Towards a Schizotypy Core: Convergence and Divergence of Two Empirically-Derived Self-Report Measures from a Nonclinical Sample.

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Abstract

Schizotypal personality traits are important for understanding the various manifestations of schizophrenia-spectrum liability. Data from a recent study suggests that the Wisconsin Schizotypy Scales and the Schizotypal Personality Questionnaire converge into positive and negative factors, though it is unclear whether these measures are redundant or whether they tap distinct facets of these latent constructs. The present study used item-level Exploratory Structural Equation Modeling (ESEM) of two empirically derived revisions of these scales, the WSS – Short Form (WSS-SF) and the SPQ – Brief Revised (SPQ-BR). ESEM analysis of the SPQ-BR supported a seven-factor subordinate and three-factor superordinate solution, whereas that of the WSS-SF revealed a three factor solution. Concurrent item-level ESEM of the SPQ-BR and WSS-SF revealed a four factor solution: positive, negative, disorganized and physical anhedonia. Nearly all of the factors identified from these ESEMs explained unique variance in clinical symptoms and, in the case of the negative factors, treatment history. These data provide further evidence that schizotypy is heterogeneous with a similar structure as seen in schizophrenia and that it may not be adequately captured by an individual measure.

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Introduction

Schizotypal personality traits have long been a focus of empirical and clinical attention (e.g., Claridge, 1988; Lenzenweger, 2006; Meehl, 1962; Raine, 2006). Schizotypy is a clinically important construct in that it is thought to be a necessary (but not sufficient) condition for schizophrenia-spectrum pathology and because it is associated with increased risk for a broad range of psychopathological states, including psychosis, distress and functional impairments as well as increased treatment utilization (e.g., Cohen, Buckner, Najolia & Stewart, 2011; Cohen & Davis, 2009; Debbané et al., 2015; Goulding, McClure-Tone & Compton, 2009; Kwapil, Gross, Silvia & Barrantes-Vidal, 2013). Just as the manifestation of schizophrenia is heterogeneous – encompassing a broad range of emotional, cognitive, perceptual, social and behavioral functions, schizotypy involves a diverse set of traits. This is not surprising given that the neurobiology underlying both schizophrenia and schizotypy is diffuse and broad-reaching (e.g., Ettinger et al., 2015). Nonetheless, at the present time, measurement of schizotypy is focused almost exclusively on overt, self-reported phenotypic features (i.e., detectable to the unaided "naked" eye) hence unaided by biological, behavioral or cognitive "endophenotypic" markers (Gottensman & Gould, 2003). Importantly, there is a lack of consensus about which features are central to schizotypy (e.g., Kwapil & Barrantes-Vidal, 2015; Linscott, 2013; Tarbox & Pogue-Geile, 2011) and this conceptual ambiguity contributes to marked variability across schizotypy measures in item content. Whether these measures are conceptually distinct, or whether they are essentially redundant in tapping schizotypal traits remains to be determined. The present study employed sophisticated statistical procedures to evaluate convergence and divergence between two distinct psychometrically-supported self-report measures of schizotypy. We were interested in evaluating common versus unique facets of these measures, and their relative importance to psychosis symptoms and clinical treatment utilization. This was intended to improve conceptual understanding of schizotypy and for the development of future measures.

The Wisconsin Schizotypy Scales (WSS; Chapman, Chapman & Raulin, 1976; Eckblad & Chapman, 1983) reflect some of the first and most important measures of schizotypy. Collectively these scales are meant to tap four different constructs: Magical Ideation, Perceptual Aberrations, Social Anhedonia and Physical Anhedonia. A relatively large literature employing these measures exists and their reliability, concurrent and predictive validity for schizophrenia-spectrum personality disorders has been documented (Chapman, Chapman, Kwapil, Eckblad & Zinser, 1994; Kwapil, 1998; Kwapil, Brown, Silvia, Myin-Germeys & Barrantes-Vidal, 2012). Short forms of these measures were also developed (Winterstein et al., 2011), as the originals are somewhat time-consuming; comprising 166 versus 60 items in total. Structurally speaking, subscale-level Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) have supported the notion that schizotypy reflects two broad domains: positive (i.e., Magical Ideation and Perceptual Aberrations) and negative (i.e., Social and Physical Anhedonia), in the original WSS (Kwapil, Barrantes-Vidal & Silvia, 2008), though a more complicated structure, comprising four domains (i.e., Magical Ideation, Perceptual Aberrations, Social Anhedonia and Physical Anhedonia) has been reported in EFA of WSS Short Forms

(WSS-SF) studies (Fonseca-Pedrero, Paino, Ortuño-Sierra, Lemos-Giráldez & Muñiz, 2013; Gross, Silvia, Barrantes-Vidal & Kwapil, 2015; Winterstein et al., 2011). Thus, examinations of the WSS suggest that schizotypy comprises of at least positive and negative domains; and as many as four domains.

An alternate measure of schizotypy, the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), is important for the present discussion because it includes a conceptually broader range of schizotypal traits than the WSS. The SPQ was modeled after the Diagnostic and Statistical Manual of Mental Disorders III-Revised definition of Schizotypal Personality Disorder (SPD; American Psychiatric Association, 1980), including three domains that conceptually overlap with the WSS: Magical Ideation, Perceptual Aberrations, No Close Friends (conceptually similar to social anhedonia; correlated at $r[275] = .76$ in Wuthrich & Bates, 2006), but also Ideas of Reference, Suspiciousness, Constricted Affect, Odd Speech, Eccentric Behavior and Social Anxiety. Although the SPQ was originally developed as a measure of SPD, the SPQ is often used as a measure of schizotypal personality – a conceptually broader construct than SPD. A relatively large literature has investigated the factor structure of the SPQ, with the intent, in part, to understand which traits comprise schizotypy and how these traits are organized. In contrast to the WSS, the factor structure of the original SPQ has been more varied, with one, two (Preti et al., 2015), three (Fonseca-Pedrero, Debbane, Schneider, Badoud & Eliez, 2015), four (Fonseca-Pedrero et al., 2014) and seven (Callaway, Cohen, Matthews, & Dinzeo, 2014; Cohen, Matthews, Najolia, & Brown, 2010) factor solutions; in part, reflecting whether subscale or item-level analysis was conducted (see below for elaboration) and whether the two-factor or second order factors were examined. It is noteworthy that short versions of the SPQ, most recently, the SPQ – Brief Revised (SPQ-BR; Callaway et al., 2014; Cohen et al., 2010) have been developed. The SPQ-BR has shown a remarkably consistent factor structure across published studies (Callaway et al., 2014; Cohen et al., 2010; Fonseca-Pedrero & Cohen, 2015; Davidson, Hoffman & Spaulding, 2016, Zhang & Brenner 2016; Yu, Bernardo & Zaroff, 2015). In sum, the WSS and SPQ show divergent factor structures and hence, appear to differ in the facets of schizotypy they tap.

Resolving the structure of schizotypy

Resolving the structure of schizotypy is an important step towards a) understanding the structure of schizotypy, b) resolving whether it reflects multiple processes or a single construct with varied expressions, and c) developing more sophisticated measures and operational definitions for empirical and clinical use. To this end, evaluating convergence and divergence of schizotypy using different measures is an important endeavor (e.g., by increasing the number of distinct "observations" of the same latent construct). As yet, a number of studies have examined convergence between various schizotypy measures (e.g., Linscott, 2013; Wuthrich & Bates, 2006), though only a few have evaluated the convergence/divergence of factor structures across measures. Of note, Gross, Mellin, Silvia, Barrantes-Videl, and Kwapil (2014) employed EFA/CFA of the WSS and SPQ. Their data supported a two-factor structure of the WSS (e.g., positive and negative) and a conceptually inconsistent SPQ structure – notably a four-factor model using CFA and a two-factor model using EFA. Moreover, there was divergence between the two sets of factors. While the positive scales (i.e., WSS Positive and SPQ Cognitive-Perceptual) tended to correlate highly (e.g., $r[1435] = .87$), there was limited convergence between the negative scales (i.e., WSS Negative and SPQ Interpersonal; $r[1435] = .34$). Relatedly, the SPQ Interpersonal and WSS Negative scales showed divergent correlates with personality more generally, with SPQ Interpersonal but not the WSS Negative scales being modestly associated with neuroticism (r's$[878] = .48$ and $.16$ respectively). Moreover, the SPQ disorganized and WSS Positive ($r[1435] = .64$) scales were highly correlated with each other, suggesting that disorganization (at least as measured using the SPQ) taps a facet of positive schizotypy. Collectively, these results raise questions about the incremental validity of schizotypal traits beyond the positive and negative factors in the WSS, namely the Constricted Affect, Social Anxiety, Odd Speech, Eccentric Behavior and Suspiciousness. Conceptually speaking, their findings support the notion that schizotypy is comprised of positive and negative traits.

