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The role of attachment anxiety in the relationship between childhood trauma and schizophrenia-spectrum psychosis

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ABSTRACT

Childhood trauma (CT) is a comprehensive concept encompassing experiences of sexual, physical, and emotional abuse, and neglect during childhood and adolescence. Patients with schizophrenia-spectrum psychosis (SSP) display higher rates of CT than healthy controls. Among the potential mediators of this association, insecure attachment has gained attention and empirical validation. The present study aimed to extend existing knowledge on this field by exploring the role of the two attachment dimensions, attachment anxiety and attachment avoidance, in the CT-SSP association. A clinical sample of 63 SSP inpatients was compared to a healthy control group on CT and attachment style measures. Correlations between CT, attachment dimensions and psychopathology were sought. Mediation analyses were also performed to examine whether attachment anxiety and/or attachment avoidance mediated the CT-SSP association. Patients displayed higher rates of CT and insecure attachment than controls. Attachment anxiety and severity of Mother Antipathy were linked to severity of hallucinations. Attachment anxiety was recognized as the sole mediator of the CT-SSP association. Our findings suggest that individuals with severe CT and increased attachment anxiety represent a risk population warranting early clinical attention, regular monitoring and tailored therapeutic interventions aimed at reducing the psychological impact of trauma.

1. Introduction

Schizophrenia is a heterogeneous, multifaceted syndrome with an intricate and still obscure etiology (van Os et al., 2010). Although high heritability estimates suggest a strong genetic influence, the role of the environment in the expression of this genetic liability is considered crucial (van Winkel et al., 2008). Among the social environmental factors that have been implicated as instigators of psychosis, CT holds a prominent position (van Winkel et al., 2013). CT is a broad and comprehensive concept referring to experiences of sexual, physical, and emotional abuse, and neglect during childhood and adolescence (Leeb et al., 2008).

1.1. Childhood trauma and psychosis

A growing body of recent research and meta-analytical data indicate a strong impact of CT on the emergence of clinical psychosis and subclinical psychotic experiences (Rössler et al., 2016; Bonoldi et al., 2013; Varese et al., 2012). Schizophrenia patients exhibit higher rates of childhood adversity compared to healthy controls (Matheson et al., 2013). Exposure to CT conveys a threefold increased risk of psychosis (Varese et al., 2012) and has been linked with the development of specific psychotic symptoms, primarily hallucinations and delusions (Bailey et al., 2018). The relationship between CT and psychosis cannot be better explained by reverse causation (Kelleher et al., 2013); remains strong after controlling for genetic risk (Alemany et al., 2013; Husted et al., 2010); and displays dose-response characteristics (Shevlin et al., 2008). Multiple pathways have been proposed as the substrate of this association (Bentall et al., 2014). Among the suggested psychological factors, insecure attachment has gained attention and empirical validation as a potential mediator (Pilton et al., 2016; Sheinbaum et al., 2015a, 2014; Sitko et al., 2014; van Dam et al., 2014). Research has also recognized neurobiological underpinnings for the negative impact of CT and insecure attachment on psychosis (Popovic et al., 2019; Debbané et al., 2016).

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1.2. Attachment theory

Attachment theory is a developmental model which applies an ethological approach to the understanding of human psychological functioning. According to this theoretical formulation, the early interactions of infants with their primary caregivers serve an inborn homeostatic mechanism which aims at seeking and maintaining proximity to supportive figures (Bowlby, 1982/1969, 1980, 1973) to ensure protection from physical or psychological threats and increase the chances of survival (Bowlby, 1982/1969). These early relational experiences lay the basis for the formation of Bowlby's internal working models of self and others (Bowlby, 1982/1969, 1973), a set of emotional, cognitive and behavioral schemas through which children learn to view themselves and other people (Shaver et al., 1996).

Children, whose proximity-seeking behaviors are met by responsive parents, develop a sense of attachment security which helps them thrive emotionally, develop confidence in their own abilities and achieve their goals (Mikulincer et al., 2003). On the contrary, children who interact with unresponsive parents form insecure relational bonds which are governed by negative representations about themselves and others (Mikulincer et al., 2003), leading to emotion regulation difficulties.

Internal working models remain active during the entire life course and are further crystallized in attachment styles, that is, systematic patterns of relational appraisals and expectations, detectable both in childhood (Ainsworth et al., 1978) and in adulthood (Hazan and Shaver, 1987). Research has shown that an individual's attachment style can be best defined through the exploration of two relational dimensions: attachment anxiety and attachment avoidance (Brennan et al., 1998). Attachment anxiety reflects the internal working models of the self and encompasses a strong desire for closeness and intimacy, a need for protection, elevated fears of abandonment or rejection, and profound worries about the availability of significant others, which trigger the use of hyperactivating strategies (i.e. very energetic, insistent attempts to attain proximity, support and love through clinging and controlling behaviors) for regulating suffering and distress (Mikulincer and Shaver, 2007). Attachment avoidance reflects one's inner representations about others and refers to discomfort with closeness and intimacy, inclination for emotional distance, reluctance for self-disclosure and a strong need for self-reliance, which lead to the employment of deactivating strategies (i.e. inhibition of seeking support and efforts to handle distress alone) in order to manage suffering and distress (Mikulincer and Shaver, 2007). These two attachment dimensions, if treated as dichotomized variables (high-low anxiety, high-low avoidance), can be combined to produce four adult attachment styles: secure (low anxiety-low avoidance), preoccupied (high anxiety-low avoidance), dismissing (low anxiety-high avoidance), and fearful (high anxiety-high avoidance) (Bartholomew and Horowitz, 1991).

