout the day. On the other hand, positive experiences might serve as emotional buffers that dampen the negative impact of daily stressors and relieve symptoms (Kanner et al., 1981; Norman and Malla, 1991; 1993). The meaning and responses of individuals to experiences are substantial given the biological and cognitive impacts of childhood trauma and recurring life stressors. Therefore, not only investigating the frequency but also the distinctive characteristics of adversities and interactions with other factors is crucial in understanding the relationship with psychotic disorders. The Experience Sampling Method (ESM), based on the data obtained through self-reports during everyday life, is a unique tool as it offers the opportunity to evaluate the experiences of individuals while interacting with the environment, with high ecological validity (Hektner et al., 2007). It enables comprehension of the effects of environmental factors and psychosocial stressors on psychiatric disorders more accurately by reducing recall bias, which is a potential problem for retrospective data. Given the difficulties of psychotic patients in expressing their experiences, ESM provides information about micro-level fluctuations related to psychotic symptoms as well as cognitive and emotional processes by considering contextual features. Although many studies have indicated that symptomatology in psychotic patients is most likely to be influenced by minor events of everyday life, there are limited studies focusing on the types and specific effects of daily life experiences. The aim of this study was to use ESM to examine the influence of different types of childhood trauma on daily stress and emotional and psychotic intensity in psychotic patients by considering the distinctive features of various daily activities and events.

## 2. Methods

### 2.1. Study sample and data collection

For this study, 57 patients aged 18–60 years who were followed up with a diagnosis of schizophrenia, schizoaffective disorder, and delusional disorder from the outpatient clinic of Marmara University in Istanbul were recruited. After the patients were routinely examined by a psychiatrist, they were informed about the study, and those who were clinically stable for at least three months and agreed to participate in the study were referred to the research psychiatrist. Written informed consent was obtained from the patient.

Patients who were in an active psychotic episode that required intensive treatment or hospital care and who had a history of substance use in the last month were excluded from the study. Also, patients with

intellectual developmental disorders that may impair compliance were not included in the assessment.

Daily activities and events and emotional and psychotic intensity of participants were assessed with the Experience Sampling Method (ESM). A clinician-developed sociodemographic and clinical data form was filled out, and SCID (Structured Clinical Interview for DSM) was applied to exclude comorbid diagnoses. The Positive and Negative Syndrome Scale (PANSS) was used to determine the severity of the psychotic disorder, and the Childhood Trauma Questionnaire (CTQ) was used to evaluate the childhood trauma history. The study was carried out in accordance with the latest version of the Declaration of Helsinki and approved by the local Ethics Committee (approval number: 09.2016.466).

### 2.2. Experience sampling method (ESM)

The Experience Sampling Method (ESM) is a random time-sampling self-assessment technique that collects data through open-ended or closed-ended questions through repetitive notifications during the day with electronic devices (DeVries, 1992; Hektner et al., 2007; Myin-Germeys et al., 2009). Previous studies have demonstrated the feasibility, validity, and reliability of ESM in the general population and specific patient populations (Csikszentmihalyi and Larson, 1987; Myin-Germeys et al., 2009).

The ESM used in our study was adapted from previous ESM studies in psychotic patients. The application of the ESM was implemented using a mobile phone. Participants received notifications randomly with average intervals of 90 min, between 07:00–23:00 or 08:00–00:00, depending on the person's sleep-wake cycle, for six consecutive days, ten times a day, and they were expected to answer research questions within 15 min. All reports that were completed later than 15 min after the notification and subjects with fewer than 20 valid reports were excluded from the analyses (Delespaul, 1995; Lardinois et al., 2011; Myin-Germeys et al., 2001; Palmier-Claus et al., 2012). One of the difficulties encountered was that some patients volunteered for the research but could not use mobile phones. A booklet was prepared for these participants. The A5-sized booklet was used to collect data from four participants; two of them were included in the study. The items were prepared by the research team.

Three interviews with participants were planned during the ESM protocol. In the first session, the method was explained to participants, and the application for ESM was downloaded onto their smartphones. They were requested to practice it in the same session to ensure they understood the method. The day after the first interview, ESM data collection began. The second interview was scheduled on the third day to overcome potential problems and increase patient compliance. At the end of the six-day ESM period, a third interview was conducted to obtain information about the process and complete final assessments.

