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Development and psychometric properties of the Multidimensional Schizotypy Scale: A new measure for assessing positive, negative, and disorganized schizotypy

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ABSTRACT

This article reports on the development of a new self-report questionnaire measure of schizotypy – the Multidimensional Schizotypy Scale (MSS). Schizotypy offers a useful and unifying construct for understanding schizophrenia-spectrum psychopathology. Questionnaire measures have been widely used to assess schizotypy and have greatly informed our understanding of the construct. However, available measures suffer from a number of limitations, including lack of a clear conceptual framework, outdated wording, unclear factor structure, and psychometric shortcomings. The MSS is based on current conceptual models and taps positive, negative, and disorganized dimensions of schizotypy. The derivation sample included 6265 participants sampled from four universities and Amazon Mechanical Turk. A separate sample of 1000 participants from these sources was used to examine the psychometric properties of the final subscales. Scale development employed classical test theory, item response theory, and differential item function methods. The positive schizotypy and negative schizotypy subscales contain 26 items each, and the disorganized schizotypy subscale contains 25 items. The psychometric properties were almost identical in the derivation and validation samples. All three subscales demonstrated good to excellent reliability, high item-scale correlations, and good item and test curve characteristics. The MSS appears to provide a promising measure for assessing schizotypy.

1. Introduction

1.1. Schizotypy and schizophrenia

Schizotypy is thought to represent the phenotypic manifestation of the underlying vulnerability for schizophrenia-spectrum psychopathology that is expressed across a broad range from subclinical expression to the prodrome to schizophrenia-spectrum personality disorders to full-blown psychosis (Kwapil and Barrantes-Vidal, 2015; Lenzenweger, 2010). Schizotypy offers a useful and unifying construct for understanding the etiology, development, and expression of schizophrenia-spectrum psychopathology. Schizotypy, and by extension schizophrenia, is heterogeneous and this heterogeneity can be captured by a multidimensional structure. Although the exact number and nature of these dimensions is not settled, there is good support for positive, negative, and disorganized dimensions (e.g., American Psychiatric Association, 2013; Kwapil and Barrantes-Vidal, 2015; Tandon et al., 2009; Vollema and van den Bosch, 1995). The positive or psychotic-like symptom dimension is characterized by disruptions in content of thought (ranging from magical ideation to full-blown delusions), perceptual oddities (including illusions and hallucinations), and suspiciousness/paranoia. The negative or deficit dimension involves diminished experiences and expression such as alogia, anergia, avolition, anhedonia and affect. The cognitive-behavioral disorganization dimension is characterized by disturbances in the ability to organize and express thoughts and behavior (ranging from mild disruptions to formal thought disorder and markedly disorganized actions). The reliable identification of these dimensions is necessary for parsing the heterogeneity of schizotypy and schizophrenia and for understanding their origins, development, and expression.

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1.2. Assessment of schizotypy

Numerous questionnaire measures have been developed to assess schizotypy (see reviews by Chapman et al., 1995; Kwapil and Chun, 2015; Mason, 2015; Mason et al., 1997) and have greatly informed our understanding of the construct. These measures offer several advantages including being relatively inexpensive, brief, and non-invasive to administer. They provide a valuable method for screening large numbers of participants from clinical and nonclinical samples and have greatly enhanced our understanding of schizotypy and the schizophrenia-spectrum. Nevertheless, such measures suffer from the same limitations as all questionnaires (e.g., self-report bias) and lack the precision of structured interviews. However, schizotypy questionnaires have proven to be valuable and widely-used measures (e.g., Barrantes-Vidal et al., 2013; Blanchard et al., 2011; Chapman et al., 1994; Gooding et al., 2005; Raine, 1991).

The most widely used of these measures are the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), the Oxford-Liverpool Inventory of Feelings & Experiences (O-LIFE; Mason et al., 1995), and the Wisconsin Schizotypy Scales (also referred to as the Chapman Scales of Psychosis Proneness), which include 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. Raine et al. (1994) reported that the SPQ has a three-factor structure with cognitive-perceptual, interpersonal, and disorganized factors, although other studies have suggested two to four-factor models provide the best fit (e.g., Compton et al., 2009; Gross et al., 2014). The O-LIFE has four factors (unusual experiences, cognitive disorganization, introvertive anhedonia, and impulsive nonconformity). Many studies indicate that a two-factor structure with positive and negative schizotypy dimensions underlies the Wisconsin Schizotypy Scales (e.g., Kwapil et al., 2008; Chan et al., 2015). The psychometric properties and the construct validity have been widely reported for the Wisconsin Schizotypy Scales (e.g., Chapman et al., 1994), SPQ (e.g., Salokangas et al., 2013), and O-LIFE (e.g., Mason and Claridge, 2006). Note that our decision to limit our discussion of other scales to the Wisconsin Schizotypy Scales, O-LIFE, and SPQ was not intended to overlook the numerous other scales of schizotypy, psychosis proneness, and related experiences. However, we refer readers to the four comprehensive reviews cited above.

Despite the valuable contributions produced by studies employing schizotypy questionnaires, currently available measures have several limitations. First, many of these measures do not map onto current multidimensional conceptualizations of schizotypy that include positive, negative, and disorganized dimensions. Specifically, some scales fail to assess schizotypy as a multidimensional construct. Furthermore, scales that do so often differ in the number and the content of the factors – and in some cases contain subscales that either do not map onto current conceptual models (e.g., impulsive nonconformity) or do not adequately assess these factors. Likewise, scales that purport to measure the same factor sometimes appear to be measuring different constructs (see Gross et al., 2014). Effective and informative study of schizotypy requires the use of measures that map onto the theoretical model of the construct. The current study of schizotypy is hampered by the use of multiple measures that appear to be measuring different constructs.

A second limitation reflects that older scales were not able to capitalize on recent advances in measurement theory. These scales were typically developed using classical test theory (CTT), but more current tools such as item response theory (IRT) and differential item functioning (DIF) improve upon psychometric properties over and above CTT (Hambleton et al., 2000). For example, Winterstein et al. (2011) examined the Wisconsin Schizotypy Scales using IRT and DIF. They found many good items within the scales, but revealed some items had low discrimination and many had high DIF for sex and ethnicity. Many of the current scales were also developed with relatively small samples (e.g., often fewer than 1000 participants) and often using participants from a single site that lacked racial and ethnic diversity. Finally, many of the existing scales employ wording that is outdated or culturally biased.

1.3. Goals of the present study

Schizotypy appears to offer a useful and unifying construct for understanding clinical and subclinical expressions of schizophrenia-spectrum psychopathology. However, the utility of this construct requires theoretically and empirically solid measurement tools. The present study developed the Multidimensional Schizotypy Scale (MSS) - a new, conceptually based, multidimensional questionnaire assessing positive, negative, and disorganized schizotypy dimensions. Our goal in developing the MSS was to build a measure that is based upon the current three-factor conceptual model of schizotypy, that has strong psychometric properties, and that is appropriate for older adolescents and adults. In doing this, we hoped to build on the strengths of existing models and measures, and to overcome conceptual and empirical limitations of extant measures mentioned above. Specifically, we aimed to develop items that avoided outdated and biased language, employed leading measurement models including CTT, IRT, and DIF, and used large and diverse derivation and cross-validation samples drawn from multiple testing sites.

