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Schizotypy, psychotic-like experiences and distress: An interaction model

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Abstract

Psychotic-like experiences (PLEs) have been found to exist on a continuum in both general and clinical populations. Such experiences may characterize normal and abnormal variations in personality, as well as prodromal or high risk states for the development of psychotic disorders. High risk paradigms tend to emphasize distress and impairment associated with PLEs, yet the extent to which individuals find PLEs to be distressing likely depends on moderating factors. In particular, individuals high in trait schizotypy may differ in their appraisal and reaction to PLEs. The current study examines the relationship between schizotypy, PLEs, and distress associated with PLEs in a college sample. Participants ($N=355$) completed the Schizotypal Personality Questionnaire – Brief Version (SPQ-B), which assesses schizotypal traits, and the Prodromal Questionnaire – Brief Version (PQ-B), which assesses both PLEs and associated distress. Schizotypy was found to significantly moderate the association between PLEs and subjective distress. Individuals high in trait schizotypy reported more PLEs, yet less distress associated with PLEs, relative to individuals low in trait schizotypy. Implications for high-risk state assessment are discussed.

Keywords

Personality; Schizophrenia-spectrum disorders; Schizotypy; Psychotic disorders; Psychosis

1. Introduction

Interest in early identification of psychotic disorders has generated increased research on psychotic-like experiences (PLEs) in both clinical and general population samples. PLEs have been found to characterize the psychosis prodrome (Yung and McGorry, 1996), and serve as risk indicators for the development of a schizophrenia-spectrum disorder (e.g., Miller et al., 2003; Cannon et al., 2008; Ruhrmann et al., 2010). PLEs are also relatively common, however, in the general population (5–8% prevalence; van Os et al., 2009), and prevalence among young people may be higher still (e.g., Spauwen et al., 2003; Yoshizumi et al., 2004; Laurens et al., 2007). Within the context of psychosis risk research, PLEs have been found to covary with familial liability toward schizophrenia and imply future psychopathology risk (Kelleher and Cannon, 2011). Evidence from a longitudinal birth cohort suggests that children who endorsed PLEs at age eleven had 5–16 fold increased risk of developing a schizophrenia-spectrum disorder by young adulthood (Poulton et al., 2000).

Models of clinical psychosis risk conceptualize PLEs that cause distress or impairment as the core feature of a high-risk or prodromal state (Miller et al., 2003; Yung et al., 2005). Such models have yielded rates of conversion to frank psychosis of 16–35% for psychosis onset within 2.5 years of initial assessment (Cannon et al., 2008; Yung et al., 2008; Ruhrmann et al., 2010).

Although recent research indicates that PLEs in healthy individuals may be etiologically related to schizophrenia-spectrum disorders, the presence of PLEs in healthy individuals without psychosis suggests that PLEs may also represent normal variations in experience. Experiences such as perceptual illusions and adherence to superstitious beliefs may be relatively common and clinically innocuous for many individuals, yet highly distressing and/or indicative of psychosis risk for others (Yung et al., 2006; Armando et al., 2010; Ndeti et al., 2012). Given such variability, research aimed at identifying factors moderating or mediating the experience of PLEs and the development of distress, impairment, or full-blown illness is needed. Understanding how individuals in the general population perceive and interpret PLEs may help to refine the use of these symptoms toward more accurate prediction of psychosis.

Schizotypal personality disorder (SPD), characterized in the DSM-IV-TR by stable and longstanding interpersonal deficits, cognitive and perceptual distortions, and ‘eccentric’ behavior (American Psychiatric Association, 2000), is also associated with PLEs. Meehl (1962, 1989, 1990), who was a forerunner in proposing a diathesis-stress model of the etiology of schizophrenia, posited that schizophrenia results not solely from a genetic predisposition or liability (i.e., “schizotaxia”), but from interactions of multiple-gene and environmental potentiators in “schizotaxic” individuals. Meehl framed schizotypy as a set of personality characteristics reflecting neural diathesis to full-blown schizophrenia, without the impairment associated with active illness. A sizeable amount of evidence supports Meehl’s theory that a spectrum of conditions genetically related to schizophrenia exists (Walker et al., 2008). In particular, SPD has been found to represent a genetically related expression of schizophrenia vulnerability (e.g., Webb and Levinson, 1993; Bergman et al., 2000; Calkins et al., 2004; Chan et al., 2010). In young people, trait schizotypy is considered a risk factor for developing a full-threshold psychotic disorder (Morrison et al., 2006; Woods et al., 2009), especially when accompanied by recent functional decline (Cannon et al., 2008). Symptoms such as substance use, decline in social functioning, paranoia, cognitive deficits, and movement abnormalities have also been found to enhance prediction of psychosis onset when presenting in combination with schizotypal traits and/or PLEs (Mittal and Walker, 2007; Cannon et al., 2008; Fusar-Poli et al., 2012).

