# Humiliation and state anxiety as predictors of attenuated psychosis in a community sample

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## Abstract

Existing literature suggests that humiliation experiences, coupled with a negative family context, significantly predicts persecutory ideation in non-clinical participants. Whether this may also be linked to attenuated psychotic experiences is unknown. The current study aimed to assess whether familial adversity and humiliation may be related to hallucination-like experiences (HLEs) and other psychotic symptoms, and if state anxiety significantly contributed to these relationships. This cross-sectional study recruited a community sample of 93 adults (38% male; mean age = 27.3 years, standard deviation = 10.8 years), who completed measures of maladaptive familial environments, past and anticipated humiliation experiences, state anxiety and attenuated psychotic symptoms. Correlations and hierarchical regressions tested for direct and indirect relationships amongst study variables. A maladaptive family context, and humiliation (past and anticipated) were positively correlated with HLEs, and facets of attenuated psychotic symptoms. Anxiety uniquely predicted audio-visual and multisensory HLEs. Past humiliation and anxiety jointly predicted cognitive-perceptual disturbance and disorganisation, whereas fear of humiliation and anxiety jointly predicted interpersonal difficulty. Elevated state anxiety, coupled with humiliation, may increase attenuated psychotic symptoms in adulthood. Future research is needed to ascertain if these relationships hold true in clinical cohorts to examine the clinical significance of these data.

**Keywords** Adverse childhood experiences · Humiliation · State anxiety · Hallucinations · Schizotypy

## Introduction

Adverse childhood experiences have been shown to be associated with a significantly increased risk of developing psychosis, in line with a robust dose-effect causal relationship (Read et al., 2005). This has also translated across the psychosis continuum, where research in non-clinical populations has suggested that childhood adversity is connected to attenuated forms of psychotic experiences (Varese et al., 2012). For instance, many negative stressors in childhood were strongly linked with schizotypal behaviors, especially positive schizotypy (odds ratio; OR = 2.01–4.15; Velikonja et al., 2015). In these non-clinical samples, traumatic events have been significantly related to a predisposition to hallucinations (Freeman & Fowler, 2009; Gracie et al., 2007), persecutory ideation or suspiciousness (Ered & Ellman, 2019; Freeman & Fowler, 2009; Gracie et al., 2007; Saha et al., 2011) as well as disorganised communication or social behaviors (Cyr et al., 2010; Ered & Ellman, 2019). A growing body of literature has identified a significant relationship between childhood sexual and/or physical abuse and subsequent development of attenuated psychotic experiences in adulthood (e.g. Shevlin et al., 2007). Less research has however, examined if other forms of interpersonal and social adversity in childhood may engender a similar predisposition to psychotic symptoms, as well as possible mechanisms

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by which this may occur. In the current study, we aimed to investigate the joint influences of humiliation experiences and state anxiety as possible predictors of attenuated psychotic symptoms within an adult community sample.

## Existing etiological models linking trauma to psychosis

Based on the stress reactivity hypothesis, the original diathesis-stress model of schizophrenia suggested that the development of psychotic symptoms could be traced to predisposing genetic vulnerabilities involving an oversensitivity to stress (Walker & Diforio, 1997). It was proposed that augmented effects of the hypothalamic-pituitary-adrenal (HPA) axis on aberrant dopamine synthesis and receptors, when coupled with significant psychosocial stressors, would perpetuate symptom onset. A subsequent traumagenic neurodevelopmental model incorporated how neuroanatomical and biological impacts of adverse childhood events could trigger psychotic symptoms within a developing brain (Read et al., 2001, 2014). An alternative social defeat theory also offered empirical evidence documenting psychosis onset via sensitisation of the mesolimbic dopaminergic system following frequent and chronic hostile group interactions (Selten & Cantor-Graae, 2005; Selten et al., 2013). A recent inclusive model was put forward integrating biopsychosocial considerations for a new psychosis phenotype involving significant history of childhood trauma (Misiak et al., 2017). By evoking multiple interactions between genetic vulnerabilities, environmental factors and childhood trauma, this model proposed a series of biological alterations and psychological mechanisms by which psychosis underpinned by a positive history of childhood trauma could serve as a distinct phenotype, warranting specific therapeutic interventions. Comprehensive debate of prevailing models is beyond the scope of the current manuscript, however, inherent links between stress, trauma, social defeat and humiliation imply that further understanding of experiences of the latter could contribute to these etiological theories.

