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Comparing two measures of schizotypy and their relationship with psychological distress in British university students

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Abstract

Aims: Schizotypy reflects the vulnerability to schizophrenia in the general population. Different questionnaires have been developed to measure aspects of schizotypy. Higher schizotypy scores have also been linked with depression, anxiety, and stress sensitivity. Here we examine the associations of schizotypy with symptoms of depression and anxiety in a sample of university students, using two different measures ($N = 271$).

Methods: A series of confirmatory factor analyses was used to examine two distinct and frequently employed measures of schizotypy: the Community Assessment of Psychic Experiences (CAPE), and the Schizotypy Personality Questionnaire (SPQ). We assessed their relationship with each other and their predictive validity for anxiety, depression, and stress sensitivity.

Results: Our results indicated the brief 7-factor SPQ (SPQ-BR) factor solution for the SPQ and the 15-item and 3 factor solution for the CAPE (i.e., CAPE-P15) as best fitting models. Particularly the CAPE dimension of persecutory ideation was a strong predictor of anxiety, depression, and stress sensitivity, whereas the SPQ dimensions of no close friends and social anxiety predicted psychological distress and stress in our student sample.

Conclusions: Our findings extend earlier work in general and patient samples and point to the importance of understanding the contribution of particularly positive schizotypy symptoms and different interpersonal aspects to psychological distress.

KEYWORDS

CAPE, factor structure, predictors, psychological distress, schizotypy, SPQ

1 | INTRODUCTION

Schizotypy is a personality trait that reflects a general vulnerability to schizophrenia and related psychotic disorders (Kwapil & Barrantes-Vidal, 2015). It exists on a continuum from a milder, subclinical expression in the general population to the full clinical disorder (Brown

et al., 2008). It is a multidimensional construct, but its exact nature, or its factor structure, remains debated (Kwapil & Barrantes-Vidal, 2015). Three factors have been suggested: a positive factor, which includes perceptual abnormalities, magical ideation, and paranoia; a negative factor, which comprises flattened affect and diminished social engagement and social withdrawal; and a disorganized

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factor involving odd speech and behavioural patterns (Kwapil et al., 2018). At present, multiple scales are used interchangeably to assess schizotypy (Kwapil & Barrantes-Vidal, 2015) with different scales focusing on different aspects.

Accurate screening of subclinical psychotic experiences is important, as they have been associated with an increased risk of developing psychotic disorders and other mental health problems (for a review see Taylor et al. (2020)), such as depression and anxiety. Symptoms of depression and anxiety are not only associated with overall schizotypy, but also with positive (Bourgin et al., 2020; Cella et al., 2008; Debbané et al., 2009; Freeman et al., 2011; Lewandowski et al., 2006; Moritz et al., 2017) and disorganized schizotypy (Kemp et al., 2018). In contrast, the negative factor has been associated with a diminished affective expression (Kemp et al., 2018). However, different scales measure different aspects of affect regulation, and the comparison has been less of a focus of previous research.

The aim of the present study was to compare two of the most widely used schizotypy scales, the Schizotypy Personality Questionnaire (SPQ; (Raine, 1991)) and the Community Assessment of Psychic Experiences (CAPE; (Stefanis et al., 2002)) in terms of their psychometric properties and their relationships with anxiety, depression and psychological distress in a student population. Investigating the relationship provides a further source of evidence (American Educational Research Association et al., 1999) of the validity of the different measures in a sample of non-clinical British students.

The original SPQ is a 74-item self-report questionnaire based on the DSM-III-R criteria for schizotypal personality disorder. It measures schizotypy in both clinical and subclinical populations on the nine features γ (ideas of reference, social anxiety, odd beliefs or magical thinking, unusual perceptual experiences, odd or eccentric behaviour, no close friends, odd speech, constricted affect and suspiciousness (Raine, 1991)). There are two short versions; the SPQ-Brief (SPQ-B; (Raine & Benishay, 1995)) and the SPQ-Brief Revised (SPQ-BR; (Cohen et al., 2010)). Reliability estimates range from good for the SPQ (Dumas et al., 2000; Raine, 1991), SPQ-B (Axelrod et al., 2001) and SPQ-BR (Callaway et al., 2014), to lower than originally reported or even limited for the SPQ (Stefanis et al., 2006) and SPQ-B (Compton et al., 2007). The underlying factor structure of the SPQ and its short versions consist of three-factors: cognitive-perceptual deficits, interpersonal deficits and disorganization (Raine et al., 1994). The cognitive-perceptual factor covers positive schizotypy (e.g., paranoia and suspiciousness), the disorganized factor includes odd behaviour and speech and the interpersonal factor covers negative schizotypy (e.g., flat affect and no close friends) and social anxiety. Support for the three-factor structure in the general population comes, for instance, from French undergraduate (Dumas et al., 2000) and adolescent samples (Badoud et al., 2011), a German (Barron et al., 2018), and a multi-national sample of 14 countries (Fonseca-Pedrero, Ortuno-Sierra, et al., 2018, but see Stefanis et al., 2006 for a four factor structure).