#### 2.2.1. Assessment of daily activities and events

At each notification, subjects were asked to report the activity with the question "what are you doing now?" and the event with the question "what was the most significant event that happened since the last notification?".

Activities and events were coded under five categories: routine, recreation, task-oriented actions, social interactions, and internal experiences. "Recreation" includes things people actively participate in, such as hobbies, worship, music, games, and planned actions. "Task-oriented actions" indicate daily competencies such as housework, shopping, job-related efforts, specific plans, and tasks. "Social interactions" are interpersonal experiences such as conflicts, conversations with other people, and other gatherings. Passive participation in daily life, such as eating, watching TV, sleeping, and self-care, was defined as "routine." "Internal experiences" include expressions of emotional states, thoughts, and bodily sensations such as pain or nausea.

Participants were asked to evaluate the activity-stress with two

questions rated on a 7-point Likert scale: "How would you evaluate this activity?" (1 = "I do it completely unwillingly," 7 = "I do it completely willingly"), and "How does this activity affect you?" (1 = very negative, 4 = neutral, 7 = very positive). Additionally, they were asked to evaluate the event-stress with the answer to the question: "How would you evaluate this event?" (1 = very negative, 4 = neutral, 7 = very positive). Responses were re-coded to allow high scores to reflect stress.

### 2.2.2. Assessment of emotions

Mood states were assessed with seven items rated for intensity on 7-point Likert scales (1 = none, 7 = very). The items "scared," "guilty," "angry," and "anxious" formed negative affect (NA), and the items "happy," "relaxed," and "strong" formed positive affect (PA). Mood items were selected from previous ESM studies and the Turkish version of the Positive and Negative Affect Schedule (PANAS) (Gencoz, 2000; Watson et al., 1988). The mean of NA and PA were re-scored separately. A high level of internal consistency was determined in the reliability analysis (Cronbach's alpha NA = 0.86, PA = 0.91).

### 2.2.3. Assessment of psychotic experiences

Psychotic experiences were assessed with five items rated for intensity on 7-point Likert scales (1 = none, 7 = very intense): "I hear voices that others do not hear," "I see images that others do not see," "I am suspicious," "My thoughts are controlled and influenced by others," "I feel uncomfortable and threatened by the looks and behaviors of those around me." These expressions represent auditory hallucination, visual hallucination, delusions of reference, delusions of control, and delusions of persecution, respectively (Cronbach's alpha = 0.87). The mean of these five items formed psychotic symptom intensity.

### 2.3. Assessment of childhood trauma

The Turkish version of the Childhood Trauma Questionnaire (CTQ) was used to evaluate adverse experiences before 20 years old, retrospectively and quantitatively (Bernstein et al., 2003; Şar et al., 2012). The scale consists of 28 questions rated in a 5-point Likert-type format and assesses five types of maltreatment: sexual, physical, emotional abuse, and emotional and physical neglect. The cut-off score based on the findings of studies was considered to be around 35 for the Turkish population. This limit is assumed to be 5 for physical and sexual abuse, 7 for emotional abuse and physical neglect, and 12 for emotional neglect (Şar et al., 2012).

### 2.4. Analysis of data

ESM data has a hierarchical structure, and multiple observations (level 1) are nested within-subjects (level 2). Multilevel linear modeling techniques are suggested to analyze ESM data as observations from the same subject are more similar than observations from different subjects. Therefore, the effect of the independent variables (trauma, stress, and their two-way interaction) on the dependent variables (negative affect, positive affect, and psychosis intensity) was analyzed using the multilevel random regression model with the "meflm" command in STATA 13.0. The impact of each CTQ subtype was examined separately for each dependent variable with multilevel regression analysis. Each significant model was tested using Bayesian information criterion (BIC) values. The differences in terms of dependent variables among the activity and event categories were examined in regression analysis at the patient level. Each category was re-coded as dummy coding. A new variable was created that has a value of one for each activity and event at that level and zero for all others. The statistical significance was interpreted, and coefficients were compared to each other. The level of statistical significance was accepted as  $p < 0.05$  for all tests.

