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## The Schizotypal Personality Questionnaire-Brief lacks measurement invariance across three countries

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### ABSTRACT

The Schizotypal Personality Questionnaire-Brief (SPQ-B) is a commonly-used tool for measuring schizotypal personality traits and due to its wide application, its cross-cultural validity is of interest. Previous studies suggest that the SPQ-B either has a three- or four-factor structure, but the majority of studies have been conducted in Western contexts and little is known about the psychometric properties of the scale in other populations. In this study factorial invariance testing across three cultural contexts—Australia, China and Chile was conducted. In total, 729 young adults (Mean age = 23.99 years, SD = 9.87 years) participated. Invariance testing did not support the four-factor model across three countries. Confirmatory Factor Analyses revealed that neither the four- nor three-factor model had strong fit in any of the settings. However, in comparison with other competing models, the four-factor model showed the best for the Australian sample, while the three-factor model was the most reasonable for both Chinese and Chilean samples. The reliability of the SPQ-B scores, estimated with Omega, ranged from 0.86 to 0.91. These findings suggest that the SPQ-B factors are not consistent across different cultural groups. We suggest that these differences could be attributed to potential confounding cultural and translation issues.

### 1. Introduction

Schizotypy is a heterogeneous construct that has been used by researchers and clinicians to describe schizotypal traits, psychosis-proneness, and psychotic-like experiences. Coined by Meehl (1962), it refers to a personality organisation that represents the vulnerability for developing psychotic-spectrum disorders. Expression of schizotypal traits (e.g. hallucinatory and delusional experiences), despite having a transient nature and possibly vanishing over time, can occur in the general population, without necessarily being associated with a mental health condition (Fonseca-Pedrero and Debbané, 2017; Linscott and Van Os, 2013; Van Os et al., 2009). For example, an international study conducted by McGrath et al. (2015) sampling 31261 adults in the community from 18 countries, found that the average life-time prevalence of psychotic experience was 5.8%. Further, evidence from a meta-analysis showed that the risk of conversion to a clinical psychotic outcome among people who report subthreshold psychotic experiences (0.56%) is 3.5 times higher than those without exposure to such

experiences (0.16%), particularly the experiences were severe or persistent (Kaymaz et al., 2012). Other longitudinal studies (e.g., Poulton et al., 2000; Zammit et al., 2013) also suggest that adolescents and young adults who report such schizotypal experiences are at greater risk of developing psychosis and related disorders than those who do not. These studies suggest that the presence of schizotypal features may represent a liability to developing symptoms of schizophrenia or transitioning from subclinical impairments to a full-blown psychosis, and this is especially the case if genetic and environmental risk factors are present (e.g. degree of relatedness to family member with schizophrenia, cannabis use) (Linscott and Van Os, 2013; Debbané et al., 2015; Van Os et al., 2009). It is therefore important to identify and address schizotypal traits as early as possible as early detection and intervention may enable prevention of, or reduce the probability of progression in psychosis (Fonseca-Pedrero et al., 2016; Ortuno-Sierra et al., 2013).

The Schizotypal Personality Questionnaire-Brief version (SPQ-B; Raine and Benishay, 1995) is one of the most popular scales used to

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assess schizotypal traits (Reynolds et al., 2000). Derived from the original 74-item scale developed by Raine (1991), it consists of 22 items, responded to using a Yes/No format, that reflect the diagnostic criteria of schizotypal personality disorder first described in the DSM-III-R (American Psychiatric Association, 1987). These items cover nine distinct domains (i.e. ideas of reference, excessive social anxiety, odd beliefs or magical thinking, unusual perceptual experiences, odd or eccentric behaviour, no close friends, odd speech, constricted affect, and suspiciousness) that are grouped into three factors which relate in part to the three components of schizophrenia: cognitive-perceptual problems (positive symptoms), interpersonal problems (negative symptoms) and disorganization (Raine and Benishay, 1995).

The brevity of the SPQ-B while still capturing the three factors reflected by the larger scale, makes it an attractive screening measure and it has been used both in non-clinical and psychiatric populations (Axelrod et al., 2001; Compton et al., 2007, 2009; Mata et al., 2005). In addition, the SPQ-B has been translated into different languages and validated in a variety of culture contexts, including China (Ma et al., 2010, 2015), Spain (Fonseca-Pedrero et al., 2009, 2011b, 2011a, 2014; Mata et al., 2005), Japan (Ito et al., 2008, 2010), and Turkey (Aycicegi et al., 2005).

Despite these advantages and its widespread use, Stefanis and colleagues (2004) argued that the 'positive' schizotypy factor in Raine's (1991) three-factor model for the SPQ, which includes items of cognitive-perceptual and paranoid dimensions, should in fact be two independent factors. They suggested a four-factor model that consists of interpersonal, cognitive-perceptual, disorganized, and paranoid factors. While this four-factor structure has been well replicated in both the SPQ and SPQ-B (Cicero, 2015; Cohen et al., 2010; Fonseca-Pedrero et al., 2009, 2014; Lahmar et al., 2014; Smallman et al., 2010), there is little evidence to suggest that it is valid across cultures. For example, the four-factor model in the SPQ-B has been replicated in Spanish community samples (Fonseca-Pedrero et al., 2009, 2011a), but the original three-factor model (cognitive-perceptual, interpersonal and disorganised) was supported in China (Ma et al., 2015), and a two-factor model was identified by Principal Component Analysis in Turkey and Italy (Aycicegi et al., 2005; Preti et al., 2015).

