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RESEARCH ARTICLE

Pathways from childhood trauma to aberrant salience: A structural equation approach to mentalization model

Ercan Ozdemir | Angus MacBeth | Helen Griffiths

Abstract

Objective: The aim of this study was to explore the relationship between affective disturbances and aberrant salience in the context of childhood trauma, attachment, and mentalization in an analogue study.

Methods: Using a cross-sectional design, an online community sample completed self-report measures of key variables. Structural equation modelling was used to test childhood trauma's influence on aberrant salience via a set of intermediate risk factors (depression, negative schizotypy, and insecure attachment). These intermediate risk factors were assumed to lead to the proximal risk factors of aberrant salience (i.e., disorganized schizotypy and disorganized attachment) depending on the vulnerability of mentalizing capacity to elevated stress.

Results: The sample (N = 1263) was 78% female and aged between 18 and 35 years. The tested models closely fitted the observed data, revealing significant pathways from childhood trauma to aberrant salience via the hypothesized pathways. The direct effect of childhood trauma on aberrant salience was significant.

Conclusion: Findings suggest that the pathway to aberrant salience may be characterized by disorganization of self-state and intersubjectivity as a function of diminishment in mentalizing ability. This may relate to changes in attachment organization and socio-cognitive capacity, which could constitute possible risk factors signalling development of aberrant salience.

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INTRODUCTION

The emergence of psychotic symptoms due to emotional reactivity to stress has been referred to as an affective pathway to psychosis (Myin-Germeys et al., 2003; Myin-Germeys & van Os, 2007). From this perspective, affective dysregulation can be characterized by the presence of clinical depression, which was found to mediate the pathways from genetic liability for psychosis and childhood adversity to early delusion formation (van Os et al., 2022). The persistence of psychotic experiences may also be associated with childhood trauma and the interactions within and between psychotic symptom dimensions (van Os & Reininghaus, 2016). Temporal relationships between negative, disorganized, and positive symptoms have been identified (Fonseca-Pedrero et al., 2018), whereby the severity of negative symptoms may predict psychosis conversion (Debbané et al., 2015), and conversion may be dependent on the severity of conceptual disorganization (Debbané et al., 2013).

Aberrant salience is a prodromal state of psychosis and may stem from an elevation in dopamine release, causing an individual to attribute unusual significance to usual internal and external stimuli (Kapur, 2003). Delusions may arise from top-down explanations of the external stimuli, whereas hallucinations may arise from salience attributed to percepts and memories. Kapur (2003) hypothesizes that mentalization impairments precede aberrant salience and identifies a state of perplexity and anxiety as the experiential dimensions of the drive to make sense of this precarious differentiation from common sense (e.g., loss of conventional understanding of the social and practical world). Hence, aberrant salience can be conceptualized as a pre-psychotic state characterized by the imposition of order and meaning on anomalous self-experiences.

Mentalization is the multidimensional capacity to understand mental states of self and others in terms of thoughts, emotions, desires, and intentions, and disturbances in the ability to mentalize have been suggested as risk markers of psychosis from various operationalizations (e.g., Bora, 2020; Brune, 2005; Sprong et al., 2007). Operationalized as a reflective function, mentalization capacity can be reactive to stress, especially in the attachment context (Luyten et al., 2020). Under attachment-related stress, those with attachment insecurities or disorganization may experience a shift to non-reflective modes of mentalizing, leading to biased and erroneous mental state attributions (Luyten et al., 2020). Hypo-mentaling is a disturbed mentalizing mode and can be observed in people with experiences of childhood trauma (Fonagy et al., 2011). Hypo-mentalizing is particularly relevant to the current research, as in this mode, the accuracy of the inferred mental state can be held with absolute conviction, resembling psychotic-like experiences (Fonagy & Luyten, 2009).
Mentalization-based models of psychosis (Weijers et al., 2020) can be considered as extension of the affective pathway hypothesis. This model identifies distal risk factors such as childhood trauma, genetic predisposition for dopaminergic sensitization, and developmental insults. Distal risk factors are posited to culminate in the prodromal state, defined by the phenomenon of aberrant salience and source monitoring, by first affecting the attachment system and mentalizing capacity (i.e., intermediate risk factors), then the way in which stress is regulated. Emotion regulation patterns associated with attachment avoidance and disorganization are characterized by an aversion to co-regulate states of distress with a close other and are assumed to be the central maintaining factor of the feedback loop defining the proximal risk factors. The feedback loop involves reactivity to social stress that inhibits mentalizing due to a compulsively self-dependent emotion regulation pattern observed in avoidant and disorganized attachment, resulting in an inability to down-regulate states of distress. This may be followed by the transition to the prodromal state (Weijers et al., 2020).