## 3. Results

### 3.1. Subjects and descriptive statistics

Of the participants, 11 subjects who had fewer than 20 valid reports and five subjects with unreliable data (those who reported compliance problems in the last interview and had almost no variation in responses) were excluded. The final sample consisted of 41 patients. Of these, 2 (4.9%) were diagnosed with schizoaffective disorder, 1 (2.4%) with delusional disorder, and 38 (92.7%) with schizophrenia (Table 1). CTQ total scores did not differ with the variables of age, gender, education, and working status. The CTQ scores of the research sample are presented in Table 2. Each participant received a total of 60 notifications on six consecutive days by ESM. The average response rate to notifications was 71% (52% - 98%) and response numbers ranged 31–59 (mean (SD) = 42.63 (7.56)). No correlation was found between ESM data and age, sex, education year, working status, duration of illness, and time without treatment. The correlation between the two mood variables was moderately negative ( $r = -0.54$ ,  $p < 0.001$ ), and between the two stress measures was weakly positive ( $r = 0.35$ ,  $p < 0.001$ ).

### 3.2. Stress levels, emotional and psychotic symptom intensity related to specific kinds of activities and events

Differences in terms of NA, PA, psychotic intensity, and stress levels among the activity and event categories were compared separately for each activity and event with regression analysis at the patient level using dummy coding. Descriptions of activities and events that were non-specific and very small in number were not included in the comparisons.

The ranking of activity-stress was as follows: Internal experiences > Task-oriented actions > Routine > Recreation = Social interactions ( $\chi^2 = 267.19$ ,  $p < 0.001$ ). The ranking of event-stress was as follows: Internal experiences > Social interactions = Task-oriented actions > Routine > Recreation ( $\chi^2 = 141.98$ ,  $p < 0.001$ ).

Internal experiences (activities and events) were associated with the highest NA ( $\chi^2 = 17.21$ ,  $p < 0.01$ ) and the lowest PA ( $\chi^2 = 18.14$ ,  $p <$

**Table 1**  
Sociodemographic and clinical characteristics of the research sample.

	n = 41
Mean age (SD)	32.76 (8.79)
Sex, n (%)	
Female	7 (17.1%)
Male	34 (82.9%)
Education, n (%)	
Elementary school	2 (4.9%)
Secondary school	4 (9.8%)
High school	18 (43.9%)
University	15 (36.6%)
Postgraduate	2 (4.9%)
Working situation, n (%)	
Working	21 (51.2%)
Not working	17 (41.47%)
Other (student, retired)	3 (7.3%)
Marital situation, n (%)	
Never married	35 (85.4%)
Married	5 (12.2%)
Divorced	1 (2.4%)
Living situation, n (%)	
With parents/relatives	33 (80.5%)
With partner/family/children	5 (12.2%)
Alone	3 (7.3%)
Age of disease onset, mean (SD)	21.73 (6.16)
Duration of disease(year), mean (SD)	11.32 (8.08)
PANSS scores, mean (SD)	
Total	62.76 (11.27)
Positive	14.59 (4.39)
Negative	16.15 (5.3)
General psychopathology	32.02 (6.1)

PANSS: Positive and negative syndrome scale.

**Table 2**  
The Childhood Trauma Questionnaire (CTQ) scores of the research sample.

CTQ scores	Mean (SD)	n (%)
Total	41.17 (11.95)	26 (63.4%)
Sexual abuse	6.34 (2.54)	14 (34.1%)
Physical abuse	6.98 (3.11)	18 (43.9%)
Emotional abuse	8.76 (3.73)	22 (53.7%)
Physical neglect	7.9 (2.76)	19 (46.3%)
Emotional neglect	11.20 (4.33)	19 (46.3%)

0.01); however, social events were not statistically different from internal experiences (events) (NA:  $\chi^2 = 13.05$ ,  $p < 0.05$ ; PA:  $\chi^2 = 22.14$   $p < 0.001$ ). Higher PA scores were associated with social interactions, recreational, and routine activities ( $\chi^2 = 18.14$ ,  $p < 0.01$ ) as well as recreational and routine events ( $\chi^2 = 22.14$   $p < 0.001$ ).

Among activities, internal experiences were associated with higher psychosis intensity than others; besides, social activities were associated with lower psychosis intensity than routine activities ( $\chi^2 = 37.78$   $p < 0.001$ ).

