The dimensional structure of short forms of the Wisconsin Schizotypy Scales

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A R T I C L E   I N F O

A B S T R A C T

The Wisconsin Schizotypy Scales (WSS) are widely used for assessing schizotypy. Confirmatory factor analysis (CFA) indicates that a two-factor structure, positive and negative schizotypy, underlies these scales. Recently developed 15-item short forms of the WSS demonstrated good reliability and validity. This study examined the factor structure underlying the short-form WSS. Consistent with the original scales, CFA on three large samples ($n = 6137$, 2171, and 2292, respectively) indicated that a two-factor model with positive and negative dimensions provided better fit than a generic schizotypy model for the short-form WSS. The short-form dimensions correlated highly with the original scale dimensions and displayed good stability across 10 weeks. Preliminary construct validity was demonstrated through associations with interview and questionnaire measures of psychopathology, functioning, and personality comparable to those found with the original WSS. This is the first study examining the dimensional structure of the short WSS and the validity of these dimensions. The findings support the multidimensional nature of schizotypy and the appropriateness of dimensions derived from the short-form WSS.

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1. Introduction

Current research conceptualizes schizotypy as a multidimensional phenotype that encompasses clinical and subclinical manifestations of the schizophrenia spectrum (Lenzenweger, 2010; Kwapil and Barrantes-Vidal, 2014). Ample evidence supports significant overlap between schizotypy and schizophrenia across behavioral and neurobiological domains, suggesting that the identification of schizotypic individuals should facilitate the detection of etiological risk and protective factors for schizophrenia-spectrum disorders (for a review see Ettinger et al., 2014). It also allows for the examination of etiological factors relatively untainted by confounds accompanying full-blown schizophrenia, such as hospitalization, medication, and stigma. Since their development by the Chapmans and colleagues, the Wisconsin Schizotypy Scales (WSS, also known as the Chapman Scales of Psychosis Proneness)—including the Perceptual Aberration (Chapman et al., 1978), Magical Ideation (Eckblad and Chapman, 1983), Physical Anhedonia (Chapman et al., 1976), and Revised Social Anhedonia (Eckblad et al., 1982) Scales—have been widely employed in the study of schizotypy.

Cross-sectional and longitudinal investigations provided evidence for the reliability and validity of the WSS (e.g., Gooding et al., 2005; Kwapil et al., 2008, 2013).

Schizotypy, and by extension schizophrenia, are conceptualized as multidimensional constructs (Raine et al., 1994; Vollema and van den Bosch, 1995; Stefanis et al., 2004), with positive and negative symptom dimensions the most consistently replicated factors. Using confirmatory factor analysis (CFA) with 6137 young adults, Kwapil et al. (2008) found evidence for a two-factor structure with positive and negative factors underlying the original WSS. In addition, they reported that, as hypothesized, the schizotypy dimensions were differentially associated with symptoms and impairment. Positive schizotypy was associated with psychotic-like experiences, substance abuse, mood disorders, and mental health treatment; negative schizotypy was associated with negative and schizoid symptoms and decreased likelihood of intimate relationships. Both dimensions were related to schizotypal and paranoid symptoms and poorer functioning. Kwapil et al. (2013) reported that both dimensions predicted schizophrenia-spectrum disorders using data from the 10-year follow-up study conducted by Chapman et al. (1994).

Despite the demonstrated validity of the WSS, the combined length of the scales (166 items) can be problematic; therefore, Winterstein et al. (2011) created 15-item short forms for each of the four WSS. They chose items based upon content analysis and psychometric properties using classical test theory, item response theory, and differential

item functioning. Winterstein et al. (2011) reported good internal consistency for the short-form scales as well as preliminary evidence for validity. Gross et al. (2012) investigated the reliability and validity of the short-form WSS using interview ratings of psychotic-like and schizophrenia-spectrum symptoms and questionnaire measures of personality and social impairment. Despite the drastic reduction in items, the short scales demonstrated good reliability, correlated highly with the original scales, and exhibited hypothesized associations with measures of psychopathology, personality, and impairment. Fonseca-Pedrero et al. (2014) reported that the brief versions of the Perceptual Aberration and Magical Ideation Scales had good psychometric properties and loaded on a single underlying factor. However, they did not examine the properties of the anhedonia scales.

The present study extends the work of Winterstein et al. (2011), Fonseca-Pedrero et al. (2014), and Gross et al. (2012) by examining the factor structure underlying the short WSS in three large samples. This is the first study examining the dimensional structure of the short WSS and the validity of these dimensions. It was hypothesized that the two-factor structure reported by Kwapil et al. (2008) for the original scales will be replicated in the shortened scales. Assuming that the structure is supported, we hypothesized that the short-form dimensions would exhibit good temporal stability and comparable associations with measures of schizotypic symptoms, impairment, personality, and social functioning as reported in Kwapil et al. (2008).