The CAPE is a measure for psychosis-like experiences (PLEs) in the general population. It was designed based on the assumption that the schizotypy construct does not cover the whole range of symptoms experienced by patients at the clinical level of psychosis, which includes affective symptoms (Konings et al., 2006). The CAPE includes

depressive symptoms, alongside positive and negative schizotypy (Stefanis et al., 2002). It has good reliability in the general population and adolescent samples (Mark & Toulopoulou, 2016). The CAPE's three factors have been supported by various studies (for a comprehensive meta-analysis see Mark & Toulopoulou, 2016). PLEs, which reflect positive schizotypy, in particular have been described as markers of poor mental health (Welham et al., 2009) and linked with various indicators of psychological distress, like anxiety (Bourgin et al., 2020). Capra et al. (2013) therefore developed a short 15-item version of the CAPE positive scale (CAPE-P15) to assess positive, sub-clinical psychotic symptoms in the general population. Its underlying factor structure for psychosis has three components: persecutory ideation, bizarre experiences and perceptual abnormalities (Capra et al., 2013), which has been confirmed by other studies (Sun et al., 2020; Therman & Ziermans, 2016).

Importantly, while both the SPQ and the CAPE are widely used in schizotypy and psychosis research, they emphasize different factors (e.g., Modinos et al., 2010; Nenadic et al., 2015). Furthermore, whereas the SPQ includes social anxiety, the CAPE includes the measurement of depression. The aim of the present study was to investigate the psychometric properties of different versions of the SPQ and the CAPE within a sample of British undergraduate students to examine the best fitting model of schizotypy. Confirmatory factor analysis was used in order to examine the underlying factor structure of SPQ (original, SPQ-B, SPQ-BR, and hierarchical SPQ-BR) and the CAPE (original, three- and four-factor versions and CAPE-P15). Furthermore, we conducted analyses of predictive validity to understand the degree to which the best fitting models of the SPQ and CAPE provide indicators of psychological distress (anxiety and depression) and perceived stress.

2 | MATERIAL AND METHODS

2.1 | Participants

The study was advertised openly through a participant recruitment system and an e-mail was sent to approximately 660 students on an Undergraduate Psychology programme. Two-hundred and seventy undergraduate psychology students from City, University of London participated with 203 completing the entire survey. Eighty-six percent of the participants were female (age range 17–51, $M = 20.2$, $SD = 3.3$). Ethnicity of the sample was 44.7% Asian British or Asian, 22.8% White British or other white background, 11.8% Black British, Caribbean, or African, 11.8% indicated multiple ethnicities, 7.8% had other ethnicities and 1.1% preferred not to say. This study was approved by the Psychology, City, University of London Research Ethics Committee (ETH1920-0340).

2.2 | Questionnaires

The *Community Assessment of Psychic Experiences* (CAPE; (Stefanis et al., 2002)) includes 42 items, assessing the positive (18 items),

negative (14 items) and depressive symptom dimensions (8 items). There are two response dimensions: the frequency of a feeling (e.g., 'Do you ever feel sad?' Never—Sometimes—Often—Nearly Always) and the level of distress that a feeling may evoke (Not distressed—A bit distressed—Quite distressed—Very distressed). Here we used the lifetime version of the CAPE. Reliability estimates are adequate, ranging from .64 to .62 (Konings et al., 2006). Using the CAPE, we calculated the CAPE-P15 (Capra et al., 2013) with a focus on positive, psychotic-like experiences. It is composed of 15 items with a three-factor structure (perceptual abnormalities, bizarre experiences, and persecutory ideation). The CAPE-P15 had high internal consistency in our sample (Cronbach's $\alpha = .79$).

The *Schizotypal Personality Questionnaire* (SPQ; (Raine, 1991)) assesses the extent to which an individual has a schizotypal personality, on nine sub-traits (ideas of reference (9 items), excessive social anxiety (8 items), odd beliefs/magical thinking (7 items), unusual perceptual experiences (9 items), odd or eccentric behaviour (7 items), no close friends (9 items), odd speech (9 items), constricted affect (8 items) and suspiciousness (8 items). Responses are dichotomous (yes/no), with one point given for each agreement with an item. The SPQ has a high internal reliability, with a Cronbach's α of .90 for the complete questionnaire and the subscale reliability estimates ranging from .66 to .81 (Raine, 1991). The SPQ-Brief (Raine & Benishay, 1995) includes 22 of the original SPQ items that correspond to a 3-factor structure of schizotypy (cognitive-perceptual, interpersonal, and disorganized). A more recent version, the SPQ-BR, comprises 32 items (Cohen et al., 2010). It has seven sub-scales (ideas of reference/suspiciousness, no close friends/constricted affect, eccentric behaviour, social anxiety, magical thinking, odd speech, and unusual perceptions) that cluster into three to four superordinate factors. The SPQ-BR has originally been rated on a 4-point Likert scale. We used the original dichotomous SPQ data to calculate the SPQ-Brief and the SPQ-BR.

