Publisher's notice

This paper has been peer-reviewed, accepted and published in the *Journal of Psychiatric Intensive Care*.

Citing this article

This Fast Track version of the paper may be cited using the DOI. Citations should include the author's or authors' name(s), the title of the article, the title of the journal followed by the words 'published online', the date of Fast Track publication and the DOI. For example:

Smith, J. (2024) Article title. *Journal of Psychiatric Intensive Care*, published online 9 January 2024. https://doi.org/10.20299/jpi.2024.xxx

Once the paper has been published in an issue of the journal, the DOI will automatically resolve to that version and the article can be cited in accordance with normal bibliographical conventions.

Journal of Psychiatric Intensive Care

Journal of Psychiatric Intensive Care
doi: 10.20299/jpi.2023.010
Received 20 July 2023 | Accepted 12 December 2023

ORIGINAL RESEARCH ARTICLE

Relationships between psychotic and affective symptoms, schizotypal and dissociative phenomena, and adverse life events among individuals with psychotic disorders

Alastair G Cardno[1], Soumaya Nasser el din[2], Deline du Toit[3], Faiz-ur Rehman[4], Shona McIlrae[5], Hannele Variend[6], Nur-Run Hussein[7], Rajesh Dasi[4], Steven J Clapcote[1], Lisa A Jones[8], William Rhys Jones[2], Clare Stephenson[2], Sarfaraz Shora[9], Tariq Mahmood[2]

[1]University of Leeds, UK; [2]Leeds & York Partnership NHS Foundation Trust, UK; [3]Cygnet Healthcare, Bradford, UK; [4]Greater Manchester Mental Health NHS Foundation Trust, UK; [5]Tees, Esk & Wear Valleys NHS Foundation Trust, UK; [6]Early Intervention Service, Wellington, New Zealand; [7]KPJ Damansara Specialist Hospital, Malaysia; [8]University of Worcester, UK; [9]Bradford District Care NHS Foundation Trust, UK.
AGC https://orcid.org/0000-0002-6136-5965; SJC https://orcid.org/0000-0002-6662-5690; LAJ https://orcid.org/0000-0002-5122-8334; TM https://orcid.org/0000-0001-6182-9996
Correspondence to: Dr Alastair G. Cardno, Senior Lecturer in Psychiatry, Division of Psychological and Social Medicine, Leeds Institute of Health Sciences, Faculty of Medicine and Health, University of Leeds, Level 10, Worsley Building, Leeds LS2 9NL, UK; a.g.cardno@leeds.ac.uk

Background: Psychotic symptoms and self-rated schizotypal phenomena have similar dimensional structures. Additionally, dissociative phenomena have conceptual links with psychosis/schizotypy and all of these phenotypes are associated with adverse life events (ALEs). The relationships between these factors among individuals with psychotic disorders are not well established and were investigated in this study.
Method: 76 participants with any psychotic disorder were recruited from mental health services in West Yorkshire, UK. Lifetime psychotic and affective symptoms were assessed by research interviews and case record review. The self-rated Schizotypal Personality Questionnaire (SPQ) with additional questions regarding inappropriate affect, Dissociative Experiences Scale (DES), and questionnaires regarding cumulative adverse life events in childhood (CLEQ) and in the year before clinical onset (BLEQ) were also administered. Relationships between factors were assessed using Spearman correlations and linear regression analysis.

Results: Correlations with relevant psychotic symptoms ranged from ~0.3 for some positive and negative SPQ subdomains to ~0 for disorganised subdomains. In contrast, SPQ and DES were highly correlated (~0.7). In univariate analysis, ALEs were associated with depression, DES, and positive and disorganised SPQ subdomains. In multivariable analysis, ALEs in childhood and before onset were independently associated with the SPQ *Unusual perceptual experiences* subdomain.
Conclusion: Among individuals with psychotic disorders, neither SPQ nor DES questionnaire responses are likely to be useful proxies for psychotic symptoms. However, particularly questionnaire-based unusual perceptual experiences may be useful when assessing the range of phenomena associated with adverse life events.

Key words: psychosis; schizotypy; dissociation; life events

Financial support: This work was supported by a Wellcome Trust Value in People (ViP) Award (AGC, 473588) and a Medical Research Council, UK, Project Grant (SJC, AGC, TM, MR/J004391/1).
Ethics: The Authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional guides on human experimentation and with the Helsinki Declaration of 1975, as revised 2008.
Declaration of interest: None

Introduction

Psychotic disorders show considerable variation in symptoms, which can be summarised by factor analysis into three main psychotic symptom dimensions (positive, negative and disorganised) (Liddle 1987; Andreasen et al. 1995; Grube et al. 1998) and two affective symptom dimensions (manic and depressive) (Serretti & Olgiati 2004). Further subdivisions or merging of dimensions are found in some studies, depending on which symptoms are analysed (Cardno et al. 1996, Fanous et al. 2012).