The items tap experiences that occur across the schizotypy continuum. Many of the experiences are similar, albeit milder, forms of symptoms experienced by patients with schizophrenia-spectrum disorders. The positive schizotypy items tap magical beliefs, referential thinking, mind reading and thought transmission, supernatural experiences, passivity experiences, unusual perceptual and somatic experiences, paranoia and suspiciousness, and special powers. Negative schizotypy items assess social disinterest, flat affect, anhedonia, alogia, anergia, and avolition. Care was taken to generate items that tap trait-like negative symptoms and did not simply tap episodic depressive symptoms or the experience of negative affect. Negative schizotypy items were worded to refer to trait-like, enduring characteristics, rather than episodic or momentary characteristics. For example, negative schizotypy items contain the specifiers, “throughout my life…”, “I have always…”, “almost always…”, “I rarely…”, “I typically…”, “I have little or no…”. Secondly we created items that reflected a diminution of functioning and interest in the world, but did not reflect increased negative affect. The disorganized schizotypy items assess disorganized thought and behavior, confusion, racing thoughts, loose associations, disrupted speech, difficulty following conversations, and slowness of thought.

The scale development procedures followed DeVellis' (2012) guidelines including: 1) development of trait specifications for the three schizotypy dimensions, 2) generation of a large pool of candidate items based on these specifications, 3) review of the items by expert and non-expert reviewers, 4) repeated administrations of the candidate items to large and diverse samples from multiple sources – interspersed with evaluation, modification, and dropping of items, 5) selection of final items based on content validity, CTT, IRT, and DIF, and 6) evaluation of the psychometric properties of the items and subscales in a large independent sample of participants. Our goal was to recruit at least 6000 participants for the derivation sample and 1000 participants for the validation sample. We aimed to include approximately 25 to 35 items in each of the three subscales. We expected to select items with relatively low endorsement frequency given the relative rarity of schizotypic experiences in the general population (e.g., Lenzenweger and Korfine, 1992) and to maximize discrimination at the high end of the scale.

2. Methods

2.1. Participants

A total of 8750 participants at four universities and on Amazon Mechanical Turk (MTurk) were administered the candidate items during a

Table 1
Summary of assessments for schizotypy items.

Administration	Survey version[a]	Date	Sample[b]	Total sample size	Dropped missing	Dropped infrequency	Dropped > age 59	Usable sample size	% female	Age M (SD)
1	1	Spring 2015	UNCG	166	18	24	0	124	62.1	19.4 (1.8)
2	1	Fall 2015	UNCG/YSU	953	79	61	0	813	71.6	19.7 (4.2)
3	2	Spring 2016	UNCG/YSU	1055	88	124	0	843	68.4	20.5 (4.2)
4	3	May 2016	MTurk	391	28	37	21	305	56.7	35.9 (9.8)
5	3	June 2016	MTurk	1296	71	105	61	1059	63.9	34.4 (10.5)
6	3	Fall 2016	UNCG	724	27	89	0	608	75.2	18.9 (2.3)
7	3	Fall 2016	YSU	641	15	90	0	536	70.8	20.0 (3.8)
8	3	Fall 2016	TTU	409	15	80	0	314	57.4	19.5 (4.2)
9	3	Fall 2016	UIUC	915	21	128	0	766	68.3	19.2 (1.5)
10	3	October 2016	MTurk	761	0	71	33	657	60.6	35.2 (9.1)
11	3	October 2016	MTurk	723	0	80	27	616	59.4	34.7 (10.0)
12	3	November 2016	MTurk	716	0	58	34	624	64.3	34.4 (10.0)
Total				8750	362	947	176	7265	65.9	26.4 (10.4)

[a] Survey 1: 81 positive schizotypy items, 79 negative schizotypy items, 86 disorganized schizotypy items, NEO-FFI, Social Desirability Scale, Infrequency Scale, Attentive Responding Scale. Survey 2: 53 positive schizotypy items, 53 negative schizotypy items, 49 disorganized schizotypy items, NEO-FFI, Social Desirability Scale, Infrequency Scale, Attentive Responding Scale. Survey 3: 42 positive schizotypy items, 39 negative schizotypy items, 37 disorganized schizotypy items, NEO-FFI, Infrequency Scale, Attentive Responding Scale.
[b] Sample: UNCG = University of North Carolina at Greensboro, YSU = Youngstown State University, TTU = Tennessee Tech University, UIUC = University of Illinois at Urbana-Champaign, MTurk = Amazon Mechanical Turk.

series of twelve assessments. Table 1 lists the universities and the number of subjects, and demographic characteristics at each administration. Participants were dropped if they had elevated scores on measures of invalid responding, failed to complete at least half of the items, or were 60 years or older. Participants 60 years of age or older were not included in the derivation or cross-validation samples because: a) schizotypy studies primarily focus on younger participants at or near the age of greatest risk for developing schizophrenia-spectrum disorders, b) we wanted to avoid age related cognitive disruptions in deriving the scales, that might especially impact the disorganization subscale, and c) we only had 176 subjects (2% of total sample) age 60 years or older; thus we did not have stable estimates for participants in this age range. The sample used for the derivation of the scale included 6265 subjects with usable data. One thousand participants (500 men and 500 women) were randomly selected from the final seven administrations and retained as a cross-validation sample (not included in the derivation analyses). Table 2 presents the demographic characteristics of the derivation and cross-validation samples.

2.2. Materials

2.2.1. Trait specification and item generation

Development of the scales began with review of existing schizotypy scales and preparation of detailed trait specifications describing positive, negative, and disorganized schizotypy. These descriptions were used to guide the creation of large pools of items. These primarily included new items, as well as items from other scales in original or modified form. Consistent with the Wisconsin Schizotypy Scales, SPQ, and O-LIFE, dichotomous (true/false) items were used in the MSS.

The items were reviewed for content and grammar by eight expert and six non-expert reviewers. The first two administrations included 81 positive, 79 negative, and 86 disorganized schizotypy items. The item pool was reduced to 53 positive, 53 negative, and 49 disorganized schizotypy items for the third administration. The final nine administrations contained 42 positive, 39 negative, and 37 disorganized schizotypy items. Participants were instructed: *The following items inquire about a broad range of attitudes, experiences, and beliefs that people have. Please answer each item in the way that best describes you. Please note that there are no right or wrong answers – just answer in the way that is most like you.*

Table 2
Characteristics of the derivation and cross-validation samples.