1.2.1. Attachment and childhood trauma

CT may be regarded as an extreme form of inappropriate parenting. Neglected and abused infants display a significantly higher rate of insecure attachment, primarily a disorganized pattern characterized by the total absence of stable, organized strategies for regulating stress (Morton and Browne, 1998; Carlson et al., 1989). Disorganized infants alternate between or simultaneously display high levels of attachment anxiety and attachment avoidance. Their behavior involves confused approach and withdrawal strategies towards the attachment figure. Lowell et al. (2014) showed that attachment style and CT function as important predictors of negative emotional and behavioral outcomes later in life, as manifested in increased occurrence of internalizing and externalizing adult symptomatology.

1.2.2. Attachment and psychosis

Compared to non-clinical samples, psychotic patients display a clear predominance of insecure attachment patterns, mainly fearful (described as disorganized in infancy) and dismissing-avoidant attachment (Carr et al., 2018). Insecure attachment has been linked to unfavorable clinical and functional outcomes (Korver-Nieberg et al., 2014; Gumley et al., 2014a). Research shows that the negative impact of insecure attachment on the clinical parameters of psychosis can be already detected in the early stages of the disease, both in ultra high-risk populations and in patients who have suffered their first psychotic episode (Korver-Nieberg et al., 2013; Gajwani et al., 2013).

1.2.3. Insecure attachment mediation of the CT-psychosis association

Although still sparse, there is recent literature examining the potential mediating role of the two attachment dimensions or the four attachment prototypes in the relationship between CT and clinical or subclinical psychosis. Only a few of these studies explore clinical samples with schizophrenia-spectrum psychosis (SSP) (Pearce et al., 2017; Pilton et al., 2016; van Dam et al., 2014), while the rest focus on non-institutionalized (Sitko et al., 2014) or non-clinical participants (Goodall et al., 2015; Sheinbaum et al., 2015a, 2014).

In SSP samples, mediation analyses have identified attachment anxiety as a partial mediator of the relationship between CT and negative psychotic symptoms (van Dam et al., 2014), and also, as a mediator of the association between childhood emotional abuse, sexual abuse, physical neglect and severity of voice-hearing (Pilton et al., 2016). Pearce et al. (2017) failed to detect an attachment-related mediation between CT and auditory hallucinations, recognizing instead a mediation of fearful attachment between CT and paranoia.

In non-clinical samples, both attachment dimensions and certain attachment styles have been recognized as mediators of the relationship between specific CT subtypes and schizotypy, a precursor of clinical psychosis. More specifically, both dimensions, especially attachment anxiety, have been shown to mediate the association between emotional abuse and schizotypy (Goodall et al., 2015). Regarding attachment styles, fearful attachment has been identified as a mediator between physical and emotional CT and subclinical psychotic symptoms, paranoia and schizotypy (Sheinbaum et al., 2014); angry-dismissive attachment (increased hostility-high avoidance-low anxiety) as a mediator between parental antipathy and subclinical positive symptoms, paranoid and schizotypal personality traits (Sheinbaum et al., 2015a); and enmeshed attachment (high anxiety-low avoidance) as a mediator between role reversal, parental antipathy and paranoid and schizotypal personality traits (Sheinbaum et al., 2015a).

In healthy siblings of SSP patients, a stronger mediation effect was found compared to the clinical group, as both attachment dimensions mediated the association between CT and psychotic-like experiences (van Dam et al., 2014). A large psychiatric survey in non-institutionalized persons has also documented a mediation of both dimensions in the relationship between childhood neglect and paranoid beliefs (Sitko et al., 2014).

1.3. Objectives

The present study aims to extend existing knowledge suggesting strong associations between CT, insecure attachment style and psychosis by:

- Comparing a clinical sample of SSP patients to a healthy control group on measures of CT and adult attachment style.
- Seeking correlations between CT, attachment dimensions and psychotic symptoms within the SSP group.
- Examining the contribution of the two attachment dimensions in the mediation of the CT-SSP association.

The following three hypotheses will be tested:

1 We expect higher levels of CT in SSP patients compared to healthy controls.
2 We expect elevated levels of insecure attachment in patients

compared to controls.

3 We expect attachment anxiety and/or attachment avoidance to mediate the CT-SSP relationship.

1.3.1. Objectives' rationale

CT disrupts the person's ability to form secure relational bonds, leading to insecure attachment patterns, characterized by increased attachment anxiety and/or avoidance.