Though affective distress and impairment associated with PLEs has been shown to indicate risk for future psychosis in clinical samples (e.g., Miller et al., 2003), whether and why individuals in the general population experience PLEs as distressing is unclear. Personality characteristics may play an important role in the appraisal and reaction to PLEs. In particular, individuals with schizotypal personality traits may be either habituated or sensitized to PLEs. To pursue this question, we examined PLEs, distress related to PLEs, and endorsement of trait-like schizotypal qualities. We hypothesize that trait schizotypy will moderate the relationship between the occurrence of PLEs and the extent to which people find these experiences to be troubling.

2. Methods

2.1. Materials

All participants completed a demographics form as well as the Prodromal Questionnaire – Brief Version (PQ-B; Loewy et al., 2008; Loewy and Cannon, 2010; Loewy et al., 2011),

the Schizotypal Personality Questionnaire – Brief Version (SPQ-B; Raine and Benishay, 1995), and the Chapman Infrequency Scale (CIS, Chapman and Chapman, 1983).

2.1.1. Prodromal questionnaire – brief version—The PQ-B is a 21-item questionnaire examining PLEs and associated distress. For example, items one and two are “Do familiar surroundings sometimes seem strange, confusing, threatening or unreal to you?” and “Have you heard unusual sounds like banging, clicking, hissing, clapping, or ringing in your ears?” Items are answered yes/no. In order to minimize responses primarily related to substance use, respondents are asked to disregard (i.e., not endorse) experiences occurring only under the influence of drugs, alcohol, and improper use of medications. If a respondent endorses an item, he/she is then asked to rate this experience on a Likert-type ‘distress scale’ of one (strongly disagree) to five (strongly agree), indicating the respondent’s agreement with the following statement: “When this happens, I feel frightened, concerned, or it causes problems for me.” The measure is designed to provide a total score based on the sum of the distress scale endorsement. The authors contend that higher scores are related to increased distress associated with PLEs. Though the authors recommend that the PQ-B be used primarily in clinical populations for high-risk screening purposes (Loewy et al., 2011), the measure was found to have acceptable psychometric properties in the current community sample (see Kline et al., 2012).

2.1.2. Schizotypal personality questionnaire – brief Version—The SPQ-B includes the most reliable 22 items from the 74-item SPQ (Raine, 1991). The measure contains three subscales assessing interpersonal, cognitive-perceptual, and disorganized domains of the schizotypy construct. Respondents indicate “yes” or “no” for each item, resulting in a possible range of scores from 0 to 22. Higher scores indicate higher levels of schizotypy, with scores of 17 and above providing a cutoff for an individual to be considered to have Schizotypal Personality Disorder (SPD) (Raine and Benishay, 1995). The SPQ-B has demonstrated acceptable internal consistency (0.72–0.80) and test-retest reliability (0.86–0.95) in college students and adolescent psychiatric patients (Compton et al., 2007).

2.1.3. Chapman infrequency scale (CIS)—The CIS is a 13-item questionnaire aimed at detecting social desirability or random responses (Chapman and Chapman, 1983). Each item is a statement, which the respondent categorizes as true or false (e.g., “Driving from New York to San Francisco is generally faster than flying between the cities”). The scale was administered to participants in order to enable us to screen out potentially invalid or random responding. Participants who endorsed three or more items in the unexpected direction on the CIS were excluded from the final analyses pool.¹

2.2. Procedure

This study was approved by the UMBC Institutional Review Board. Participants ($N=355$) were recruited from UMBC introductory psychology courses from November 2010 to May 2011. Participants were excluded from the final analysis pool if they endorsed three or more responses in the unexpected direction on the Chapman Infrequency Scale ($n=27$).

