

Associations of Multiple Measures of Openness to Experience with a Brief Questionnaire of Positive, Negative, and Disorganized Schizotypy

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Kemp, K. C., Raulin, M. L., Burgin, C. J., Barrantes-Vidal, N., & Kwapil, T. R. (2022). Associations of multiple measures of openness to experience with a brief questionnaire of positive, negative, and disorganized schizotypy. *Journal of Individual Differences*, 43(1), 1–9. DOI: 10.1027/1614-0001/a000348

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Abstract:

The vulnerability for schizophrenia-spectrum disorders is expressed across a continuum of clinical and subclinical symptoms and impairment known as schizotypy. Schizotypy is a multidimensional construct with positive, negative, and disorganized dimensions. Openness to experience offers a useful personality domain for exploring multidimensional schizotypy. This study examined the factor structure of openness and its relation to schizotypy using the Multidimensional Schizotypy Scale-Brief (MSS-B) in a sample of 2,236 adults. Positive schizotypy was broadly associated with elevated openness and negative schizotypy was generally associated with diminished openness. Principal components analysis of 15 openness facets replicated the four-factor structure of openness including Fantasy/Feelings, Eccentricity, Nontraditionalism, and Ideas factors. All three schizotypy dimensions were associated with Eccentricity. Positive schizotypy was associated with Fantasy/Feelings, whereas negative schizotypy was inversely associated with Fantasy/Feelings. Results support the construct validity of the MSS-B, use of alternative openness measures in examining schizotypy, and the multidimensional structures of schizotypy and openness.

Keywords: schizophrenia-spectrum | schizotypy | personality | openness

Article:

Current models suggest that schizophrenia represents the most extreme manifestation of a continuum of subclinical and clinical symptoms and impairment known as schizotypy (Kwapil & Barrantes-Vidal, 2015; Lenzenweger, 2010). Schizotypy includes subclinical expressions, prodromal and at-risk mental states, schizophrenia-spectrum disorders, and full-blown psychotic disorders. Schizotypy offers a useful construct for evaluating the expression and etiology of schizophrenia-spectrum disorders. Schizotypy has a multidimensional structure consisting of positive (psychotic-like), negative (deficit), and disorganized dimensions (Kwapil & Barrantes-Vidal, 2015). Positive schizotypy involves odd beliefs, unusual perceptual experiences, and

paranoid ideation. Negative schizotypy is characterized by functional deficits including affective flattening, avolition, anhedonia, alogia, and asociality. Disorganized schizotypy is characterized by disruptions in organizing and expressing thought, speech, and behavior. The Multidimensional Schizotypy Scale (MSS; Kwapil, Gross, Silvia, et al., 2018) and Multidimensional Schizotypy Scale-Brief (MSS-B; Gross, Kwapil, Raulin, et al., 2018) offer promising measures of positive, negative, and disorganized schizotypy. The MSS and MSS-B have good psychometric properties (e.g., Gross, Kwapil, Raulin, et al., 2018; Kemp, Gross, et al., 2020; Kwapil, Gross, Silvia, et al., 2018; Li et al., 2020), and the validity of the scales has been demonstrated in an interview (e.g., Kemp et al., 2021), questionnaire (e.g., Gross, Kwapil, Burgin, et al., 2018), and ambulatory assessment (e.g., Kwapil et al., 2020) studies.

Schizotypy and Openness to Experience

Psychopathology can be conceptualized in terms of maladaptive variants of normal personality (e.g., Widiger & Samuel, 2005). Models of psychopathology such as the Hierarchical Taxonomy of Psychopathology (HiTOP) and the DSM-5 Section III dimensional trait model are purportedly aligned with the domains of the Five-Factor Model (FFM) of general personality (Kotov et al., 2017). Therefore, normal models of personality should enhance our understanding of positive, negative, and disorganized schizotypy. Previous studies demonstrated that the schizotypy dimensions are differentially associated with FFM (Costa & McCrae, 1992) personality dimensions and facets (e.g., Gross et al., 2014; Ross et al., 2002). Openness to experience, broadly defined as the inclination to consider and engage with unfamiliar or unconventional activities, feelings, and ideas (McCrae & Costa, 1985), appears particularly relevant for understanding multidimensional schizotypy.

Much of the work evaluating openness in schizotypy has focused on positive and negative schizotypy, such that positive schizotypy is typically associated with elevated openness, whereas negative schizotypy is associated with diminished openness (Chmielewski & Watson, 2008; Gross et al., 2014; Kwapil, Gross, Burgin, et al., 2018; Ross et al., 2002). However, these studies have typically been limited by failing to include disorganized schizotypy. Reliance on measures that seemingly do not capture the full range of openness (e.g., McCrae & Costa's [2010] NEO measures of openness) has likely further limited this line of research. For example, HiTOP and the DSM-5 dimensional trait model reportedly align with the FFM; however, their respective "Thought Disorder" and "Psychoticism" factors, which overlap with conceptualizations of multidimensional schizotypy (e.g., Kotov et al., 2020), demonstrate less consistency with openness to experience than expected. It has been argued that this poor alignment may be due to there being no normal variant of these Thought Disorder/Psychoticism factors (e.g., Widiger & Crego, 2019). Furthermore, as noted by Crego and Widiger (2017) and Gore and Widiger (2013), McCrae & Costa's conceptualization and measurement of openness largely focus on adaptive expressions of the construct. Thus, measures such as the widely used NEO may not adequately capture the maladaptively high openness that characterizes magical and referential thinking and predilection for fantasy in schizotypy, or in Psychoticism or Thought Disorder. However, other measures appear to better capture maladaptive expressions of the construct and appear useful for examining schizotypy. For example, the HEXACO Personality Inventory (Lee & Ashton, 2004) and the Inventory of Personal Characteristics (IPC; Tellegen & Waller, 1987) include "unconventionality" as part of their measure of openness. Likewise, the Experiential Permeability Inventory (EPI; Piedmont et al., 2009) measures maladaptive variants of both high and low openness.