Attachment anxiety involves the employment of hyperactivating strategies to deal with interpersonal distress. These strategies result in heightened sensitivity to stress, hypervigilance, increased anticipation and detection of threat, amplified ascription of malevolence, preferential recall of negative interpersonal events, reduced Theory of Mind (ToM) capacity, emotional dysregulation and negative affectivity (Dykas and Cassidy, 2011; Bentall and Fernyhough, 2008). Processed through these cognitive and emotional schemata, social information may be distorted and given false meaning, potentially fueling further misperceptions and misattributions of internal and external events. Compromised information processing, ToM impairment, hostile attributional biases and negative affect may hinder proper source monitoring and reality testing (Bentall et al., 2014), thus rendering the individual vulnerable to the development of positive psychotic symptoms (Carr et al., 2018).

Attachment avoidance involves the employment of deactivating strategies to manage interpersonal distress. These strategies result in an affective and cognitive shutdown, marked by relational disengagement, emotional inhibition, suppression of distressful memories, impaired mentalization capacity, reduced attention to negative stimuli and novel information (MacBeth et al., 2011; Mikulincer et al., 2003). Negative models of others, social withdrawal, anhedonia and emotional isolation, inattention to relational cues and reduced ToM capacity may introduce cognitive biases and cause erroneous appraisals regarding interpersonal events. Subsequent impaired reality testing may lay the ground for the development of positive psychotic symptoms, especially paranoia, and further compromise one's social functioning, thus reinforcing the disengagement pattern (negative psychotic symptomatology) (Korver-Nieberg et al., 2014).

Taking into account that the aforementioned affective, cognitive and metacognitive sequelae of attachment anxiety and attachment avoidance have been also identified as key factors involved in the development of SSP (Green et al., 2015; Horan et al., 2008; Kinderman et al., 2003; Brébion et al., 2002), we propose that CT-induced attachment anxiety and/or avoidance may mediate the CT-SSP relationship.

2. Methods

2.1. Participants

We recruited 63 inpatients with SSP (SSP; 44 men, 19 women) and 61 age- and gender-matched healthy controls (HC; 43 men, 18 women). Patients were recruited from the Second Department of Psychiatry, Aristotle University of Thessaloniki, while healthy controls were recruited by word of mouth from the community, mostly from the same catchment area as the patients. The study was approved by the Aristotle University Ethics Committee and all participants provided informed consent.

The following exclusion criteria were set: inadequate comprehension of the Greek language, age above 65, mental retardation, neurocognitive or neurodevelopmental disorder, general medical condition with potential effects on cognitive performance, diagnosis of a current substance-related disorder. Additionally, in the patient group, those who were diagnosed with Substance-Induced Psychotic Disorder or Psychotic Disorder Due to a General Medical Condition were considered ineligible for the study.

All patients met DSM-IV criteria for Schizophrenia and other Psychotic Disorders (American Psychiatric Association, 1994). The diagnosis of SSP in the patient group was initially based on chart review. Diagnosis was confirmed with the use of the Greek version (translation and adaptation into Greek by S. Beratis) of the Mini-International Neuropsychiatric Interview 5.0.0. (M.I.N.I.) (Lecrubier et al., 1997; Sheehan et al., 1997). M.I.N.I. was also used to establish the absence of mental illness in the control group. According to the DSM-IV classification, the SSP group consisted of 33 patients with Schizophrenia, 8 with Delusional Disorder, 6 with Schizoaffective Disorder, 3 with Brief Psychotic Disorder, 13 with Psychotic Disorder Not Otherwise Specified. Patients were assessed after clinical stabilization (T_1). At the time of assessment, all patients received antipsychotic medication. In the patient group, CT and adult attachment style were assessed at T_1. CT was also measured at T_2 (T_2 = outpatient status, three months after initial testing).

2.2. Measures

2.2.1. Childhood adverse experiences

CT was assessed with the Childhood Experience of Care and Abuse Questionnaire (CECA.Q), a self-report measure designed to elicit information about adverse events during childhood and adolescence (Bifulco et al., 2005). The questionnaire extracts the following scales: Mother/Father Antipathy (i.e. hostile, cold, rejecting, scapegoating behaviors towards the child), Mother/Father Neglect (i.e. disinterest in child's material care, health, schoolwork, friendships), Physical Abuse by parent (screening), Severity of Physical Abuse by Mother/Father, Sexual Abuse (screening), Severity of Sexual Abuse (first abuse). Cut-off scores indicating severe abuse and neglect are provided. An index of total CT severity was also calculated by summing the number of different CT types affecting the individual. CECA.Q displays satisfactory internal consistency (Smith et al., 2002); test-retest reliability in high-risk for depression (Bifulco et al., 2005) and psychotic samples (Fisher et al., 2011); high concurrent validity with existing measures (Fisher et al., 2011). Forward and backward translation was used to provide a conceptually and linguistically equivalent Greek version of the original English version. Author consent was obtained to use CECA.Q in our research.