When interpreting the Gross et al., (2014) findings, several considerations should be made. First, the authors employed subscale level EFA and CFA (i.e., use of predefined summary scores based on conceptually-driven or prior EFA-based solutions). While informative, EFA using predefined subscales is not ideal for either the WSS or SPQ given the few numbers of indicators being used (i.e., one or two per factor). Despite the use of "parceling" to create more robust estimates, more indicators are recommended to identify a well-defined factor (see Chmielewski & Watson, 2008; Floyd & Widaman, 1995; MacCallum, Widaman, Zhang & Hong, 1999). This is a broad concern for

factor analytic studies of the SPQ and WSS. The handful of item-level analyses conducted on either the WSS or SPQ often fail to support a simple coherent structure. With respect to the WSS, factor analysis of individual scales tends to yield multidimensional structures (e.g., Blanchard, Gangestad, Brown & Horan, 2000; Lenzenweger, Bennett & Lilenfeld, 1997). The only studies to our knowledge conducting item-level analysis on all WSS scales simultaneously involve the short forms, and found that magical ideation, perceptual aberration and social and physical anhedonia were each separable (Fonseca-Pedrero et al., 2013; Winterstein et al., 2011). Item level analysis of the SPQ has yielded complicated and largely inconsistent findings as well (e.g., Chmielewski & Watson, 2008), though consistency has been reported with the SPQ-BR (Callaway et al., 2014; Cohen et al., 2010; Fonseca-Pedrero & Cohen, 2015; Davidson, Hoffman & Spaulding, 2016, Zhang & Brenner 2016; Yu, Bernardo & Zaroff, 2015). Across three separate studies, use of EFA and CFA have supported a seven factor subordinate solution with a three-factor super-ordinate solution (Callaway et al., 2014; Cohen et al., 2010; Fonseca-Pedrero & Cohen, 2015 see also Davidson, Hoffman & Spaulding, 2016). To redress these inconsistencies, the present study conducted item-level Exploratory Structural Equation Modeling (ESEM; Asparouhov & Muthén, 2009) of the WSS-SF and SPQ-BR and evaluated their convergence.

A second consideration with the Gross et al., (2014) study involves the use of Neuroticism for establishing divergent/convergent validity. Neuroticism is an important facet of schizotypy, and is thought of as a nonspecific vulnerability marker of schizophrenia-risk (see Horan, Brown & Blanchard, 2007 for a qualitative meta-analysis). However, its nonspecific nature limits its specificity as an indicator of validity regarding schizotypy. Moreover, the SPQ and SPQ-BR tap neuroticism-related constructs that are not included in the WSS or WSS-SF, namely social anxiety and suspiciousness – constructs that are important to schizophrenia-spectrum disorders (Blanchard, Mueser & Bellack, 1998; Morrison & Cohen, 2014). Including items measuring these constructs within the SPQ Interpersonal/negative factor likely served to increase convergence between the SPQ Interpersonal/negative scales and neuroticism. Importantly, social anxiety and suspiciousness are conceptually distinct from the core negative schizotypy features in some studies (Brown, Silvia, Myin-Germeys, Lewandowski & Kwapil, 2008; Cohen & Matthews, 2010; Kwapil et al., 2012) and withholding them from the negative factor has not reduced fit statistics in several CFA studies of the SPQ-BR (Callaway et al., 2014; Cohen et al., 2010). In evaluating the convergence of the negative schizotypy scales from the WSS and SPQ, it would be important to employ convergent validity indicators beyond neuroticism and to consider social anxiety and suspiciousness as potentially distinct; at least within the confines of the EFA/CFA findings. The present study redressed this issue by evaluating the convergence of empirically-derived factors from the SPQ-BR and WSS-SF in relation to current psychosis (i.e., defined dimensionally using a validated clinical measure), global psychopathology and clinical services utilization (i.e., history of outpatient or inpatient psychological/psychiatric history).

Method

Participants

Participants were undergraduates who participated in an on-line survey for experimental credit (i.e., to satisfy undergraduate course requirements). Of the 629 participants who began the survey, 550 completed it. Five participants were excluded due to responding to at least three of four infrequent items (Chapman & Chapman 1983). The mean age of the sample was 19.69 years (SD = 2.88; Range = 18 – 51) and 72% were female. Approximately 77% identified as Caucasian, 13% as African-American, 4% as Asian-American, and 6% as "other". Six percent of the sample reported being Hispanic or Latino. This study was approved by the Louisiana State University Human Subject Review Board and subjects offered informed consent prior to completing the surveys.

Procedures and Measures

Schizotypal traits.

Two sets of measures were used in this study. First involved the Brief-Revised version of the Schizotypal Personality Questionnaire (SPQ-BR; Callaway et al., 2014; Cohen et al., 2010). The SPQ-BR was developed from the SPQ using

EFA and CFA to maximize internal consistency and factor independence. The response format employs a five-point scale from "strongly disagree" to "strongly agree". Items (n = 32) reflect seven subordinate (i.e., odd/eccentric behavior, odd speech, constricted affect/no close friends, excessive social anxiety, unusual perceptual experiences, odd beliefs, ideas of reference/suspiciousness) and three superordinate (i.e., positive, negative and disorganization) factors (see Callaway et al., 2014; Cohen et al., 2010; Fonseca-Pedrero & Cohen, 2015 for reliability and validity data). The second involved the short form of the WSS (i.e., the WSS-SF; Winterstein et al., 2011), including brief versions of the Magical Ideation, Perceptual Aberration, Revised Physical Anhedonia and the Revised Physical Anhedonia Scales. Each scale comprises 15 true-false items, for a total of 60 items. The WSS-SF was developed using Item Response Theory (IRT) and Differential Item Functioning to maximize internal consistency, and has psychometric support from several recent studies (Fonseca-Pedrero et al., 2013; Gross et al., 2015; Winterstein et al., 2011).

Mental Health Symptoms and History.

The 52-item BSI (Derogatis & Melisaratos, 1983), a commonly used measure of psychiatric symptomatology, was employed. Symptoms, including somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobia, paranoia and psychoticism, are based on a 5-point Likert scale from "strongly disagree" to "strongly agree" reflecting the prior month epoch. Increasing scores reflect increasing symptom severity. We were most interested in severity of psychosis (measured using the Psychosis scale; per the factor analysis in Derogatis & Melisaratos, 1983), and global psychopathology (measured using a sum of the remaining scales). The BSI has been used in hundreds of published studies research, has demonstrated good reliability and convergent validity (see Derogatis & Melisaratos, 1983), and has shown modest (but not redundant) convergence with the SPQ in other studies (e.g., r's = .42 and .52 with Anxiety and Depression in Cohen and Matthews, 2010). In the present study, average Psychosis (range 8 to 35; possible range 8 to 40; M ± SD = 14.51 ± 5.54) and Global Psychopathology (range 37 to 166; possible range = 37 to 35; M ± SD = 70.83 ± 24.83) scores were computed. We were also interested in understanding treatment utilization, assessed using face-valid self-report questions. These included outpatient (i.e., "Have you ever received psychological treatment for a psychological/psychiatric concern in an outpatient setting"; coded dichotomously) and inpatient (i.e., "Have you ever been admitted to an inpatient psychiatric hospital where you stayed overnight?"; coded dichotomously) treatment history. Approximately 32% (175 of 544) of the sample reported a history of outpatient psychological/psychiatric treatment, and 3% (14 of 544) reported a history of inpatient psychological/psychiatric treatment (data missing for 1 participant).