2. Method

2.1. Participants

WSS data were obtained from three large, independent samples of undergraduates. The first two samples completed the original WSS. We then derived the short WSS scores and dimensions from the original scales, allowing us to compare performance, factor structure, and the correlates of these factors between the original and short scales. The first sample included 6137 students (76% female) with a mean age of 19.4 ($SD = 3.7$). This sample was used by Kwapil et al. (2008) to examine the factor structure of the original schizotypy scales and by Winterstein et al. (2011) to derive the short forms. Therefore, a second sample of 2171 participants (76% female) with a mean age of 19.6 ($SD = 3.3$) from Kwapil et al. (2012) was used in the CFAs to provide an independent comparison of the findings from the original sample. The third sample was collected specifically for the present study to provide an independent sample that completed only the short WSS. It contained 2292 participants (76% female) with a mean age of 19.5 ($SD = 2.8$). Note that the three groups did not differ significantly on age or sex composition.

To examine the temporal stability of the schizotypy dimension scores, a subset of 106 participants from sample 1 volunteered to complete the schizotypy scales on two occasions about 10 weeks apart (sample 1a). In terms of demographics and WSS scores, this subset was comparable to the original sample. To examine construct validity of the short forms, a subset of 780 participants from sample 1 completed personality and social adjustment questionnaires (sample 1b). Likewise, this subset was comparable to the original sample. An overlapping subset of 430 participants from sample 1 was administered structured diagnostic interviews (sample 1c). This subset displayed similar demographics but slightly higher WSS scores than the original sample. Note that samples 1b and 1c were examined in Kwapil et al. (2008) and Gross et al. (2012).

2.2. Materials and procedures

The first two samples completed the original WSS (which were used to compute short WSS scores), whereas participants in the third sample only completed the short WSS. The original scales take about 25 min to

complete, whereas the short forms take about 10 min. All participants completed a 13-item infrequency measure (Chapman and Chapman, 1983) to screen for invalid responders. The rate of omitted subjects ranged from 6.3% to 9.3% across the three samples. The Perceptual Aberration Scale measures psychotic-like perceptual and bodily experiences, the Magical Ideation Scale assesses beliefs in invalid causality, the Revised Social Anhedonia Scale taps asociality and diminished pleasure from social situations, and the Physical Anhedonia Scale assesses deficits in sensory and aesthetic pleasure.

Sample 1b ($n = 780$) completed the NEO-PI-R (Costa and McCrae, 1992), a self-report measure of the Five-Factor Model of personality, as well as the Social Adjustment Scale (Weissman, 1999), a self-report measure of social functioning in school, leisure, and family contexts. Sample 1c ($n = 430$) completed portions of the Structured Clinical Interview for DSM-IV (First et al., 1995) assessing mood episodes and substance use disorders. Quantitative ratings of substance use and impairment were coded using the rating system described in Kwapil (1996). The International Personality Disorders Examination (World Health Organization, 1995) was used to provide diagnoses and dimensional ratings of schizophrenia-spectrum personality disorders. The Wisconsin Manual for Assessing Psychotic-like Experiences (Chapman and Chapman, 1980) was used to assess seven classes of clinical and subclinical psychotic symptoms. The Negative Symptom Manual (Kwapil and Dickerson, 2001) assesses six classes of clinical and subclinical negative symptoms of schizophrenia. The Global Assessment of Functioning Scale (GAF; American Psychiatric Association, 2000) assesses overall functioning. The diagnostic interviews were conducted by a licensed psychologist and advanced graduate students who were unaware of participants' WSS scores. Participants provided informed consent and received credit for their participation. The study was approved by the UNCG Institutional Review Board.

3. Results

Descriptive statistics for the short WSS in the first two samples are reported in Gross et al. (2012) and descriptives for the third sample are reported in Table 1. These values were comparable across the three samples, and the short scales demonstrated good reliability and high correlations with their original scale counterparts.

3.1. Confirmatory factor analyses

CFAs were conducted to examine the factor structure underlying the shortened scales in each of the samples. Sample size and number of participants per observable variable were more than sufficient (Bentler and Chou, 1987) and well above the 200 participants minimum recommended by Barrett (2007). The WSS items have a binary response format so they were treated as categorical indicators in the models. Note that the specification of categorical item-level observed variables precludes the use of many traditional fit statistics (e.g., GFI or RMSEA). Model fit was assessed using the Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC), and Sample-Size Adjusted BIC; smaller values indicate better fit (Kline, 2011). Unlike

Table 1
Descriptive statistics for the Shortened Wisconsin Schizotypy Scales in sample 3 ($n = 2292$).

	M	SD	Range	Skew (SE)	Kurtosis (SE)	Alpha	Binary alpha
Magical Ideation	3.55	2.93	0–15	0.86 (.05)	0.30 (.10)	.75	.93
Perceptual Aberration	1.29	2.12	0–15	2.50 (.05)	7.70 (.10)	.79	.86
Social Anhedonia	2.46	2.64	0–15	1.54 (.05)	2.52 (.10)	.77	.89
Physical Anhedonia	2.35	2.17	0–14	1.25 (.05)	1.75 (.10)	.65	.82