### 3.3. The relationship between childhood trauma, stress levels, emotional and psychotic symptom intensity

Multilevel regression analyses in two-level measures (patient and day level) showed that CTQ scores had a significant impact on increased negative affect ( $\beta$  (SE) = 0.4 (0.10),  $z = 3.83$ ,  $p < 0.001$ ) and psychotic intensity ( $\beta$  (SE) = 0.46 (0.12),  $z = 3.86$ ,  $p < 0.001$ ) and decreased positive affect ( $\beta$  (SE) = -0.31 (0.09),  $z = -3.24$ ,  $p < 0.001$ ). A significant interaction effect was found between CTQ and stress scores on psychotic intensity (Table 3). PANSS scores were found to be associated with psychotic intensity ( $\beta$  (SE) = 0.35 (0.13),  $p = 0.009$ ). Results remained similar after adding age, sex, education, and PANSS scores to the model.

The impact of childhood trauma subtypes on NA, PA, psychosis intensity, and stress levels are presented in Table 4. CTQ total scores were associated with heightened activity-stress ( $\beta$  (SE) = 0.2 (0.1),  $z = 1.97$ ,  $p < 0.05$ ), and event-stress ( $\beta$  (SE) = 0.27 (0.08),  $z = 3.36$ ,  $p < 0.001$ ).

Stress levels related to each activity and event type in the low and high CTQ score groups were compared using multilevel univariate regression analysis at the patient level. High and low trauma groups in terms of overall scores and subtypes scores were coded with dummy codes (low group with 0 and high group with 1) and compared for each activity and event stress. Stress levels in social activities were found to be greater in the high CTQ group (Table 5). Furthermore, only the high level of sexual abuse group was found to have higher activity-stress in social activities among the trauma types ( $\beta = 0.75$ ,  $p < 0.05$ ).

## 4. Discussion

The present study, as the first experience sampling results of the Turkish population of psychotic patients, demonstrates that childhood trauma, particularly emotional maltreatment, is associated with increased stress levels, negative affect, psychotic symptom intensity, and decreased positive affect. It also highlights the negative impact of internal experiences and the positive impact of recreational actions on

stress, emotions, and psychotic intensity in the flow of daily life.

It has been suggested that increased emotional and behavioral responses to daily life experiences are an indicator of susceptibility to psychosis and also a possible mechanism in the relationship between childhood trauma and psychosis (Glaser et al., 2006; Myin-Germeys and van Os, 2007; Lardinois et al., 2011; McLaughlin et al., 2020). This study demonstrated that overall childhood trauma per se is associated with increased negative affect and stress reactions, along with a decrease in positive affect. In addition, it revealed the independent direct impact of trauma and stress as well as their synergistic effects on psychotic intensity. The current study replicates the finding of Lardinois et al. (2011) showing the predictive effect of the interaction of trauma with stress on psychotic symptoms but differs from it in that it indicates the independent effect of trauma on negative affect and psychosis. Similar to our findings, one general population study designed with retrospective scales showed that overall trauma had an impact both directly and via stress sensitivity indirectly on psychotic experiences (Rössler et al., 2016). These findings imply that trauma may have a direct impact on emotional and psychotic symptom intensity, not solely through the stress response. It thus highlights the previously demonstrated relationship between trauma and affective processes such as depression, anxiety, and emotional regulation difficulties (McLaughlin et al., 2020; Morgan and Gayer-Anderson, 2016), as well as the impact on the formation of psychotic symptoms with the mechanisms detailed below. Again, our results indicate that childhood trauma is associated with an increase in perceived stress, in contrast to the general population study of Glaser et al. (2006) showing no main effect of trauma on daily stress. Existing literature has indicated that life events are appraised as more stressful and are accompanied by more negative affect, both in psychotic patients and in individuals with childhood trauma. A general population study demonstrated that people with a history of childhood trauma were more vulnerable to mood and anxiety symptoms since they perceived later events as more distressful (McLaughlin et al., 2010). Similarly, it has been shown that schizophrenia patients evaluated events as less controllable and unmanageable, although they reported fewer life events than healthy controls (Horan et al., 2005).