2.2.2. Adult attachment style

The Experiences in Close Relationships-Revised Questionnaire (ECR-R) was used to assess adult attachment style. ECR-R is a self-report measure that explores the two principal attachment dimensions in emotionally intimate relationships: avoidance and anxiety (Fraley et al., 2000). By averaging the person's responses to each dimension, ECR-R extracts two rating scales: Attachment Avoidance and Attachment Anxiety. High scores in each of these two scales are indicative of insecure attachment. ECR-R displays good factor structure, temporal stability, convergent and discriminant validity (Sibley et al., 2005). For the purposes of this study, we used the validated Greek version of ECR-R which shows good psychometric properties (Tsagarakis et al., 2007).

The two attachment dimensions measured by ECR-R were dichotomized in order to create the four-category model of attachment. Following the method used by van Dam et al. (2014), the 80th percentile of the Anxiety and Avoidance scores for the control subjects was chosen as the appropriate cut-off point. According to this definition, subjects with Anxiety ratings equal to or greater than 2.77 were appointed to the high anxiety group and subjects with Avoidance ratings equal to or greater than 3.61 to the high avoidance group.

2.2.3. Psychopathological assessment

In the patient group, symptom severity was measured with the Greek version (Lykouras et al., 1997) of the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987). The assessment was conducted with the use of the Greek version of the Structured Clinical Interview for the PANSS (SCI-PANSS) (Lykouras et al., 1997). Based on a

Greek validation study (Lykouras et al., 2000), we applied the five-factor model to extract positive (PF), negative (NF), excitement (EF), depression (DF) and cognitive factor (CF) scores. The five factorial scores, along with PANSS P3 item as an index of hallucinations, were used in the correlation analyses. PANSS P3 item was included because CT has been primarily associated with severity of hallucinations in psychosis. All interviews were conducted and rated by an expert rater (the first author).

2.3. Statistical analyses

Statistical analyses were performed using SPSS version 22.0. software package for Windows. Kolmogorov-Smirnov test was used to check for normality, and variables were also examined for skewness and kurtosis. As the variables of interest were not normally distributed, non-parametric tests were performed. Chi-squared analysis was employed to assess whether SSP inpatients reported higher rates of CT and insecure attachment styles compared to HCs. Odds ratios were also calculated. To examine the frequencies of particular CT types, the scales of CECA.Q were transformed into dichotomous variables on the basis of cut-off scores provided by Bifulco et al. (2005). Mann-Whitney U tests sought differences in the two attachment dimensions between SSP inpatients and HCs; and differences in psychopathology between inpatients with and without CT. Spearman's correlations sought associations between CT severity, attachment dimensions and psychopathology. Mediation analyses were performed to explore if the two attachment dimensions mediated the CT-SSP association. A parallel multiple mediator model was tested with PROCESS, a conditional process modeling program, using Hayes's ordinary least squares regression-based path analysis (Hayes, 2013). Mediation analyses were conducted by using the PROCESS macro for SPSS with bootstrapping of 5000 samples. Education was found to negatively correlate with both attachment dimensions and was included as a covariate in mediation analyses.

3. Results

3.1. Reliability of the Greek version of CECA.Q

The internal consistency and temporal stability of the Greek version of CECA.Q were examined to validate its psychometric reliability. Cronbach's alpha was used in order to assess the internal consistency of the Antipathy and Neglect scales. Both ratings displayed high reliabilities: Cronbach's alpha = 0.91 for Antipathy and 0.87 for Neglect. To explore the temporal stability of the scores in the patient group, CECA.Q was administered on two separate occasions: T_1 = initial testing and T_2 = 3 months after initial testing. Test-retest reliability was assessed with Spearman's correlation coefficient (r_s) and showed high levels of agreement for all trauma scores, as presented in Table 1. Test-retest reliability was not examined in the control group.

Table 1
Test-retest reliability of CECA.Q in the patient group. Spearman's correlations between CECA.Q measures at T_1 (patient status-initial testing) and T_2 (outpatient status-three months after initial testing).

CECA-Q scales	r_s	p
Mother Antipathy	.719	.000*
Father Antipathy	.853	.000*
Mother Neglect	.655	.000*
Father Neglect	.713	.000*
Mother Physical Abuse (severity)	.904	.000*
Father Physical Abuse (severity)	.956	.000*
Sexual Abuse (screening)	.915	.000*
Sexual Abuse (severity)	.860	.000*

* $p < .05$.

3.2. Main analysis

For the main analysis we used the scores obtained at T_1.

3.2.1. Baseline demographics

While there were no differences between patients and healthy controls regarding age and gender, the two groups differed in the education level, as shown in Table 2. Psychotic patients had a lower level of education than healthy controls.