	Derivation sample ($n = 6265$)	Cross-validation sample ($n = 1000$)
Sex	1975 male, 4290 female	500 male, 500 female
Age in years: mean (SD)	26.4 (10.4)	26.7 (10.2)
Age in years: median (IQR)	21.0 (13)	22.0 (15)
Age in years: range	18–59	18–59
Ethnicity/race		
Caucasian	4429 (71%)	695 (70%)
Black/African American	763 (12%)	114 (11%)
Hispanic/Latino	371 (6%)	63 (6%)
Asian/Pacific Islander	434 (7%)	88 (9%)
Native American	42 (1%)	4 (<1%)
Other	225 (4%)	36 (4%)
English as first language	5890 (94%)	931 (93%)

2.2.2. Additional measures administered

In addition to the candidate schizotypy items, all participants completed the Infrequency Scale (Chapman and Chapman, 1983), the Attentive Responding Scale (ARS; Maniaci and Rogge, 2014), and the NEO-FFI-3 neuroticism subscale (McCrae and Costa, 2010). Participants in the first three administrations completed the Social Desirability Scale (Crowne and Marlowe, 1960). Participants were dropped from the analyses if they had scores of 3 or above on the Infrequency Scale or the ARS total, or 4 or above on the ARS variable responding index. Neuroticism and social desirability were assessed to determine the association of each candidate schizotypy item with these constructs. We specifically included a measure of neuroticism to: a) make sure that we retained and selected negative schizotypy items that were not tapping high levels of neuroticism, and b) to generally insure that our items from all the dimensions were tapping higher levels of their intended schizotypy dimension than levels of instability and distress that characterize neuroticism. The Social Desirability Scale was discontinued after the third administration ($n = 2174$), because none of the retained schizotypy items had significant positive correlations with social desirability.

2.3. Procedures

All participants completed the survey online using Qualtrics software. University students were recruited electronically and received course credit. MTurk participants were recruited via the MTurk website

and received $1.00. The project received IRB approval at each institution. The survey began with the informed consent form and demographic items. The schizotypy, infrequency, ARS, and social desirability items were intermixed and presented in six blocks administered in random order, followed by the neuroticism items.

2.3.1. Data analysis and item evaluation

The psychometric selection of items for the positive, negative, and disorganized schizotypy subscales was based solely on the derivation sample. The cross-validation sample was used to assess the subscales' psychometric properties after the final item selection. CTT, IRT, and DIF statistics, along with content validity, were used for the item selection process. CTT statistics included mean endorsement frequency, correlation of the item with its schizotypy dimension, correlations with the other two schizotypy dimensions, and correlations with neuroticism.

Two-parameter logistic IRT models, generated using IRTPRO Version 3 (Scientific Software International Inc., 2015) produced discrimination and difficulty parameters, as well as item response curves. IRTPRO uses maximum likelihood estimation for item parameter estimation. DIF was assessed for sex differences and racial/ethnic differences. Note that a 2 PL IRT model was used for scale development as it provided superior model fit to the 1 PL and 3 PL models, and because the c parameters generated from the 3 PL models were low (ranging from 0.00 to 0.05).

Retention and final selection of items was based on the following factors. First, efforts were made to ensure content validity by generating and retaining items that covered the full range of the constructs described in the trait specifications. In terms of CTT, preference was given to items that had low endorsement frequency (0.05 to 0.35), high item-scale correlation with the items for that dimension, and relatively lower correlations with the other two schizotypy dimensions. Preference was given to negative schizotypy items with low correlations with neuroticism, and positive and disorganized schizotypy items with low to medium correlations with neuroticism. In terms of IRT values, preference was given to items with high discrimination. Consistent with preference for low endorsement items, it was expected that items would have difficulty values of approximately 0.5 to 2.5. Items with markedly elevated DIF for sex or ethnicity were not included in the final scale. Average grade reading level of the scale based upon five indices was computed using Readable.io (2017). Note that we could not determine completion time of the MSS in the present sample

Table 3
Item-level statistics from the cross-validation sample for the MSS positive schizotypy subscale.

Item	Classical test theory					Item response theory		Differential item functioning	
	P	Point-biserial correlations							
		Positive schizotypy	Negative schizotypy	Disorganized schizotypy	Neuroticism	Discrimination	Difficulty	χ^2 sex	χ^2 ethnic
I believe that dreams have magical properties.	0.33	0.55	0.00	0.15	0.13	1.56	0.66	6.7	0.3
I believe that ghosts or spirits can influence my life.	0.27	0.54	0.02	0.17	0.14	1.38	0.97	8.9	1.2
I believe that I could read other peoples' minds if I really tried.	0.09	0.50	0.03	0.08	−0.01	1.98	1.83	0.1	0.0
I have had the momentary feeling that I might not be human.	0.11	0.54	0.10	0.19	0.17	2.14	1.60	1.4	0.0
Some people can make me aware of them just by thinking about me.	0.14	0.53	0.04	0.13	0.07	1.75	1.52	4.8	0.0
I have had the momentary feeling that someone's place has been taken by a look-alike.	0.07	0.45	0.04	0.16	0.10	1.91	2.05	0.4	0.1
I often wonder if everyone in the world is part of a secret experiment.	0.14	0.61	0.16	0.26	0.17	2.36	1.33	0.5	2.8
I have worried that people on other planets may be influencing what happens on Earth.	0.08	0.46	0.09	0.11	0.10	1.87	1.92	1.5	0.1
I occasionally have the feeling that my thoughts are not my own.	0.08	0.48	0.12	0.31	0.21	1.98	1.86	0.8	0.9
I have sometimes felt that strangers were reading my mind.	0.10	0.51	0.06	0.24	0.17	1.91	1.70	7.5	0.1
I have felt that there were messages for me in the way things were arranged, like furniture in a room.	0.07	0.46	0.04	0.12	0.06	1.98	1.99	0.6	4.0
Sometimes I feel that a television show or movie has a special message just for me.	0.23	0.52	0.01	0.15	0.15	1.51	1.15	0.1	0.8
I believe that there are secret signs in the world if you just know how to look for them.	0.37	0.57	0.03	0.17	0.13	1.64	0.51	0.1	0.2
I sometimes wonder if there is a small group of people who can control everyone else's behavior.	0.09	0.51	0.10	0.20	0.13	2.03	1.75	2.5	1.4
I occasionally worry that people I see on the street are spying on me.	0.08	0.50	0.12	0.30	0.21	2.14	1.81	1.4	0.0
I often worry that other people are out to get me.	0.13	0.48	0.22	0.45	0.39	1.61	1.63	0.5	0.3
I often think that I hear people talking only to discover that there was no one there.	0.11	0.44	0.10	0.29	0.22	1.49	1.87	0.0	2.2
Occasionally I have felt as though my body did not exist.	0.11	0.52	0.12	0.32	0.24	2.08	1.61	0.1	1.1
At times I have wondered if my body was really my own.	0.09	0.55	0.12	0.29	0.22	2.43	1.63	0.0	0.0
I have felt that something outside my body was a part of my body.	0.07	0.50	0.08	0.23	0.09	2.24	1.88	5.7	3.0
There are times when it feels like someone is touching me when no one is actually there.	0.13	0.54	0.08	0.27	0.19	1.92	1.50	0.6	1.5
Sometimes when I look at ordinary objects they seem strange or unreal.	0.19	0.60	0.14	0.32	0.24	2.12	1.17	1.4	1.4
There are times when I think I see another person, but there is actually no one there.	0.12	0.47	0.09	0.21	0.24	1.56	1.77	2.0	2.6
I have had experiences with seeing the future, ESP or a sixth sense.	0.23	0.48	0.02	0.10	0.09	1.20	1.27	0.4	1.5
I often worry that someone or something is controlling my behavior.	0.06	0.49	0.07	0.30	0.21	2.23	1.93	0.9	0.5
I often find hidden meanings or threats in things that people say or do.	0.23	0.57	0.19	0.33	0.25	1.76	1.04	1.2	5.5

Table 4
Item-level statistics from the cross-validation sample for the MSS negative schizotypy subscale.