Data Analyses

Our analyses were conducted in five steps. First, we evaluated the factor structure of the SPQ-BR and WSS-SF using item-level CFA. We tested one, two (Preti et al., 2015), three (Fonseca-Pedrero et al., 2015), four (Fonseca-Pedrero et al., 2014) and seven (Callaway et al., 2014; Cohen et al., 2010) factor solutions indicated in the literature for the SPQ or SPQ-BR (both super-ordinate and subordinate models; see intro for elaboration). Second, we tested one, two (Gross et al., 2014), and four (Winterstein et al., 2011) factor solutions for the WSS-SF. None of the solutions for the WSS-SF were acceptable, hence, we employed ESEM to establish the factor structure. At the subscale level, and due to the continuous nature of the data, the maximum likelihood parameter estimates (with standard errors and a chi-square test statistic that is robust to non-normality), was used (Asparouhov & Muthén, 2009). Standard structural equation modeling parameter estimates, standard errors, goodness-of-fit statistics, and statistical advances normally associated with CFA are reported; including the goodness-of-fit indices employed: Comparative Fit Index (CFI; good fit > .95), the Tucker- Lewis index (TLI; good fit > .95), the Root Mean Square Error of Approximation (RMSEA; good fit < .08) (and 90% confidence interval) and Standardized Root Mean Square Residual (SRMR; continuous variables; good fit <0.80) or Weighted Root Mean Square Residual (WRMR; categorical variables; good fit <0.95; Hu & Bentler, 1999). Factor scores, computed from the ESEM were used for the subsequent analyses. Third, to ensure consistently derived component scores for the WSS and SPQ, we subjected the SPQ-BR to ESEM (despite its adequate CFA support). Conceptual interpretability, as well as fit indices, were used to guide decisions regarding factor structure selection. Fourth, we sought to explore the convergence between the WSS-SF and SPQ-BR. This included examination of the inter-correlations between the factor scores identified in the first step, and an

additional ESEM of the combined WSS-SF/SPQ-BR. The latter analysis was conducted at the item level. Finally, we examined the overlap of the ESEM-derived WSS-SF, SPQ-BR and combined WSS-SF/SPQ-BR solutions with respect to clinical symptoms and treatment history. Linear and logistic regressions were used to evaluate whether the combined WSS-SF/SPQ-BR solution (entered in step 2) explained variance in clinical variables and treatment history (dependent variables) beyond that associated with the WSS-SF or SPQ-BR (entered separately in Step 1 of independent regressions). Significant contributions in step 2 would suggest that the combined solution is uniquely important for understanding clinical state and treatment history; and hence, the individual scales are not redundant in their conceptual coverage. Note that collinearity was an issue with regressions using the SPQ-BR (i.e., tolerance < .10; Variance Inflation Factor > 10), but not the WSS-SF. To address this, all predictor variables showing high collinearity were excluded from the appropriate steps of the regressions (e.g., the Negative and Disorganization factors of the combined SPQ-BR/WSS-SF factors). Unless otherwise noted, all variables were normally distributed.

Table 1. Goodness-of-fit indices from the item-level Confirmatory Factor Analysis for the SPQ-BR and WSS-SF

Model	χ^2	df	CFI	TLI	RMSEA (90% CI)	WRMR
SPQ-BR						
1 factor	5574.07	464	0.72	0.70	0.14 (0.14-0.15)	3.41
7 factors	1123.47	443	0.96	0.96	0.05 (0.05-0.06)	1.21
7 bifactor	1489.45	432	0.94	0.93	0.07 (0.06-0.07)	1.54
7 factors and 1 higher order	1581.51	457	0.94	0.93	0.07 (0.06-0.07)	1.64
7 factors and 3 higher order	1264.89	454	0.96	0.95	0.06 (0.05-0.06)	1.38
7 factors and 4 higher order	1280.16	453	0.95	0.95	0.06 (0.05-0.06)	1.38
WSS-SF						
CFA						
1 factor	5368.86	1710	0.35	0.35	0.06 (0.06-0.07)	2.70
2 factors		No conversion.				
4 factors	2657.24	1704	0.83	0.83	0.03 (0.03-0.03)	1.63
2 higher-order factor + 4 first-factors		No conversion.				

Note. χ^2 = Chi-square; df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; WRMR = Weighted Root Mean Square Residual.

Results

Factor Structure of the Schizotypy Scales.

CFA results are presented in Table 1. For the SPQ-BR, good fit statistics were observed for the seven-factor and seven-factor with three and four higher order superordinate solutions. The latter two were essentially indistinguishable in fit statistics. For the WSS-SF, poor fit statistics were found for all models tested; including the model reported in Gross et al., (2014). For this reason, we employed ESEM to derive the optimal factor structure for the WSS-SF. Summary results of the ESEM are in Table 2 and item level loadings are in Table SS1. A four-factor ESEM model showed good fit indices; however, the solution was conceptually uninterpretable. Of note, one factor contained high loadings (i.e., > .35) on the Magical Ideation and Perceptual Aberration items whereas the other three factors comprised mixed items from the Social and Physical Anhedonia scales. The three-factor solution, which showed good RMSEA and potentially acceptable TLI and CFI statistics, was much more interpretable and was used for the consequent analyses presented in this article. Magical Ideation and Perceptual Aberration items grouped in the same latent factor, dubbed "Positive schizotypy" and the second and third factors represented primarily physical (11 of 17 items) and social anhedonia (12 of 13 items) items. These factors were named "Physical" and "Social" Anhedonia accordingly. Two items did not load meaningfully on any factor and one item loaded onto multiple factors.

Table 2. Summary of fit indices from the item-level ESEM of WSS-SF and SPQ-BR measures and the WSS-SF and SPQ-BR measures combined

Model	χ^2	df	CFI	TLI	RMSEA (90 % CI)	WRMR/SRMR	
SPQ-BR (Item-Level)							
One factor	5574.07	464	0.72	0.70	0.14 (0.14-15)	3.41	- -
Two factor	3875.35	433	0.81	0.78	0.12 (0.12-0.13)	2.46	- -
Three factor	2669.35	403	0.88	0.85	0.10 (0.10-0.11)	1.81	- -
Seven factor	658.77	293	0.98	0.97	0.05 (0.04-0.05)	0.61	- -
WSS-SF (Item-Level)							
One factor	4042.86	1710	0.59	0.57	0.05 (0.05-0.05)	2.29	- -
Two factor	2384.34	1651	0.87	0.86	0.03 (0.03-0.03)	1.26	- -
Three factor	2012.13	1593	0.93	0.92	0.02 (0.02-0.03)	1.01	- -
Four factor	1536.76	1536	0.96	0.95	0.02 (0.01-0.02)	0.87	- -
SPQ-BR & WSS-SF (Item-Level)							
One factor	9812.32	4094	0.70	0.69	0.05 (0.05-0.05)	2.49	
Two factor	7729.43	4003	0.80	0.79	0.04 (0.04-0.04)	1.90	
Three factor	5909.25	3913	0.89	0.89	0.03 (0.03-0.03)	1.39	
Four factor	5294.23	3824	0.92	0.91	0.03 (0.06-0.03)	1.21	
Five factor	4850.44	3736	0.94	0.93	0.02 (0.02-0.03)	1.06	
Six factor	4527.88	3649	0.95	0.95	0.02 (0.02-0.02)	0.95	
Seven Factor	4190.37	3563	0.98	0.97	0.05 (0.04-0.05)	0.61	

Note. χ^2 = Chi-square; df = Degrees of Freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; WRMR = Weighted Root Mean Square Residual; SRMR = Standardized Root Mean Square Residual;