Schizotypy is usually conceptualised as a range of subclinical trait-like phenomena with conceptual similarities to psychotic symptoms, and has similarities in factor structure (Reynolds et al. 2000). It is commonly assessed using self-rated questionnaires in the general population (Raine 1991; Mason et al. 2005). The main focus can be on the overall schizotypy score summed across all questions, or scores for the subdomains derived from factor analysis. Individuals with psychotic disorders have relatively high overall schizotypy scores (Jones et al. 2000; Cochrane et al. 2010) and a similar factor structure to general population samples (Rossi & Daneluzzo 2002), but the relationships between schizotypy subdomains and their nearest corresponding psychotic symptoms are not clear. This issue is relevant to how useful schizotypy measures may be as brief screening instruments for psychotic symptoms, and to what extent schizotypal experiences and psychotic symptoms may have shared or differing aetiologies. One study has found significant correlations between positive and negative symptom dimensions and corresponding schizotypy dimensions (Thomas et al. 2019), while another found significant correlations between positive but not negative or disorganised dimensions (Cochrane et al. 2010).

Dissociative experiences are another group of phenomena with some conceptual similarities to psychotic and affective symptoms and schizotypy (WHO 2019; APA 2022). They involve alterations in conscious experiences, for example, having no memory of events that are known to have occurred, or alterations in identity or perceptions. They are commonly assessed using an overall score from a self-rated questionnaire (Bernstein & Putnam 1986). Dissociative experiences are notably correlated with positive and disorganised schizotypal dimensions in the non-clinical population (Startup 1999). Dissociative experiences are also commoner among individuals with psychotic disorders than the general population (Renard et al. 2017), particularly those with auditory hallucinations (Pilton et al. 2015). However, particular types of dissociative experience do not notably differ in their associations with psychotic disorders (Renard et al. 2017).

Adverse life events are a risk factor for psychotic (Varese et al. 2012; Stanton et al. 2020) and depressive disorders (Brown & Harris 1978; McLaughlin et al. 2010; Bjørndal et al. 2022) and for positive psychotic symptoms (van Nierop et al. 2014). Some studies have found a particular association with hallucinations (Upthegrove et al. 2015). Adverse life events are also associated with schizotypy (Toutountzidis et al. 2022), again predominantly with positive subdomains (Dong et al. 2021), and with dissociation (Dalenberg et al. 2012),

in general population samples. Among individuals with psychotic disorders, dissociation scores are higher among those reporting cumulative traumas (Álvarez et al. 2015; Renard et al. 2017). However, the extent to which each of these phenomena is associated with adverse life events among individuals with psychotic disorders is not clear. This issue is relevant to assessing the consequences of such life events in this population and informing optimal management.

The aims of this study were to investigate the relationships: (1) between psychotic and affective symptoms, schizotypy and dissociation (including relationships between specific schizotypy subdomains and corresponding psychotic symptoms); and (2) between these phenotypes and cumulative adverse life events during childhood, and in the year before clinical onset, among individuals with psychotic disorders.

Method

The Clinical Variation in Psychoses Study (CVPS) was based on a sample recruited from mental health services in West Yorkshire between 2008 and 2013. It comprised 76 individuals, with any psychotic symptoms or a manic/hypomanic episode. It was not systematically collected; it was not based on consecutive referrals to the services. Study assessments were based on clinical research interviews (Schedules for Clinical Assessment in Neuropsychiatry (SCAN); Wing et al. 1990) and review of case records by psychiatrists.

The CVPS had NHS Research Ethics Committee approval (08/H1313/17) and NHS Trusts' research governance approval. All participants gave written informed consent.

Inclusion criteria

Evidence of a past or present psychotic disorder, based on the presence of either (1) one or more psychotic symptoms (delusions, hallucinations, negative symptoms (marked poverty of speech, restricted affect or social withdrawal), formal thought disorder, inappropriate affect, grossly bizarre or catatonic behaviour); or (2) evidence of manic or hypomanic symptoms.

Exclusion criteria

Psychosis due to direct effects of organic pathology (e.g. delirium, dementia), including drug intoxication and withdrawal. This is because such symptoms are likely to have different causes from symptoms in functional psychoses.

Age less than 16 years, so participants could give their own informed consent.

Lack of capacity to give informed consent, after giving all practicable support to assist with gaining capacity.

Symptom dimensions

Ratings of hallucinations and delusions were based on the global ratings of these symptoms in the Scale for the Assessment of Positive Symptoms (SAPS) (0–5 rating scales) (Andreasen 1984a). We used the most severe lifetime rating of each symptom. We considered hallucinations and delusions separately (SAPS items 7 and 20, respectively), including due to the interest in the relationship between hallucinations and dissociative phenomena (Pilton et al. 2015) and adverse life events (Upthegrove et al. 2015).

Negative and disorganised dimensions were based on the presence/absence of lifetime-ever symptoms from the Operational Criteria Checklist (OPCRIT) (McGuffin et al. 1991), They were:

- Negative dimension (scored 0–2): negative formal thought disorder (i.e. poverty of speech) (presence of OPCRIT item 29 = score 1) and restricted/blunted affect (presence of OPCRIT items 32 or 33 = score 1).
- Disorganised dimension (scored 0–2): positive formal thought disorder (presence of OPCRIT items 27 or 28 = score 1) and inappropriate affect (presence of OPCRIT item 34 = score 1).

We used OPCRIT ratings for these dimensions as they gave better separation from other dimensions than SAPS/SANS (Andreasen 1984a, b).

Manic and depressive dimensions were based on lifetime ratings of the Bipolar Affective Disorder Dimension Scale (BADDS) (0–100 rating scales) (Craddock et al. 2004). We used BADDS ratings because they incorporate both the number of symptoms and the frequency and severity of episodes, whereas we have found that using OPCRIT symptom ratings can result in ceiling effects.