Research on the relationship between mentalization and psychosis suggests that mentalization disturbances might depend on symptom severity: schizophrenia-diagnosed patients report more severe mentalization disturbances than patients in remission (Bora et al., 2009), and those exhibiting more severe conceptual disorganization were found to be the most impaired in mentalizing compared to other symptom profiles (Sprong et al., 2007). The relationship between mentalization and conceptual disorganization was further described in a narrative review (Lysaker, Minor, et al., 2020). Notably, a network model involving mentalization, social cognition, neurocognition, and symptoms reported self-reflectivity and conceptual disorganization as the central nodes (Hasson-Ohayon et al., 2018). The findings imply that mentalization disturbances as the predominantly related to conceptual disorganization rather than positive or negative symptoms.

Mentalization disturbances may be characterized by increased difficulties to understand mental states under attachment related stressors (Nolte et al., 2013). Stress-reactive fluctuations in the ability to mentalize may be rooted in early attachment relationships, such that relational avoidance, anxiety, or the simultaneous activation of anxiety/avoidance may synergistically interact with mentalization (Fonagy & Bateman, 2016). High rates of avoidant and disorganized attachment have been observed in individuals diagnosed with schizophrenia, and associations between attachment avoidance and positive and negative symptoms in clinical and non-clinical samples have also been reported (Gumley, Schwannauer, et al., 2014; Gumley, Taylor, et al., 2014; Korver-Nieberg et al., 2014). A recent meta-analysis found anxious attachment to be associated only with positive symptoms (van Bussel et al., 2021), and anxious attachment may represent a more relevant risk factor for schizophrenia than avoidant attachment (Herskell et al., 2021).

The conceptual overlap between the social anhedonia dimension of negative symptoms and avoidant attachment (Carr et al., 2018) and associations between attachment anxiety and depression (Dagan et al., 2018) might partially account for the discrepant findings on the relationship between insecure attachment and psychosis symptom dimensions. Findings regarding the relationship between insecure attachment dimensions and negative symptoms reported stronger associations for community than for clinical samples, and the high prevalence of disorganized attachment in clinical samples may indicate a link between symptom severity and attachment disorganization (Carr et al., 2018).

The above evidence points towards a process model representing how intermediate risk factors such as affective dysregulation may culminate in the development of aberrant salience through interactions with disturbed mentalization capacity and an attachment system rooted in developmental adversities. Accordingly, the aim of the current study is to test this process model of aberrant salience development, namely that childhood trauma exerts its influence on aberrant salience sequentially through (1) affective disturbances coupled with insecure attachment, (2) mentalization impairment, and (3) the pairing between conceptual and relational disorganization. The tested theoretical model is presented in Figure 1.
METHODS

Design

The research used a cross-sectional online survey design. Ethical approval was obtained from the ethics committee. Recruitment from the general population took place between September 2021 and December 2021. Volunteers aged 18–35 years took part by responding to advertisements posted on social media. Due to ethical considerations, individuals stating that they were currently experiencing a mental health crisis or a severely low mood were excluded.

Measures

Demographic information was collected on gender, age, education level, employment, language, ethnicity, mental health diagnosis, ongoing mental health problems, and treatment status.

The short form of the Childhood Trauma Questionnaire (CTQ-SF; Bernstein et al., 2003) is a screening measure of childhood abuse and/or neglect in both clinical and non-clinical populations. The CTQ-SF involves 28 items, which are rated on a 5-point scale ranging from 1 (never true) to 5 (very often true), generating five trauma dimensions and a 3-item denial scale. Correspondence between the CTQ-SF and therapist-rated childhood trauma provides evidence for the scale's construct validity (Bernstein et al., 2003). In the current study, all the trauma dimensions were found to be reliable (emotional abuse ($\alpha = .900$), physical abuse ($\alpha = .865$), sexual abuse ($\alpha = .955$), emotional neglect ($\alpha = .917$), and physical neglect ($\alpha = .816$)).