There has been little consistency linking type of trauma to the development of specific symptom domains (e.g. hallucinations versus delusions; Bentall et al., 2012a; Longden et al., 2016), though adversities associated with an intention to harm have been suggested as more reliable predictors of psychosis (van Nierop et al., 2014). For example, a twin study revealed that those who had faced maltreatment by an adult (OR = 3.16) or peer-bullying (OR = 2.47) were significantly more likely to report psychotic symptoms than victims of accidental trauma (OR = 1.47). Similarly, forms of abuse or neglect and bullying in childhood, but not losses or general traumatic events, have been specifically associated with positive psychotic symptoms (Cristobal-Narvaez et al.,

2016). An epidemiological study also found that physical and sexual abuse were especially liable in pathways to psychosis (Shevlin et al., 2007). A body of work has suggested such adverse events occurring within a maladaptive family context, involving early negative parental relations, familial bullying, or neglectful parenting, may manifest as persecutory ideation in later life (Bentall et al., 2014; Bentall et al., 2012b; Garety et al., 2001; Lopes, 2013). This would likely transpire via development of negative beliefs about the self and others, the inability to trust, poor socioemotional skills, or hypervigilance to threat (Murphy et al., 2015; Taylor et al., 2004).

## Humiliation experiences and state anxiety

Humiliation has been defined as "the deep dysphoric feeling associated with being, or perceiving oneself as being, unjustly degraded, ridiculed or put down – in particular, one's identity has been demeaned or devalued" (Hartling & Luchetta, 1999, p. 264). As such, perception of harm by an active agent, likely perceived to be of higher social rank, appears central to the experience of humiliation (Klein, 1991). In some instances, this may take the form of anticipation or expectation that an adverse event entailing humiliation may take place (Collazzoni et al., 2017). Humiliating events in themselves may be traumatic (Leask, 2013), and adverse childhood experiences may lead to feelings of humiliation (e.g. Negrao et al., 2005).

Emerging evidence has suggested direct links between early life humiliation (e.g. being cruelly criticised, bullied, insulted or scorned) and subsequent delusional ideation (Collazzoni et al., 2017). In addition to a maladaptive family context, the authors found that accumulated, but not anticipated, humiliation significantly predicted persecutory ideation held by non-clinical participants. While the study offered preliminary support for the merit of examining humiliation experiences, it did not consider a broader array of psychotic symptoms, that is, hallucinations or disorganisation.

Another important mechanism worth considering is state anxiety. Existing literature has indicated that anxiety may influence the development and maintenance of psychotic symptoms (Hartley et al., 2012; Myin-Germeys & van Os, 2007). In fact, there is empirical evidence suggesting that associations between childhood adversity and psychotic symptoms, especially paranoia, may be partially mediated by anxiety (Fisher et al., 2012; Freeman & Fowler, 2009). Given that humiliation has also been implicated in the pathogenesis of anxiety (Elison & Harter, 2007; Kendler et al., 2003), further investigations of the possible interrelationships amongst these variables is warranted.

## Aims and hypotheses of the current study

The current study aimed to extend the work of Collazzoni et al. (2017). Also employing a community sample, we examined whether past accumulated and future anticipation of humiliation, and a maladaptive familial environment, would contribute to positive psychotic symptoms, involving hallucination-like experiences (HLEs) and disorganisation, in adulthood. As research has shown support for childhood adversity contributing to hallucinatory experiences (Freeman & Fowler, 2009; Gracie et al., 2007) and disorganised thought, communication or behaviors (Cyr et al., 2010; Ered & Ellman, 2019), it is entirely plausible that humiliation, coupled with a dysfunctional familial environment, could also be involved in these other symptom domains. There is less evidence supporting similar relationships with negative psychotic symptoms; this latter set of analysis will be exploratory in nature. We also examined whether state anxiety would contribute as a predictor within these relationships. The following hypotheses were put forward:

**Hypothesis 1** A maladaptive family context, humiliation experiences and state anxiety would be significantly positively correlated with HLEs and disorganisation.

**Hypothesis 2** A maladaptive family context and humiliation, involving past but not anticipated, experiences would jointly significantly positively predict HLEs and disorganisation.

**Hypothesis 3** State anxiety would significantly contribute to the relationships between maladaptive family context and HLEs as well as disorganisation.