3.2.2. Hypothesis 1

Compared to controls, SSP patients displayed significantly higher rates for all CT types; these results are presented in Table 3. The case-control comparison revealed that patients were 11.6 times more likely to have been exposed to CT than controls, as shown in Table 3.

3.2.2.1. Associations between CT and psychopathology within the SSP group. P3 (hallucinations) score was the only psychopathology index differentiating the two SSP subgroups, those with and those without a history of CT. Compared to SSP patients without CT, those with CT displayed higher P3 scores. Psychopathology comparisons between specific CT types, identified differences only in regard to Mother Antipathy and Mother Neglect. SSP patients with Mother Antipathy or Mother Neglect displayed more hallucinations than those without a history of the aforementioned CT types. These results are presented in Supplement Table 1.

Regarding the impact of CT type severity, solely the severity of Mother Antipathy was associated with psychotic symptomatology, more specifically with hallucinations, as presented in Supplement Table 2.

3.2.3. Hypothesis 2

Compared to HCs, SSP patients displayed significantly higher rates of preoccupied and fearful attachment; these results are presented in Table 4. The OR calculation revealed that patients were 14 times more likely to have an insecure attachment style than controls, as shown in Table 4. Concerning the two attachment dimensions, marked differences were found between patients and controls, as patients displayed higher levels of attachment anxiety and attachment avoidance; these results are shown in Table 5.

3.2.3.1. Associations of attachment dimensions with psychopathology in the SSP group. As presented in Supplement Table 3, solely Attachment Anxiety was correlated with psychopathology, more specifically with P3 (hallucinations) score.

3.2.4. Hypothesis 3

CT was entered as the independent dichotomous variable and both attachment dimensions, anxiety and avoidance, were entered as possible mediators. The outcome variable, SSP, was also categorical and dichotomous. According to our data, only attachment anxiety was found to mediate the relationship between CT and SSP. The parallel mediation model did not reveal a statistically significant mediating role for attachment avoidance. The total, direct and indirect effects are shown in Fig. 1.

4. Discussion

4.1. Rates of childhood trauma in the healthy control group

The rates of childhood physical (CPA: 9.8%) and sexual abuse (CSA: 1.6%) in the healthy control group lay within the ranges reported for high and high-middle-income countries in a WHO World Mental Health Survey carried out by Kessler et al. (2010) (CPA: 5.3–10.8%; CSA: 0.6–2.4%). Studies of children and adolescent populations tend to report higher rates of abuse and neglect (Nikolaidis et al., 2018). This

Table 2
Baseline demographics and clinical characteristics.

Characteristics	Patients (n = 63)	Controls (n = 61)	Test	p
Gender (% male)	69.84	70.49	χ^2 = .006	.937
Age (Mean; SD)	40.44 (10.003)	39.33 (9.621)	t = - .633	.528
Level of education in years (Mean; SD)	11.13 (3.270)	15.90 (2.838)	t = 8.671	.000*
Age of SSP onset	29.65 (9.09)			
Duration of illness (months)	130.14 (121.11)			
Chlorpromazine equivalent dose mg/d (Mean; SD)	1024.1 (669.8)			
PANSS total score	89.84 (16.88)			

* $p < .05$.

Table 3
Rates of presence of CT in SSP patients and healthy controls (HCs). Between group comparisons.

Childhood trauma	SSP (n = 63) N	%	HCs (n = 61) n	%	Between group comparisons χ^2	p	ORs (95% CI)
Total[a]	42	66.7	9	14.8	34.5	.000*	11.55 (4.79–27.87)
Mother Antipathy	15	23.8	0	0	16.5	.000*	
Mother Neglect	11	17.5	0	0	11.7	.001*	
Father Antipathy	18	28.6	3	4.9	12.3	.000*	7.73 (2.14–27.89)
Father Neglect	11	17.5	1	1.6	8.9	.003*	12.69 (1.58–101.65)
Physical Abuse	25	39.7	6	9.8	14.7	.000*	
Mother Physical Abuse	14	22.2	3	4.9	7.8	.005	5.52 (1.50–20.34)
Father Physical Abuse	14	22.2	5	8.2	4.7	.030	3.20 (1.07–9.52)
Sexual Abuse	13	20.6	1	1.6	11.2	.001*	15.60 (1.97–123.42)

Bonferroni correction: *$p < .05/10 = .005$.
[a] Total number of subjects that reported at least one type of childhood trauma.
ORs for mother antipathy and neglect were not calculated because there were no such cases in the control group.

may be due to differences in the way CT is measured or to latent intrusion of fallacies in the retrospective assessment of CT in adults, such as failures of autobiographical memory (Piolino et al., 2002) and desirability biases (Rosenbaum and Langhinrichsen-Rohling, 2006).