The Depression Anxiety Stress Scale-21, depression subscale (DASS-21; Antony et al., 1998) was used to assess mood states. Each subscale is formed of seven items rated on a 4-point scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). Strong correlations between DASS-21 and Beck's anxiety and depression scales and State–Trait Anxiety Inventory's trait factor supports DASS-21's construct validity. The scale showed acceptable reliability in the current sample ($\alpha = .907$).

Subscales of the Multidimensional Schizotypy Scale Brief (MSS-B; Kwapil et al., 2018) were administered to assess the negative (13 items), positive (13 items), and disorganized (12 items) dimensions of schizotypy. MSS-B is rated on a 2-point scale, in which 0 represents 'false' and 1 represents 'true'. Negative schizotypy is operationalized with three items assessing lack of emotional experiences and ten items assessing social anhedonia. The negative dimension was found to be reliable ($\alpha = .835$). The disorganization subscale assesses confusion in the self-state involving cognitive, affective, and behavioural dimensions of experience, the reliability of which was acceptable ($\alpha = .903$). Dimensions of the MSS-B predicted interview rated positive, negative, and disorganized symptoms, providing support for the
measure's convergent validity (Kemp et al., 2020). A comparison of the mean scores of negative schizotypy \((M = 3.76, SD = 3.33)\) and disorganized schizotypy \((M = 4.85, SD = 4.01)\) in the current sample with the mean scores of negative schizotypy \((M = 2.15, SD = 2.60)\) disorganized schizotypy \((M = 1.79, SD = 2.94)\) observed in the MSS-B's validation study (Gross et al., 2018) suggests relatively higher scores in the current community sample.

The Revised Psychosis Attachment Measure (PAM-R; Pollard et al., 2020) is a 26-item scale that assesses attachment anxiety, avoidance, and disorganization. The items are rated on a 4-point scale \((0 = \text{not at all}, 3 = \text{very much})\). PAM-R showed acceptable test-retest reliability and convergent validity (Pollard et al., 2020). The avoidance \((a = .863)\), anxiety \((a = .857)\), and disorganization \((a = .905)\) subscales were reliable.

The Reflective Functioning Questionnaire (RFQ-8; Fonagy et al., 2016) is an 8-item self-report measure rated on a seven-point Likert scale \((1 = \text{strongly disagree}, 7 = \text{strongly agree})\). RFQ-8 was employed to measure the extent to which uncertainty is attributed to mental states. This subscale is referred to as uncertainty about mental states and is assumed to reflect hypomentalizing. The construct validity of RFQ-8 was supported by its associations with measures of empathy, perspective taking, and mindfulness (Fonagy et al., 2016). The RFQ-8's uncertainty about mental states scale showed acceptable reliability in the present study \((a = .796)\).

The Perceived Stress Scale (PSS; Cohen et al., 1983) is a measure assessing the extent to which life is perceived stressful in the past month. The 10-item measure is rated on a 5-point scale \((0 = \text{never}, 4 = \text{very often})\) was found to be correlated with measures assessing stress, anxiety, and depression (Lee, 2012). The PSS was found to be reliable in the present study \((a = .885)\).

The Aberrant Salience Inventory (ASI; Cicero et al., 2010) is a 5-dimensional measure assessed by 29 items that responded categorically as ‘Yes’ or ‘No’. The ASI was used to examine pre-psychotic experiences. ASI's convergent validity was supported by its associations with different psychosis-proneness measures (Cicero et al., 2010). The increased significance \((a = .804)\), senses sharpening \((a = .787)\), impending understanding \((a = .800)\), heightened emotionality \((a = .720)\), and heightened cognition \((a = .718)\) dimensions were found to be reliable.

The 6-item infrequency subscale of the Attentive Responding Scale (ARS; Maniaci & Rogge, 2014) was employed to detect participants who manifest inattentive responding. The items were responded to in a yes/no format and the cut-off point for exclusion was set to above a score of 3 (Kwapil et al., 2018). None of the participants were excluded due to inattentive responding.