Item	Classical test theory								
	P	Point-biserial correlations				Item response theory		Differential item functioning	
		Positive schizotypy	Negative schizotypy	Disorganized schizotypy	Neuroticism	Discrimination	Difficulty	χ^2 sex	χ^2 ethnic
Throughout my life I have noticed that I rarely feel strong positive or negative emotions.	0.16	0.12	0.45	0.16	0.04	1.24	1.72	3.8	1.3
I rarely feel strong emotions even in situations in which other people usually do.	0.21	0.10	0.45	0.18	0.00	1.15	1.43	13.2*	2.3
Throughout my life there have been very few things that interest me.	0.13	0.14	0.54	0.34	0.24	1.76	1.57	0.9	3.8
My emotions have almost always seemed flat regardless of what is going on around me.	0.17	0.10	0.51	0.21	0.07	1.51	1.42	14.2*	4.0
Generally I do not have many thoughts or emotions.	0.05	0.08	0.26	0.07	0.01	0.97	3.44	2.3	3.6
I often look forward to upcoming events.	0.08	0.04	0.48	0.19	0.18	1.85	1.95	1.4	0.9
Throughout my life, very few things have been exciting or interesting to me.	0.11	0.13	0.56	0.34	0.26	2.00	1.62	2.5	3.7
I tend to have few interests.	0.19	0.13	0.51	0.32	0.26	1.45	1.38	3.4	2.6
I have always preferred to be disconnected from the world.	0.18	0.20	0.59	0.31	0.20	1.98	1.22	2.7	3.9
Having close friends is not as important as people say.	0.13	0.11	0.53	0.12	0.08	1.82	1.58	2.2	0.6
I have never really been interested in having close relationships.	0.07	0.09	0.59	0.17	0.09	3.22	1.67	0.2	0.0
In general, it is important for me to have close relationships with other people.	0.16	0.05	0.62	0.09	0.07	2.26	1.25	0.0	0.0
When I move to a new place, I feel a strong desire to make friends.	0.34	0.01	0.56	0.13	0.13	1.62	0.61	0.2	12.7*
If given the choice, I would much rather be with another person than alone.	0.22	0.03	0.51	0.06	0.05	1.49	1.19	4.0	0.9
Although there are things I enjoy doing by myself, I usually have more fun when I do things with other people.	0.16	0.08	0.55	0.08	0.16	1.81	1.36	2.4	1.0
I enjoy meeting new people and making new friends.	0.16	0.04	0.59	0.18	0.24	2.08	1.30	1.1	7.1
It has never been important to me to be involved with other people.	0.14	0.15	0.55	0.18	0.06	1.92	1.48	0.8	2.0
Most of the time I feel a desire to be connected with other people.	0.21	0.01	0.65	0.13	0.10	2.42	1.02	0.0	0.0
Throughout my life, I have had little interest in dating or being in a romantic relationship.	0.10	0.07	0.43	0.16	0.09	1.34	2.09	0.0	0.9
I generally am not interested in being emotionally close with others.	0.19	0.09	0.68	0.20	0.11	2.95	1.04	0.8	0.0
There are just not many things that I have ever really enjoyed doing.	0.13	0.17	0.54	0.40	0.30	1.80	1.58	0.0	2.3
I have little or no interest in sex or romantic relationships.	0.08	0.04	0.40	0.15	0.12	1.39	2.30	1.9	0.3
I greatly enjoy traveling to new places.	0.08	0.01	0.33	0.06	0.11	1.09	2.68	1.8	2.1
Just being with other people can make me feel good.	0.09	0.03	0.46	0.17	0.12	1.70	1.96	0.2	0.1
Spending time with close friends and family is important to me.	0.05	0.07	0.43	0.10	0.04	2.01	2.19	2.8	0.2
Having a meal with other people is almost always better than eating alone.	0.20	0.06	0.51	0.12	0.13	1.47	1.29	0.2	0.3

Differential functioning analyses: *$p < 0.001$.

(because they completed other measures). However, a separate sample of 28 college students all completed the MSS in under 10 min.

3. Results

3.1. Selection of items for the three dimensions

3.1.1. Item statistics

A total of 26 positive, 26 negative, and 25 disorganized schizotypy items were retained for the final subscales from the pool of 118 schizotypy items in survey 3 (Supplemental Table 1 lists the items and scoring key). Ten of the items were taken directly from other scales (five from the Magical Ideation, three from the Perceptual Aberration, and one each from the Revised Social Anhedonia and Physical Anhedonia Scales) and eights items were modified from other scales (three each from the Revised Social Anhedonia and Cognitive Slippage (Miers and Raulin, 1987) Scales, and two from the Schizotypal Personality Questionnaire). Based on five indices, the average reading grade level of the items was 8.2. All three subscales were unidimensional based on scree plots and ratios of the eigenvalues of the first to second factors >4 for each subscale. Tables 3 to 5 present the CTT, IRT, and DIF statistics for the final items for the three subscales from the cross-validation sample.

3.1.2. Subscale statistics

The positive, negative, and disorganized subscales are scored as the number of items endorsed in the schizotypic direction. Table 6 presents statistics for the final versions of the three subscales in the derivation and cross-validation samples. Note that the psychometric properties were comparable in the two samples. As expected given the selection of items with relatively low endorsement frequency, the subscales exhibited marked positive skew. Cronbach's alpha was calculated for the subscales. However, Cronbach's alpha may underestimate internal consistency for binary items; therefore, binary alpha was also calculated (Hancock and Mueller, 2001; Liu et al., 2010). All three subscales demonstrated good to excellent internal consistency reliability with either method in both samples.

Table 7 presents the intercorrelations of the schizotypy subscales and the correlations with neuroticism in the two samples. Note that given the large sample size, alpha was set at 0.001 and results were considered in terms of effect sizes. The pattern of correlations was invariant across the samples. Positive and negative schizotypy were modestly

Table 5
Item-level statistics from the cross-validation sample for the MSS disorganized schizotypy subscale.