The *Patient Health Questionnaire version 9* (PHQ-9; (Kroenke et al., 2001)) is a nine-item scale that assesses nine symptom criteria for major depressive disorder. The PHQ-9 follows the timing criteria suggested by the DSM (symptoms must be present for 2 weeks, at least 50% of the time). The scores of the PHQ-9 range from 0 to 27, as each item can be rated from 0 (not present at all) to 3 (present nearly every day). Psychometric properties of the PHQ-9 are good, with high estimates of reliability (Cronbach's $\alpha = .89$) and sufficient criterion, construct, and external validity estimates.

The *General Anxiety Disorder Assessment version 7* (GAD-7; (Spitzer et al., 2006)) is a brief measure of Generalized Anxiety Disorder. Its seven items which are rated on frequency (from 'not at all' to 'nearly every day'), with a maximum severity score of 21, based on the diagnostic criteria according to the DSM-IV. The GAD-7 also has one overall rating of distress, which can be scored from 'not difficult at all' to 'extremely difficult'. The GAD-7 has excellent reliability (Cronbach's $\alpha = .92$) and validity scores.

The *Stress Response Inventory* (SRI; (Koh et al., 2001)) assesses a range of stress responses. The SRI is based on the assumption that stress can occur on a cognitive, emotional, somatic, or behavioural

level. These levels are reflected on seven subscales of the SRI: tension, anger, aggression, somatisation, depression, fatigue, and frustration. The questionnaire consists of 39 items and is scored on a Likert scale, from 'not at all' (0 points) to 'absolutely' (4 points). It has satisfactory to high internal consistency scores, with Cronbach's α values up to .91.

2.3 | Procedure

Participants were recruited through a university call via email and advertising on campus using an opportunity sampling strategy. All participants gave informed consent before completing the questionnaires online in Qualtrics. Based on the start and end time on Qualtrics, participants took between 20 min⁻¹ h to fill in the questionnaires. However, given that this was filled in online it is likely that the longer times may indicate that participants may have taken a break during that time.

2.4 | Data analysis

Internal factor structures of the original SPQ (Raine, 1991) and CAPE (Stefanis et al., 2002), the SPQ-Brief (Raine & Benishay, 1995), SPQ-BR (Cohen et al., 2010) and Hierarchical model of SPQ-BR (Cohen et al., 2010) and the CAPE three factor (Brenner et al., 2007), four factor (Brenner et al., 2007) and short 15-item version (Capra et al., 2013) were examined by confirmatory factor analysis (CFA) using polychoric correlation matrices with Robust Maximum Likelihood (MLR) estimates method in Mplus 8.1. MLR was used because both questionnaires have less than a six-point Likert-type answer format and, since these two are screening tests, we expected non-normal distribution of the results, and hence violation of multinormal distribution. All models were analysed on items except the original version of the SPQ (Raine, 1991), which was analysed for the scales, which usually gives better fit than analysis on items. Missing data were handled by using the listwise method.

The SPQ questions were collected in its original dichotomous response format and we calculate the fit for the SPQ-BR using these, while the SPQ-BR questions are typically collected in a polytomous Likert scale format. Even though it was not possible to recalculate the dichotomous response format into a polytomous Likert scale format, it was still possible to compare the goodness of fit indices between the two versions of the questionnaires. Given that a dichotomous response format (true/false or yes/no) reduces variance and degrades psychometric properties, an adequate goodness-of-fit would make it likely that performance with the same questionnaire using a Likert-scale type response format would have been even better.

As model fit indices, we used: (a) Sattora-Bentler scaled chi-square (χ^2) (Sattora & Bentler, 2001); (b) the root mean squared error of approximation (RMSEA; (Steiger, 2000)), where values of <.05 were taken as good fit, .05–.08 as moderate fit (Akaike, 1987; Hu & Bentler, 1999); (c) the comparative fit index (CFI) values between .90

and .95 indicated acceptable, and values above .95 good fit; and (d) the standardized root mean square residual (SRMR) with values below .08 indicated good fit (Hu & Bentler, 1999). We report descriptive statistics and zero order correlations between SPQ and CAPE with PHQ, SRI and GAD. In additional regression analyses, we examined the predictive validities of the best fitting models of the CAPE and SPQ and their various subscales (entered in the regression model simultaneously) with respect to PHQ-9, GAD-7, and SRI.

3 | RESULTS

3.1 | Confirmatory factor analysis

Table 1 shows the confirmatory factor analyses results. Table 2 provides an overview of the descriptive statistics for the original SPQ and CAPE, their best fitting solutions, the SPQ-BR and CAPE-P15 (see Table 3 at the end of the section for individual items), their respective subscales, as well as PHQ-9, GAD-7, and SRI. Both SPQ and CAPE provided satisfactory models of fit within our student population. Specifically, the seven-factor solution of the SPQ-BR and the three-factor solution of the CAPE-P15 (highlighted in bold in the table) yielded the best fit indices. The remaining models of the two examined questionnaires did not fit our data well.