We have used all of these definitions in previous studies of symptom dimensions (Cardno et al. 1999; Rijsdijk et al. 2011; Richards et al. 2022).

The CVPS did not include formal assessment of inter-rater reliability but assessments were conducted by an academic psychiatrist experienced in clinical research assessments of psychoses (AGC) or by psychiatrists trained by him. Additionally, we have found good reliability of each scale in previous studies (Cardno et al. 1999; Craddock et al. 2004).

Questionnaires

Schizotypal Personality Questionnaire (SPQ). The standard questionnaire comprises 74 questions and statements relating to schizotypal experiences (Raine 1991). These have some similarities to psychotic symptoms, but are milder and occur frequently in the general population,

including experiences of the supernatural, feeling noticed by people in public, or social difficulties. They are often thought of as personality traits. Unlike most schizotypy questionnaires, the SPQ includes items relating to how a person feels that other people regard them, for example, as eccentric. Answers are yes/no and standard scoring involves taking the total score. Scores for the nine standard subdomains were also analysed (Raine 1991).

The questionnaire covers all experiences relevant to DSM-III-R schizotypal personality disorder (APA 1987), with the exception of inappropriate affect, where a person appears to laugh/giggle for no apparent reason.

We therefore added six new items relating to this, creating a tenth subdomain. The additional items were devised by AGC and LAJ who have experience of research into psychotic symptoms, psychotic-like experiences and schizotypy (Cardno et al. 1996, 1999, 2021; Jones et al. 2000). The additional items were distributed amongst the standard 74 items. The new items were:

1. Do people sometimes think you are laughing or smiling for no reason?
2. People don't understand why I smile or laugh.
3. Do you sometimes find yourself laughing for no reason?
4. People say they can't have a serious conversation with me.
5. Sometimes everything makes me laugh whether it's funny or not.
6. People sometimes say that I pull silly faces for no reason.

Dissociative Experiences Scale (DES). The scale comprises 28 statements about dissociative experiences, such as losing awareness of surroundings or events (Bernstein & Putnam 1986). Respondents are asked to mark the percentage of time each one happens on a 10 cm line. Standard scoring involves rating each item out of 100 and taking the average across the 28 items.

Childhood Life Events Questionnaire (CLEQ). This comprises 12 questions asking whether major adverse life events (e.g. death of parent) occurred up to the age of 16 years (Upthegrove et al. 2015). Answers are yes/no and scores were based on the total number of events. The questionnaire was devised by LAJ and colleagues at Cardiff and Birmingham Universities, and has been used by them in clinical research of psychoses and mood disorders (Perry et al. 2016, 2020).

Brief Life Events Questionnaire (BLEQ).The standard scale comprises 12 questions asking about major adverse life events in the year before onset of mental health problems or contact with services (Brugha et al. 1985; Brugha & Cragg 1990). We included an additional general question asking if anything else had happened which contributed to the respondent becoming unwell, as we have done in previous research (Upthegrove et al. 2015; Perry et al. 2016, 2020). Answers are yes/no and scores were based on the total number of events.

The life events questionnaires focused most on moderate to severely threatening loss events. They do not include specific questions about abusive experiences, but participants can rate such experiences in the BLEQ general question about other life events.

Analysis

Analyses were conducted in SPSS version 26 (https://www.ibm.com/spss).

Relationships between phenotypes (psychotic and affective symptoms and schizotypal and dissociative experiences) were investigated using Spearman correlations. Associations between phenotypes and life events measures were analysed using linear regression, adjusted for sex and age. Where more than one phenotype was associated with a life events measure, multivariable linear regression was conducted to assess the independence of associations.

The threshold for statistical significance was $p<0.05$, two-tailed. We did not formally adjust for multiple testing as the study was exploratory and many of the variables were correlated. Novel findings from the study require confirmation in independent samples.

Results

Mean age at onset was 26.5 (SD 8.9) years, range 12 to 57 years, defined as first contact with mental health services. Mean duration of clinical observation (age at last information minus age at onset) was 14.5 (SD 12.8) years, range 0 to 44 years. 80.3% were male (the relatively high proportion of males was due to recruitment including from male inpatient wards). 82.9% were of white ethnicity.

DSM-IV (APA 1994) main-lifetime diagnoses were: schizophrenia 38.2%; schizoaffective disorder 11.8%; bipolar I disorder 36.8%; other affective disorders 2.6%; drug induced disorder 5.3%; other disorders 5.3%.

Correlations between phenotypes

SPQ total score, including the additional questions regarding inappropriate affect, had low and non-significant correlations with psychotic and affective symptoms ($r = -0.06$ (mania) to 0.17 (delusions, and negative symptoms)).

Table 1 shows the correlations between SPQ subdomains and their conceptually closest psychotic symptom. There were significant correlations of modest size ($r \approx 0.3$) for *Ideas of reference*, *Suspiciousness*, and

Table 1. Correlations between schizotypal subdomains and their closest corresponding psychotic symptoms.