Item	Classical test theory					Item response theory		Differential item functioning	
	P	Point-biserial correlations							
		Positive schizotypy	Negative schizotypy	Disorganized schizotypy	Neuroticism	Discrimination	Difficulty	χ^2 sex	χ^2 Ethnic
Most of the time I find it is very difficult to get my thoughts in order.	0.20	0.30	0.19	0.71	0.39	2.90	0.98	0.1	1.0
No matter how hard I try, I can't organize my thoughts.	0.10	0.22	0.18	0.61	0.35	2.56	1.55	0.2	0.1
Even when I have time, it is almost impossible to organize my thoughts.	0.18	0.24	0.21	0.63	0.34	2.27	1.15	0.5	0.8
Most of the time my thoughts seem clear and organized.	0.22	0.22	0.15	0.61	0.37	1.93	1.03	1.3	0.0
My thoughts are so hazy and unclear that I wish that I could just reach up and put them into place.	0.15	0.34	0.19	0.65	0.36	2.58	1.23	0.0	1.5
My thoughts almost always seem fuzzy and hazy.	0.08	0.22	0.19	0.58	0.26	2.50	1.72	0.0	0.0
Things slip my mind so often that it's hard to get things done.	0.25	0.27	0.18	0.67	0.38	2.65	0.83	0.3	0.3
I have a hard time staying on topic while speaking.	0.22	0.27	0.22	0.60	0.33	1.87	1.03	2.5	0.5
My thoughts often feel so jumbled that I have difficulty doing anything.	0.17	0.29	0.25	0.72	0.42	3.19	1.07	1.7	0.3
My thoughts are almost always hard to follow.	0.15	0.29	0.24	0.71	0.33	3.02	1.19	1.0	0.1
I find that I am very often confused about what is going on around me.	0.14	0.37	0.22	0.59	0.36	2.07	1.42	0.1	0.0
I often find that when I talk to people I don't make any sense to them.	0.14	0.30	0.26	0.57	0.29	1.91	1.49	0.2	0.1
People find my conversations to be confusing or hard to follow.	0.13	0.22	0.30	0.57	0.25	1.83	1.53	2.9	0.4
I have trouble following conversations with others.	0.10	0.24	0.32	0.65	0.29	2.82	1.50	0.9	0.1
When people ask me a question, I often don't understand what they are asking.	0.08	0.25	0.23	0.55	0.22	2.21	1.80	2.5	0.0
It is usually easy for me to follow conversations.	0.11	0.22	0.30	0.55	0.26	1.96	1.68	1.3	0.5
My lack of organization often makes it hard to do the things that I am supposed to do.	0.22	0.23	0.19	0.65	0.37	2.37	0.97	0.0	1.5
My thoughts and behaviors are almost always disorganized.	0.14	0.28	0.24	0.75	0.37	3.95	1.19	0.5	1.2
I often feel so disconnected from the world that I am not able to do things.	0.12	0.32	0.33	0.53	0.38	1.82	1.67	3.9	0.1
My thoughts and behaviors feel random and unfocused.	0.15	0.33	0.24	0.73	0.38	3.41	1.19	0.0	0.0
I often have difficulty organizing what I am supposed to be doing.	0.22	0.28	0.15	0.72	0.39	3.33	0.89	0.0	0.4
When I try to do one thing, I often become confused and start doing something else.	0.20	0.31	0.11	0.62	0.35	2.13	1.10	3.1	0.0
I often feel so mixed up that I have difficulty functioning.	0.14	0.30	0.23	0.66	0.39	2.51	1.33	1.8	0.2
I often struggle to stay organized enough to complete simple tasks throughout the day.	0.18	0.24	0.17	0.66	0.36	2.44	1.14	0.2	0.0
I often have difficulty following what someone is saying to me.	0.11	0.28	0.27	0.61	0.27	2.37	1.52	1.1	1.3

correlated, whereas disorganized schizotypy had moderate positive correlations with the other two dimensions. Positive and disorganized schizotypy were unassociated with sex, whereas negative schizotypy had a modest correlation – indicating that men scored slightly higher than women, consistent with the longstanding finding of greater negative symptoms in men than in women (e.g., Tandon et al., 2009). Neuroticism had a modest correlation with negative schizotypy, medium correlation with positive schizotypy, and a large correlation with disorganized schizotypy. Based upon usable data from the first three administrations ($n = 1780$), social desirability had small, but significant negative correlations with the positive ($r = -0.25, p < 0.001$), negative ($r = -0.10$, $p < 0.001$), and disorganized ($r = -0.25$, $p < 0.001$) schizotypy subscales. ANOVAs were computed comparing the racial/ethnic groups on scores on the three subscales. None of the analyses were significant: positive schizotypy, $F(5,994) = 1.50$; negative schizotypy, $F(5,994) = 2.62$; disorganized schizotypy, $F(5,994) = 1.26$.

Fig. 1 presents the test information curves for the three schizotypy subscales. As was intended, maximum test information (greatest discrimination) and minimal error occurred at high trait levels.

4. Discussion

In his landmark address, Meehl (1962) stated that the "most important research need is development of high-validity indicators for compensated schizotypy" (p. 830). Thirty-three years later the Chapmans concluded that, "Attempts to use questionnaires to measure proneness

Table 6
Descriptive statistics, reliability, and correlations of the schizotypy subscales in the derivation ($n = 6265$) and cross-validation ($n = 1000$) samples.

Subscale	Items	Sample	Mean (SD)	Skew (SE)	Kurtosis (SE)	Alpha	Binary
Positive schizotypy	26	Derivation	3.58 (4.41)	1.86 (0.03)	3.75 (0.06)	0.89	0.89
		Cross-validation	3.71 (4.50)	1.70 (0.08)	2.88 (0.16)	0.89	0.89
Negative schizotypy	26	Derivation	3.53 (4.36)	1.83 (0.03)	3.45 (0.06)	0.88	0.87
		Cross-validation	3.78 (4.61)	1.66 (0.08)	2.51 (0.16)	0.89	0.88
Disorganized schizotypy	25	Derivation	4.05 (5.81)	1.77 (0.03)	2.44 (0.06)	0.94	0.95
		Cross-validation	3.88 (5.69)	1.83 (0.08)	2.64 (0.16)	0.94	0.94

Alpha = coefficient alpha reliability; binary = binary alpha reliability.

Table 7
Correlations of the schizotypy subscales in the derivation ($n = 6265$) and cross-validation ($n = 1000$) samples.

Subscale	Positive schizotypy	Negative schizotypy	Disorganized schizotypy	Sex	Neuroticism
Positive schizotypy		.19*	**.48***	–.01	**.37***
Negative schizotypy	.16*		**.34***	–.11*	.24*
Disorganized schizotypy	**.43***	**.34***		–.01	***.55****
Sex	.02	–.12*	.02		.15*
Neuroticism	**.32***	.24*	***.55****	.18*	

*$p < 0.001$.
Results for the derivation sample are listed above the diagonal and for the cross validation sample are listed below the diagonal.
Positive correlations with sex indicate higher scores in women.
Medium effect sizes are in bold, large effect sizes in bold and italics.

to schizophrenia or to psychosis have achieved a measure of success that encourages vigorous pursuit of the best possible measure or set of measures" (Chapman et al., 1995, p. 101). Kwapil and Barrantes-Vidal (2015) stated that "psychometric assessment provides a promising point of entry for assessing schizotypy" and advocated for the development of new measures built on current conceptual models. We believe that schizotypy provides a vital construct for understanding the etiology, development, and expression of schizophrenia-spectrum psychopathology and that psychometric measures provide valuable tools for assessing this relevant construct. We especially harken to the