## Materials and methods

### Participants and procedure

Participants comprised 93 individuals, recruited from the community via advertising on noticeboards and social media platforms (e.g. Facebook). A proportion of participants were first-year students enrolled in the Research Experience Program run by the Department of Psychological Sciences at Swinburne University of Technology ($n = 24$; 25.8%). Inclusion criteria were: (i) aged 18 to 65 years, (ii) adequate English language abilities, (iii) no serious diagnosed mental health conditions (high-prevalence anxiety and depressive disorders were permitted, but not psychotic or other disorders necessitating psychiatric medications), (iv) no known history of serious neurological disorders or traumatic brain injury, (v) normal, or corrected-to-normal,

hearing and vision. The assessment took place in a quiet room typically within a single session, with all measures administered on a 15-inch Acer Travelmate laptop. The study was approved by the institutional human research ethics committee (#20190365-1891), and procedures conformed to the Declaration of Helsinki (World Medical Association, 2013). Participants also provided written informed consent.

### Measures

The current study formed part of a larger multisite investigation of hallucinatory experiences in the general population[1] (Moseley et al., 2020); only materials relevant for this study are described. Basic sociodemographic information, including age, sex, handedness, parental income, alcohol, nicotine and cannabis use, and self-reported mental health diagnosis, was collected (see Table 1). The Depression Anxiety and Stress Scale[2] was used to evaluate negative emotions (DASS-21; Lovibond & Lovibond, 1995), with the *Anxiety subscale* (Cronbach's $\alpha = 0.84$) representing state anxiety (i.e. over the past week). The following measures were also employed to characterise variables of interest.

### Risky families questionnaire

The Risky Families Questionnaire (RFQ; Taylor et al., 2004) is a 13-item measure assessing familial environment in childhood and early adolescence (i.e. 5 to 15 years of age), involving family conflict, maladaptive parenting, and disordered familial patterns (e.g. "How often would you say there was quarrelling, arguing, or shouting between your parents?"). Responses are rated on five-point Likert scales ranging from *1 = Not at all* to *5 = Very often*, with higher summed scores indicating a greater maladaptive family context. Previous research has shown acceptable internal reliability (Cronbach's = 0.62; Collazzoni et al., 2017).

### Humiliation inventory

The Humiliation Inventory (HI; Hartling & Luchetta, 1999) is a 32-item measure assessing subjective experiences associated with interpersonal humiliation (e.g. being bullied, insulted, criticised), and comprises two subscales: *Cumulative Humiliation Subscale* (CHS) and *Fear of Humiliation*

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[1] Of the $N = 93$ participants in our study, $n = 82$ took part in the larger multisite investigation.

[2] DASS-21 scores should be multiplied by two for descriptive interpretation of severity ratings, where **depression**: *normal* 0–9, *mild* 10–13, *moderate* 14–20, *severe* 21–27, *extremely severe* > 28; **anxiety**: *normal* 0–7, *mild* 8–9, *moderate* 10–14, *severe* 15–19, *extremely severe* > 20; and **stress**: *normal* 0–14, *mild* 15–18, *moderate* 19–25, *severe* 26–33, *extremely severe* > 34.

*Subscale* (FHS). The CHS evaluates cumulative past humiliation experiences, and the FHS gauges current fear or anticipation of humiliation. Responses are rated on five-point Likert scales ranging from *1 = Not at all* to *5 = Extremely*, with higher summed scores indicating greater humiliation experiences. These subscales have demonstrated excellent internal reliability (Cronbach's = 0.96-0.97; Hartling & Luchetta, 1999).

### Launay-slade hallucination scale-extended

The Launay-Slade Hallucination Scale-Extended (LSHS-E; Vellante et al., 2012) is a 16-item measure assessing multisensory hallucinatory experiences in the general population, and comprises four subscales: *Audio-visual HLEs*[3] (e.g. "I have been troubled by hearing voices in my head"), *Multisensory HLEs* (e.g. "I have smelt a particular odour even though there was nothing there"), *Intrusive Thoughts* (e.g. "No matter how hard I try to concentrate on my work, unrelated thoughts always creep into my mind"), and *Daydreams* (e.g. "The people in my daydreams seem so true to life that I sometimes think they are"). Reponses are rated on five-point Likert scales ranging from *0 = Certainly does not apply to me* to *4 = Certainly applies to me*, with higher summed scores indicating increased unusual sensory experiences. The four-factor structure was confirmed via factor analysis, with high internal reliability (Cronbach's α = 0.87) shown in a non-clinical sample (Vellante et al., 2012). For the current study, subscales involving audio-visual and multisensory HLEs were used to gauge hallucinatory experiences.