Table 4 shows McDonald's omega for the subscales of best fitting schizotypy questionnaire solutions and zero order correlations thereof with gender, age. The SPQ-BR demonstrated satisfactory reliability estimates in the present sample, with the lowest McDonald's omega value at .62 for unusual perception, .71 for social anxiety and the highest of .79 for odd speech. For the CAPE-P15 the McDonald's omega values were adequate for each subscale, ranging from .71 for persecutory ideation to .87 for perceptual abnormalities. Table 5 shows the correlations between CAPE and SPQ-BR and the PHQ-9, GAD-7, and SRI. Both the GAD-7 and the PHQ-9 showed high internal consistency, with McDonald's omega values of .92 and .91,

respectively. For the SRI the McDonald's omega values ranged between .81 and .90. The correlations of the positive symptom factors of the SPQ-BR and the CAPE-P15 were moderate to high. The CAPE-P15 persecutory ideation factor and the corresponding SPQ-BR ideas of reference/suspiciousness factor showed the highest association of $r = .66$. The associations between CAPE-P15 perceptual abnormalities and bizarre experiences dimensions and the SPQ-BR unusual perception factor showed a moderate and large associations of $r = .53$ and $r = .59$, respectively (Gignac & Szodorai, 2016).

3.2 | Predictive validity

Table 5 shows the analysis of predictive validity of the best fitting schizotypy questionnaire solutions, the SPQ-BR and CAPE-P15. The items of the two measures are shown in Table 6. Both questionnaires explained between 22% and 40% of the variance of all criterion variables. Multiple determination coefficients of both questionnaires were similar. However, overall, the CAPE-P15 persecutory ideation dimension was the strongest predictor of depression, anxiety, and different dimensions of stress with β 's ranging from .40 to .52. The association with somatization was the weakest with $\beta = .21$. Bizarre experiences and perceptual abnormalities only predicted anxiety ($\beta = .33$) and aggression (β 's = .26, respectively) significantly. In contrast the SPQ-BR ideas of reference/suspiciousness dimension only predicted the SRI dimensions of tension, aggression, anger, and depression significantly with β 's ranging from .18 to .24. The SPQ-BR social anxiety dimension however predicted all criterion variables with β 's ranging from .17 to .24, with the exception of the SRI aggression and anger. The no close friends/constricted affect dimension emerged as the strongest predictor of all criterion variables with significant associations that ranged between $\beta = .23$ and .4. Magical thinking and odd speech, in contrast, showed only few significant associations with the criterion variables (β 's = .15–.18) and no significant associations with any of the criterion variables were observed for the SPQ-BR unusual

TABLE 1 Goodness of fit indices for different versions of the SPQ and CAPE

	χ^2	DF	p	χ^2/DF	CFI	TLI	RMSEA (IC90)	SRMR	BIC
Schizotypal Personality Questionnaire (SPQ)									
Original version (Raine, 1991)	55.01	17	.000	3.24	.943	.906	.105 (.075–.137)	.056	6502.50
Brief SPQ (Raine & Benishay, 1995)	375.17	206	.000	1.82	.816	.794	.064 (.053–.074)	.075	7340.15
SPQ-BR (Cohen et al., 2010)	568.09	443	.000	1.28	.918	.908	.037 (.027–.046)	.060	4910.10
Hierarchical model of SPQ-BR (Cohen et al., 2010)	581.80	447	.000	1.30	.912	.902	.039 (.029–.047)	.063	7330.88
Community Assessment of Psychic Experiences (CAPE)									
Original version (Stefanis et al., 2002)	1663.84	816	.000	2.03	.749	.735	.072 (.067–.077)	.095	16254.58
Three factor (Brenner et al., 2007)	1688.25	816	.000	2.07	.741	.727	.073 (.068–.086)	.094	8685.63
Four factor (Brenner et al., 2007)	498.57	227	.000	2.20	.817	.796	.077 (.068–.086)	.098	8685.63
15-item version (Capra et al., 2013)	137.27	87	.000	1.57	.925	.910	.053 (.036–.070)	.052	4635.82

Note: The best fitting version of the questionnaire is shown in bold.

Abbreviations: BIC, Bayesian Information Criterion; CFI, comparative fit index; RMSEA, root mean squared error of approximation; SRMR, the standardized root mean square residual; TLI, Tucker–Lewis index.

TABLE 2 Means, standard deviations, minimum, maximum, skewness and kurtosis for the SPQ, SPQ-BR, CAPE and CAPE-P15, PHQ-9, GAD-7 and SRI