SPQ subdomain	Psychotic symptom	n	Spearman correlation (r)	*p*-value
Unusual perceptual experiences	Global hallucinations (SAPS item 7)	50	0.23	0.107
Ideas of reference	Delusions of influence (OPCRIT item 58)	49	0.33	0.020*
Suspiciousness	Persecutory delusions (OPCRIT item 54)	51	0.31	0.028*
Odd thinking	Global delusions (SAPS item 20)	51	0.26	0.071
Constricted affect	Restricted affect (OPCRIT item 32)	49	0.31	0.028*
	Global affective flattening (SANS item 8)	50	0.18	0.223
No close friends	Global anhedonia-asociality (SANS item 22)	49	0.16	0.271
Odd speech	Positive formal thought disorder (OPCRIT item 28)	49	–0.01	0.959
	Global positive formal thought disorder (SAPS item 34)	50	0.08	0.561
Odd behaviour	Bizarre behaviour (OPCRIT item 17)	49	–0.07	0.588
	Global bizarre behaviour (SAPS item 25)	51	–0.02	0.870
Inappropriate affect[1]	Inappropriate affect (OPCRIT item 34)	49	0.03	0.838
	Inappropriate affect (SANS item 6)	51	0.06	0.664
Social anxiety	No clear equivalent in OPCRIT or SAPS/SANS			

*$p<0.05$. [1]additional to standard SPQ subdomains. SPQ = Schizotypal Personality Questionnaire; OPCRIT = Operational Criteria Checklist; SAPS = Scale for the Assessment of Positive Symptoms; SANS = Scale for the Assessment of Negative Symptoms.

Constricted affect, each with OPCRIT symptoms. Other correlations were lower and non-significant.

DES also had low and non-significant correlations with psychotic and affective symptoms (r = –0.03 (delusions) to 0.26 (hallucinations)).

However, SPQ total score and DES were substantially correlated (n = 44, r = 0.77, $p<0.001$).

Among SPQ subdomains, DES had significant correlations with positive subdomains (n = 40; r = 0.72, $p<0.001$ (*Unusual perceptual experiences*) to r = 0.45, $p = 0.004$ (*Odd thinking*)); core disorganised subdomains (n = 40; r = 0.59, $p<0.001$ (*Odd speech*) and r = 0.50, $p = 0.001$ (*Odd behaviour*)); and also *Social anxiety* (n = 40; r = 0.33, p = 0.039); while core negative subdomains were not significantly correlated (n = 40; r = 0.16, $p = 0.312$ (*Constricted affect*) and r = 0.24, $p = 0.144$ (*No close friends*)); and nor was the additional disorganised subdomain of *Inappropriate affect* (n = 40; r = 0.25, $p = 0.123$).

Associations between phenotypes and adverse life events

In linear regression analysis, cumulative adverse life events in childhood (CLEQ score) was significantly associated with SPQ total score, and three positive SPQ subdomains (Table 2).

In multivariable linear regression of CLEQ on the three associated SPQ subdomains together, only *Unusual perceptual experiences* remained significantly associated (n = 52; B = 0.27 (95%CI 0.04–0.51); $p = 0.022$).

Cumulative adverse life events in the year before clinical onset (BLEQ score) was significantly associated with depression, DES score, SPQ total score, and five positive and disorganised SPQ subdomains (Table 2).

In multivariable linear regression of BLEQ on depression, DES, and the five associated SPQ subdomains together, again only SPQ *Unusual perceptual experiences* remained significantly associated (n = 35; B = 0.45 (95%CI 0.01–0.89); $p = 0.046$).

Finally, in multivariable linear regression of SPQ *Unusual perceptual experiences* on CLEQ and BLEQ together, both remained significantly associated: n = 52; CLEQ B = 0.47 (95%CI 0.04–0.90), $p = 0.033$; BLEQ B = 0.43 (95%CI 0.08–0.77), $p = 0.017$. $R^2 = 0.33$; CLEQ and BLEQ together accounted for a third of the variance in SPQ *Unusual perceptual experiences*.

Discussion

Correlations between phenotypes

There were significant correlations of modest size between two positive schizotypy subdomains (*Ideas of reference* and *Suspiciousness*) and their closest corresponding psychotic symptoms (r 0.31–0.33), while the other positive subdomains (*Unusual perceptual experiences* and *Odd*

Table 2. Linear regression analysis of adverse life events on phenotypic variables (adjusted for age and sex).

Phenotype	CLEQ			BLEQ		
	n	B (95%CI)	*p*-value	n	B (95%CI)	*p*-value
Symptom dimensions						
Hallucinations	54	0.14 (–0.09–0.37)	0.218	54	0.04 (–0.26–0.34)	0.791
Delusions	55	0.13 (–0.16–0.42)	0.361	55	0.07 (–0.30–0.44)	0.704
Negative	53	0.65 (–0.30–1.59)	0.176	53	0.96 (–0.22–2.13)	0.108
Disorganised	53	–0.52 (–1.33–0.29)	0.205	53	–0.16 (–1.20–0.88)	0.757
Manic	50	–0.00 (–0.01–0.01)	0.630	50	–0.00 (–0.02–0.12)	0.728
Depressive	50	0.01 (–0.00–0.03)	0.149	50	0.02 (0.00–0.04)	0.035*
DES total	44	0.02 (–0.01–0.05)	0.155	44	0.05 (0.01–0.09)	0.010*
SPQ total[1]	56	0.02 (0.00–0.04)	0.046*	56	0.03 (0.01–0.06)	0.012*
SPQ subdomains						
Unusual perceptual experiences	52	0.26 (0.09–0.42)	0.003**	52	0.34 (0.14–0.54)	0.002**
Ideas of reference	52	0.16 (0.00–0.31)	0.047*	52	0.29 (0.11–0.48)	0.002**
Suspiciousness	52	0.16 (0.00–0.31)	0.047*	52	0.32 (0.15–0.50)	0.001**
Odd thinking	52	0.08 (–0.10–0.27)	0.370	52	0.21 (–0.01–0.43)	0.064
Constricted affect	52	0.06 (–0.18–0.30)	0.601	52	0.06 (–0.25–0.36)	0.714
No close friends	52	0.11 (–0.07–0.30)	0.226	52	0.14 (–0.09–0.38)	0.227
Odd speech	52	0.15 (–0.02–0.32)	0.083	52	0.33 (0.13–0.53)	0.002**
Odd behaviour	52	0.15 (–0.05–0.36)	0.143	52	0.32 (0.07–0.57)	0.012*
Inappropriate affect[2]	52	0.24 (–0.00–0.48)	0.054	52	0.13 (–0.18–0.44)	0.399
Social anxiety	52	0.14 (–0.02–0.31)	0.085	52	0.18 (–0.03–0.38)	0.089