Table 3. Zero-order correlation matrix for the SPQ-BR and WSS-SF factors.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
SPQ-BR SUBORDINATE FACTORS									
1. Magical Thinking	1.00	.18*	.35*	.25*	.25*	.43*	.51*	.44*	.00
2. Social Anxiety	.18*	1.00	.42*	.37*	.63*	.51*	.21*	.21*	-.05
3. Eccentric Behavior	.35*	.42*	1.00	.55*	.49*	.50*	.44*	.35*	.01
4. Odd Speech	.25*	.37*	.55*	1.00	.32*	.55*	.33*	.32*	.13*
5. No Close Friends/Aff	.25*	.63*	.45*	.32*	1.00	.51*	.40*	.32*	-.17*
6. Suspiciousness/IR	.43*	.51*	.50*	.55*	.51*	1.00	.66*	.49*	-.04
7. Unusual Perceptions	.52*	.22*	.40*	.37*	.40*	.66*	1.00	.52*	-.05
WSS-SF									
8. Positive	.44*	.21*	.35*	.32*	.32*	.49*	.52*	1.00	-.06
9. Physical Anhedonia	.00	-.05	.01	.13*	-.17*	-.04	-.05	-.06	1.00
10. Social Anhedonia	.17*	.48*	.33*	.23*	.52*	.34*	.21*	.29*	-.11*

* = p < .05

To maintain consistency in empirically-derived independent variables for the consequent analyses, we conducted ESEM on the SPQ-BR. The standardized factor loadings for these ESEM models were high and all statistically significant (see Tables 2). The seven factor solution showed good fit statistics, which, for comparison sake, were much better than the one, two, three and four factor solutions that were also examined. Item level loadings are

presented in Table SS2, which showed a clear and unambiguous structure; the same as reported in prior studies (Callaway et al., 2014; Cohen et al., 2010).

Convergence of the SPQ-BR and WSS-SF.

Table 3 contains the correlation matrix between the SPQ-BR and WSS-SF factor scores. There were three notable findings. First, the three WSS-SF measures showed relatively high independence from each other (all r[543]'s < .29; Range = -.06 - .29). In contrast, the SPQ-BR scales showed higher levels of inter-correlation (Range of r[543]'s = .18 - .66). Second, the WSS-SF Positive factor showed significant correlations with each of the SPQ-BR factors, with the lowest being Social Anxiety (r[543] = .21) and the highest being with Magical Thinking (r[543] = .44), Suspiciousness/Ideas of Reference (r[543] = .49) and Unusual Perceptions (r[543] = .52) scales. Third, the "Negative" factor from the SPQ-BR (i.e., No Close Friends/Constricted Affect) was highly correlated with the WSS-SF Social Anhedonia (r[543] = .52) but not the WSS-SF Physical Anhedonia (r[543] = -.05). Finally, the SPQ-BR Social Anxiety scale was highly correlated with the WSS-SF Social (r[543] = .48) but not the Physical (r[543] = -.05) Anhedonia Scales.

Table 4: Correlations between the WSS-SF and SPQ-BR factors and the combined WSS-SF/SPQ-BR factors.

	Combined WSS-SF & SPQ-BR Factors			
	Positive	Physical Anhedonia	Negative	Disorganization
Positive	1.00	-.18*	.38*	.34*
Physical Anhedonia	-.18*	1.00	-.19*	.09*
Negative Schizotypy	.38*	-.19*	1.00	.43*
Disorganization	.34*	.09*	.43*	1.00
WSS-SF Factors				
Positive	.84*	-.12*	.35*	.32*
Physical Anhedonia	-.10*	.94*	-.12*	.14*
Social Anhedonia	.33*	-.21*	.68*	.17*
SPQ-BR Factors				
Magical Thinking	.66*	-.05	.24*	.41*
Social Anxiety	.17*	-.03	.89*	.42*
Eccentric Behavior	.31*	-.13*	.48*	.89*
Odd Speech	.31*	.19*	.40*	.78*
No Close Friends/Constricted Affect	.37*	-.33*	.87*	.41*
Suspiciousness/Ideas of Reference	.67*	-.07	.64*	.65*
Unusual Perceptions	.76*	-.14*	.37*	.51*

* = p < .05

The ESEM fit statistics of the item-level WSS-SF and SPQ-BR are included in Table 2 (see Table SS3 for item-level loadings). We explored seven different factor solutions, with the first three factor structures showing poor CFI and TLI statistics. The seven factor solution showed good fit statistics, but along with the five and six factor solutions, were uninterpretable from a conceptual standpoint. With these solutions, the conceptually-related SPQ-BR and WSS-SF items diverged, for example, such that Magical Ideation and Magical Thinking items loaded separately. This divergence was judged to reflect method variance between measures (notably in the dichotomous versus Likert-style response scales) rather than conceptual differences. The four factor solution showed some good (i.e., RMSEA) and some potentially acceptable (i.e., TLI/CFI) fit statistics, but was conceptually sound and was used for the consequent analyses in this article. Factor 1 (i.e., Positive Traits) primarily reflected items from the Perceptual Aberration (15 of 15 items), Magical Ideation (14 of 15 items), Magical Thinking (3 of 3 items) and Unusual Perceptions (3 of 4 items) scales. Factor 2 (i.e., Physical Anhedonia) primarily reflected 11 (of 15) items from the Physical Anhedonia scale and 6 (of 15) items from the Social Anhedonia scale. Factor 3 (i.e., Negative traits) primarily reflected items from the

Constricted Affect/No Close Friends scale (6 of 6 items), Social Anxiety (4 of 4 items) and Social Anhedonia (8 or 15 items) items. Factor 4 (Disorganization traits) reflected items from the Eccentric Behavior and Odd Speech items (8 of 8 items). The Suspiciousness items showed relatively low loadings for each of the factors and the Ideas of Reference showed some cross-loading. Correlations between the Combined SPQ-BR/WSS-SF and the factor solutions for the SPQ-BR and WSS-SF are included in Table 4.

Table 5: Linear regressions to evaluate the relative contributions of the WSS-SF and SPQ-BR and the combined factor structures.

	Psychosis		Global Psychopathology	
	B	**t**	**β**	**t**
Regression 1: WSS-SF				
Step 1: WSS-SF	$\Delta R^2 = .30, \Delta F^2 = 75.84^*$		$\Delta R^2 = .32, \Delta F^2 = 78.67^*$	
Positive	0.40	10.51*	0.39	10.26*
Physical Anhedonia	-0.04	1.08	-0.08	2.03*
Social Anhedonia	0.26	6.87*	0.29	7.49*
Step 2: Combined WSS-SF/SPQ	$\Delta R^2 = .20, \Delta F^2 = 51.81^*$		$\Delta R^2 = .18, \Delta F^2 = 45.21^*$	
Positive	0.20	3.42*	0.15	2.49*
Physical Anhedonia	-0.20	2.11*	-0.28	2.96*
Negative	0.02	0.38	0.05	1.09
Disorganized	0.09	1.46	0.15	2.44*
Regression 2: SPQ-BR				
Step 1: SPQ-BR	$\Delta R^2 = .50, \Delta F^2 = .74.50^*$		$\Delta R^2 = .49, \Delta F^2 = 67.73^*$	
Magical Thinking	-0.08	2.05*	-0.02	-0.60
Social Anxiety	0.11	2.51*	0.09	2.05*
Eccentric Behavior	0.08	1.83	0.00	0.00
Odd Speech	0.16	3.98*	0.21	4.92*
No Close Friends/Aff	0.19	4.20*	0.24	5.17*
Suspicious/Referential	0.27	5.27*	0.26	5.05*
Unusual Perceptions	0.17	3.80*	0.12	2.61*
Step 2: Combined WSS-SF/SPQ	$\Delta R^2 = .02, \Delta F^2 = 9.63^*$		$\Delta R^2 = .03, \Delta F^2 = 16.04^*$	
Positive	.24	3.98*	.29	4.60*
Physical Anhedonia	-.05	1.27	-.10	2.62*
Negative	a	a	a	a
Disorganized	a	a	a	a

* = p < .05, a = variable excluded due to collinearity.

Clinical correlates.