Analysis

Analysis was conducted in RStudio 2021.09.0 (R Core Team, 2022), with the hypothesized structural equation models tested using the Lavaan package version 0.6-12 (Rosseel, 2012). Duplicate cases were identified \((n = 16)\) based on IP addresses, and location data (i.e., latitude and longitude) and first responses were kept based on date of survey completion. Only participants who provided complete research data were included in the analysis \((n = 1263)\).

Two covariance-based structural equation models tested the indirect effects of childhood trauma on aberrant salience via the intermediate risk factors of negative schizotypy and depression, which were set to covary with avoidant attachment in the first model and with anxious attachment in the second model. For both models, the pathways from the intermediate risk factors sequentially follow perceived stress and uncertainty about mental states, leading to the proximal risk factors designated as the covariance between disorganized schizotypy and disorganized attachment.

Total scores for the disorganized and negative schizotypy dimensions of the MSS-B, avoidant, anxious, and disorganized attachment dimensions of the PAM-R, perceived stress (PSS), DASS-21 depression subscale, and uncertainty about mental states factor of the RFQ were treated as observed variables. The latent variables included in the measurement model were childhood trauma and aberrant salience. Childhood trauma dimensions were defined as emotional abuse, physical abuse, sexual abuse, emotional
neglect, and physical neglect. The latent variable aberrant salience was estimated through the following ASI dimensions: increased significance, senses sharpening, impending understanding, heightened emotionality, and heightened cognition.

Multivariate normality was tested using Mardia multivariate skewness and kurtosis tests (Mardia, 1970). If the assumption of multivariate normality was violated, then a diagonally weighted least squares (DWLS) estimator is to be used. Goodness of fit was evaluated through the \( \chi^2 \) statistic, comparative fit index (CFI), and the root mean square error of approximation (RMSEA) around a 90% confidence interval. Criteria for acceptable model fit with a non-significant \( \chi^2 \) statistic were CFI \( \geq 0.95 \) and RMSEA \( \leq 0.06 \) and CFI \( \geq 0.90 \) and RMSEA \( \leq 0.08 \) with a significant \( \chi^2 \) statistic (Hu & Bentler, 1999). The fitness of the model was adjusted following Yuan and colleagues’ (2016) equivalence-testing procedure (https://www3.nd.edu/~kyuan/EquivalenceTesting/RMSEA_e.R).

Indirect effect size estimates were compared against the rule of thumb effect size intervals for simple mediation analysis suggested by Preacher and Kelley (2011). For a simple mediation model, indirect effects of .01, .09, and .2 are considered small, moderate, and large. These values were adjusted according to the number of serial mediators. The adjusted values are 0.01 (.01*10), .027 (.09*.3), .0.12 (.25*.5) for the three serial mediators. Preacher and Kenny’s (2011) interval values were squared for four serial mediators, giving the following magnitudes: 0.0001, 0.008, and 0.06.

Sample size

The a-priori effect size was determined based on a meta-analysis on mentalization in schizotypy reporting small to moderate associations (Bora, 2020). Accordingly, estimating an effect size of 0.20 and statistical power of 0.8 suggested a minimum of 888 participants to form the hypothesized structural equation model with 2 latent and 17 observed variables (Soper, 2023; see https://www.danielsoper.com/statcalc/calculator.aspx?id=89).

Gender invariance

Partial least squares structural equation modelling (PLS-SEM) was conducted to test the invariance of hypothesized relationships between male and female participants using the \texttt{plspm} package in R. The small subsample size of male participants did not allow a covariance-based SEM to be conducted. PLS-SEM, on the other hand, is more robust with small sample sizes, and the rule of thumb approach to determine the minimum sample size is having 10 participants per indicator (Willaby et al., 2015). Accordingly, the minimum required sample size with 17 indicators was 170 participants.

RESULTS

Sample characteristics

Sample characteristics are presented in Table 1. The study advertisement reached 184,629 people, of whom 3053 clicked on the study link. 83\% (\( n = 2535 \)) of these potential participants gave informed consent, of whom 50\% (\( n = 1263 \)) provided complete responses. Mann-Whitney \( U \) tests were conducted to explore whether the participants with partial survey completion differed in the schizotypy and CTQ dimensions compared to the participants who provided complete research data. The results suggested that the groups did not differ significantly in any of the variables (see Table S1).