*p<0.05; **p<0.01. [1]Including the additional questions regarding inappropriate affect; [2]Additional to standard SPQ subdomains. CLEQ = Childhood Life Events Questionnaire; BLEQ = Brief Life Events Questionnaire; DES = Dissociative Experiences Questionnaire; SPQ = Schizotypal Personality Questionnaire.

thinking) had slightly lower non-significant correlations (r 0.23–0.26). This is consistent with some correspondence between questionnaire self-ratings and clinician ratings of these phenomena which are based on individuals' reports of their subjective experiences, and with previous studies that have found correlations between positive schizotypal phenomena and positive psychotic symptoms (Cochrane et al. 2010; Thomas et al. 2019).

There was also a significant correlation of modest size between the negative schizotypy subdomain of *Constricted affect* and the OPCRIT symptom restricted affect (r = 0.31). Again this is consistent with some correspondence between questionnaire self-ratings and clinician ratings, this time of an observed phenomenon. However, correlations between schizotypy negative subdomains and symptoms rated on SANS were somewhat lower and non-significant, suggesting that the rating instrument may be relevant to the degree of correlation: OPCRIT mainly rates the presence or absence of these symptoms, while SANS rates the degree of severity. This may be one factor underlying the inconsistent results from previous studies that have investigated associations between negative schizotypal phenomena and negative symptoms (Cochrane et al. 2010; Thomas et al. 2019).

Correlations between disorganised schizotypy subdomains and symptoms were close to zero. This is consistent with the lack of correlation found in a previous study of schizotypy (Cochrane et al. 2010) and also between self-rated and observer-rated positive formal thought disorder (Kircher et al. 2014).

Overall, none of the schizotypy subdomains was closely correlated with corresponding clinical symptoms, suggesting that these self-rated schizotypal phenomena are unlikely to be useful for brief screening of psychotic symptoms among individuals with psychotic disorders, and that there are likely to be considerable differences in the factors contributing to variation in schizotypal experiences and in corresponding symptoms among these individuals.

In the current study, symptoms were rated on a lifetime basis, which corresponds with the trait conceptualisation of schizotypy. However, there may also be a state component, which might have contributed to the higher correlations in studies that used current rather than lifetime symptom ratings (Cochrane et al. 2010).

In contrast to clinical symptoms, dissociation and schizotypy scores were highly correlated, particularly for the positive and disorganised schizotypy subdomains, consistent with previous findings in the non-clinical population (Startup 1999).

Associations between phenotypes and adverse life events

Cumulative adverse life events in childhood were associated with several positive schizotypy subdomains, and events in the year before clinical onset were additionally associated with depression, dissociation, and some disorganised schizotypy subdomains. All of these findings are consistent with results from previous studies, as outlined in the introduction.

When these phenotypes were combined in multivariable analysis, only the *Unusual perceptual experiences* schizotypy subdomain remained significantly associated. Due to the sample size, some independent association with other variables is not excluded, but the results are consistent with the strongest association being with the phenomena in this schizotypy subdomain.

In contrast to some previous studies (van Nierop et al. 2014; Upthegrove et al. 2015), hallucinations and other psychotic symptoms were not significantly associated. Again some degree of association is not excluded, but the results are consistent with adverse life events being more strongly associated with a broader range of perceptual phenomena than clinical hallucinations or other psychotic symptoms. In the SPQ, *Unusual perceptual experiences* include mistaking shadows for people or noises for voices, sensing a force around you, seeing your face change in a mirror, hearing a voice speaking your thoughts aloud, seeing things invisible to others, everyday things seeming unusually large or small, your sense of smell becoming unusually strong, feeling distracted by distant sounds, and having thoughts so strong that you can almost hear them (Raine 1991). In keeping with these results, it has been observed that effect sizes for associations with adverse life events may be greater for self-rated than interviewer-rated psychotic phenomena (Upthegrove et al. 2015).

Study strengths and limitations

General study strengths included sampling a broad range of psychotic disorders, assessed by clinically experienced psychiatrists, and most participants had a duration of illness sufficient for most symptoms to manifest. General limitations included sample size and non-systematic ascertainment, leading to a predominance of male participants and relatively severe illnesses due to recruitment including from inpatient wards.