### Schizotypal personality questionnaire

The Schizotypal Personality Questionnaire-Brief Revised (SPQ-B; Davidson et al., 2016) is a 32-item measure exploring aspects of schizotypy, and comprises three subscales: *Cognitive-Perceptual* (e.g. "I have had experiences with astrology, seeing the future, UFOS, ESP, or a sixth sense"), *Disorganisation* (e.g. "I have some eccentric habits"), and *Interpersonal Difficulty* (e.g. "I rarely laugh or smile"). Responses are rated on five-point Likert scales ranging from *1 = Strongly disagree* to *5 = Strongly agree*, with higher summed scores indicating greater schizotypy. For the current study, cognitive-perceptual approximated positive psychotic symptoms, disorganisation was akin to disorganised symptoms, and interpersonal difficulty was more closely aligned with negative psychotic symptoms; all three subscales were included in our analysis.

### Statistical analyses

Power calculations were performed using G*Power 3.1.9.4. For a linear multiple regression using a fixed model, $R^2$ deviation from zero, with a large effect size $f^2 = 0.20$, $α = 0.05$, and four predictors, the total sample size required was 98. Data analysis was performed with IBM SPSS, v.26. To test Hypothesis 1, Pearson's correlation analysis[4] was used to establish relationships amongst key study variables. To protect against family-wise error, the Benjamini-Hochberg procedure (1995) was employed to control for false discoveries, based on the method described in McDonald (2007). Owing to the large number of correlation analyses performed, a more conservative threshold was applied such that no more than one false positive would be produced (cf. typical false discovery rate thresholds of 0.050 or 0.100; i.e. 5% or 10% of accepted significant results respectively would be false positives). In our case, a false discovery rate of 0.028 (i.e. no more than one false positive based on 36 correlation analyses) was used.

To test Hypotheses 2 and 3, a series of five hierarchical regressions were conducted to explore the relative contribution of childhood adversity, humiliation and state anxiety in predicting the psychotic symptoms under consideration. Outcome variables were audio-visual and multisensory HLEs (LSHS-E) as well as cognitive-perceptual disturbance, disorganisation and interpersonal difficulty (SPQ-B). Therefore, childhood adversity (RFQ) and past humiliation (CHS) were entered at Step 1, anticipated humiliation (FHS) was entered at Step 2, and state anxiety (DASS-21) was entered at Step 3. These variables were entered into the regression in chronological sequence of their potential impact on an individual across their lifetime, thereby facilitating investigation of the contribution of each added predictor beyond the influence of the previous one. This is in line with the method adopted by Collazzoni et al. (2017), with the addition of state anxiety in our model. Age and sex were not entered as covariates as they were not significantly correlated with any of the outcome variables following correction (see Table A in Supplementary materials). The number of predictors was within recommended guidelines for minimum sample size requirements (Tabachnick & Fidell, 2007), and residual assumptions of normality and homoscedasticity were supported (i.e. no transformations were required for the LSHS-E and SPQ-B subscales).

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[3] These refer to unusual sensory experiences in the audio and/or visual domains, concurrently or otherwise.

[4] Normality checks revealed that variables were largely normal (-1.0 < skewness/kurtosis < 1.0), supporting the use of subsequent parametric analyses.

# Results

## Demographic and clinical characteristics

Demographic and clinical characteristics of participants are shown in Table 1. Mean age was 27.3 years (standard deviation = 10.8 years), with 38% of the sample identifying as male, and the majority were right-hand dominant. Most participants described having at least adequate parental income to meet familial needs during their growing years. The largest proportion also endorsed consuming alcohol roughly once a week, but no current nicotine or cannabis use. A small proportion reported one or more mental health disorders, relating to high-prevalence or non-specific conditions (see Table B in Supplementary materials for a breakdown). Descriptive interpretation of DASS-21 severity ratings showed that participants had *mild* anxiety (with depression and stress scores within the *normal* range). The rest of Table 1 displays the mean and standard deviations for childhood adversity (RFQ), humiliation experiences (HI), and attenuated psychotic symptoms (LSHS-E and SPQ-B).