2.3. Statistical analyses

To examine self-reported distress associated with PLEs separately from endorsement of PLEs themselves, the components of the PQ-B (“raw” and “distress”) were analyzed as

¹In the current sample, we found that item three (“There have been times when I have dialed a telephone number only to find that the line was busy”) elicited 32% endorsement. As most current phone plans provide call waiting or direct voice mail instead of busy signals, this item was judged to be archaic and was not counted toward the cutoff of three or more unexpected responses.

separate variables. PLEs were assessed using the total of “yes/no” item endorsements within the measure, with a possible range of 0–21. Averaged distress scores for each participant were obtained by summing the total of Likert-scale distress ratings for each endorsed PLE probe (consistent with scoring instructions from the author), then dividing this sum by the number of items endorsed to differentiate distress from total item endorsements. Participants who endorsed no items on the PQ-B were given a distress score of zero. Distress ratings, therefore, reflect how much a respondent generally finds her/his experienced PLEs to be disturbing, with a possible range of 0–5. In order to examine the most clinically relevant index of distress among participants in this college sample, “highest distress” was also examined for each participant by examining the highest distress rating a respondent chose for any item within the PQ-B.

The three measures (PQ-raw, PQ-distress, and SPQ-B) were correlated using Pearson zero-order correlations to examine the extent of collinearity and general relatedness. SPQ-B and PQ-raw scores were then centered and entered into a linear regression with an interaction term (PQ-raw*SPQ-B) predicting PQ-distress scores. To explore the exact nature of the hypothesized interaction effect, SPQ-B scores and interaction terms were further transformed to represent moderation effects at one standard deviation above (high-schizotypy) and below (low-schizotypy) the mean SPQ-B score, per guidelines by Cohen et al. (2003) and Aiken and West (1991). Inclusion of the variables in this manner, and the calculation of separate regression equations, provides an exact estimate of the effect of PLEs on distress at different levels of schizotypal traits. Each regression was performed using the entire sample, with interaction terms modified to examine the slope of the predicted distress function at higher and lower levels of schizotypy.

In order to determine whether a particular subscale of the SPQ-B was responsible for the moderation effect, Pearson correlations among PQ-B raw scores and SPQ-B subscales were examined and regressions were re-run using each subscale of the SPQ-B separately. Gender and age were controlled via inclusion in the regression models. Predicted distress at high and low levels of self-reported schizotypy was plotted in order to visually demonstrate the moderation effect. All analyses were conducted using SPSS 19. Missing data accounted for less than 5% of data and was excluded list-wise per analysis.

3. Results

The average age of participants was 20.3 years (SD=2.1 years); 54% were female. The sample was ethnically diverse (43% Caucasian, 18% Black/African American, 30% Asian, 9% Mixed or ‘Other’).

All measures demonstrated acceptable normality. Descriptive statistics of measures are displayed in Table 1. Pearson correlations between measures were moderate to large (see Table 2), suggesting positive associations between trait schizotypy, PLEs, and distress. Two hundred seventy eight participants, or 85% of the sample, endorsed at least one PLE as assessed by the PQ-B, with items 6 (“Do you have difficulty getting your point across, because you ramble or go off the track a lot when you talk?”) and 18 (“Do you find yourself feeling mistrustful or suspicious of other people?”) eliciting particularly positive response rates of 42% and 41% respectively. As indicated by the “highest distress” rating, nearly half (46%) indicated that they “agreed” or “strongly agreed” with the PQ-B distress statement (“when this happens, I feel frightened, concerned, or it causes problems for me”) for at least one PLE. A large proportion ($n=203$, or 62%) of participants scored above the author-recommended PQ-B screening threshold of six or greater on the summed distress scale. On the SPQ-B, 12 participants (4%) scored above the author-recommended cutoff of 17 or greater.