Some life events during the year before clinical onset might have been consequences of the emerging psychosis; however, the independent association also with childhood life events is consistent with these acting as premorbid risk factors.

The life events assessments were made retrospectively, so could have involved recall bias. Many of the events could potentially be corroborated, which would strengthen their status. Additionally, findings from prospective longitudinal studies are consistent with adverse life events being premorbid risk factors for perceptual

and other psychotic-like experiences (Shakoor et al. 2016; Croft et al. 2019).

Additionally, child abuse is a recognised risk factor for psychosis (Varese et al. 2012; Stanton et al. 2020), and could possibly be more strongly associated with clinical hallucinations and other psychotic symptoms than the adverse life events investigated here (Upthegrove et al. 2015).

Some statistically significant results could be false positives due to multiple statistical testing but many of the results are consistent with those of previous studies.

The regression analyses were adjusted for sex and age, but there could be further unmeasured confounders.

Conclusion

The results of this study suggest that schizotypal and dissociative phenomena are not closely related to psychotic symptoms among individuals with psychotic disorders. However, if the associations with adverse life events are scientifically meaningful, these self-rated phenomena may be valuable (especially unusual perceptual experiences) when assessing the range of consequences of traumatic experiences with a view to optimising management.

Acknowledgements

The authors gratefully thank all of the patients, relatives and clinical staff involved, and Qadeer Nazar, Ivor Hodgson, Madeline Goodwin, Kiran Patel, Chhaya Pandit, Uma Rajendran, David Yeomans and Chris Inglehearn for their contributions to this study.

References

Álvarez, M.J., Masramon, H., Peña, C., Pont, M., Gourdier, C., Roura-Poch, P. and Arrufat, F. (2015) Cumulative effects of childhood traumas: polytraumatization, dissociation, and schizophrenia. *Community Mental Health*, 51(1): 54–62. https://doi.org/10.1007/s10597-014-9755-2

Andreasen, N.C. (1984a) *The Scale for the Assessment of Positive Symptoms (SAPS).* University of Iowa.

Andreasen, N.C. (1984b) *The Scale for the Assessment of Negative Symptoms (SANS).* University of Iowa.

Andreasen, N.C., Arndt, S., Alliger, R., Miller, D. and Flaum, M. (1995) Symptoms of schizophrenia. Methods, meanings, and mechanisms. *Archives of General Psychiatry*, 52(5): 352–360. https://doi.org/10.1001/archpsyc.1995.03950170015003

APA (1987) *Diagnostic and Statistical Manual of Mental Disorders*, 3rd edn revised (DSM-III-R). Washington DC, American Psychiatric Association.

APA (1994) *Diagnostic and Statistical Manual of Mental Disorders*, 4th edn (DSM-IV). Washington DC, American Psychiatric Association.

APA (2022) *Diagnostic and Statistical Manual of Mental Disorders*. 5th edn text revision (DSM-5-TR). American Psychiatric Publishing.

Bernstein, E.M. and Putnam, F.W. (1986) Development, reliability, and validity of a dissociation scale. *Journal of Nervous & Mental Disease*, 174(12): 727–735. https://doi.org/10.1097/00005053-198612000-00004

Bjørndal, L.D., Kendler, K.S., Reichborn-Kjennerud, T. and Ystrom, E. (2022) Stressful life events increase the risk of major depressive episodes: a population-based twin study. *Psychological Medicine*, published online 3 August 2022. https://doi.org/10.1017/S0033291722002227

Brown, G.W. and Harris, T.O. (1978) *Social origins of depression: A study of psychiatric disorder in women*. Tavistock Publications.

Brugha, T.S. and Cragg, D. (1990) The List of Threatening Experiences: the reliability and validity of a brief life events questionnaire. *Acta Psychiatrica Scandinavica* 82(1): 77–81. https://doi.org/10.1111/j.1600-0447.1990.tb01360.x

Brugha, T., Bebbington, P., Tennant, C. and Hurry, J. (1985) The List of Threatening Experiences: a subset of 12 life event categories with considerable long-term contextual threat. *Psychological Medicine*, 15(1): 189–194. https://doi.org/10.1017/S003329170002105X

Cardno, A.G., Jones, L.A., Murphy, K.C., Asherson, P., Scott, L.C., Williams, J., Owen, M.J. and McGuffin, P. (1996) Factor analysis of schizophrenic symptoms using the OPCRIT checklist. *Schizophrenia Research*, 22(3): 233–239. https://doi.org/10.1016/S0920-9964(96)00060-6

Cardno, A.G., Jones, L.A., Murphy, K.C., Sanders, R.D., Asherson, P., Owen, M.J. and McGuffin, P. (1999) Dimensions of psychosis in affected sibling pairs. *Schizophrenia Bulletin*, 25(4): 841–850. https://doi.org/10.1093/oxfordjournals.schbul.a033423

Cardno, A.G., Selzam, S., Freeman, D. and Ronald, A. (2021) Psychotic-like experiences in adolescence occurring in combination or isolation: associations with schizophrenia risk factors. *Psychiatric Research & Clinical Practice*, 3(2): 67–75. https://doi.org/10.1176/appi.prcp.20200010

Cochrane, M., Petch, I. and Pickering, A.D. (2010) Do measures of schizotypal personality provide non-clinical analogues of schizophrenic symptomatology? *Psychiatry Research*, 176(2–3): 150–154. https://doi.org/10.1016/j.psychres.2009.01.031