Linear regression analysis (Table 5) suggested that the schizotypy factor solutions explained approximately half the variance in Psychosis and in Global Psychopathology symptoms; though much of this was from the SPQ-BR and the Combined WSS-SF/SPQ-BR as opposed to the WSS-SF. Evaluation of the beta weights suggested that the lionshare of contribution to Psychosis was made by the factors covering positive and negative traits. Similarly, the significant

contributions to Global Psychopathology, Social Anxiety and Disorganized traits were primarily made by Positive and Negative (e.g., Social Anhedonia) related factors from the combined WSS-SF and SPQ-BR measures. Importantly, the beta-weights for Physical Anhedonia, which was a significant contributor to both Psychosis and Global Psychopathology, were negative suggesting an inverse relationship. Logistic regressions evaluating relative contributions to treatment history of the subject (Table 6) suggested some significant, but relatively modest contributions. With respect to outpatient treatment history, significant positive beta weights were observed for the WSS-SF Positive factor and Social Anhedonia factors and the SPQ-BR Negative trait factors. The combined WSS-SF/SPQ-BR factors explained significant variance beyond that of the individual factors. With respect to inpatient treatment history, the contributions of the schizotypy scales were even more modest; with the Social Anhedonia scale from the WSS-SF being the lone statistically significant contributor.

Discussion

To date, there is a lack of consensus about which features are central to schizotypy, and there is inconsistency in conceptual coverage across measures of schizotypy. The present study aimed to address these issues by evaluating the convergence and divergence of two self-report measures of schizotypy: the SPQ-BR and WSS-SF. In contrast to Gross et al., (2014) who reported support for a two-factor solution, our data indicate that schizotypy comprises a much more diverse set of factors. In the case of the WSS-SF, the social and physical anhedonia scales did not converge, suggesting that they do not collectively reflect a "negative" factor. In the case of the superordinate solution of the SPQ-BR, disorganization subscales were separable from other positive traits (for both the SPQ-BR and WSS-SF). Moreover, support for the seven-factor subordinate solution suggests that even within the positive, negative and disorganized factors, there is heterogeneity with respect to schizotypal traits. Combined, the measures support a superordinate solution common to those seen in schizophrenia studies (i.e., positive, negative and disorganized) with the addition of a physical anhedonia factor. In sum, the present findings support the notion that schizotypy shows heterogeneity in a manner similar to schizophrenia, and, at least of the measures examined here, a single measure of schizotypy was inadequate for capturing this heterogeneity.

Importantly, most of the dimensions revealed by factor analysis were clinically meaningful in some capacity. This addresses an important question in schizotypy research, namely, 'which of the many traits associated with schizotypy are central to the construct, and hence, most pertinent for psychometric measurement'? (e.g., as in Kwapil & Barrantes-Vidal, 2015; Tarbox & Pogue-Geile, 2011). In terms of current symptoms, nearly all of the SPQ-BR and WSS-SF subfactors were associated with psychosis as well as more global psychopathology in some capacity. This is consistent with findings that a broad range of schizotypy factors are associated with clinical outcomes (Cohen et al., 2011; Cohen & Davis, 2009; Debbané et al., 2015; Goulding et al., 2009; Kwapil et al., 2013). In terms of treatment history involving inpatient modality, it was generally the negative traits that were significant predictors of treatment history. Social Anhedonia from the WSS-SF showed significant beta-weights in predicting both inpatient and outpatient therapy history, and the No-Close friends/Constricted Affect scale from the SPQ-BR was associated with outpatient therapy history. The notion that negative traits and symptoms are a particularly pernicious aspect of the psychosis continuum and of schizophrenia pathology is not new, and has been found in studies of schizotypy (e.g., Kwapil et al., 2013), clinical high-risk (e.g., Lencz, Smith, Auther, Correll & Cornblatt, 2004) and patients with schizophrenia (e.g., Milev, Ho, Arndt & Andreasen, 2005).

We believe that it is not particularly helpful to interpret the present findings in terms of superiority of one measure over another, particularly if the ultimate goal of psychometric measurement of schizotypy is to understand the various manifestations of schizophrenia-spectrum risk. Rather, we believe that evaluation of current measures can contribute to "next generation" measures that offer improved construct/content validity and efficiency of administration over current measures. The present findings suggest that the WSS-SF and SPQ-BR are by no means redundant; yet it seems cumbersome to recommend simultaneous administration of these measures in future studies. Consider further that other measures exist that tap additional constructs that may offer even further added value (e.g., impulsive nonconformity; Mason, Claridge & Jackson, 1995). With this in mind, we believe the current measures should be evaluated in concert, rather than in competition, with the goal of identifying their unique and common contributions, and consolidating them. Inspiration for this sort of endeavor might be drawn from the International Personality Item Pool, a public domain pool of over 2000 personality-related items tapping a broad range of personality constructs

and has spawned a considerable amount of research to date (see Goldberg et al., 2006). The development of new schizotypy measures might also help address structural validity issues identified with specific measures; for example, in the less than optimal factor structure of the WSS-SF (revealed in this study) nd the SPQ (e.g., Chmielewski & Watson, 2008) from item-level analysis.

Table 6: Logistic regressions to evaluate the relative contributions of the WSS-SF and SPQ-BR and the combined factor structures.

	Outpatient Treatment		Inpatient Treatment	
	B (SE)	Wald	B (SE)	Wald
Regression 1: WSS				
Step 1: WSS	$X^2 = 37.50^*, \Delta R^2 = .07$		$X^2 = 11.53^*, \Delta R^2 = .02$	
Positive	0.42 (0.12)	11.94*	-0.49 (0.32)	2.35
Physical Anhedonia	0.03 (0.12)	0.06	0.46 (0.35)	1.76
Social Anhedonia	0.49 (0.13)	14.95*	-0.71 (0.34)	4.45*
Step 2: Combined WSS/SPQ	$X^2 = 11.59^*, \Delta R^2 = .09$		$X^2 = 5.53^*, \Delta R^2 = .03$	
Positive	-0.53 (0.21)	6.21*	1.05 (0.66)	2.51
Physical Anhedonia	-0.17 (0.36)	0.22	-1.01 (1.19)	0.72
Negative	0.22 (0.16)	1.94	0.41 (0.47)	0.76
Disorganized	0.17 (0.13)	1.74	-0.61 (0.36)	2.96+
Regression 2: SPQ-BR				
Step 1: SPQ-BR	$X^2 = 31.58^*, \Delta R^2 = .06$		$X^2 = 10.37, \Delta R^2 = .02$	
Magical Thinking	0.02 (0.13)	0.01	0.42 (0.40)	1.08
Social Anxiety	0.13 (0.14)	0.85	-0.25 (0.38)	0.43
Eccentric Behavior	0.21 (0.13)	2.40	-0.50 (0.38)	1.77
Odd Speech	0.14 (0.14)	1.09	0.09 (0.38)	0.06
No Close Friends/Aff	0.30 (0.14)	4.66*	0.36 (0.39)	0.84
Suspicious/Referential	-0.02 (0.16)	0.01	-0.78 (0.45)	2.95+
Unusual Perceptions	-0.06 (0.16)	0.13	-0.10 (0.44)	0.05
Step 2: Combined WSS/SPQ	$X^2 = 8.28^*, \Delta R^2 = .07$		$X^2 = 3.51, \Delta R^2 = .03$	
Positive	0.57 (0.20)	8.11*	-0.28 (0.52)	0.30
Physical Anhedonia	0.03 (0.14)	0.04	0.63 (0.37)	2.97+
Negative	a	a	a	a
Disorganized	a	a	a	a

* = p < .05, + = p < .10, ΔR^2 = Cox & Snell R square, a = variable excluded due to collinearity.

The present findings reveal potential insights about the nature of the social and emotional abnormalities in schizotypy; abnormalities thought central to schizotypy by many theorists and researchers (e.g., Meehl, 1962). Conceptually speaking, social anhedonia is often thought to reflect the absence of positive and affiliative emotions, reflected in social apathy or indifference, as opposed to an aversive/anxious state. Structural Equation Modeling of data from both the WSS (Lewandowski et al., 2006) and SPQ (Cohen & Matthews, 2010) support this distinction. In the present

study, both the WSS-SF social anhedonia and the SPQ-BR No Close Friends/Constricted Affect scales were highly associated with social anxiety. Importantly, social anxiety as measured using the SPQ and SPQ-BR (i.e., feeling uncomfortable, different and odd around others) taps a qualitatively different phenomenon than clinical social anxiety (i.e., preoccupation with negative evaluation by others). Indeed, "social oddness", and its potential emotional, cognitive and behavioral sequelae are considered key to schizophrenia-spectrum (Lenzenweger & Loranger, 1989; Sullivan, 1962), and may not be particularly redundant with anxiety, at least a subcomponent of negative affect, neuroticism or other Big Five personality factors (Watson, Clark & Chmielewski, 2008). Conceptually speaking, negative schizotypal traits seem distinct from social oddness and, as argued elsewhere, should probably reside on distinct factors (Lewandowski et al., 2006, Cohen & Matthews, 2010). Nonetheless, it seems worthwhile to further evaluate their potential links. Notably, it is possible that negative traits contribute to a kind of eccentric or odd personal style, and the awareness of this increases subjective social discomfort and concern (of the type measured by the SPQ's Social Anxiety subscale). This type of negative affect is not unlike the "aversive drift" discussed by Meehl (1962).