Age, gender, PQ-raw scores, SPQ-B scores, and the PQ-SPQ interaction terms were entered into linear regressions predicting mean distress scores. The overall model was significant [adjusted $R^2=0.34$, $F(5, 298)=30.14$, $p<0.001$].² Standardized regression coefficients are displayed in Table 3. Interaction terms were computed to represent moderation effects at one standard deviation above (12.46) and below (3.10) the mean (7.78) SPQ-B score. The regressions were identical but considered separately to examine the effects of PLEs (PQ-raw) on distress (PQ-distress) at high and low levels of schizotypy. Predicted distress scores at high and low levels of schizotypy are illustrated in Fig. 1. PQ-raw scores significantly predicted distress scores at both high and low levels of schizotypy. The interaction term was significant, indicating that SPQ-B scores moderated the relationship between PQ-raw and PQ-distress scores.

Given conceptual overlap between the PLEs and trait schizotypy, we reanalyzed both correlations and regressions within each of the SPQ-B subscales (cognitive-perceptual, interpersonal, and disorganized) in order to determine the extent to which a particular SPQ-B subscale might be responsible for the moderation effects. PQ-B raw scores yielded a large correlation with the cognitive-perceptual subscale ($r=0.75$, $p<0.01$), and moderate correlations with the interpersonal ($r=0.34$, $p<0.01$) and disorganized ($r=0.41$, $p<0.01$) subscales. Three additional regressions were run using only a single subscale of the SPQ-B as a predictor and moderator. In each regression, the interaction term remained significant, indicating that all three subscales contributed to the interaction. See Table 4 for results from the regressions examining each subscale separately.

4. Discussion

Findings from this study support our hypothesis that trait schizotypy moderates the association between number of self-reported PLEs and associated distress. A substantial proportion (85%) of the current sample endorsed one or more PLE as assessed by the PQ-B. A similar study by Loewy et al. (2007) found that 93% of participants in a college sample endorsed at least one item on a longer version of the Prodromal Questionnaire. Given the PQ-B's aim of assessing attenuated psychosis-like experiences rather than hallucinations or delusions per se, the higher rate of positive responding relative to studies examining more narrowly defined psychotic symptoms in the general population (e.g., 5% median prevalence as reported by van Os et al., 2009) is not surprising. In the current study, a greater number of self-reported PLEs predicted higher levels of distress associated with PLEs overall. This relationship, however, was stronger in individuals low in trait schizotypy, and weaker in individuals high in trait schizotypy. SPQ-B subscales reflecting cognitive-perceptual disturbances, interpersonal difficulties, and disorganized behaviors, as well as the SPQ-B summed total, contributed to a significant interaction model, with all three schizotypy domains apparently buffering the relationship between PLEs and distress. These results suggest that individuals with fewer schizotypal traits find PLEs to be more disturbing, frightening, or impairing than their peers with more schizotypal traits.

Schizotypal personality is characterized by distortions in thinking and perception that are pervasive and stable over time (American Psychiatric Association, 2000). The strong correlation between SPQ-B scores and PLE endorsements ($r=0.58$) reflects some overlap among the constructs of schizotypy and PLEs. In particular, the PLE construct overlaps considerably with the SPQ-B cognitive-perceptual subscale ($r=0.75$), which essentially assesses disordered perceptions and thinking similar to items specified within the PQ-B.

²A separate regression predicting "highest distress" from age, gender, PQ-raw score, SPQ-B score, and an interaction term (PQ*SPQ) was significant [Adjusted $R^2=0.55$, $F(5, 298)=68.58$, $p<0.001$]. The interaction term was also significant in the regression predicting highest (rather than mean) distress score ($\beta=-0.25$, $t=-5.63$, $p<0.001$).

Consistent with this conceptual similarity, findings from the current sample suggest that individuals higher in trait schizotypy experience more PLEs relative to their low-schizotypy peers; however, the interpretation of PLEs appears to vary depending on the level of schizotypy endorsed. For those with longstanding trait schizotypy, psychotic-like experiences do not appear to engender as much distress relative to those with lower trait schizotypy. It is conceivable that, for individuals with high schizotypy, PLEs may have initially been perceived as frightening or confusing, but over time these experiences have been rendered affectively neutral through repeated exposure. Alternatively, these individuals may have always perceived PLEs to be benign or simply regard these experiences as common and unalarming. Further study of the mechanism behind this relation may be useful. For example, future studies might inquire about the duration of such experiences (longstanding vs. recent onset), attention and meaning assigned to these experiences, strategies used to cope with PLEs, whether participants have sought out mental health services due to distress engendered by PLEs, and whether PLEs predict current and future impairment in participants with and without other markers of schizotypy.