	Mean	Std. deviation	Range	Skewness		Kurtosis	
				Statistic	Std. Error	Statistic	Std. Error
SPQ							
CP- Ideas of Reference	3.42	2.70	0–9	.51	.17	–.84	.34
CP-Paranoid ideation/suspiciousness	3.04	2.24	0–8	.58	.17	–.55	.34
CP-Odd Beliefs/Magical Thinking	1.09	1.57	0–7	1.77	.17	2.90	.34
CP-Unusual perceptual experiences	2.07	2.06	0–8	1.07	.17	.36	.34
Dis-Odd/Eccentric Behaviour	1.64	2.04	0–7	1.06	.17	–.17	.34
Dis-Odd speech	3.23	2.37	0–9	.50	.17	–.46	.34
IP-Excessive Social Anxiety	4.45	2.49	0–8	–.17	.17	–1.14	.34
IP-No close friends	2.92	2.39	0–9	.58	.17	–.64	.34
IP-constricted affect	2.26	1.89	0–8	.66	.17	–.28	.34
Total	24.11	14.38	0–66	.68	.17	.05	.34
SPQ-BR							
CP-Ideas of reference/Suspiciousness	2.25	1.92	0–6	.52	.17	–.88	.34
CP-Odd beliefs/Magical thinking	.60	1.02	0–4	1.68	.17	1.89	.34
CP-Unusual perception	.60	.90	0–4	1.50	.17	1.68	.34
Dis-Odd/eccentric behaviour	1.03	1.35	0–4	1.07	.17	–.21	.34
Dis-Odd speech	2.17	1.52	0–4	–.03	.17	–1.56	.34
IP-No close friends/constricted affect	2.03	1.75	0–6	.51	.17	–.81	.34
IP-Excessive social anxiety	2.31	1.49	0–4	.31	.17	–1.33	.34
CAPE							
Positive	29.07	8.03	20–67	1.64	.17	2.97	.34
Depressive	17.10	4.86	9–32	.82	.17	.10	.34
Negative	27.21	7.36	14–49	.68	.17	–.02	.34
CAPE-P15							
Persecutory ideation	8.19	2.27	5–18	1.22	.17	2.18	.34
Bizarre experiences	9.40	2.92	7–19	1.73	.17	2.54	.34
Perceptual abnormalities	3.54	1.41	3–12	3.32	.17	11.95	.34
PHQ-9 sum	9.08	6.86	0–27	.62	.18	–.57	.35
GAD-7 sum	7.68	5.80	0–21	.75	.18	–.40	.35
SRI							
Tension	7.61	5.60	0–23	.64	.18	–.28	.35
Aggression	2.62	3.46	0–16	1.53	.18	1.88	.35
Somatization	2.73	3.02	0–12	1.30	.18	1.01	.35
Anger	7.25	5.35	0–22	.78	.18	.05	.35
Depression	10.80	8.24	0–32	.60	.18	–.81	.35
Fatigue	8.50	4.98	0–20	.31	.18	–.77	.35
Frustration	10.52	7.33	0–28	.36	.18	–.89	.35
Total	50.04	33.25	0–150	.57	.18	–.30	.35

Abbreviations: CAPE, Community Assessment of Psychic experiences; CP, cognitive perceptual; Dis, disorganized; GAD, General Anxiety Disorder Assessment; IP, interpersonal; PHQ, Patient Health Questionnaire version; SRI, Stress Response Inventory.

perception and eccentric behaviour dimensions. We also conducted a sensitivity analysis including gender as an additional predictor in the regression analysis. However, this did not change any of the significant associations between the CAPE-15, the SPQ-BR and anxiety, depression and perceived stress.

4 | DISCUSSION

This study examined two widely used schizotypy measures, the SPQ and the CAPE, within a sample of British undergraduate students to examine the best fitting model of schizotypy. We then used the best

TABLE 3 Individual items of the CAPE-P15 and the SPQ-BR

CAPE-P15	In the past 3 months, have you...	Subscale
1	...felt as if people seem to drop hints about you or say things with a double meaning?	Persecutory Ideation
2	...felt as if some people are not what they seem to be?	Persecutory Ideation
3	...felt that you are being persecuted in anyway?	Persecutory Ideation
4	...felt as if there is a conspiracy against you?	Persecutory Ideation
5	...felt that people look at you oddly because of your appearance?	Persecutory Ideation
6	...felt as if electrical devices such as computers can influence the way you think?	Bizarre Experiences
7	...felt as if the thoughts in your head are being taken away from you?	Bizarre Experiences
8	...felt as if the thoughts in your head are not your own?	Bizarre Experiences
9	...ever been so vivid that you were worried other people would hear them?	Bizarre Experiences
10	...heard your thoughts being echoed back at you?	Bizarre Experiences
11	...felt as if you are under the control of some force or power other than yourself?	Bizarre Experiences
12	...felt as if a double has taken the place of a family member, friend or acquaintance?	Bizarre Experiences
13	...heard voices when you are alone?	Perceptual Abnormalities
14	...heard voices talking to each other when you are alone?	Perceptual Abnormalities
15	...seen objects, people or animals that other people cannot see?	Perceptual Abnormalities
SPQ-BR		
1	Do you sometimes feel that people are talking about you?	Ideas of Reference
2	Do you sometimes feel that other people are watching you?	Ideas of Reference
3	When shopping do you get the feeling that other people are taking notice of you?	Ideas of Reference
4	I often feel that others have it in for me.	Suspiciousness
5	Do you sometimes get concerned that friends or co-workers are not really loyal or trustworthy?	Suspiciousness
6	Do you often have to keep an eye out to stop people from taking advantage of you?	Suspiciousness
7	Do you feel that you cannot get 'close' to people.	No Close Friends
8	I find it hard to be emotionally close to other people.	No Close Friends
9	Do you feel that there is no one you are really close to outside of your immediate family, or people you can confide in or talk to about personal problems?	No Close Friends
10	I tend to keep my feelings to myself.	Constricted Affect
11	I rarely laugh and smile.	Constricted Affect
12	I am not good at expressing my true feelings by the way I talk and look.	Constricted Affect
13	Other people see me as slightly eccentric (odd).	Eccentric Behaviour
14	I am an odd, unusual person.	Eccentric Behaviour
15	I have some eccentric (odd) habits.	Eccentric Behaviour
16	People sometimes comment on my unusual mannerisms and habits.	Eccentric Behaviour
17	Do you often feel nervous when you are in a group of unfamiliar people?	Social Anxiety
18	I get anxious when meeting people for the first time.	Social Anxiety
19	I feel very uncomfortable in social situations involving unfamiliar people.	Social Anxiety
20	I sometimes avoid going to places where there will be many people because I will get anxious.	Social Anxiety
21	Do you believe in telepathy (mind-reading)?	Magical Thinking
22	Do you believe in clairvoyance (psychic forces, fortune telling)?	Magical Thinking
23	Have you had experiences with astrology, seeing the future, UFO's, ESP, or a sixth sense?	Magical Thinking
24	Have you ever felt that you are communicating with another person telepathically (by mind-reading)?	Magical Thinking
25	I sometimes jump quickly from one topic to another when speaking	Odd Speech
26	Do you tend to wander off the topic when having a conversation?	Odd Speech
27	I often ramble on too much when speaking.	Odd Speech
28	I sometimes forget what I am trying to say.	Odd Speech
29	I often hear a voice speaking my thoughts aloud.	Unusual Perception
30	When you look at a person or yourself in a mirror, have you ever seen the face change right before your eyes?	Unusual Perception
31	Are your thoughts sometimes so strong that you can almost hear them?	Unusual Perception
32	Do everyday things seem unusually large or small?	Unusual Perception