The present results should be interpreted in the light of several limitations. First, participants in this study were college students which may limit generalization to other populations of interest. This raises potential generalizability issues, as the sample was relatively constricted in age, ethnicity, SES and psychiatric history. Secondly, measurement of schizotypy was based solely on self-report, and future studies should consider the use of external informants, interviews and even biobehavioral or biological markers. Third, the schizotypy measures employed different response systems (i.e., dichotomous versus Likert-style), and this may have introduced method variance that reduced convergence between these measures. Fourth, our convergent validity measures were not particularly comprehensive and were based on self-report. Fifth, we only employed two measures of schizotypy, and these measures were short forms of the full versions. It is possible that greater overlap would have been observed if other measures, or if the full SPQ or WSS would have been used. It is the case that the SPQ-BR and WSS-SF were empirically derived in a much more sophisticated fashion than their predecessors (e.g., using EFA/CFA to maximize internal consistency and factor independence), so the use of these brief versions is not necessarily a major liability. Finally, our data was cross-sectional in nature. Longitudinal tracking of individuals as they navigate their daily routines, either as part of a life events study or experience sampling method (e.g., Kwapil et al., 2012), would shed additional light on the structure of schizotypy.

In sum, understanding schizophrenia liability across a continuum of pathological to healthy and even adaptive outcomes is critical for understanding a large swath of mental health issues, and for understanding personality more generally. Schizotypy is a complicated and heterogeneous construct, and the present data suggest that individual measures may not sufficiently capture its complexity. This is important for the development and future refinement of self-report measures of schizotypy. Advances in genetics, neuroimaging, cognitive sciences and behavioral analysis will likely prove important for early identification of individual at risk for schizophrenia-spectrum disorders, though reliable brief screening measures that can be efficiently distributed to large swaths of people will also be critical, particularly as timely prophylactic intervention may delay, ameliorate, or prevent the onset of the clinical outcome in these individuals. We believe the present findings call for refinement of current schizotypy measures to allow for more comprehensive measurement of schizotypy.

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Supplemental Tables

Table SS1. Item-level ESEM of SPQ-BR items.

Item	Item Text	F1	F2	F3	F4	F5	F6	F7
MT30	I believe in clairvoyance (psychic forces, fortune telling) .	**0.87**	0.02	-0.12	0.12	0.02	0.12	-0.05
MT12	I believe in telepathy (mind-reading).	**0.72**	0.04	0.03	-0.03	-0.06	0.04	0.12
MT47	I have had experiences with astrology, seeing the future, UFO's, ESP, or a sixth sense.	**0.63**	-0.01	0.10	-0.01	0.00	-0.04	0.22
MT55	I have felt that I am communicating with another person telepathically (by mind-reading).	**0.43**	-0.07	0.05	-0.09	0.04	-0.01	0.56
SA38	I often feel nervous when I am in a group of unfamiliar people.	0.01	**0.88**	0.04	-0.02	-0.01	0.00	-0.03
SA29	I get anxious when meeting people for the first time.	-0.02	**0.79**	-0.08	0.06	0.03	0.04	0.05
SA46	I feel very uncomfortable in social situations involving unfamiliar people.	0.00	**0.78**	0.02	0.02	0.11	0.09	-0.04
SA2	I sometimes avoid going to places where there will be many people because I will get anxious.	0.11	**0.70**	0.04	0.00	0.09	-0.09	0.03
EB67	I am an odd, unusual person.	-0.02	-0.01	**0.85**	-0.01	0.10	0.05	0.04
EB5	Other people see me as slightly eccentric (odd).	0.08	0.08	**0.83**	0.02	0.01	-0.10	-0.05
EB70	I have some eccentric (odd) habits.	-0.03	-0.02	**0.80**	0.03	0.04	0.10	0.06
EB14	People sometimes comment on my unusual mannerisms and habits.	0.05	0.00	**0.73**	0.11	-0.06	0.05	0.05
OS16	I sometimes jump quickly from one topic to another when speaking.	0.00	-0.04	0.08	**0.81**	-0.02	-0.02	-0.04
OS58	I tend to wander off the topic when having a conversation.	0.00	0.00	0.03	**0.81**	0.11	0.01	0.06
OS34	I often ramble on too much when speaking.	-0.01	0.03	0.09	**0.66**	0.02	0.14	-0.01
OS25	I sometimes forget what I am trying to say.	0.01	0.29	-0.10	**0.56**	-0.04	0.01	0.07
CF66	I feel that I cannot get "close" to people.	0.01	0.00	-0.01	0.01	**0.89**	0.05	0.03
CF33	I find it hard to be emotionally close to other people.	0.11	-0.01	0.03	0.03	**0.85**	-0.09	-0.01
CA73	I tend to keep my feelings to myself.	0.03	0.09	0.12	-0.02	**0.68**	0.01	-0.18
CF41	I feel that there is no one I am really close to outside of my immediate family, or people I can confide in or talk to about personal problems.	-0.02	0.11	0.02	-0.01	**0.63**	0.08	0.07
CA26	I rarely laugh and smile.	-0.05	0.26	-0.04	-0.10	**0.52**	0.01	0.16
CA17	I am not good at expressing my true feelings by the way I talk and look.	-0.07	0.10	0.18	0.15	**0.51**	0.00	-0.13

IT63	I sometimes feel that people are talking about me.	0.00	0.05	0.07	0.00	0.04	**0.85**	-0.04
IR60	I sometimes feel that other people are watching me.	0.03	0.09	0.01	0.04	-0.03	**0.79**	0.08
IR45	When shopping, I get the feeling that other people are taking notice of me.	0.00	0.25	0.12	-0.02	-0.04	**0.60**	-0.03
S59	I often feel that others have it in for me.	0.04	0.00	0.01	-0.01	0.18	**0.58**	0.19
S65	I often have to keep an eye out to stop people from taking advantage of me.	0.03	-0.06	0.00	0.02	0.22	**0.51**	0.13
S27	I sometimes get concerned that friends or co-workers are not really loyal or trustworthy.	0.01	-0.07	-0.10	0.06	0.38	**0.47**	0.03
UP64	My thoughts are sometimes so strong that I can almost hear them.	-0.05	0.07	0.03	0.04	-0.05	0.12	**0.76**
UP31	I often hear a voice speaking my thoughts aloud.	0.10	-0.01	-0.03	0.23	0.06	0.04	**0.58**
UP22	When I look at a person or myself in a mirror, I have seen the face change right before my eyes.	0.16	0.10	0.01	0.14	-0.03	-0.02	**0.44**
UP48	Everyday things seem unusually large or small.	0.02	0.19	0.08	0.04	0.10	0.08	**0.44**

Note factor scores greater than .35 are bold faced.

Table SS2. Item-level ESEM of WSS-SF items.