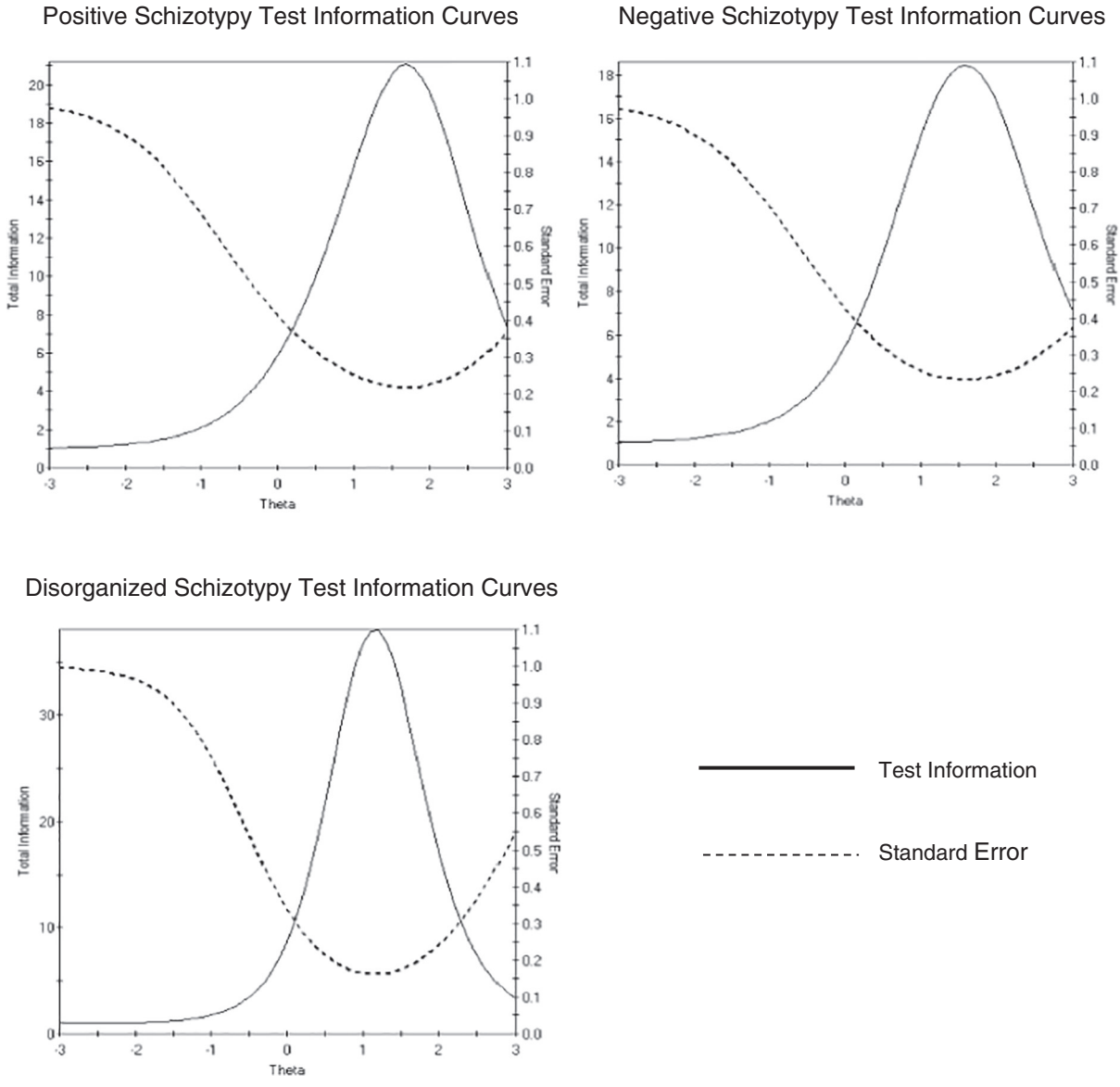

Fig. 1. Test information curves for the positive, negative, and disorganized schizotypy subscales.

call by Meehl and the Chapmans regarding the need for conceptually-based, reliable, and valid measures.

Nevertheless, it is reasonable to consider, "why do we need another schizotypy questionnaire?" and "what does the MSS have to offer above-and-beyond currently available measures?" As proponents of the psychometric method, we have assessed tens of thousands of participants with such measures and examined their associations with psychopathology, impairment, and physiological measures using questionnaire (e.g., Kwapil et al., 2008), interview (e.g., Barrantes-Vidal et al., 2013), laboratory (e.g., Kaczorowski et al., 2009), DNA (e.g., de Castro-Català et al., 2015), and daily life assessments (e.g., Kwapil et al., 2012). Furthermore, we have benefited from innovative research using schizotypy measures conducted by colleagues in the field (e.g., Blanchard et al., 2011; Bolinsky et al., 2017; Gooding et al., 2005). Psychometric schizotypy measures have greatly enhanced our understanding of the construct. However, it is expected that newer measures will be developed as our conceptual models evolve and our measurement tools become more sophisticated. Thus, we believe it is time for a new-generation measure that builds on both the strengths and limitations of preceding measures to capture our current multidimensional conceptualization of schizotypy and employ modern measurement tools. It was in this spirit that we developed the MSS.

The scale development procedures for the MSS offered a number of strengths, consistent with the best practices described by DeVellis (2012). These included using comprehensive trait specifications to develop large pools of items and administering them to large, diverse, multi-site samples. The derivation of the final subscales was based on content validity, CTT, IRT, and DIF, and we cross-validated our item and scale properties in another large sample.

Although studies are needed to evaluate the construct validity of the MSS, the scale appears to offer a number of promising features. The measure was designed to tap the three most widely reported dimensions of schizotypy/schizophrenia. Note that this offers an improvement over the widely used Wisconsin Schizotypy Scales, which assesses only positive and negative schizotypy. Furthermore, the Wisconsin Schizotypy Scales dimensions were derived years after the scales were created – and it is not clear if these factor-analytically derived dimensions provide full content coverage of positive and negative schizotypy. The 77-item MSS is comparable in length to the SPQ (72 items) and shorter than the O-LIFE (104 items) and the Wisconsin Schizotypy Scales (166 items). The psychometric properties of the MSS subscales were closely comparable in the derivation and validation samples. The subscale reliabilities are good to excellent (and exhibited no shrinkage in the validation sample). Furthermore, the reliabilities were comparable or superior to other leading schizotypy measures (e.g., Chapman et al., 1982; Mason et al., 1995; Raine, 1991). Finally, all three subscales are maximally discriminating at the high end of the traits. The MSS was derived and cross-validated in a sample aged 18 to 59 years old. We recommend caution in using the MSS with participants outside of this age range until psychometric properties are established for these ages.

The three subscales were designed to provide good content coverage of positive, negative, and disorganized schizotypy. In contrast, the Wisconsin Schizotypy Scales factor-derived positive schizotypy dimension is primarily drawn from the Perceptual Aberration and the Magical Ideation Scales, which largely tap body-image aberrations and odd beliefs (from Meehl's (1964) checklist). The Wisconsin Schizotypy Scales negative schizotypy dimension, like the O-LIFE introvertive anhedonia subscale, is based on items from the Physical and Revised Social Anhedonia Scales. The MSS positive and negative schizotypy dimensions were designed to draw from broader content areas. For example, the positive schizotypy subscale includes items that also tap suspiciousness and passivity experiences, whereas the negative schizotypy subscale also assesses avolition, alogia, and flattened affect.