Craddock, N., Jones, I., Kirov, G. and Jones, L. (2004) The Bipolar Affective Disorder Dimension Scale (BADDS) – a dimensional scale for rating lifetime psychopathology in bipolar spectrum disorders. *BMC Psychiatry*, 4: 19. https://doi.org/10.1186/1471-244X-4-19

Croft, J., Heron, J., Teufel, C., Cannon, M., Wolke, D., Thompson, A., Houtepen, L. and Zammit, S. (2019) Association of trauma type, age of exposure, and frequency in childhood and adolescence with psychotic experiences in early adulthood. *JAMA Psychiatry*, 76(1): 79–86. https://doi.org/10.1001/jamapsychiatry.2018.3155

Dalenberg, C.J., Brand, B.L., Gleaves, D.H., Dorahy, M.J., Loewenstein, R.J., Cardeña, E., Frewen, P.A., Carlson, E.B. and Spiegel, D. (2012) Evaluation of the evidence for the trauma and fantasy models of dissociation. *Psychological Bulletin*, 138(3): 550–588. https://doi.org/10.1037/a0027447

Dong, F., Calkins, M.E., Compton, P., Medoff-Cooper, B., Barzilay, R., J. H. Taylor, J.H., Moore, T.M., Gur, R.C., Gur, R.E. and Hodgson, N.A. (2021) Association between traumatic stressful events and schizotypal symptoms among a community-based sample of adolescents: a 2-year longitudinal study. *Schizophrenia Research*, 233: 44–51. https://doi.org/10.1016/j.schres.2021.06.029

Fanous, A.H., Zhou, B., Aggen, S.H., Bergen, S.E., Amdur, R.L., Duan, J., Sanders, A.R., Shi, J., Mowry, B.J., Olincy, A., et al. (2012) Genome-wide association study of clinical dimensions of schizophrenia: polygenic effect on disorganized symptoms. *American Journal of Psychiatry*, 169(12): 1309–1317. https://doi.org/10.1176/appi.ajp.2012.12020218

Grube, B.S., Bilder, R.M. and Goldman, R.S. (1998) Meta-analysis of symptom factors in schizophrenia. *Schizophrenia Research*, 31(2–3): 113–120. https://doi.org/10.1016/S0920-9964(98)00011-5

Jones, L. A., Cardno, A.G., Murphy, K.C., Sanders, R.D., Gray, M.Y., McCarthy, G., McGuffin, P., Owen, M.J. and Williams, J. (2000) The Kings Schizotypy Questionnaire as a quantitative measure of schizophrenia liability. *Schizophrenia Research*, 45(3): 213–221. https://doi.org/10.1016/S0920-9964(99)00183-8

Kircher, T., Krug, A., Stratmann, M., Ghazi, S., Schales, C., Frauenheim, M., Turner, L., Fährmann, P., Hornig, T., M. Katzev, M. et al. (2014) A rating scale for the assessment of objective and subjective formal Thought and Language Disorder (TALD). *Schizophrenia Research*, 160: 216–221. https://doi.org/10.1016/j.schres.2014.10.024

Liddle, P.F. (1987) The symptoms of chronic schizophrenia. A re-examination of the positive-negative dichotomy. *British Journal of Psychiatry*, 151: 145–151. https://doi.org/10.1192/bjp.151.2.145

Mason, O., Linney, Y. and Claridge, G. (2005) Short scales for measuring schizotypy. *Schizophrenia Research*, 78: 293–296. https://doi.org/10.1016/j.schres.2005.06.020

McGuffin, P., Farmer, A. and Harvey, I. (1991) A polydiagnostic application of operational criteria in studies of psychotic illness. Development and reliability of the OPCRIT system. *Archives of General Psychiatry*, 48(8): 764–770. https://doi.org/10.1001/archpsyc.1991.01810320088015

McLaughlin, K.A., Conron, K.J., Koenen, K.C. and Gilman, S.E. (2010) Childhood adversity, adult stressful life events, and risk of past-year psychiatric disorder: a test of the stress sensitization hypothesis in a population-based sample of adults. *Psychological Medicine*, 40(10): 1647–1658. https://doi.org/10.1017/S0033291709992121

Perry, A., Gordon-Smith, K., Di Florio, A., Forty, L., Craddock, N., Jones, L. and Jones, I. (2016) Adverse childhood life events and postpartum psychosis in bipolar disorder. *Journal of Affective Disorders*, 205: 69–72. https://doi.org/10.1016/j.jad.2016.06.061

Perry, A., Gordon-Smith, K., Di Florio, A., Fraser, C., L., Craddock, N., Jones, L. and Jones, I. (2020) Adverse childhood experiences and postpartum depression in bipolar disorder. *Journal of Affective Disorders*, 263: 661–666. https://doi.org/10.1016/j.jad.2019.11.042

Pilton, M., Varese, F., Berry, K. and Bucci, S. (2015) The relationship between dissociation and voices: a systematic literature review and meta-analysis. *Clinical Psychology Review*, 40: 138–155. https://doi.org/10.1016/j.cpr.2015.06.004

Raine, A. (1991) The SPQ: a scale for the assessment of schizotypal personality based on DSM-III-R criteria. *Schizophrenia Bulletin*, 17(4): 555–564. https://doi.org/10.1093/schbul/17.4.555