Item	Item Text	F1	F2	F3
AB5	I have felt that something outside my body was a part of my body.	**0.88**	-0.04	-0.16
AB6	Sometimes I have had feelings that I am united with an object near me.	**0.87**	0.00	-0.08
AB15	At times I have wondered if my body was really my own.	**0.86**	-0.11	-0.17
AB11	I have sometimes had the feeling that one of my arms or legs is disconnected from the rest of my body.	**0.86**	-0.11	0.05
AB12	I have had the momentary feeling that my body has become misshapen.	**0.86**	-0.14	-0.03
AB9	I can remember when it seemed as though one of my limbs took on an unusual shape.	**0.85**	-0.13	-0.10
AB4	Sometimes I have felt that I could not distinguish my body from other objects around me.	**0.85**	-0.11	0.00
AB14	Parts of my body occasionally seem dead or unreal.	**0.81**	-0.07	0.16
AB8	I have sometimes felt that some part of my body no longer belongs to me.	**0.80**	-0.05	0.21

AB7	Sometimes I have had a passing thought that some part of my body was rotting away.	**0.79**	0.05	0.15
AB10	I sometimes have to touch myself to make sure I'm still there.	**0.78**	-0.11	0.02
M3	I have noticed sounds on my records that are not there at other times.	**0.76**	0.06	-0.13
AB1	Occasionally it has seemed as if my body had taken on the appearance of another person's body.	**0.73**	-0.29	-0.03
M12	I have had the momentary feeling that I might not be human.	**0.72**	0.02	0.14
AB2	I have sometimes felt confused as to whether my body was really my own.	**0.70**	-0.05	0.15
M1	I have felt that there were messages for me in the way things were arranged, like in a store window.	**0.69**	0.24	-0.16
AB3	I have sometimes had the feeling that my body is decaying inside.	**0.65**	0.05	0.20
M5	At times I perform certain little rituals to ward off negative influences.	**0.64**	0.14	0.06
M4	I have had the momentary feeling that someone's place has been taken by a look-alike.	**0.64**	0.09	0.18
M9	The hand motions that strangers make seem to influence me at times.	**0.62**	0.09	0.05
M2	I have occasionally had the silly feeling that a TV or radio broadcaster knew I was listening to him.	**0.61**	0.21	-0.15
AB13	Sometimes I feel like everything around me is tilting.	**0.60**	0.03	0.20
M6	I have sometimes felt that strangers were reading my mind.	**0.59**	0.12	0.06
M8	I have sometimes had the passing thought that strangers are in love with me.	**0.56**	0.05	0.02
M15	I have worried that people on other planets may be influencing what happens on Earth.	**0.56**	0.10	0.16
M13	I think I could learn to read others' minds if I wanted to.	**0.53**	0.16	0.15
M7	If reincarnation were true, it would explain some unusual experiences I have had.	**0.46**	0.11	0.18
M10	I have sometimes been fearful of stepping on sidewalk cracks.	**0.43**	0.06	0.16
M14	Horoscopes are right too often for it to be a coincidence.	**0.40**	0.08	0.15
PHY10	I don't understand why people enjoy looking at the stars at night.	**0.38**	-0.21	0.23
PHY8	Flowers aren't as beautiful as many people claim.	**0.35**	-0.19	**0.35**
PHY1	I have often found walks to be relaxing and enjoyable.	0.08	**0.97**	0.00
PHY2	A brisk walk has sometimes made me feel good all over.	0.04	**0.85**	-0.07
PHY12	Beautiful scenery has been a great delight to me.	-0.13	**0.84**	0.06
PHY7	It has often felt good to massage my muscles when they are tired or sore.	-0.01	**0.76**	0.16

SA9	Knowing that I have friends who care about me gives me a sense of security.	0.04	**0.76**	-0.02
PHY9	I like playing with and petting soft little kittens or puppies.	-0.11	**0.74**	0.15
SA4	Just being with friends can make me feel really good.	-0.05	**0.74**	-0.15
SA14	When things are going really good for my close friends, it makes me feel good too.	-0.08	**0.74**	-0.27
PHY4	After a busy day, a slow walk has often felt relaxing.	-0.05	**0.73**	-0.06
PHY14	A good soap lather when I'm bathing has sometimes soothed and refreshed me.	-0.18	**0.69**	0.22
PHY13	The first winter snowfall has often looked pretty to me.	-0.19	**0.69**	-0.02
PHY3	The sound of the rain falling on the roof has made me feel snug and secure.	0.09	**0.69**	0.00
SA12	Although there are things that I enjoy doing by myself, I usually seem to have more fun when I do things with other people.	0.03	**0.69**	-0.47
PHY15	Standing on a high place and looking out over the view is very exciting.	-0.03	**0.67**	-0.01
SA13	I feel pleased and gratified as I learn more and more about the emotional life of my friends.	0.11	**0.65**	-0.33
PHY11	When I'm feeling a little sad, singing has often made me feel happier.	0.02	**0.56**	0.00
SA11	If given the choice, I would much rather be with others than be alone.	0.21	**0.49**	-0.57
SA3	I prefer watching television to going out with other people.	0.01	0.08	**0.78**
SA6	I prefer hobbies and leisure activities that do not involve other people.	0.02	0.10	**0.72**
SA15	Making new friends isn't worth the energy it takes.	0.12	-0.06	**0.69**
SA5	I'm much too independent to really get involved with other people.	0.07	0.11	**0.68**
SA7	I don't really feel very close to my friends.	0.17	-0.07	**0.58**
SA8	People who try to get to know me better usually give up after awhile.	0.29	-0.05	**0.56**
SA2	I never had really close friends in high school.	0.18	0.03	**0.55**
SA10	People are usually better off if they stay aloof from emotional involvements with most others.	0.17	0.05	**0.46**
SA1	Having close friends is not as important as many people say.	0.25	-0.03	**0.35**
PHY5	The beauty of sunsets is greatly overrated.	0.09	-0.11	**0.32**
M11	Numbers like 13 and 7 have no special powers.	-0.14	0.16	0.17
PHY6	The sound of rustling leaves has never much pleased me.	0.08	-0.04	0.11

Note factor scores greater than .35 are bold faced.

Table SS3. Item-level ESEM of the combined SPQ-BR and WSS-SF items.

Item	Item Text	F1	F2	F3	F4
CA17	I am not good at expressing my true feelings by the way I talk and look.	-0.11	-0.13	**0.48**	0.26
CA26	I rarely laugh and smile.	0.04	-0.23	**0.60**	0.02
CA73	I tend to keep my feelings to myself.	-0.08	-0.12	**0.62**	0.09
CF33	I find it hard to be emotionally close to other people.	0.04	-0.14	**0.68**	0.08
CF41	I feel that there is no one I am really close to outside of my immediate family, or people I can confide in or talk to about personal problems.	0.02	-0.17	**0.67**	0.08
CF66	I feel that I cannot get "close" to people.	0.04	-0.16	**0.77**	0.08
EB14	People sometimes comment on my unusual mannerisms and habits.	0.04	-0.14	0.06	**0.73**
EB5	Other people see me as slightly eccentric (odd).	-0.04	-0.14	0.13	**0.71**
EB67	I am an odd, unusual person.	0.00	-0.20	0.17	**0.80**
EB70	I have some eccentric (odd) habits.	0.02	-0.20	0.13	**0.80**
IR45	When shopping, I get the feeling that other people are taking notice of me.	0.22	-0.04	**0.39**	0.32
IR60	I sometimes feel that other people are watching me.	**0.38**	0.06	0.32	**0.43**
IR63	I sometimes feel that people are talking about me.	0.34	0.05	**0.37**	**0.41**
MI1	I have felt that there were messages for me in the way things were arranged, like in a store window.	**0.69**	0.26	-0.27	0.15
MI10	I have sometimes been fearful of stepping on sidewalk cracks.	**0.42**	0.07	0.11	-0.02
MI11	Numbers like 13 and 7 have no special powers.	-0.21	0.15	0.26	-0.04
MI12	I have had the momentary feeling that I might not be human.	**0.71**	0.01	0.11	-0.07
MI13	I think I could learn to read others' minds if I wanted to.	**0.64**	0.14	-0.04	0.10
MI14	Horoscopes are right too often for it to be a coincidence.	**0.48**	0.10	0.02	0.06
MI15	I have worried that people on other planets may be influencing what happens on Earth.	**0.60**	0.09	0.02	0.01
MI2	I have occasionally had the silly feeling that a TV or radio broadcaster knew I was listening to him.	**0.56**	0.22	-0.14	0.19