HPA axis dysregulations and autonomic nervous system hyperreactivity have been proposed as underlying mechanisms of stress reactivity as they are the main stress regulation systems, and have been shown to be related to the impact of childhood trauma at the neurobiological level (De Bellis et al., 1994; Galvin et al., 1991; Heim et al., 2000; Myin-Germeys and van Os, 2007; Van Winkel et al., 2008; Walker et al., 2008; Walker and Diforio, 1997; Wied and Jansen, 2002). On the other hand, it has been suggested that psychotic experiences occur as a result of excessive dopamine release in the face of distress related to the underlying endogenous dopamine sensitivity in psychotic patients (Collip et al., 2008; Davis et al., 1991; Howes and Murray, 2014; Kapur, 2003; Myin-Germeys et al., 2005b; Pani et al., 2000; Van Winkel et al., 2008). Moreover, the synergistic interaction of abnormalities in the HPA axis and dopamine system has been associated with the development of psychotic symptoms (Brunelin et al., 2008; Davis et al., 1991; Mizrahi et al., 2012; Vuillermot et al., 2010; Walker et al., 2008; Walker and Diforio, 1997). Cognitive models also guide our understanding of the exacerbation of psychotic symptoms in relation to subjective distress and emotional fluctuations. Garety et al. (2001) proposed that psychotic

**Table 3**  
The multilevel regression model estimates the effect of CTQ, stress, and their interaction on negative affect, positive affect, and psychosis.

	Negative Affect			Positive Affect			Psychosis		
	$\beta$ (SE)	z	p	$\beta$ (SE)	z	p	$\beta$ (SE)	z	p
Activity-stress	0.05 (0.02)	2.8	<b>0.005</b>	-0.09 (0.02)	-5.16	<b>&lt;0.001</b>	0.08 (0.01)	5.56	<b>&lt;0.001</b>
Event-stress	0.18 (0.02)	11.65	<b>&lt;0.001</b>	-0.26 (0.02)	-16.50	<b>&lt;0.001</b>	0.08 (0.01)	5.72	<b>&lt;0.001</b>
CTQ*Activity-stress interaction	0.03 (0.02)	1.73	0.077	-0.01 (0.02)	-0.44	0.66	0.03 (0.02)	2.02	<b>0.04</b>
CTQ*Event-stress interaction	-0.02 (0.02)	-1.33	0.182	0.06 (0.02)	3.71	<b>&lt;0.001</b>	0.03 (0.01)	2.13	<b>0.03</b>
	$\chi^2 = 188.44$ $p < 0.001$			$\chi^2 = 361.53$ $p < 0.001$			$\chi^2 = 120.21$ $p < 0.001$		

**Table 4**  
The impact of CTQ subtype scores on affect, psychosis, and stress levels.

	Negative affect				Positive affect				Psychosis				Activity-stress				Event-stress			
	$\beta$ (SE)	z	p	BIC	$\beta$ (SE)	z	p	BIC	$\beta$ (SE)	z	p	BIC	$\beta$ (SE)	z	p	BIC	$\beta$ (SE)	z	p	BIC
Sexual abuse	0.16 (0.13)	1.27	0.21		-0.2 (0.13)	-1.61	0.11		0.22 (0.14)	1.55	0.12		0.12 (0.11)	1.17	0.24		0.07 (0.09)	0.73	0.47	
Physical abuse	0.42 (0.11)	3.73	<0.001	3013.984	-0.31 (0.12)	-2.56	0.01	3090.337	0.37 (0.13)	2.76	<0.01	2410.618	0.07 (0.11)	0.65	0.51		0.16 (0.09)	1.81	0.07	
Emotional abuse	0.41 (0.11)	3.66	<0.001	3013.867	-0.33 (0.12)	-2.76	<0.01	3089.431	0.37 (0.13)	2.86	<0.01	2410.162	0.21 (0.11)	2.07	<0.05	4075.462	0.22 (0.08)	2.66	<0.01	4374.6
Physical neglect	0.2 (0.12)	1.60	0.11		-0.18 (0.13)	-1.42	0.16		0.38 (0.13)	2.85	<0.01	2410.207	0.03 (0.11)	0.25	0.81		0.18 (0.09)	2.01	<0.05	4377.241
Emotional neglect	0.37 (0.11)	3.18	0.001	3016.408	-0.34 (0.12)	-2.83	<0.01	3089.124	0.42 (0.13)	3.25	0.001	2408.205	0.24 (0.10)	2.34	<0.05	4074.384	0.29 (0.09)	3.67	<0.001	4369.489

The impact of each CTQ subtype was examined separately for each dependent variable with multilevel regression analysis. A lower Bayesian information criterion (BIC) value indicates a better model.