4.2. Childhood trauma and increased risk for psychosis

Our data corroborate previous results in CT and SSP literature, showing a marked predominance of CT in the patient group (Matheson et al., 2013). Our observed rates of childhood physical (CPA) and sexual abuse (CSA) approximate those stated in a recent meta-analysis by Bonoldi et al. (2013) (CPA: 39.7% vs 39%; CSA: 20.6% vs 26%). We report a slightly lower CSA rate, possibly due to the preponderance of male gender in our sample, as it has been shown that studies with higher proportions of females detect higher CSA rates (Bonoldi et al., 2013). The effect size of the CT-SSP association was large; the OR lying in the high end of the value range reported in two recent meta-analyses (Matheson et al., 2013; Varese et al., 2012), nearly identical to the one reported by Janssen et al. (2004). Compared to most other case-control studies, we have detected a higher OR, which may be partly due to the composition of our patient group. In Greece, the private mental health sector is overdeveloped, thus absorbing a significant part of the socioeconomically privileged and less disabled patients, whereas the public sector is disproportionately burdened with involuntary admissions and more deprived patients. Consequently, our inpatient pool consists of individuals with severe symptoms, low socioeconomic status and inadequate supportive systems, probably reflecting poor family ties and experiences of childhood neglect and abuse. Due to the cross-sectional and retrospective design of our study, we cannot infer causality between the examined variables. However, this strong CT-SSP association confirms our first hypothesis and gives our suggested CT-SSP pathway the benefit of the doubt.

Table 5
Differences in the two attachment dimensions between patients with psychosis and healthy controls (Mann–Whitney U test).

Variable	Patients Median	Range	Controls Median	Range	U	P	r
Attachment Avoidance	3.22	4.6	2.33	5.2	1183.0	.000*	.332
Attachment Anxiety	3.88	5.3	2.17	3.9	462.5	.000*	.655

* $p < .05$.

4.3. Psychosis is associated with increased rates of insecure attachment

The presence of high attachment anxiety and avoidance in our SSP group confirms previous research data which indicate elevated rates of

Table 4
Rates of attachment style in SSP patients and healthy controls (HCs). Between group comparisons.

Attachment style	SSP (n = 63) N	%	HCs (n = 61) n	%	Between group comparisons χ^2	p	ORs (95% CI)
Total[a]	55	87.3	20	32.8	38.5	.000*	14.09 (5.65–35.16)
Low anxiety-Low avoidance (Secure)	8	12.7	41	67.2	38.5	.000*	0.07 (0.03–0.18)
High anxiety-Low avoidance (Preoccupied)	30	47.6	7	11.5	19.3	.000*	7.01 (2.77–17.77)
Low anxiety-High avoidance (Dismissing)	3	4.8	8	13.1	2.7	.102	0.33 (0.08–1.31)
High anxiety-High avoidance (Fearful)	22	34.9	5	8.2	13.0	.000*	6.01 (2.10–17.20)

Bonferroni correction: *$p < .05/5 = .01$.
[a] Total number of subjects that reported an insecure attachment style.

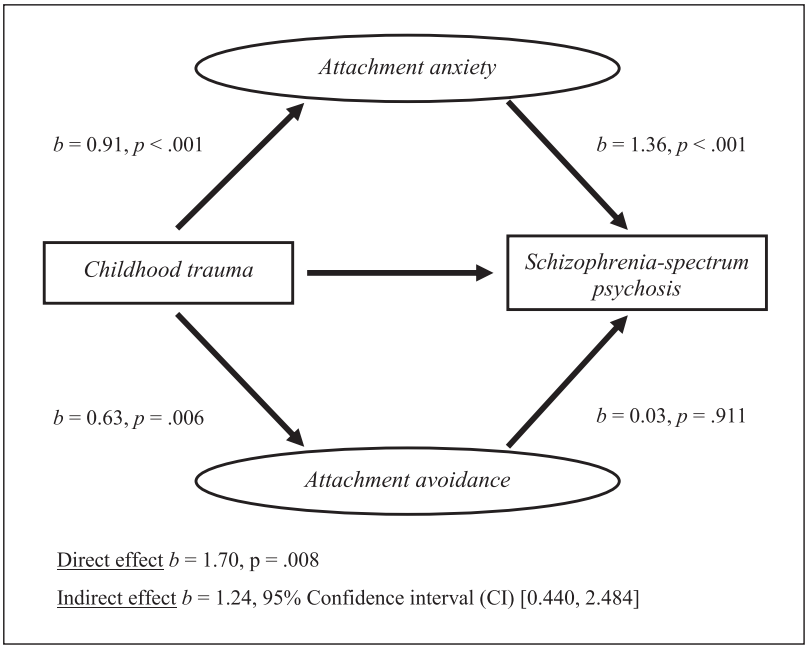

Fig. 1. Diagrammatic representation showing the mediating role of attachment anxiety versus attachment avoidance in the relationship between CT and SSP.