Perhaps the most challenging dimension to assess is cognitive-behavioral disorganization. First, disorganization may be due to other transient or enduring conditions (e.g., ADHD, depression, substance abuse). Secondly, the experience of disorganized schizotypy (especially pronounced disorganization) may impair one's ability to recognize and report these experiences. Finally, it is not clear that current measures of disorganized schizotypy tap deterioration or disruption of thought and behavior. As Gross et al. (2014) noted, the SPQ disorganized factor seems to tap "oddness" that may be "due to volitional behaviors resulting from positive symptoms, rather than cognitive and behavioral disorganization" (p. 404). Likewise, a review of the O-LIFE cognitive disorganization items suggests that they tap social anxiety and low self-esteem. The MSS, similar to the Cognitive Slippage Scale, targeted disruptions in thought, organization, and communication, rather than perceptions that others view the respondent as odd or eccentric.

The pattern of correlations among the MSS subscales is consistent with our multidimensional model of schizotypy. The MSS positive and negative schizotypy subscales were minimally correlated, consistent with the findings from the Wisconsin Schizotypy Scales (Kwapil et al., 2008) and the O-LIFE (Mason and Claridge, 2006), but in contrast to the large correlation between the SPQ cognitive-perceptual and interpersonal factors (Gross et al., 2014). The medium size correlations of MSS disorganized schizotypy subscale with positive and negative subscales were consistent with correlations of the O-LIFE subscales. We offer two caveats regarding the MSS. First, our focus on the three dimensions and on making a relatively short scale means that we do not recommend examination of facets underlying the three dimensions. In addition, consistent with our multidimensional model, we do not recommend computation of a total schizotypy score, but rather use of the three subscale scores. Note that the finding of small negative correlations between the MSS subscales and social desirability is consistent with DeVylder and Hilmire (2015) and suggests that high social desirability scorers are less likely to report schizotypic experiences.

Having put forth the MSS, we appreciate the proverb that, "the proof of the pudding is in the eating". In other words, good scale development procedures and initial psychometric properties provide a promising start, but the next step is to focus on validation of the scale. Lenzenweger (2010), Fonseca-Pedrero et al. (2008), and Kwapil and Barrantes-Vidal (2015) provide useful guidelines for construct validation of schizotypy that ultimately involve identification and differentiation of the processes underlying the positive, negative, and disorganized dimensions of schizotypy. We highlight three lines of study for assessing the validity of the new scale. First of all, we recommend hypothesis-driven cross-sectional studies examining the correlates of the three subscales. For example, an interview study (comparable to Kwapil et al. (2008)) could examine whether the schizotypy dimensions are differentially associated with psychotic, negative, and disorganized symptoms, prodromal symptoms, Cluster A personality disorder traits, impairment in social and role functioning, mood symptoms and episodes, and substance use. Similar studies could examine whether the MSS subscales are associated with cognitive impairments, daily life experiences, genetic variation, etc. We also recommend longitudinal assessment to examine whether nonclinically ascertained participants with high scores on the subscales are at heightened risk for developing schizophrenia-spectrum psychopathology and disorders (as examined by Chapman et al. (1994) for the Wisconsin Schizotypy Scales). Finally both cross-sectional and longitudinal studies could compare the MSS and other measures of schizotypy to determine whether the MSS provides incremental validity over-and-above existing measures.

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Contributors

Thomas R. Kwapil, Ph.D., designed the study, contributed to the data analyses, and was lead author of the manuscript.

Georgina M. Gross, M.S., designed the study, coordinated the data collection, and contributed to the data analyses and manuscript preparation.

Paul J. Silvia, Ph.D., contributed to the study design, data analyses, and manuscript preparation.

Michael L. Raulin, Ph.D., contributed to the study design, data collection, and manuscript preparation.

Neus Barrantes-Vidal, Ph.D., contributed to the study design and manuscript preparation.

Conflict of interest

None of the authors had a conflict of interest.

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References

American Psychiatric Association, 2013. Diagnostic and Statistical Manual of Mental Disorders. 5th ed. Author, Washington, DC.

Barrantes-Vidal, N., Gross, G., Sheinbaum, T., Mitjavila, M., Ballespi, S., Kwapil, T.R., 2013. Positive and negative schizotypy are associated with prodromal and schizophrenia-spectrum symptoms. Schizophr. Res. 145, 50–55.

Blanchard, J.J., Collins, L.M., Aghevli, M., Leung, W.W., Cohen, A.S., 2011. Social anhedonia and schizotypy in a community sample: the Maryland Longitudinal Study of Schizotypy. Schizophr. Bull. 37, 587–602.

Bolinsky, P.K., Smith, E.A., Schuder, K.M., Bolinsky, D.C., et al., 2017. Schizophrenia spectrum personality disorders in psychometrically identified schizotypes at two-year follow-up. Psychiatry Res. 252, 289–295.

de Castro-Català, M., Barrantes-Vidal, N., Sheinbaum, T., Moreno-Fortuny, A., Kwapil, T.R., Rosa, A., 2015. COMT-by sex interaction effect on psychosis proneness. Biomed. Res. Int. http://dx.doi.org/10.1155/2015/829237.

Chan, R.K., Shi, H., Geng, F., Liu, W., Yan, C., Wang, Y., Gooding, D.C., 2015. The Chapman psychosis-proneness scales: consistency across culture and time. Psychiatry Res. 228, 143–149.

Chapman, L.J., Chapman, J.P., 1983. Infrequency scale for personality measures. (Unpublished scale available from T.R. Kwapil). UIUC Department of Psychology, Champaign, IL 61820.

Chapman, L.J., Chapman, J.P., Raulin, M.L., 1976. Scales for physical and social anhedonia. J. Abnorm. Psychol. 85, 374–382.

Chapman, L.J., Chapman, J.P., Raulin, M.L., 1978. Body image aberration in schizophrenia. J. Abnorm. Psychol. 87, 399–407.

Chapman, L.J., Chapman, J.P., Miller, E.G., 1982. Reliabilities and intercorrelations of eight measures of proneness to psychosis. J. Consult. Clin. Psychol. 50, 187–195.

Chapman, L.J., Chapman, J.P., Kwapil, T.R., Eckblad, M., Zinser, M.C., 1994. Putatively psychosis-prone subjects ten years later. J. Abnorm. Psychol. 103, 171–183.

Chapman, J.P., Chapman, L.J., Kwapil, T.R., 1995. Scales for the measurement of schizotypy. In: Raine, Lencz, T., Mednick, S. (Eds.), Schizotypal Personality Disorder. Cambridge University Press, Cambridge, England.

Compton, M.T., Goulding, S.M., Bakeman, R., McClure-Tone, E.B., 2009. Confirmation of a four-factor structure of the Schizotypal Personality Questionnaire among undergraduate students. Schizophr. Res. 111, 46–52.