TABLE 4 Correlational coefficients between gender, age, CAPE and SPQ scales

	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender	–											
2. Age	–.10											
Community Assessment of Psychic Experiences (Capra et al., 2013)												
3. Persecutory ideation	–.14	–.04										
4. Bizarre experiences	–.05	–.01	.67*									
5. Perceptual abnormalities	–.08	.05	.55*	.73*								
Schizotypal Personality Questionnaire—BR (Cohen et al., 2010)												
6. Ideas of reference Suspiciousness	.20*	.04	.66*	.46*	.41*							
7. No close friends Constricted affect	.08	–.13	.43*	.36*	.24*	.44*						
8. Eccentric behaviour	.20*	–.04	.48*	.49*	.49*	.47*	.44*					
9. Social anxiety	–.02	.09	.29*	.21*	.12	.30*	.34*	.29*				
10. Magical thinking	.07	.04	.38*	.48*	.41*	.37*	.16	.37*	.20			
11. Odd speech	.02	.09	.31*	.25*	.14	.31*	.22	.37*	.28*	.20		
12. Unusual perception	.20*	–.00	.50*	.59*	.53*	.48*	.34*	.50*	.22	.39*	.30*	
McDonald's omega	–	–	.708	.781	.871	.763	.751	.769	.705	.760	.787	.623

Note: Adjusted p -value for correction based $*p < .001$. Medium effect sizes in bold, large effect sizes in bold and italics. (r effects: small $\geq .10$, medium $\geq .30$, and large $\geq .50$).

TABLE 5 Correlation coefficients between CAPE and SPQ7 scales with outcome variables

	GAD -7	PHQ- 9	SRI Tension	SRI Aggression	SRI Somatization	SRI Anger	SRI Depression	SRI Fatigue	SRI Frustration
Gender	.03	.09	.00	–.07	.10	.00	.02	.07	.12
Age	–.01	.01	.02	.01	.20*	.02	–.02	–.03	.04
CAPE (Capra et al., 2013)									
3. Persecutory ideation	.51*	.50*	.57*	.59*	.41*	.53*	.55*	.51*	.52*
4. Bizarre experiences	.44*	.38*	.46*	.49*	.44*	.44*	.41*	.39*	.42*
5. Perceptual abnormalities	.23*	.24*	.33*	.51*	.35*	.40*	.28*	.26*	.28*
SPQ—BR (Cohen et al., 2010)									
Ideas of reference/ Suspiciousness	.41*	.38*	.44*	.51*	.30*	.45*	.44*	.36*	.40**
No close friends/ Constricted affect	.47*	.55*	.50*	.47*	.36*	.46*	.54*	.45*	.48*
Eccentric behaviour	.36*	.36*	.38*	.45*	.29*	.41*	.39*	.38*	.33*
Social anxiety	.42*	.41*	.40*	.27*	.30*	.31*	.41*	.37*	.37*
Magical thinking	.23*	.10	.21	.31*	.28*	.31*	.12	.20	.23
Odd speech	.27*	.32*	.26*	.29*	.11	.25*	.34*	.32*	.21
Unusual perception	.32*	.26*	.34*	.38*	.25*	.32*	.27*	.24*	.28*
McDonald's omega	.92	.91	.84	.85	.82	.81	.90	.85	.89

Note: Adjusted p -value for correction based $*p < .001$. Medium effect sizes in bold, large effect sizes in bold and italics.

fitting versions of these questionnaires, to measure the degree to which they predict psychological distress, specifically anxiety and depression, as well as stress in various domains.