Given the association of schizotypal traits with risk for future psychosis, neutral or non-distressing PLEs should not be dismissed as clinically irrelevant. Widely used diagnostic measures that assess for psychosis risk syndromes (e.g., the SIPS; Miller et al., 2003) characterize psychosis risk partly as a function of distress associated with PLEs. For individuals with high trait schizotypy, however, the more salient dimensions along which PLEs might be assessed include the quantity, frequency, intensity, and persistence of these experiences (as opposed to how distressing or bothersome such experiences are perceived to be).

4.1. Limitations

The use of a college sample may limit the generalizability of these findings to individuals with full-blown SPD. Similar to an estimated population prevalence of 3% (American Psychiatric Association, 2000), 4% ($n=12$) of the current sample scored above the published threshold of 17 (indicating likely diagnosis of SPD) on the SPQ-B. Despite this small subsample n , recent research supports a continuum model of schizotypy and psychosis that extends beyond the ‘disorder’ construct and acknowledges the prevalence of these traits and experiences in the general population (see van Os et al., 2009; Chapman et al., 2011).

A second possible limitation concerns the ‘distress scale’ of the PQ-B as used in the current study. To our knowledge, the scale has not been analyzed by taking a mean of all PLE distress scores. Our ‘adapted’ use of the measure involved simply dividing the summed PQ-B distress score by the raw score. Although this technique does not venture far from the scoring instructions of the author group, it may require further validation. A third limitation is the lack of a face-to-face clinician interview to confirm PLE endorsements and schizotypal traits. Some participants endorsed many items on either the SPQ-B or the PQ-B, suggesting that a few participants within the sample may have met diagnostic criteria for a psychosis-spectrum disorder; however, such diagnoses could not be confirmed via the use of questionnaires. Prior analyses performed within the current sample support the validity of these self-report instruments (Kline et al., 2012), and the use of a reliability questionnaire to screen out potentially invalid responses helps to compensate for the lack of a clinician-administered assessment (Chapman and Chapman, 1983). We believe that the use of validated self-report questionnaires was sufficient for the goals of the current study.

4.2. Conclusions

As assessed by the raw symptom checklist of the PQ-B, PLEs are prevalent within a college sample. Overall, quantity of PLEs significantly predicts reported distress and impairment

associated with PLEs. This association between PLEs and distress is moderated by schizotypal personality traits. For individuals who endorse several PLEs, those with higher trait schizotypy report less distress associated with those experiences relative to peers with lower trait schizotypy. This finding suggests that, for individuals with schizotypal personality traits, PLEs are more likely to be interpreted as benign, whereas for individuals low on schizotypal traits, PLEs are more likely to be interpreted as distressing.

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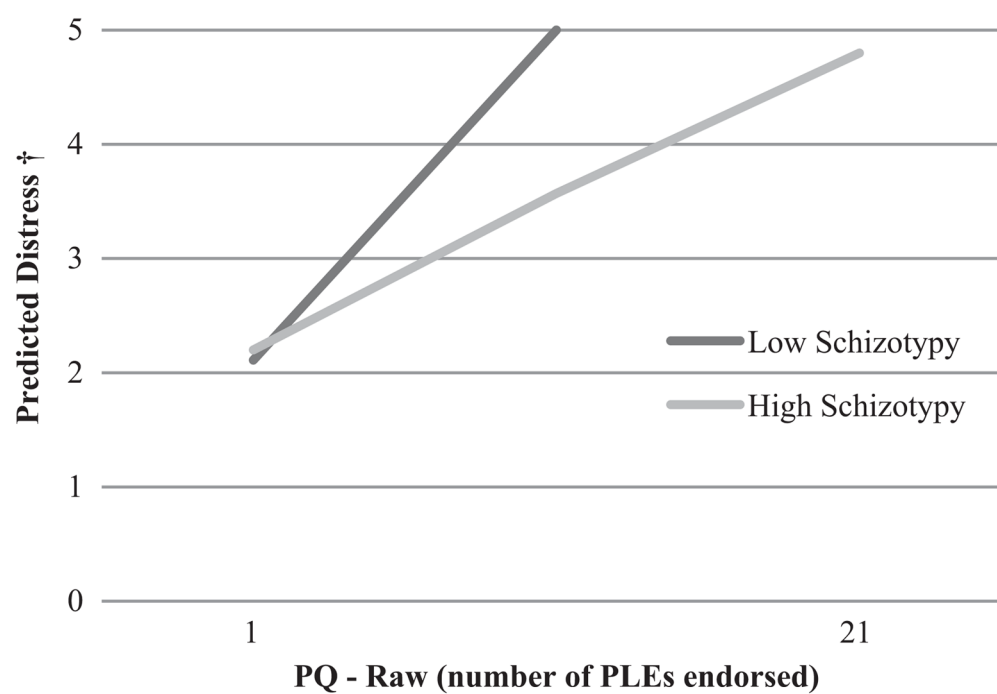