Crowne, D.P., Marlowe, D., 1960. A new scale of social desirability independent of psychopathology. J. Consult. Psychol. 24, 349–354.

DeVellis, R.F., 2012. Scale Development: Theory and Applications. 3rd ed. Sage Publications, Washington, DC.

DeVylder, J.E., Hilmire, M., 2015. Screening for psychotic experiences: social desirability biases in a non-clinical sample. Early Interv. Psychiatry 9, 331–334.

Eckblad, M.L., Chapman, L.J., 1983. Magical ideation as an indicator of schizotypy. J. Consult. Clin. Psychol. 51, 215–225.

Eckblad, M.L., Chapman, L.J., Chapman, J.P., Mishlove, M., 1982. The Revised Social Anhedonia Scale. (Unpublished test copies available from T.R. Kwapil). UIUC Department of Psychology, Champaign, IL 61820.

Fonseca-Pedrero, E., Piano, M., Lemos-Giráldez, S., García-Cueto, E., Campillo-Álvarez, A., Villazón-García, U., Muñiz, J., 2008. Schizotypy assessment: state of the art and future prospects. Int. J. Clin. Health Psychol. 8, 577–593.

Gooding, D.C., Tallent, K.A., Matts, C.W., 2005. Clinical status of at-risk individuals 5 years later: further validation of the psychometric high-risk strategy. J. Abnorm. Psychol. 114, 170–175.

Gross, G.M., Mellin, J., Silvia, P.J., Barrantes-Vidal, N., Kwapil, T.R., 2014. Comparing the factor structure of the Wisconsin Schizotypy Scales and the Schizotypal Personality Questionnaire. Pers. Dis. Theory Res. Treat. 5, 397–405.

Hambleton, R.K., Robin, F., Xing, D., 2000. Item response models for the analysis of educational and psychological test data. In: Tinsley, H.E.A., Brown, S.D. (Eds.), Handbook of Applied Multivariate Statistics and Mathematical Modeling. Academic, San Diego, pp. 553–585.

Hancock, G.R., Mueller, R.O., 2001. Rethinking construct reliability within latent variable systems. In: Cudeck, R., du Toit, S., Sörbom, D. (Eds.), Structural Equation Modeling: Present and Future. Scientific Software International, Lincolnwood, pp. 195–216.

Kaczorowski, J.A., Barrantes-Vidal, N., Kwapil, T.R., 2009. Neurological soft signs in psychometrically identified schizotypy. Schizophr. Res. 115, 293–302.

Kwapil, T.R., Barrantes-Vidal, N., 2015. Schizotypy: looking back and moving forward. Schizophr. Bull. 41 (Suppl. 2), S366–S373.

Kwapil, T.R., Chun, C.A., 2015. The psychometric assessment of schizotypy. In: Mason, O., Claridge, G. (Eds.), Schizotypy: New Dimensions. Routledge, London.

Kwapil, T.R., Barrantes-Vidal, N., Silvia, P.J., 2008. The dimensional structure of the Wisconsin Schizotypy Scales: factor identification and construct validity. Schizophr. Bull. 34, 444–457.

Kwapil, T.R., Brown, L.H., Silvia, P.J., Myin-Germeys, I., Barrantes-Vidal, N., 2012. The expression of positive and negative schizotypy in daily life: An experience sampling study. Psychol. Med. 42, 2555–2566.

Lenzenweger, M.F., 2010. Schizotypy and Schizophrenia: The View From Experimental Psychopathology. Guilford Press, New York.

Lenzenweger, M.F., Korfine, L., 1992. Confirming the latent structure and base rate of schizotypy: a taxometric analysis. J. Abnorm. Psychol. 101, 567–571.

Liu, Y., Wu, A.D., Zumbo, B.D., 2010. The impact of outliers on Cronbach's coefficient alpha estimate of reliability: ordinal/rating scale item response. Ed. Psychol. Meas. 70, 5–21.

Maniaci, M.R., Rogge, R.D., 2014. Caring about carelessness: participant inattention and its effects on research. J. Res. Pers. 48, 61–83.

Mason, O., 2015. The assessment of schizotypy and its clinical relevance. Schizophr. Bull. 41 (Suppl. 2), S374–S385.

Mason, O., Claridge, G., 2006. The Oxford-Liverpool inventory of feelings and experiences O-LIFE: further description and extended norms. Schizophr. Res. 82, 203–211.

Mason, O., Claridge, G., Jackson, M., 1995. New scales for the assessment of schizotypy. Personal. Individ. Differ. 18, 7–13.

Mason, O., Claridge, G., Williams, L., 1997. Questionnaire measurement. In: Claridge, G. (Ed.), Schizotypy: Implications for Illness and Health. Oxford University Press, New York, pp. 19–37.

McCrae, R.R., Costa, P.T., 2010. NEO Inventories for the NEO Personality Inventory-3 NEO-PI-3, NEO Five-Factor Inventory-3 NEO-FFI-3 Professional Manual. PAR, Lutz, FL.

Meehl, P.E., 1962. Schizotaxia, schizotypy, schizophrenia. Am. Psychol. 17, 827–831.

Meehl, P.E., 1964. Manual for use with Checklist of Schizotypic Signs. University of Minnesota, Research Laboratories of the Department of Psychiatry, Minneapolis.

Miers, T.C., Raulin, M.L., 1987. Cognitive Slippage Scale. In: Corcoran, K., Fischer, J. (Eds.), Measures for Clinical Practice: A Source Book. Free Press, New York, pp. 125–127.

Raine, A., 1991. The SPQ: a scale for the assessment of schizotypal personality based on DSM–III–R criteria. Schizophr. Bull. 17, 555–564.

Raine, A., Reynolds, C., Lencz, T., Scerbo, A., Triphon, N.N., Kim, D.D., 1994. Cognitive-perceptual, interpersonal, and disorganized features of schizotypal personality. Schizophr. Bull. 20, 191–201.

Readable.io, 2017. (on-line program). https://readable.io/text/.

Salokangas, R.R., Dingemans, P., Heinimaa, M., Svirskis, T., Luutonen, S., Hietala, J., ... Klosterkötter, J., 2013. Prediction of psychosis in clinical high-risk patients by the Schizotypal Personality Questionnaire. Results of the EPOS project. Eur. Psychiatry 28, 469–475.

Scientific Software International, Inc, 2015. IRTPRO, Version 3. Scientific Software International, Inc., Skokie, IL.

Tandon, R., Nasrallah, H.A., Keshavan, M.S., 2009. Schizophrenia, "just the facts" 4. Clinical features and conceptualization. Schizophr. Res. 110, 1–23.

Vollema, M.G., van den Bosch, R.J., 1995. The multidimensionality of schizotypy. Schizophr. Bull. 21, 19–31.

Winterstein, B.P., Ackerman, T., Silvia, P.J., Kwapil, T.R., 2011. Psychometric properties of the Wisconsin Schizotypy Scales: classical test theory, item response theory, and differential item functioning. J. Psychopathol. Behav. Assess. 33, 480–490.