For the CAPE, the best fitting questionnaire solution was the CAPE-P15, which includes three dimensions of positive PLEs (Capra et al., 2013). This finding was in line with factor solutions that were found to be most robust by others (e.g., Armando et al. (2010),

Wigman et al. (2011), and Yung et al. (2009)). For the SPQ, the brief version SPQ-BR provided the best fit, although some of the fit indices were comparatively lower than for the CAPE-P15.

Our confirmatory factor analysis used the available factor solutions and versions for the two schizotypy measures (Brenner et al., 2007; Capra et al., 2013; Cohen et al., 2010; Raine, 1991; Raine & Benishay, 1995; Stefanis et al., 2002). Our results showed

TABLE 6 Regression analysis examining predictive validity of SPQ and CAPE with PHQ-9, GAD-7, and SRI

	PHQ-9	GAD-7	SRI						
			Tension	Aggression	Somatization	Anger	Depression	Fatigue	Frustration
CAPE-15									
Persecutory ideation	.47*	.40*	.48*	.43*	.21	.41*	.52*	.46*	.45*
Bizarre experiences	.14	.33**	.17	.02	.27	.08	.13	.14	.17
Perceptual abnormalities	-.11	-.22	-.05	.26*	.05	.13	-.08	-.08	-.08
R ²	.26	.30	.34	.40	.22	.30	.31	.27	.29
F(3, 184)	21.75**	26.38**	30.83**	40.15**	.17.14**	25.92**	27.39**	22.68**	24.43**
SPQ-BR									
Ideas of reference/ Suspiciousness	.11	.14	.18	.24	.05	.19*	.19	.09	.15
No close friends/ Constricted affect	.40*	.27*	.29*	.24*	.23	.27**	.34	.28*	.31*
Eccentric behaviour	.04	.02	.04	.12	.05	.17	.06	.11	.02
Social anxiety	.21*	.24*	.22*	.04	.17	.10	.20	.18	.19
Magical thinking	-.08	.04	-.00	.09	.18	.14	-.07	.04	.07
Odd speech	.16	.07	.05	.07	-.07	.03	.15	.15	.02
Unusual perception	.00	.06	.08	.06	.04	-.01	-.02	-.05	.03
R ²	.40	.34	.37	.37	.22	.34	.41	.31	.31
F(3, 184)	17.24**	13.23**	14.79**	15.21**	7.06**	12.90**	17.63**	11.42**	11.62**

Note: Significant associations are in bold, * $p < 0.001$.

Abbreviations: CAPE, Community Assessment of Psychic experiences; SPQ-BR, Schizotypal Personality Questionnaire Brief Revised.

that the two best fitting solutions, the CAPE-P15 and the SPQ-BR measured different aspects of schizotypy. Whereas the CAPE-P15 includes only positive psychotic symptoms and not the depressive (e.g., sadness, pessimism, and low self-esteem), and negative symptom dimensions (social withdrawal, affective flattening and avolition) that are included in the original CAPE, the SPQ-BR still includes wider features of schizotypy including cognitive-perceptual (ideas of reference/suspiciousness, magical thinking and unusual perceptual experiences), interpersonal (social anxiety, no close friends and constricted affect) and disorganized ones (eccentric behaviour and odd speech).

The averages for the three CAPE-P15 subscales that we observed in our British student sample were comparable to those that were recently reported in an Australian sample of university students (Capra et al., 2017). The persecutory ideation subscale provided the best predictor for depression, anxiety, and stress, in line with previous findings which showed strong correlations with psychological distress (Capra et al., 2017) and stress reactivity (Chun et al., 2017). The good fit of the CAPE-P15 to our data and its relationship to various experiences of psychological distress is in line with other research that associated PLEs in the general population with a greater probability of mental health disorders (e.g., Wigman et al., 2011; Yung et al., 2009; Zammit et al., 2013), including affective dimensions (Dolphin et al., 2015; Fonseca-Pedrero, Inchausti, et al., 2018; Varghese et al., 2011; Yung et al., 2009), anxiety (Ronald et al., 2014), self-harm, suicidal ideation and behaviours (Capra et al., 2015; Fonseca-Pedrero,

Inchausti, et al., 2018; Honings et al., 2016) and distress more generally (Capra et al., 2017).