insecure attachment along the psychosis continuum (Harder et al., 2014). The computed OR lay within, although in the high end of, the value range reported in related literature (Ponizovsky et al., 2007). We identified preoccupied attachment as the prevalent pattern in our clinical sample; a pattern typical of internalizing disorders which emerge when individuals try to exercise excessive control over their emotional and cognitive state (Dozier et al., 2008). Preoccupied attachment has been found to mediate the association between parental antipathy and paranoid or schizotypal personality traits in a non-clinical sample of young adults assessed by interview measures (Sheinbaum et al., 2015a); and has been also associated with high levels of psychotic and affective symptoms in schizophrenia outpatients (Ponizovsky et al., 2013). Our study has also detected high levels of fearful and quite low levels of dismissing attachment. These findings stand in partial contrast to a recent meta-analysis by Carr et al. (2018) which singled out fearful attachment as the predominant attachment pattern in psychosis (followed by dismissing attachment), and indicated low frequency for the preoccupied pattern. The reversed position of the preoccupied attachment style in our study, compared to prior research, may be due to the composition of our clinical sample which consisted mainly of chronic patients, whereas many earlier studies focused on first-episode patients (Gumley et al., 2014b; MacBeth et al., 2011); a differentiation possibly indicating an interesting interplay between attachment style and stage of illness. Preoccupied and fearful attachment were identified as the primary attachment patterns in our SSP sample; two patterns sharing high levels of attachment anxiety, but differing in attachment avoidance. Based on this and given the inpatient status of our sample and the inability to ascertain the temporal sequence of events, we may either assume that attachment anxiety exerts a stronger pull towards SSP expression than attachment avoidance, or that the active disease state rather favors a hyperactivation than a deactivation of the attachment system.

4.4. Childhood trauma, attachment dimensions and psychotic symptomatology

Our findings suggest that CT exerts a specific effect on the positive psychotic load of SSP patients by increasing the severity of hallucinations. This stands in accordance with the results of a recent meta-analysis by Bailey et al. (2018) linking CT primarily to hallucinations and delusions and not negative psychotic symptoms. Bailey's study also revealed that the association between CT and hallucinations was more consistent than the one between CT and delusions. Among CT types, harmful maternal behaviors, mainly maternal antipathy, had the strongest impact on the severity of hallucinations. This observation brings to mind the emphasis given by early attachment theorists on the importance of the mother-infant interaction for the psychological stability of the child (Bowlby 1982/1969; Ainsworth et al., 1978). Contrary to prior research indicating an association between childhood sexual abuse (CSA) and hallucinations (Bendall et al., 2013; Sheffield et al., 2013), our study found no such connection. This may be due to the predominance of male gender in our sample, whereas research has shown CSA to be more common in female patients with psychosis (Duhig et al., 2015). This caveat may have restricted us from detecting the aforementioned association.

Regarding the correlations between attachment dimensions and psychopathology, we detected a positive association between attachment anxiety and hallucinations. While there have been relevant data in clinical samples (Berry et al., 2012), the evidence for an association between attachment anxiety and positive psychotic symptoms remains equivocal (Korver-Nieberg et al., 2014). On the other hand, our study did not replicate existing data modestly associating attachment avoidance with positive and negative psychotic symptoms (Gumley et al., 2014a).

Putting these findings together, we suggest that hostility, rejection and scapegoating related to Mother Antipathy may nurture negative schematic beliefs about the self, as defenseless, worthless or unwanted, thus leading to high attachment anxiety and the employment of hyperactivating strategies to regulate distress. Negative self-schemas may act as relational blueprints guiding adult social interactions and disrupting social information processing. In this sense, Mother Antipathy and adult anxious attachment may trigger a specific symptom formation mechanism which can be better understood through the pathway formulated in our hypothesis argumentation (see Section 1.3.1.). An interesting notion on this matter is that auditory hallucinations may contain critical self-evaluations of the voice-hearer stemming from one's early relational experiences (Birchwood et al., 2004). The attribution of these internal mental events to external sources and their perception as audible stimuli may serve an existential reconstruction effort, seeking to provide a more bearable explanation for one's current distress.

4.5. Attachment anxiety mediates the relationship between CT and psychosis

Our initial hypothesis was partially confirmed as only attachment anxiety was found to mediate the relationship between CT and SSP. Contrary to our initial assumption, attachment avoidance was not identified as a mediator. The involvement of attachment anxiety is not surprising given that prior research in SSP samples has recognized it as a mediator in the relationship between CT and specific psychotic symptoms, namely voice-related severity and distress (Pilton et al., 2016), and negative symptomatology (van Dam et al., 2014). Research in non-clinical samples has also provided evidence for a mediation of attachment anxiety (either as a separate dimension or a component of anxious attachment styles) in the relationship between CT and paranoid beliefs or schizotypy (Sheinbaum et al., 2015a; Goodall et al., 2015), both precursors of clinical psychosis.