Fig. 1.

Predicted average distress scores at high and low levels of self-reported schizotypy.

Note: 'Predicted distress' represents results from regression analysis rather than raw data.

Table 1

Means and distributions of SPQ-B, PQ-raw, and PQ-distress scores.

Measure	Mean	Median	S.D.	Range	Skewness	Kurtosis
SPQ-B (N=307)	7.78	7.00	4.68	0.00–21.00	0.32	–0.47
Cog-perceptual Subscale	2.42	2.00	1.94	0.00–8.00	0.56	–0.44
Interpersonal Subscale	3.44	3.00	2.36	0.00–8.00	0.25	–1.03
Disorganization Subscale	1.96	2.00	1.78	0.00–6.00	0.57	–0.80
PQ-raw (N=324)	4.79	4.00	4.27	0.00–21.00	1.06	0.83
Average PQ-distress (N=319)	2.12	2.50	1.29	0.00–5.00	–0.36	–0.95
Highest PQ-distress (N=319)	2.83	3.00	1.65	0.00–5.00	–0.55	–1.00

SPQ-B, Schizotypal Personality Questionnaire – Brief Version; PQ, Prodromal Questionnaire.

Table 2

Pearson correlations among the three primary study measures.

Measure	SPQ-B	PQ-raw	PQ-distress
SPQ-B	1		
PQ-raw	0.58 ^a	1	
Average PQ-distress	0.37 ^a	0.54 ^a	1

List-wise $N=298$. SPQ-B, Schizotypal Personality Questionnaire – Brief Version; PQ, Prodromal Questionnaire.

^aCorrelation is significant at $p<0.001$ (2-tailed).

Table 3

Regression model predicting average distress.

Predictor	Effects on PQ-distress			
	<i>B</i> (standard error)	β	<i>t</i>	<i>p</i>
Intercept				
At low SPQ-B	1.87 (0.51)	N/A	3.68	<0.001
At high SPQ-B	2.07 (0.53)	N/A	3.88	<0.001
Age	0.02 (0.03)	0.03	0.64	0.52
Gender	−0.05 (0.13)	−0.02	−0.37	0.71
SPQ-B	0.02 (0.02)	0.07	1.20	0.23
PQ-raw*SPQ-B (interaction)	−0.01 (<0.01)	N/A	−3.98	<0.001
PQ-raw				
Effects at low SPQ-B	0.24 (0.03)	0.78	8.46	<0.001
Effects at high SPQ-B	0.13 (0.02)	0.44	7.01	<0.001

N = 298; SPQ-B, Schizotypal Personality Questionnaire – Brief Version; PQ, Prodromal Questionnaire.

Low and high SPQ-B are at ± 1 SD from the mean of SPQ-B. PQ-raw was centered in all analyses.

Table 4

Results from regressions examining effects of SPQ-B subscales on PQ distress.

SPQ-B Subscale	Full model		Interaction term (PQ-raw*SPQ-subscale)		
	Adj. <i>R</i> ²	<i>F</i>	<i>p</i>	β	<i>t</i>
Cognitive-Perceptual	0.33	31.01	<0.001	-0.29	-5.49
Interpersonal	0.31	26.22	<0.001	-0.16	-3.16
Disorganized	0.31	28.52	<0.001	-0.25	-4.72

N=298; SPQ-B, Schizotypal Personality Questionnaire – Brief Version; PQ, Prodromal Questionnaire.

Full moderated regression models estimated, only interaction term coefficients are shown in table.