The sample (\( N = 1263 \)) was predominantly female (\( n = 984; 78\% \)). The mean age of the participants was 27.84 (SD = 4.77). Participants were 88\% white and 16\% unemployed. Self-reported mental health diagnosis was 78\%. Self-reported ongoing mental health problems were reported by 67\% of participants,
with 50% reporting receiving treatment at the time of participation. A one-way ANOVA test indicated significant gender differences in depression, senses sharpening and heightened cognition dimensions of ASI, and negative schizotypy, where male participants had higher scores in each dimension (see Table S2). Correlations between study variables are reported in Table 2.

### Measurement model

A hierarchical confirmatory factor analysis (CFA) was tested, which included negative schizotypy and depression at the lowest level, estimating disorganized schizotypy, which estimated aberrant salience. All constructs were treated as latent variables estimated by their respective items and showed close fit to the observed data based on Yuan and colleagues’ (2016) equivalence-testing procedure. Figure 2 provides the diagram for the tested CFA model. Another hierarchical CFA was conducted, in which disorganized attachment was estimated by avoidant and anxious attachment dimensions and yielded a mediocre model fit.

The remaining endogenous variables were tested for goodness of fit. The latent variable perceived stress, as estimated by its 10 items, revealed a close fit. However, the SEMs tested with the 10-item PSS led to convergence issues for the structural model. Two items (i.e., ‘how often have you been upset...
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<td>10.36</td>
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<td>3.76</td>
<td>4.85</td>
<td>13.17</td>
<td>14.38</td>
<td>15.22</td>
<td>23.89</td>
<td>1.07</td>
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<td>6.65</td>
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<td>3.33</td>
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<td>4.89</td>
<td>5.89</td>
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<td>.64</td>
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<td>0.31</td>
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<td>-0.84</td>
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<td>-1.28</td>
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*Note: CTQ EA (emotional abuse), PA (physical abuse), SA (sexual abuse), EN (emotional neglect), PN (physical neglect) are abbreviations for the Childhood Trauma Questionnaire and its subscales. DASS D refers to the Depression subscale of the Depression, Anxiety, and Stress Scale. MSS NS (negative schizotypy) and DS (disorganized schizotypy) indicate the Multidimensional Schizotypy Scale-Brief's subscales. PAM Av, PAM Anx, and PAM Dis are the avoidant and disorganized attachment subscales of the Psychosis Attachment Measure-Revised. PSS Str refers to the Perceived Stress Scale. RFQ U is the uncertainty dimension of the Reflective Functioning Questionnaire-8. ASI IS (increased significance), SS (senses sharpening), IU (impending understanding), HE (heightened emotionality), and HC (heightened cognition) are abbreviations of the Aberrant Salience Inventory and its subscales. Bonferroni corrected p = .0004.

*p < .0004.
because of something that happened unexpectedly’ and ‘how often have you been angered because of things that were outside your control’) had loadings below 0.6 and excluding these items enhanced the measurement model’s fit. The eight-item scale was used in the SEM. The 2-dimensional RFQ model showed a poor model fit. The alternative unidimensional RFQ using only the uncertainty scale enhanced the model fit and was included in the SEM (see Table S3 for the goodness of fit indices for the measurement models).

Structural equation models

The Mardia test indicated that the multivariate normality assumption was violated. Accordingly, the DWLS estimator was used. Two SEMs were tested involving the variables presented in the theoretical model (see Figure 1). One of the models involved avoidant attachment, and the other involved anxious attachment, designated in the same position in the tested models. Another difference in these models was the exclusion of the covariance between disorganized attachment and schizotypy in the attachment anxiety model. This covariance was excluded due to a model convergence problem reporting a correlation estimate larger than 1 between the disorganization pair. The resulting models revealed acceptable fit (see Tables S4 and S5 for the goodness of fit indices). Following Yuan and colleagues’ (2016) equivalence-testing procedure, the models showed close fit, as indicated by the RMSEA value falling in the 0.019–0.056 range.