**Table 5**

The comparison of stress levels related to each activity and event type between high and low CTQ groups.

	Activity-stress		Event-stress	
	High CTQ vs Low CTQ $\beta$ (SE)	p	High CTQ vs Low CTQ $\beta$ (SE)	p
Routine	0.31 (0.2)	0.12	0.34 (0.21)	0.10
Recreation	0.28 (0.22)	0.19	0.21 (0.22)	0.33
Task-oriented actions	0.44 (0.24)	0.069	0.21 (0.23)	0.91
Internal experiences	0.27 (0.67)	0.69	0.01 (0.3)	0.97
Social interactions	0.64 (0.29)	<0.05	0.25 (0.24)	0.30

symptoms emerge when a triggering stimulus leads to the mutual interaction of certain cognitive processes and emotional responses, resulting in an abnormal conscious experience. Furthermore, it has been indicated that childhood adversities create a cognitive vulnerability that contributes to the biased appraisal of experiences via maladaptive schemas about self and others, which are also characteristics of psychosis (Kuipers et al., 2006; Van Winkel et al., 2013; Read et al., 2005).

As stated above, our findings indicate a prominent link between the emotional maltreatment subtype and stress reactivity, even though it has been presumed that childhood adversities have general impacts on stress regulation (Morgan and Gayer-Anderson, 2016; Reininghaus et al., 2016). All trauma subtypes, except for sexual abuse, were associated with psychosis intensity and event-stress. In addition, both physical abuse and emotional maltreatment (abuse/neglect) were associated with higher negative affect and lower positive affect, with emotional maltreatment also linked to greater stress levels. The influence of all trauma types on event-stress and psychosis intensity is consistent with the literature showing the overall negative impact of childhood trauma on stress appraisal and psychotic symptoms (McLaughlin et al., 2010; Lopilato et al., 2019). On the other hand, it is noteworthy that our findings are similar to the limited number of studies on the association between childhood trauma and stress sensitivity, which supports the impact of emotional and physical maltreatment but not sexual abuse. An ESM study investigating the links between childhood trauma and stress sensitivity in young people demonstrated that stress sensitivity was modified by physical and emotional maltreatment (Rauschenberg et al., 2017). Again, the study by Rössler et al. (2016) showed that emotional abuse, emotional neglect, and physical neglect were associated with subclinical psychotic experiences triggered by stress sensitivity. Since emotional and physical abuse are more likely to be repetitive and pervasive, they might lead to long-term damage to a developing brain and particularly influence chronic emotional and cognitive processes (Dye, 2020; Heim et al., 2013; Cassiers et al., 2018). Emotional maltreatment has been linked to lower self-esteem, attachment impairments, externalizing bias, and difficulties in regulating negative feelings and physical sensations, which in turn may contribute to a reduced ability to cope with distress in psychotic patients (Ackner et al., 2013; Bentall et al., 2014; Carr et al., 2013; Van Winkel et al., 2013). The finding of this study that sexual abuse is not predictive of emotional and psychotic reactivity is surprising. This might be explained by its presumably lower frequency and less chronicity than other childhood subtypes. Nevertheless, the impact of trauma on psychosis seems to be related to the intensity, degree of threat, and persistence of trauma, but we were unable to assess these factors in this study. Another explanation for this finding could be that the majority of the participants in our sample were males. It has been indicated that the link between psychosis and sexual abuse was found to be quite significant in women but not in men, and that males less frequently show severe reactions to trauma in general (Bebbington et al., 2011; Fisher et al., 2009).

Both among activities and events, internal experiences were reported as more stressful by participants, and these were linked to higher negative affect and psychotic intensity in all comparisons. In view of biological models suggesting that stimulus-independent dopamine release related to hyperdopaminergic dysfunction in schizophrenia leads

to misinterpreting usual internal and external stimuli, resulting in the formation of delusions and hallucinations, and cognitive models such as jumping to conclusions and externalizing biases, this data draws attention to the subjective experiences of individuals (Howes and Murray, 2014; Kapur, 2003; Kuipers et al., 2006). Conversely, recreational actions were evaluated more positively and related to higher positive emotions, indicating a possible buffer effect on daily life stressors. These are the kinds of experiences in which one can determine their own personal space and feel competent. Active participation in daily life is thought to be related to the sense of autonomy and motivational processes, and thus promotes well-being in schizophrenia patients (Breitborde et al., 2012).