Our finding of attachment anxiety acting as a mediator in the CT-SSP association lends credence to the pathogenetic path formulated in our hypothesis argumentation. Additionally, the recognition of attachment anxiety as the sole mediator may reflect a stronger impact of this dimension on crucial emotional, cognitive and metacognitive risk factors for psychosis. Attachment anxiety generates and sustains a state of high cognitive alertness (Mikulincer and Shaver, 2007) which favors the establishment of attentional and attributional biases, imbues the individual with chronic negative affect (Mikulincer et al., 2003), and impacts the processing of social information, especially ToM performance (Pos et al., 2015) and facial emotion perception (Davis et al., 2014). ToM impairment and negative affectivity may undermine source monitoring accuracy (Bright-Paul et al., 2008; de Sousa et al., 2016), potentially laying a conducive ground for the development of positive psychotic symptoms (Brébion et al., 2002). Research has identified negative affectivity, deficits in social cognition and source monitoring errors as key risk factors for the emergence of SSP (Horan et al., 2008; Green et al., 2015; Brunelin et al., 2007).

Our hypothesis of attachment avoidance also mediating the CT-SSP association has not been confirmed. This finding stands in contrast to research data in clinical (Pearce et al., 2017; Sitko et al., 2014) and non-clinical samples (Sheinbaum et al., 2015a; Goodall et al., 2015) indicating a mediating effect of this attachment dimension. The fact that our study failed to detect mediation through attachment avoidance may be attributed to the differential effect of the two attachment dimensions on ToM capacity and trait affectivity, two factors playing a critical role in our suggested pathway from CT to SSP. While attachment anxiety is thought to undermine mentalization capacity, avoidance may, to a certain degree, stabilize ToM functioning (Fonagy and Luyten, 2009). Pos et al. (2015) have provided some empirical validation for this formulation as they showed that SSP patients with lower and higher levels of attachment avoidance, compared to medium levels, performed better on ToM tasks. Based on this, we may assume that our patients' high attachment avoidance levels did not exert a negative impact on their ToM performance. Another possible explanation implicates negative affectivity, a known risk factor for SSP (Horan et al., 2008), mainly affected by attachment anxiety and not avoidance (Sheinbaum et al., 2015b).

4.6. Limitations

Our study carries the inherent caveats of case-control studies, namely latent intrusion of selection, recall and observation biases, and inability to definitively ascertain the temporal sequence of events and establish causal relations between variables. Further, the small size of our sample and the overrepresentation of male gender may restrict the generalization of our results.

CT was assessed retrospectively through self-report and not child welfare or social services case records, thereby potentially introducing inaccuracies in our assessment. However, research has provided strong support for the reliability of retrospective CT reports (Fisher et al., 2011).

CT was assessed with an unpublished measure, the Greek version of the CECA.Q, a shortcoming possibly affecting the reliability of the reports. Despite the lack of a full validation, we provide information for excellent internal consistency and test-retest reliability of the instrument in our clinical sample, which offers support to the validity of our results. On the same matter, assessment of test-retest reliability both in patients and controls might have been a more comprehensive approach.

Adult attachment style was assessed by a self-report measure. Concerns have been raised that, compared to narrative interviews, self-report measures explore conscious appraisals about relationships and not the unconscious mental processes proposed by attachment theory (Bifulco, 2002). However, self-report measures have been found to adequately explore and detect insecure attachment strategies (Shaver and Mikulincer, 2002).

CT and adult attachment style reports may have been affected by psychopathology because SSP patients were initially assessed during hospitalization. On this matter, the confirmation of patients' CT reports at T_2 (outpatient status) supports the reliability of their T_1 data.

As a last point, we acknowledge that the confirmation of hypothesis 3 at T_1 would have been more robust if the mediation effect had been also replicated at T_2, namely in the phase of clinical remission.

4.7. Strengths

Our study contributes data to the field from an Eastern Mediterranean sample, which adds to the more predominant sources, primarily Anglo-Saxon. Further, the reliability of our results is strengthened by the inclusion of a clinical and a non-clinical control group, and by two provisions regarding the assessment of CT and adult attachment style. First, a test-retest design was used to confirm the reliability of the retrospective CT reports. Secondly, a culturally validated two-dimensional measure of attachment was used, because the two-dimensional conceptualization is considered superior to the categorical model for exploring individual differences (Mikulincer and Shaver, 2007).

4.8. Clinical implications

Our findings suggest that individuals with severe CT and anxious adult attachment style may form a high-risk population for the emergence of psychosis. Public mental health services, especially early intervention programs, need to be alert and regularly observant of this vulnerable group. Efforts should concentrate on the development of effective psychotherapeutic interventions with the aim of alleviating or remediating the attachment-related sequelae of CT. There is evidence of promising attachment-based psychotherapeutic modules (Berry and Danquah, 2016; Diamond et al., 2016; Brent et al., 2014) and effective therapies focusing on trauma, like cognitive processing therapy and trauma-focused cognitive behavioral therapy (Watkins et al., 2018). A tailoring of these interventions to meet the specific needs of people affected by CT and afflicted by SSP poses an interesting challenge.

Further research, preferably based on longitudinal data, needs to be done in this area to clarify the observed interaction between CT and insecure attachment and to examine the possible interplay with other social environmental and neurobiological risk factors.

Conflicts of interest

None.

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Supplementary materials

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