Figure 3 illustrates the SEMs only with the theoretically relevant estimates (see Tables S6 and S7 for the full estimates). The hypothesized indirect effects of childhood trauma on aberrant salience via negative schizotypy and depression following stress, mental state uncertainty, and both the disorganized schizotypy and disorganized attachment paths were supported only in the avoidant attachment model. Excluding perceived stress, significant three-variable serial indirect effects were observed involving anxious attachment mental state uncertainty and the proximal risk factors. Finally, the direct effect of childhood trauma was significant. These results are presented in Table 3.
A comparison between the insecure attachment models indicated the avoidance model as a better fit to the observed data ($\chi^2 (1, 91) = 22.682, p < .001$). Two equivalent models based on alternative theoretical rationales were tested on the attachment avoidance model. First, RFQ was repositioned as the proximal factor estimating aberrant salience and then in between the intermediate risk factors (i.e., negative schizotypy, avoidant attachment, and depression) and perceived stress. The first model was to explore whether diminishment in RF could be predicted by conceptual and relational disorganization. The effects of the hypothesized pathways were weaker, and the disorganization variables had larger effect sizes than the RFQ uncertainty.

The second model was to investigate the RF construct as a developmentally inhibited ability to make sense of mental states under the activation of the attachment system. The hypothesized pathways in this model were either insignificant or significant, with considerably smaller path coefficient estimates. Finally, an alternative model was tested without the RFQ, and the only significant estimate was the total effect.
Tests of gender invariance

The hypothesized models were fitted into PLS-SEMs. Male (n = 147) and female (n = 984) participants were compared to test the invariance of the models' structure. There were not statistically significant differences in path coefficients in the attachment anxiety model. However, three paths were significantly different between men and women in the avoidant attachment model. The direct effect of childhood trauma on aberrant salience was significantly higher for women than for men ($\beta_{\text{difference}} = .17, p < .05$). In addition, path coefficients for the relationship between negative schizotypy and aberrant salience ($\beta_{\text{difference}} = .15, p < .05$) and between avoidant and disorganized attachment ($\beta_{\text{difference}} = .14, p < .05$) were higher for men.

DISCUSSION

The present study aimed to investigate the putative mechanisms involved in the formation of aberrant salience postulated from a mentalization perspective. It was hypothesized that childhood trauma may exert its influence on aberrant salience first through the intermediate risk factors designated as affective disorders (i.e., negative and depressive symptoms) and insecure attachment. The initial association between affective disorders and the diminished capacity to regulate psychological distress may form a vulnerability to stress reactivity, which may be observed as a diminishment in the mentalization capacity and the simultaneous operation of heightened anxiety and avoidance in the attachment system. The state of aberrant salience might emerge from this secondary coupling between disorganized attachment and disorganized schizotypy.

Our results provide cross-sectional support for the proposed process model of aberrant salience formation. The indirect effects of childhood trauma on aberrant salience followed the hypothesized pathways involving affective disorders, perceived stress, and socio-cognitive alterations in the context of attachment avoidance. Partial support for the attachment anxiety model was provided, in which the indirect effects of anxious attachment without perceived stress were significant. The results indicate the primacy of affective disorders in maintaining the risk of psychosis. These findings are in line with Bleuler's (1950) assertion positing affective disorders as the core of schizophrenia and psychotic experiences as accessory symptoms, and various contemporary perspectives conceptualizing affective...
disorders as the maintaining factor of positive symptoms (Birchwood, 2003; Garety & Freeman, 2013; van Os et al., 2022).

The difference between the anxious and avoidant attachment models challenges current theoretical assumptions regarding the mentalizing profiles associated with avoidant and anxious attachment organizations. It is suggested that anxious attachment forms a liability to higher stress reactivity and consequent reduction in mentalization capacity, while avoidant attachment can be characterized by a higher threshold to react to stressors and showing a faster recovery of the mentalization capacity (Luyten et al., 2020). Our data suggests this may be a statistical artefact emerging from the instability in model structures: attachment anxiety predicts stress, while avoidant attachment does not. The defined covariances between attachment insecurities and affective disorders may explain why the pathways in the anxious attachment model do not involve perceived stress: the additional significant pathway from anxious attachment to stress reduces the influence of depression and negative schizotypy on stress, making the affective disturbances pathway insignificant. The covariances were required to test the hypothesized relationships between the intermediary risk factors. As hypothesized attachment avoidance covaried more strongly with negative schizotypy and attachment anxiety with depression. Finally, comparisons of the hypothesized model to the equivalent models, in which the position of the RFQ was changed according to alternative theoretical assumptions, support the staging of the observed variables in the hypothesized model.