MI3	I have noticed sounds on my records that are not there at other times.	**0.72**	0.10	-0.03	0.04
MI4	I have had the momentary feeling that someone's place has been taken by a look-alike.	**0.69**	0.13	0.08	-0.14
MI5	At times I perform certain little rituals to ward off negative influences.	**0.60**	0.12	-0.02	0.09
MI6	I have sometimes felt that strangers were reading my mind.	**0.53**	0.15	0.11	0.09
MI7	If reincarnation were true, it would explain some unusual experiences I have had.	**0.47**	0.11	0.14	0.01
MI8	I have sometimes had the passing thought that strangers are in love with me.	**0.51**	0.03	-0.03	0.17
MI9	The hand motions that strangers make seem to influence me at times.	**0.62**	0.12	0.06	-0.05
MT12	I believe in telepathy (mind-reading).	**0.61**	0.03	-0.11	0.23
MT30	I believe in clairvoyance (psychic forces, fortune telling) .	**0.58**	0.06	-0.08	0.29
MT47	I have had experiences with astrology, seeing the future, UFO's, ESP, or a sixth sense.	**0.53**	-0.02	-0.13	0.33
MT55	I have felt that I am communicating with another person telepathically (by mind-reading).	**0.68**	-0.04	-0.13	0.26
OS16	I sometimes jump quickly from one topic to another when speaking.	0.04	0.13	0.04	**0.63**
OS25	I sometimes forget what I am trying to say.	0.05	0.12	0.27	**0.37**
OS34	I often ramble on too much when speaking.	0.11	0.09	0.15	**0.60**
OS58	I tend to wander off the topic when having a conversation.	0.07	0.12	0.15	**0.66**
PA1	I have often found walks to be relaxing and enjoyable.	0.18	**0.99**	0.02	-0.17
PA10	I don't understand why people enjoy looking at the stars at night.	0.38	-0.16	0.22	-0.23
PA11	When I'm feeling a little sad, singing has often made me feel happier.	0.04	**0.55**	-0.04	0.10
PA12	Beautiful scenery has been a great delight to me.	-0.13	**0.84**	0.11	-0.08
PA13	The first winter snowfall has often looked pretty to me.	-0.14	**0.69**	0.01	-0.10
PA14	A good soap lather when I'm bathing has sometimes soothed and refreshed me.	-0.11	**0.66**	0.15	-0.03
PA15	Standing on a high place and looking out over the view is very exciting.	0.03	**0.66**	-0.03	0.01
PA2	A brisk walk has sometimes made me feel good all over.	0.16	**0.87**	-0.09	-0.13
PA3	The sound of the rain falling on the roof has made me feel snug and secure.	0.11	**0.68**	0.02	0.05
PA4	After a busy day, a slow walk has often felt relaxing.	0.04	**0.73**	-0.10	-0.14
PA5	The beauty of sunsets is greatly overrated.	0.05	-0.10	**0.36**	-0.07
PA6	The sound of rustling leaves has never much pleased me.	0.06	-0.02	0.14	-0.07
PA7	It has often felt good to massage my muscles when they are tired or sore.	0.01	**0.76**	0.23	0.00
PA8	Flowers aren't as beautiful as many people claim.	0.31	-0.20	0.32	0.01

PA9	I like playing with and petting soft little kittens or puppies.	-0.16	**0.70**	0.19	0.21
PAbb1	Occasionally it has seemed as if my body had taken on the appearance of another person's body.	**0.67**	-0.27	0.02	0.11
PAbb10	I sometimes have to touch myself to make sure I'm still there.	**0.78**	-0.09	0.01	-0.08
PAbb11	I have sometimes had the feeling that one of my arms or legs is disconnected from the rest of my body.	**0.89**	-0.02	0.11	-0.36
PAbb12	I have had the momentary feeling that my body has become misshapen.	**0.85**	-0.08	0.06	-0.12
PAbb13	Sometimes I feel like everything around me is tilting.	**0.54**	0.03	0.23	0.05
PAbb14	Parts of my body occasionally seem dead or unreal.	**0.83**	-0.05	0.13	-0.20
PAbb15	At times I have wondered if my body was really my own.	**0.86**	-0.05	-0.09	-0.21
PAbb2	I have sometimes felt confused as to whether my body was really my own.	**0.68**	-0.02	0.19	-0.19
PAbb3	I have sometimes had the feeling that my body is decaying inside.	**0.61**	0.02	0.15	0.07
PAbb4	Sometimes I have felt that I could not distinguish my body from other objects around me.	**0.87**	-0.09	-0.01	-0.20
PAbb5	I have felt that something outside my body was a part of my body.	**0.82**	-0.04	-0.11	0.12
PAbb6	Sometimes I have had feelings that I am united with an object near me.	**0.83**	-0.02	-0.08	0.09
PAbb7	Sometimes I have had a passing thought that some part of my body was rotting away.	**0.76**	0.03	0.10	0.10
PAbb8	I have sometimes felt that some part of my body no longer belongs to me.	**0.80**	-0.03	0.22	-0.19
PAbb9	I can remember when it seemed as though one of my limbs took on an unusual shape.	**0.84**	-0.09	-0.13	-0.01
S27	I sometimes get concerned that friends or co-workers are not really loyal or trustworthy.	0.27	-0.06	0.42	0.14
S59	I often feel that others have it in for me.	**0.39**	-0.06	0.32	0.32
S65	I often have to keep an eye out to stop people from taking advantage of me.	0.33	0.03	0.33	0.24
SA1	Having close friends is not as important as many people say.	0.29	-0.03	0.30	-0.18
SA10	People are usually better off if they stay aloof from emotional involvements with most others.	0.19	0.00	**0.45**	-0.02
SA11	If given the choice, I would much rather be with others than be alone.	0.04	**0.51**	-0.28	0.19
SA12	Although there are things that I enjoy doing by myself, I usually seem to have more fun when I do things with other people.	-0.08	**0.72**	-0.18	0.22
SA13	I feel pleased and gratified as I learn more and more about the emotional life of my friends.	0.05	**0.67**	-0.18	0.16
SA14	When things are going really good for my close friends, it makes me feel good too.	-0.11	**0.77**	-0.05	-0.04
SA15	Making new friends isn't worth the energy it takes.	0.17	-0.07	**0.61**	-0.11
SA2	I never had really close friends in high school.	0.24	0.01	**0.45**	-0.11

SA3	I prefer watching television to going out with other people.	0.10	0.06	**0.64**	-0.19
SA4	Just being with friends can make me feel really good.	-0.11	**0.74**	0.05	0.12
SA5	I'm much too independent to really get involved with other people.	0.14	0.08	**0.58**	-0.19
SA6	I prefer hobbies and leisure activities that do not involve other people.	0.09	0.02	**0.51**	0.03
SA7	I don't really feel very close to my friends.	0.11	-0.10	**0.64**	-0.07
SA8	People who try to get to know me better usually give up after awhile.	0.19	-0.10	**0.64**	0.04
SA9	Knowing that I have friends who care about me gives me a sense of security.	-0.04	**0.76**	0.17	0.07
SA2	I sometimes avoid going to places where there will be many people because I will get anxious.	-0.03	0.05	**0.71**	0.04
SA29	I get anxious when meeting people for the first time.	-0.13	0.14	**0.76**	0.10
SA38	I often feel nervous when I am in a group of unfamiliar people.	-0.20	0.13	**0.81**	0.11
SA46	I feel very uncomfortable in social situations involving unfamiliar people.	-0.17	0.06	**0.83**	0.15
UP22	When I look at a person or myself in a mirror, I have seen the face change right before my eyes.	**0.39**	-0.04	0.01	0.28
UP31	I often hear a voice speaking my thoughts aloud.	**0.45**	-0.03	0.08	0.33
UP48	Everyday things seem unusually large or small.	0.32	-0.06	0.22	0.31
UP64	My thoughts are sometimes so strong that I can almost hear them.	**0.50**	0.01	0.08	0.30
CA17	I am not good at expressing my true feelings by the way I talk and look.	-0.11	-0.13	**0.48**	0.26
CA26	I rarely laugh and smile.	0.04	-0.23	**0.60**	0.02
CA73	I tend to keep my feelings to myself.	-0.08	-0.12	**0.62**	0.09
CF33	I find it hard to be emotionally close to other people.	0.04	-0.14	**0.68**	0.08

Note factor scores greater than .35 are bold faced.