## Pearson correlational analysis

A Pearson's correlation matrix depicting relationships amongst key study variables is shown in Table 2. Based on the false discovery rate of 0.028, maladaptive family context was significantly positively correlated with humiliation experiences (past and anticipated), multisensory HLEs, cognitive-perceptual disturbance, and interpersonal difficulty. In addition, past humiliation was significantly positively correlated with audio-visual and multisensory HLEs, cognitive-perceptual disturbance, disorganisation and interpersonal difficulty; whereas anticipated humiliation was significantly positively with multisensory HLEs, cognitive-perceptual disturbance, disorganisation and interpersonal difficulty.

**Table 1** *Demographic and clinical characteristics (N = 93)*

|  | Number (percentage) or mean ± standard deviation |
|---|---|
| **Demographic** | |
| Age (years) | 27.3 ± 10.8 |
| Sex (% male) | 35 (38.0) |
| Handedness (% right, left, both) | 81 (87.1), 8 (8.6), 4 (4.3) |
| Parental income (% <sufficient, sufficient, >sufficient to meet needs) | 15 (16.1), 44 (47.3), 34 (36.6) |
| Alcohol use (% never, up to weekly, more than weekly) | 12 (12.9), 62 (66.7), 19 (20.4) |
| Nicotine use (% current smoker) | 12 (12.9) |
| Cannabis use (% never, up to weekly, more than weekly) | 66 (72.5), 19 (20.9), 6 (6.6) |
| **Clinical** | |
| Self-reported mental health condition (% yes) | 20 (17.2) |
| DASS-21[†] | |
|    Depression | 4.6 ± 3.9 |
|    Anxiety | 4.2 ± 4.0 |
|    Stress | 28.0 ± 8.6 |
| Maladaptive family context (RFQ) | 6.2 ± 4.7 |
| Humiliation (HI) | 72.5 ± 27.4 |
|    Cumulative humiliation (CHS) | 29.9 ± 12.4 |
|    Fear of humiliation (FHS) | 42.6 ± 18.2 |
| Hallucination-like experiences (LSHS-E) | 21.0 ± 11.9 |
|    Audio-visual HLEs | 4.4 ± 3.9 |
|    Multisensory HLEs | 7.4 ± 5.1 |
|    Intrusive thoughts | 5.8 ± 0.3.1 |
|    Daydreams | 3.4 ± 3.0 |
| Schizotypal traits (SPQ-B) | 50.4 ± 20.6 |
|    Cognitive-perceptual disturbance | 18.0 ± 9.7 |
|    Disorganised | 16.2 ± 7.0 |
|    Interpersonal difficulty | 16.2 ± 8.1 |

*Note.* DASS-21 = Depression Anxiety Stress Scales; RFQ = Risky Families Questionnaire; HI = Humiliation Inventory; CHS = Cumulative Humiliation Subscale; FHS = Fear of Humiliation Subscale; LSHS-E = Launay-Slade Hallucination Scale-Extended; HLEs = Hallucination-like experiences; Schizotypal Personality Questionnaire-Brief Revised (SPQ-B).

[†] DASS-21 scores should be multiplied by two for descriptive interpretation of severity ratings, where ***depression***: *normal* 0–9, *mild* 10–13, *moderate* 14–20, *severe* 21–27, *extremely severe* > 28; ***anxiety***: *normal* 0–7, *mild* 8–9, *moderate* 10–14, *severe* 15–19, *extremely severe* > 20; and *stress*: *normal* 0–14, *mild* 15–18, *moderate* 19–25, *severe* 26–33, *extremely severe* > 34.

**Table 2** *Pearson's correlation matrix depicting relationships amongst key study variables (N = 93)*

| | Cumulative humiliation (CHS) | Fear of humiliation (FHS) | Audio-visual HLEs (LSHS-E) | Multisensory HLEs (LSHS-E) | Cognitive-perceptual disturbance (SPQ-B) | Disorganisation (SPQ-B) | Inter-personal difficulty (SPQ-B) | State anxiety (DASS-21 subscale) |
|---|---|---|---|---|---|---|---|---|
| **Maladaptive family context (RFQ)** | 0.467[*] | 0.307[*] | 0.117 | 0.236[*] | 0.291[*] | 0.231 | 0.358[*] | 0.184 |
| **Cumulative humiliation (CHS)** | | 0.583[*] | 0.253[*] | 0.374[*] | 0.537[*] | 0.459[*] | 0.496[*] | 0.326[*] |
| **Fear of humiliation (FHS)** | | | 0.135 | 0.246[*] | 0.496[*] | 0.420[*] | 0.582[*] | 0.430[*] |
| **Audio-visual HLEs (LSHS-E)** | | | | 0.630[*] | 0.598[*] | 0.559[*] | 0.162 | 0.275[*] |
| **Multisensory HLEs (LSHS-E)** | | | | | 0.580[*] | 0.499[*] | 0.283[*] | 0.384[*] |
| **Cognitive-perceptual disturbance (SPQ-B)** | | | | | | 0.596[*] | 0.510[*] | 0.485[*] |
| **Disorganisation (SPQ-B)** | | | | | | | 0.496[*] | 0.439[*] |
| **Interpersonal difficulty (SPQ-B)** | | | | | | | | 0.453[*] |