A group comparison test indicated gender invariance for the attachment anxiety model, and gender differences were observed in the avoidant attachment model, in which severity of childhood trauma led to more severe experiences of aberrant salience in women, whereas in men, severity of negative schizotypy predicts an increase in aberrant salience and higher attachment avoidance predicts higher disorganized attachment. Similar patterns were observed in a systematic review on gender differences in trauma in psychosis samples, indicating that women report more childhood trauma than men in a majority of studies, and consistent links between more severe negative symptoms in traumatized men and more depressive symptoms in traumatized women were found (Vila-Badia et al., 2021). However, our findings are preliminary given the relative underpowering of the male subsample ($n_{\text{male}} = 147$).

The current study also presents an account of the role of mentalization impairments in aberrant salience formation, contributing to advancements in psychosis research conducted from attachment and stress-reactivity paradigms. In terms of the attachment paradigm, the study offers a coherent explanation for the mixed meta-analytic findings in the literature on the relationship between attachment avoidance (Gumley, Schwannauer, et al., 2014; Gumley, Taylor, et al., 2014; Korver-Nieberg et al., 2014), attachment anxiety (Herstell et al., 2021), and psychosis symptomatology. Our results suggest that attachment avoidance is predominantly linked to negative schizotypy, whereas attachment anxiety is linked predominantly to depression.

A number of limitations are identified. First, the cross-sectional design means support for the theoretical assumptions leading to the tested model being only suggestive. An intensive longitudinal data collection procedure is required to further support the hypothesized links between mentalization and aberrant salience. A further methodological concern is the use of self-report assessments that may fail to fully detect implicit processes such as mentalization or conceptual overlap between symptom domains. However, this methodology was the only viable option for the study design. A further limitation is the skew in gender distribution, in which the number of female participants was considerably higher than that of male and non-binary participants. The conducted PLS-SEM might be underpowered to accurately detect the differences in model structure observed in the avoidant attachment model. These findings require further investigation in a statistically powered, gender-balanced sample. Another limitation is testing the dimensions of attachment insecurity in two separate models to reduce model complexity. This problem can be resolved by exploring such complex models using network modelling approaches to panel studies, which can offer insight into maintaining or bridging factors between symptomatic and transdiagnostic risk factors.
CONCLUSION

It has previously been found that emotional reactivity to stress may lead to positive symptomatic states in sub-clinical (Kwapil et al., 2012; Muddle et al., 2021; Pries et al., 2020) and clinical samples (Klippel et al., 2021; So et al., 2018). The current study builds on these findings by identifying attachment avoidance, not anxiety, as a possible maintaining factor to stress reactivity. An area of further research can involve exploring the dynamic interaction between emotional reactivity and mentalizing reactivity to perceived stress and how attachment dimensions may influence these relationships.

The current results also suggest several specific experiential signs that may be risk indicators of aberrant salience. Firstly, a lack of emotional experiences can modulate heightened reactivity to emotional experiences. A second signal is the transformation of the aversion to regulate distress interpersonally, an emotion regulation style observed in attachment avoidance, escalating to difficulties in relationships with close others, reflecting the simultaneous operation of heightened anxiety and avoidance in attachment disorganization. Further investigation of the interactions between proximal and distal risk factors in the current model for the risk of psychotic experiences is needed. It would also be useful to unpack the relative contributions of emotion regulation and mental state understanding within these models, potentially using longitudinal designs or incorporating more dynamic measurement models such as experience sampling. From a therapeutic perspective, identifying mentalization disturbances as a maintaining factor of aberrant salience (through its influence on conceptual and relational disorganization) opens up additional options for psychological interventions. Treatments that target mentalization disturbances, such as metacognitive reflection and insight therapy (Lysaker, Gagen, et al., 2020) or mentalization-based treatment for psychosis (Weijers et al., 2016) may promote resilience towards distress and better regulation of unusual self-experiences.

AUTHOR CONTRIBUTIONS
Ercan Ozdemir: Conceptualization; methodology; data curation; formal analysis; writing – original draft; investigation; validation; project administration; visualization; writing – review and editing.
Angus MacBeth: Conceptualization; methodology; supervision; writing – review and editing.
Helen Griffiths: Conceptualization; methodology; supervision; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT
The authors report that there are no conflicts of interest.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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REFERENCES


**SUPPORTING INFORMATION**

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Data S1.

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