Social activities were found to be associated with higher positive affect and lower stress and psychosis intensity. However, social events experienced between the notifications were associated with relatively more negative affect and stress. These findings correspond with previous ESM research on social experience. Existing literature suggests that psychotic patients experience higher stress and prefer to be alone when they are with others but report more positive affect when they are with others than when alone (Mote and Fulford, 2020). This difference might be related to the fact that patients were asked to report significant events between notifications in the event assessment, but they were asked to record activities in the flow of daily life, regardless of their importance in the activity assessment. Therefore, memorable events could be associated with negative emotions and distress, whereas activities represent sociability and active involvement. Additionally, social activities were associated with greater stress in the high CTQ group, particularly in the high sexual abuse group. This finding is also remarkable as it seems in contradiction with our previous findings that sexual abuse was not associated with stress sensitivity. Nevertheless, it is also in line with an ESM study showing that sexual abuse was associated with increased sensitivity to only social stress in psychotic patients (Reininghaus et al., 2016). These results may indicate difficulties in social contexts in everyday life that could be related to the impact of negative cognitive beliefs about self and others, linked to traumatic experiences such as sexual abuse, that have substantial interpersonal consequences.

Several limitations should be kept in mind while interpreting the results of our study. Firstly, we have a relatively small sample size. Second, since ESM data collection needs the use of a mobile application, is time-consuming, and requires high cooperation, the possibility that patients with relatively higher functionality were included in our study should be considered. The study sample consisted of 82.9% males; thus, the results are more representative of men, and it may cause to overlook gender differences in variables. Third, the ESM is based on subjective data. Subjective appraisals of experiences may raise questions about the reliability of data. However, in our study, the correlation between the daily psychotic symptoms and the PANSS positive symptom scale ( $r = 0.535$ ,  $p < 0.0001$ ) but not with the PANSS negative symptoms scale, and the relatively minimal impairment in the insight (mean (SD) PANSS-G12 scores = 2.73 (1.3)) of the patients support reliability. Besides, we believe that conducting three interviews with each patient, close monitoring, and cooperation with caregivers may have improved patient compliance. Lastly, childhood trauma was evaluated by using the CTQ, a retrospective, self-report questionnaire. Recall bias, cognitive impairments, or psychotic symptomatology may raise concerns about reliability, but studies of the retrospective measures of childhood abuse in patient groups show that such reports are reliable (Fisher et al., 2011). In our study, the mean (SD) total CTQ score was 41.17 (11.95), similar to previous studies (38.3–41.5) in Turkish psychotic populations (Şar et al., 2012).

## Conclusions

This study indicates the everyday life impact of childhood maltreatment, particularly the emotional subtype, on emotional and psychotic symptomatology. In clinical practice, for patients with a

history of childhood trauma, the inclusion of treatment strategies to support trauma processing in addition to antipsychotic treatment can reduce subthreshold psychotic symptoms and daily stress. Moreover, assessing implicit and chronic adverse experiences such as emotional maltreatment may be more crucial than asking only about certain incidents. Additionally, close monitoring of patients' daily experiences or activities they engage in may give an idea about the fluctuation in their psychotic interpretation and provide an opportunity for personal intervention at the appropriate time, taking into account their specific characteristics and traumatic burden. For a better understanding of the impact of childhood trauma on psychosis, we suggest researchers evaluate the quality of life and functionality of patients along with symptom intensity using ESM with larger samples over longer assessment periods.

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## CRediT authorship contribution statement

**Gonca Dokuz:** Conceptualization, Methodology, Investigation, Writing – original draft, Data curation. **Ayşe Sakallı Kani:** Writing – original draft, Writing – review & editing. **Ömer Uysal:** Methodology, Formal analysis. **Mehmet Kemal Kuşçu:** Conceptualization, Methodology, Investigation, Writing – review & editing, Supervision, Project administration.

## Declaration of Competing Interest

The authors declare that they have no conflicts of interest.

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