*Note.* RFQ = Risky Families Questionnaire; CHS = Cumulative Humiliation Subscale; FHS = Fear of Humiliation Subscale; LSHS-E = Launay-Slade Hallucination Scale-Extended; HLEs = Hallucination-like experiences; Schizotypal Personality Questionnaire-Brief Revised (SPQ-B); DASS-21 = Depression Anxiety Stress Scales

[*]Significant following Benjamini-Hochberg false discovery rate correction of 1/36 = 0.028 (i.e. no more than one false positive based on 36 correlation analyses).

Anxiety was significantly positively correlated with all study variables under consideration, except for maladaptive family context (nb. subscales from the HI, LSHS-E and SPQ-B were significantly positively correlated within each respective measure; subscales of the LSHS-E and SPQ-B were also mostly significantly positively correlated with one another). No other significant correlations were found.

## Hierarchical regressions

For audio-visual HLEs, the overall model was significant, $F_{(4,92)} = 2.8$, $p = .031$, partial $\eta^2 = 0.112$, adjusted $R^2 = 0.072$, with only state anxiety remaining a significant unique predictor in Step 3. For multisensory HLEs, the overall model was significant, $F_{(4,92)} = 6.3$, $p < .001$, partial $\eta^2 = 0.223$, adjusted $R^2 = 0.188$, likewise with only state anxiety remaining a significant unique predictor in Step 3. For cognitive-perceptual disturbance, the overall model was significant, $F_{(4,92)} = 15.5$, $p < .001$, partial $\eta^2 = 0.413$, adjusted $R^2 = 0.386$, with cumulative humiliation and state anxiety serving as significant joint predictors in the final model. For disorganisation, the overall model was significant, $F_{(4,92)} = 10.0$, $p < .001$, partial $\eta^2 = 0.313$, adjusted $R^2 = 0.282$, with cumulative humiliation and state anxiety again serving as significant joint predictors in the final model. For interpersonal difficulty, the overall model was significant, $F_{(4,92)} = 16.8$, $p < .001$, partial $\eta^2 = 0.433$, adjusted $R^2 = 0.407$, with fear of humiliation and state anxiety serving as significant joint predictors in the final model.

## Discussion

The current study aimed to extend on Collazzoni et al. (2017) by considering whether humiliation experiences, coupled with a maladaptive family context, would jointly predict attenuated psychotic symptoms in adulthood, and if state anxiety would significantly contribute to these relationships. Our first hypothesis that maladaptive family context, humiliation and state anxiety would be significantly positively correlated with HLEs and disorganisation was partially supported. Multisensory HLEs were significantly positively correlated with cumulative humiliation only (no significant correlations were found for audio-visual HLEs). Cognitive-perceptual disturbance (and interpersonal difficulty) was significantly positively correlated with all three constructs, whereas disorganisation was significantly positively correlated with maladaptive family context and cumulative humiliation only. Anxiety was significantly positively correlated with cumulative, and fear of, humiliation (but not maladaptive family context).

Our second hypothesis that maladaptive family context and past, but not anticipated, humiliation would jointly predict HLEs and disorganisation was partially supported, whereas our third hypothesis that state anxiety would significantly contribute to these relationships was supported. In the current study, maladaptive family context was not a significant predictor across any of the steps of the models. In contrast, past and anticipated humiliation significantly contributed to HLEs and disorganisation within various steps of each regression (cumulative humiliation was retained as a significant predictor of cognitive perceptual disturbance and disorganisation, whereas fear of humiliation was retained as a significant predictor of interpersonal difficulty). In the final models, state anxiety was the only unique significant