In our data, the strong correlation between the criterion variables and persecutory ideation in particular highlight the importance of social factors related to suspiciousness and distrust in others with respect to experiences of psychological distress. The associations between bizarre experiences and perceptual abnormalities and the criterion variables were less robust. Bizarre experiences were significantly associated with higher generalized anxiety and somatization. Finally, perceptual abnormalities predicted lower depression and anxiety, possibly due to a suppression effect when the other subscales were included in the statistical model. The schizotypy subscales were highly correlated. Thus, an explanation could be that by accounting for the joint contribution of these, what remains uniquely represented by the 'perceptual abnormalities' dimension, could reflect spiritual experiences or magical thinking, which have been associated with spiritual wellbeing and feelings of connectedness (Unterrainer et al., 2011) and might therefore be related to lower anxiety and depression. For anxiety such an interpretation would be supported by a negative association with the SPQ domain of magical thinking, although this association did not reach significance. In contrast, we found a significant positive correlation between perceptual abnormalities and indices of aggression towards others, as previously reported by other studies that suggested that the relationship might be mediated by peer-victimization (Lam et al., 2016; Raine et al., 2011).

A different pattern emerged for the SPQ-BR, which, unlike the CAPE, does not include affective symptoms, but includes aspects of social anxiety and broader social functioning, such as not having close friends and constricted affect. Social anxiety and a lack of friends are related (Brook & Willoughby, 2015; Hur et al., 2020) and are frequent concerns of university students (Diehl et al., 2018; Parade et al., 2010; Russell & Shaw, 2009). These dimensions of social functioning are thus likely to capture relevant issues in our student population. In our sample the scores on the SPQ were similar to what has previously been reported in other student populations using the SPQ (Fonseca-Pedrero, Compton, et al., 2014; Fonseca-Pedrero, Fumero, et al., 2014). Our findings showed that for the SPQ-BR solution the persecutory ideation/suspiciousness dimension and other aspects of positive schizotypy did not significantly predict poorer mental health in terms of anxiety and depression, despite high intercorrelations ($r = .66$) with the equivalent domain on the CAPE-P15 that was highly predictive of these, when other aspects of schizotypy were accounted for in the model. Although, for four indices of stress, that is, tension, aggression, anger, and depression, the associations with persecutory ideation/suspiciousness on the SPQ-BR were significant. Overall, not having close friends provided the best predictor for both indicators of psychological distress (i.e., anxiety and depression) and all aspects of stress in our sample. Social anxiety was also reliably related with psychological distress and stress, albeit with smaller effect sizes. This finding corroborates previous research that shows that social connections play a key role in adjustment to university and mental health (Buote et al., 2007; Hefner & Eisenberg, 2009; Piccirillo, 2016). It suggests that general issues around social anxiety and relationships explain additional variance with respect to psychological distress and stress. Thus, in terms of the experiences that are captured by both measures, it appears that the social anxiety and not having close friends matches key concerns of students better than persecutory ideation and other aspects of positive symptoms and more importantly, depression, or negative symptoms.

Alternatively, another suggestion would be that the two SPQ subscales could reflect criterion variables, that is social problems might be a consequence of schizotypy rather than a defining characteristic (e.g., Minor et al., 2020; Springfield & Pinkham, 2020). That is, is someone schizotypic because he or she does not have close friends; or is the causal link reversed, whereby schizotypic experiences, such as bizarre thinking, unusual perception and persecutory ideation lead to a smaller number of friends and social anxieties. Some evidence suggests that the link between anxiety and a lack of social closeness is indeed amplified by positive schizotypy (Kwapil et al., 2012) and it has been suggested that positive schizotypy leads to avoidance of social contact due to social anxiety, low self-esteem, and social rejection. Although, it needs to be noted that particularly negative schizotypy seems to be associated with decreased social contact and social disconnection (Barrantes-Vidal et al., 2010; Kwapil et al., 2012). For future studies, it will be important to consider these findings when deciding which questionnaires to use. If the focus is on PLEs the CAPE-P15 works best and if the focus is on understanding the contribution of social anxiety and lack of close friendships the SPQ-BR might work better. However, given the known risk of stress as a risk

factor in the transitioning to psychosis, the focus on understanding the interactions of positive symptoms, social indices anxiety and psychological distress should be further investigated in future studies.

The current findings need to be interpreted in the light of several methodological considerations. First, our sample was largely female and included undergraduate psychology students. This limits the generalizability and highlights the need for future studies that are more representative for the general population. Second, the cross-sectional nature does not allow for conclusions about the direction or causality of associations with psychological distress or stress. Finally, the SPQ-BR has been rated on a 4-point Likert scale, which has shown high convergence and improved internal reliability (Cohen et al., 2010). However, as our analysis was based on the original SPQ questionnaire (Raine, 1991), we employed a dichotomous answering option to derive other solutions for the questionnaire. As such, the data of the SPQ-BR from the current study cannot be directly compared to other studies that used a four-point Likert scale.

Our study compared two frequently used schizotypy measures. Our findings highlight that data from the two measures cannot be compared easily, particularly with respect to their predictive validity. Our results suggest that particularly persecutory ideation and indices of social functioning, such as social isolation (not having close friends) and social anxiety determine the degree to which a participant/student will higher psychological distress, (Leigh-Hunt et al., 2017; Rohde et al., 2016), including PLEs (Fett et al., 2021). Our findings highlight the importance of understanding social determinants of mental health and distress in the student population. Longitudinal studies are needed to examine heightened distress as a contributing factor to the risk for transitioning into clinical disorders, as well as impact on functioning and academic outcomes.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author, [CH], upon reasonable request.

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