Only two previous studies have provided evidence of the four-factor model solution of the SPQ across different cultural groups in the same study (Cicero, 2015; Fonseca-Pedrero et al., 2014). Cicero (2015) replicated the four-factor structure within cultural subgroup samples in the United States (i.e. Asian, Caucasian, Pacific Islander, etc.) while Fonseca-Pedrero and colleagues (2014) established measurement invariance for the four-factor model across samples of Spanish and US college students. Although the four-factor structure of SPQ-B has not been replicated in Eastern contexts, past evidence of measurement invariance across diverse ethnic groups demonstrated in Cicero's study infers that a four-factor model may apply in both Western and Eastern cultures.

In relation to culture, Cohen et al. (2015) suggested that it is important to assess schizotypy in different cultures as social and affective functioning has the potential to vary considerably across cultures. In fact, previous studies have demonstrated variation in schizotypal traits and psychotic-like experiences across countries (Cicero, 2015; Linscott and Van Os, 2013). For example, Caucasian respondents have been reported to have lower scores on the SPQ than other ethnic groups on the 'interpersonal' schizotypal factor while Chinese respondents tend to report significantly lower SPQ scores than their Caucasian counterparts (Chen et al., 1997; Cicero, 2015). These findings suggest that potential ethnic or cultural factors were at play, which is worth investigation.

The current study aims to examine the measurement invariance of the four-factor structure of the SPQ-B across samples from both Western (i.e., Australia and Chile) and Eastern cultures (i.e., China). In light of Cicero's (2015) findings in the United States across multiple ethnic groups, we hypothesized that the four-factor structure in the SPQ-B would be invariant across countries. In addition, in line with reported

**Table 1**

Gender composition, mean and standard deviation of age across sample populations.

Country	<i>n</i>	Male	Female	Mean age (SD)	Age range
Australia	139	64 (46.7%)	72 (51.8%)	32.23 (12.66)	18–69
China	269	92 (34.2%)	177 (65.8%)	23.13 (11.42)	18–92
Chile	321	149 (46.4%)	172 (53.6%)	21.15 (2.20)	18–34

Note: SD = standard deviation.

cultural variations in SPQ scores, we further hypothesized that scores would differ between countries.

## 2. Method

### 2.1. Participants

Data for the current study were drawn from a larger series of studies examining schizotypal traits and social cognition (e.g., see Prado et al., 2014). The participants were 729 ( $M = 23.99$  years,  $SD = 9.87$  years) non-clinical community sample and university students recruited in Australia, mainland China, and Chile. A total of 304 males ( $M = 23.58$  years,  $SD = 7.50$  years) and 421 females ( $M = 24.07$  years,  $SD = 11.05$  years) took part in the study. Refer to Table 1 for detailed gender and age composition in the sample populations. The Australian sample included 139 participants, of whom 64 were male (46.7%) and 72 female (51.8%) with a mean age of 32.23 ( $SD = 12.66$ ). The average years of education was 15.6 ( $SD = 3.77$ ). All of the sample were born in Australia, with the majority reporting that both parents were also born in Australia. Of those whose parents were born elsewhere, 17 participants indicated that one or both of their parents were born in the UK. Seven indicated that one or both of their parents were born in New Zealand or South Africa. Four indicated that one of their parents was born in Europe and one in Scandinavia. The Mainland Chinese sample included 269 participants, of whom 92 were male (34.2%) and 177 female (65.8%) with a mean age of 23.13 ( $SD = 11.42$  years). The average years of education for this group was 15.63 years ( $SD = 2.25$ ). All participants indicated that they and their parents were born in China. The Chilean sample included 321 participants, of whom 149 were male (46.4%) and 172 female (53.6%) with a mean age of 21.15 ( $SD = 2.20$  years). The Chilean group reported an average years of education of 15.96 ( $SD = 2.02$ ). All of the Chilean sample were born in Chile and only four participants indicated that one of their parents was not born in Chile. For those four, three reported one parent had been born in another South American country (Argentina, Peru and Venezuela) and the other had one parent from Palestine. The three groups differed significantly with regard to age ( $F(2, 726) = 75.691$ ,  $p < 0.001$ ), with the Australian sample being significantly older than the other two groups (32.23), and the Chinese sample (23.13) being older than the Chilean sample (21.15). There was no difference between the groups with regard to years of education.

### 2.2. Materials

The Schizotypal Personality Questionnaire–Brief (SPQ-B) is a 22-item dichotomous (yes/no) format self-report questionnaire for the assessment of schizotypal personality traits developed by Raine and Benishay (1995). Based on the 74-item SPQ, it consists of three subscales: Cognitive-Perceptual dimension (ideas of reference, paranoid ideation magical thinking and unusual perception, e.g. “When shopping, do you get the feeling that other people are taking notice of you?”); Interpersonal dimension (social anxiety, no close friends, blunted affect and paranoid ideation, e.g. “I feel very uncomfortable in social situations involving unfamiliar people”); and Disorganized dimension (odd speech and behavior, e.g. “I am an odd, unusual person”). It produces a total score and an individual score for each subscale,

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