Renard, S.B., Huntjens, R.J., Lysaker, P.H., Moskowitz, A., Aleman, A. and Pijnenborg, G.H. (2017) Unique and overlapping symptoms in schizophrenia spectrum and dissociative disorders in relation to models of psychopathology: a systematic review. *Schizophrenia Bulletin*, 43(1): 108–121. https://doi.org/10.1093/schbul/sbw063

Reynolds, C.A., Raine, A., Mellingen, K., Venables, P.H. and Mednick, S.A. (2000) Three-factor model of schizotypal personality: invariance across culture, gender, religious affiliation, family adversity, and psychopathology. *Schizophrenia Bulletin*, 26(3): 603–618. https://doi.org/10.1093/oxfordjournals.schbul.a033481

Richards, A.L., Cardno, A., Harold, G., Craddock, N.J., Di Florio, A., Jones, L., Gordon-Smith, K., Jones, I., Sellers, R., Walters, J.T.R., et al. (2022) Genetic liabilities differentiating bipolar disorder, schizophrenia, and major depressive disorder, and phenotypic heterogeneity in bipolar disorder. *JAMA Psychiatry*, 79(10): 1032–1039. https://doi.org/10.1001/jamapsychiatry.2022.2594

Rijsdijk, F.V., Gottesman, I.I., McGuffin, P. and Cardno, A.G. (2011) Heritability estimates for psychotic symptom dimensions in twins with psychotic disorders. *American Journal of Medical Genetics Part B: Neuropsychiatric Genetics*, 156b(1): 89–98. https://doi.org/10.1002/ajmg.b.31145

Rossi, A. and Daneluzzo, E. (2002) Schizotypal dimensions in normals and schizophrenic patients: a comparison with other clinical samples. *Schizophrenia Research*, 54(1–2): 67–75. https://doi.org/10.1016/S0920-9964(01)00353-X

Serretti, A. and Olgiati, P. (2004) Dimensions of major psychoses: a confirmatory factor analysis of six competing models. *Psychiatry Research*, 127(1–2): 101–109. https://doi.org/10.1016/j.psychres.2003.07.005

Shakoor, S., Zavos, H.M., Haworth, C.M., McGuire, P., Cardno, A.G., Freeman, D. and Ronald, A. (2016) Association between stressful life events and psychotic experiences in adolescence: evidence for gene-environment correlations. *British Journal of Psychiatry*, 208(6): 532–538. https://doi.org/10.1192/bjp.bp.114.159079

Stanton, K.J., Denietolis, B., Goodwin, B.J. and Dvir, Y. (2020) Childhood trauma and psychosis: an updated review. *Child & Adolescent Psychiatric Clinics of North America*, 29(1): 115–129. https://doi.org/10.1016/j.chc.2019.08.004

Startup, M. (1999) Schizotypy, dissociative experiences and childhood abuse: relationships among self-report measures. *British Journal of Clinical Psychology*, 38(4): 333–344. https://doi.org/10.1348/014466599162908

Thomas, E.H., Rossell, S.L., Tan, E.J., Neill, E., Van Rheenen, T.E., Carruthers, S.P., Sumner, P.J., Louise, S., Bozaoglu, K. and Gurvich, C. (2019) Do schizotypy dimensions reflect the symptoms of schizophrenia? *Australian & New Zealand Journal of Psychiatry*, 53(3): 236–247. https://doi.org/10.1177/0004867418769746

Toutountzidis, D., Gale, T.M., Irvine, K., Sharma, S. and Laws, K.R. (2022) Childhood trauma and schizotypy in non-clinical samples: a systematic review and meta-analysis. *PLoS One*, 17(6): e0270494. https://doi.org/10.1371/journal.pone.0270494

Upthegrove, R., Chard, C., Jones, L., Gordon-Smith, K., Forty, L., Jones, I. and Craddock, N. (2015) Adverse childhood events and psychosis in bipolar affective disorder. *British Journal of Psychiatry*, 206(3): 191–197. https://doi.org/10.1192/bjp.bp.114.152611

van Nierop, M., Lataster, T., Smeets, F., Gunther, N., van Zelst, C., de Graaf, R., ten Have, M., van Dorsselaer, S., Bak, M., Myin-Germeys, I. et al. (2014) Psychopathological mechanisms linking childhood traumatic experiences to risk of psychotic symptoms: analysis of a large, representative population-based sample. *Schizophrenia Bulletin*, 40 (Suppl 2): S123–130. https://doi.org/10.1093/schbul/sbt150

Varese, F., Smeets, F., Drukker, M., Lieverse, R., Lataster, T., Viechtbauer, W., Read, R., van Os, J. and Bentall, R.P. (2012) Childhood adversities increase the risk of psychosis: a meta-analysis of patient-control, prospective- and cross-sectional cohort studies. *Schizophrenia Bulletin*, 38(4): 661–671. https://doi.org/10.1093/schbul/sbs050

Wing, J. K., Babor, T., Brugha, T., Burke, J., Cooper, J.E., Giel, R., Jablenski, A., Regier, D. and Sartorius, N. (1990) SCAN. Schedules for Clinical Assessment in Neuropsychiatry. *Archives of General Psychiatry*, 47(6): 589–593. https://doi.org/10.1001/archpsyc.1990.01810180089012

WHO (2019). International Classification of Diseases, 11th revision (ICD-11). World Health Organization. https://icd.who.int/browse11