**Table 3** Hierarchical regressions predicting positive psychotic symptoms

| | Audio-visual HLEs (LSHS-E) | | | Multisensory HLEs (LSHS-E) | | | Cognitive-perceptual disturbance (SPQ-B) | | | Disorganisation (SPQ-B) | | | Interpersonal difficulty (SPQ-B) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $R^2$ change | β | p | $R^2$ change | β | p | $R^2$ change | β | p | $R^2$ change | β | p | $R^2$ change | β | p |
| **Step 1** | .064 | | .051 | .114 | | **.004** | .290 | | **<.001** | .211 | | **<.001** | .267 | | **<.001** |
| Maladaptive family context (RFQ) | | −.001 | .991 | | .091 | .417 | | .052 | .603 | | .021 | .841 | | .162 | .117 |
| Cumulative humiliation (CHS) | | .254 | **.030** | | .285 | **.013** | | .512 | **<.001** | | .449 | **<.001** | | .421 | **<.001** |
| **Step 2** | <.001 | | .887 | .067 | | **.008** | .050 | | **.011** | .035 | | **.044** | .125 | | **<.001** |
| Maladaptive family context (RFQ) | | .000 | .997 | | .077 | .478 | | .040 | .681 | | .011 | .916 | | .142 | .132 |
| Cumulative humiliation (CHS) | | .264 | .056 | | .105 | .410 | | .358 | **.002** | | .319 | **.011** | | .176 | .112 |
| Fear of humiliation (FHS) | | −.018 | .887 | | .320 | **.008** | | .275 | **.011** | | .231 | **.044** | | .436 | **<.001** |
| **Step 3** | .48 | | **.031** | .063 | | **.031** | .073 | | **.001** | .068 | | **.004** | .041 | | **.014** |
| Maladaptive family context (RFQ) | | −.006 | .955 | | .070 | .504 | | .033 | .723 | | .004 | .968 | | .137 | .136 |
| Cumulative humiliation (CHS) | | .238 | .078 | | .076 | .537 | | .327 | **.003** | | .289 | **.016** | | .153 | .157 |
| Fear of humiliation (FHS) | | −.107 | .415 | | .219 | .072 | | .166 | .121 | | .126 | .273 | | .354 | **.001** |
| State anxiety (DASS-21) | | .245 | **.031** | | .279 | **.008** | | .301 | **.001** | | .290 | **.004** | | .225 | **.014** |

*Note.* RFQ = Risky Families Questionnaire; CHS = Cumulative Humiliation Subscale; FHS = Fear of Humiliation Subscale; LSHS-E = Launay-Slade Hallucination Scale-Extended; HLEs = Hallucination-like experiences; Schizotypal Personality Questionnaire-Brief Revised (SPQ-B); DASS-21 = Depression Anxiety Stress Scales

predictor of audio-visual and multisensory HLEs. Cumulative humiliation and state anxiety jointly significantly predicted cognitive-perceptual disturbance and disorganisation, and fear of humiliation and state anxiety jointly predicted interpersonal difficulty. The final regression models explained 7.2–41.3% of the total variance. On its own, state anxiety accounted for 7.2% and 22.3% of the variance in audio-visual and multisensory HLEs respectively, whereas cumulative humiliation and state anxiety mutually accounted for 41.3% and 28.2% of the variance in cognitive-perceptual disturbance and disorganisation respectively.

Our findings were in line with Collazzoni et al. (2017) in some ways, but diverged in others. For instance, maladaptive family context did not make a significant contribution in the current study. This could be because our RFQ scores were somewhat lower than that previously reported (Collazzoni et al., 2017; cf. RFQ = 33.3). In other words, our sample endorsed growing up in a relatively less adverse familial environment, and this could thus be less of a factor in the onset of attenuated psychotic experiences (also observed in the lack of significant correlations in this regard). The other reason could be that we focused on positive psychotic symptoms and disorganisation, rather than persecutory ideation as outcomes. Internalisation of familial conflict in childhood could foster the development of aberrant beliefs that others may be conspiring against or out to harm oneself, whereas potential pathways to HLEs and disorganisation are less clear. Our findings were in accordance with existing literature in that past humiliation was more pertinent than anticipated humiliation. In the current study, cumulative humiliation predicted cognitive-perceptual disturbance and disorganisation, but not HLEs. We contend that this could be because the cognitive-perceptual subscale of the SPQ taps into unusual beliefs and thinking (akin to, but broader than, persecutory ideation examined in Collazzoni et al., 2017). Yet how humiliation experiences may translate into disorganised thoughts and behaviors (or manifest as negative psychotic symptoms in interpersonal difficulty) warrants further scrutiny. A notable observation relates to the significant contribution of feared humiliation to interpersonal schizotypy, which is seemingly logical given the strong social anxiety component of the latter domain. If robustly corroborated, we speculate that this finding could offer clinical utility in terms of ameliorating interpersonal difficulties via effective management of threat of humiliation and associated anxiety.

Our other novel contribution in examining the predictive utility of state anxiety in shaping psychotic experiences was fruitful. Research has suggested that negative emotions not only trigger, but also perpetuate psychotic symptoms (Freeman & Garety, 2003). For example, worry and rumination were shown to predict heightened auditory hallucinations as

well as persecutory delusions (Hartley et al., 2014). Anxious hypervigilance may induce a higher likelihood of increased detection of ambiguous signals, and thereby, proneness to hallucinations (Waters et al., 2012). We speculate that parallel mechanisms may underlie its involvement in facets of attenuated psychotic symptoms assessed in the current study. Future replication efforts, incorporating humiliation experiences, are essential.

Psychosis continuum studies in the general population permit scrutiny of subclinical psychosis indicators, not confounded by comorbid disorders or symptoms as well as medication effects. Given the significant contribution of humiliation experiences and state anxiety in predicting attenuated psychotic symptoms, our findings indicate these psychological constructs should be shown due consideration in existing models of trauma and psychosis. For instance, humiliation experiences could exert specific profound neurobiological effects on the mesolimbic dopaminergic system, in line with the social defeat theory (Selten & Cantor-Graae, 2005; Selten et al., 2013). More generally, the impact of humiliation experiences on the HPA axis and related neuroanatomy and substrates (Read et al., 2001, 2014) as well as psychosocial influences (Misiak et al., 2017) also deserves further research attention.

## Limitations

There were several limitations to the current study. The cognitive-perceptual subscale selected from the SPQ served as a good approximation for positive psychotic symptoms, but did not explicitly distinguish between HLEs and delusions. To counter this, we turned to the audio-visual and multisensory HLEs subscales from the LSHS to delineate the former. Our participant numbers were relatively modest. This means that we may have overlooked possible significant relationships, owing to a lack of statistical power. It is noted however, that our regression analyses fulfilled the recommended sample size requirements (Tabachnick & Fidell, 2007). Moreover, this is the first known study to investigate the impact of humiliation experiences on HLEs and disorganisation, with state anxiety as a significant predictor. Related to this, there is also preliminary evidence supporting depression and stress as perpetuating psychotic symptoms (Freeman & Garety, 2003; Hartley et al., 2012; Myin-Germeys & van Os, 2007). However, we did not further investigate these constructs because the current study was focused on the role of state anxiety as a potential predictor (and depression and stress levels were not elevated in our cohort). Finally, as we were unable to collect information on the ethnicity or racial composition of the sample, this means the generalisability of our current findings may be limited.

## Directions for future research

There are several major avenues for future research. As our study was conducted in the general population, replication in clinical cohorts would be the next imperative step. Given known links between trauma and psychosis, we expect that a maladaptive family context would serve as a significant predictor in these groups, with humiliation experiences exerting an even more profound influence. To this end, investigating whether state anxiety would serve as a significant mediator of these relationships would be especially important. If this pattern of findings is corroborated in clinical groups, it may be worthwhile exploring whether specifically addressing state anxiety in therapeutic interventions may help to reduce positive psychotic indicators and/or overall symptom load. Other than the attenuated psychotic symptoms sampled in the current study, this could also involve elucidation of the impact of unique delusional themes. Extending the consideration beyond general anxiety, it is possible that social anxiety may exert a unique or cumulative effect, especially given the interpersonal nature of humiliation experiences. It would also be fruitful to further examine the possible contributing effects of other negative emotions, especially as these are often heightened in psychosis groups.

Heightened anxiety, at times coupled with an accumulated history or fear of humiliation experiences, were key in determining the emergence of attenuated psychotic symptoms within a community sample. Adverse familial environments were not influential in this context. Further research is necessary to ascertain whether this pattern of findings translates to clinical cohorts.

## Declarations

**Ethics approval** The study was approved by the institutional human research ethics committee (#20190365-1891), and procedures conformed to the Declaration of Helsinki. Participants provided written informed consent.

**Conflict of Interest** The authors have declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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