Kemp, Burgin, et al. (2020) examined the association of MSS positive, negative, and disorganized schizotypy with NEO-Personality Inventory-3 (NEO-PI-3; McCrae & Costa, 2010) openness to experience, HEXACO openness to experience, IPC unconventionality, and the EPI. Additionally, they reported that four factors underlie the various facets of openness (Fantasy/Feelings, Ideas, Eccentricity, Nontraditionalism). Consistent with the odd ideas that characterize positive schizotypy, MSS positive schizotypy was broadly associated with increased openness (especially eccentricity). Negative schizotypy was generally inversely associated with openness, especially aspects involving fantasy, aesthetics, actions, and feelings, but was modestly associated with the eccentricity aspects of openness. Disorganized schizotypy was generally unassociated with openness, although it was modestly associated with eccentricity. These findings highlight the importance of including maladaptive expressions of openness in conceptualization and measurement of the construct, especially when relating it to psychopathology.

Kemp, Burgin, et al. (2020) demonstrated that MSS assessed positive, negative, and disorganized schizotypy have differential patterns of associations with openness. However, these associations have not been evaluated using the MSS-B. The MSS-B was designed to maintain the same content coverage of positive, negative, and disorganized schizotypy as the MSS, and the analogous MSS and MSSB subscales show high concordance (Kemp, Gross, et al., 2020). Thus, the MSS-B appears to offer a promising brief alternative that largely maintains the full-length version's strong psychometric properties. Furthermore, studies that have directly compared the validity of the MSS and MSS-B support the use of the short-scale (e.g., Gross, Kwapil, Burgin, et al., 2018). However, Smith et al. (2000) noted that evidence for the validity of the original measure does not automatically confer to brief forms and that reduction in items may endanger content coverage even if the original and short forms correlate highly. Therefore, it is necessary to demonstrate the validity of short-forms relative to original measures.

Goals and Hypothesis

The goal of the present study was to examine the expression of adaptive and maladaptive variants of openness to experience in positive, negative, and disorganized schizotypy using the MSS-B. Specifically, we aimed to replicate Kemp, Burgin, et al.'s (2020) findings using the full-length MSS regarding (a) the differential associations of positive, negative, and disorganized schizotypy with measures of openness to experience; (b) the factor structure of openness to experience; and (c) the associations of multidimensional schizotypy with openness factors (provided an identifiable factor structure emerges). We expected positive schizotypy to be broadly associated with elevated openness, and that it would be most strongly associated with maladaptive aspects of openness (e.g., eccentricity), as well as openness to fantasy, aesthetics, and ideas. Consistent with the characterization of negative schizotypy involving diminished affect, thoughts, and interest in the world, we expected negative schizotypy to be broadly associated with low openness (although directly associated with an eccentricity factor of openness). Finally, disorganized schizotypy was hypothesized to be generally unassociated with openness, although modestly associated with eccentricity. Replication of the associations between schizotypy and openness will provide further support for the use of the MSS-B as a short-form of the MSS, and for the inclusion of alternative measures of openness in evaluating schizotypy. Finally, replication of the factor structure of openness will provide support for considering the multidimensional structure of openness.

Method

Participants

Participants were recruited through Amazon Mechanical Turk (MTurk) and the participant pools at three universities. A total of 2,775 participants completed the study, although 539 (19.4%) were omitted due to invalid or incomplete responding. The final sample included 1,281 participants enrolled from Kemp, Burgin, et al.'s (2020) study and 955 newly enrolled participants. Due to a programming error, demographic information is missing for 589 participants (26.3%). Demographic characteristics for the remaining 1,647 participants were: Mage = 22.0 years, SD = 8.4; 61.3% female; 6.8% Black, 7.2% Asian/Pacific Islander, 74.3% Caucasian, 7.8% Hispanic/Latino, .9% Native American, and 3.2% other. The sample size provided power of at least .80 to detect small effect sizes in regression analyses with three predictors at α of .001

Measures

The Multidimensional Schizotypy Scale (MSS; Kwapil, Gross, Silvia, et al., 2018) and Multidimensional Schizotypy Scale-Brief (MSS-B; Gross, Kwapil, Raulin, et al., 2018) contain true-false items that examine positive, negative, and disorganized schizotypy. The scales were developed using large and diverse samples following best practices specified by DeVellis (2012) and item selection was based on content coverage, and classical test theory, item response theory, and differential item functioning metrics (see source articles for each scale for complete details and items). Both scales have good to excellent internal consistency and test-retest reliability, and the subscales show strong concordance across the original and brief measures (Gross, Kwapil, Raulin, et al., 2018; Kemp, Gross et al., 2020; Kwapil, Gross, Silvia, et al., 2018). The MSS-B positive, negative, and disorganized schizotypy subscale scores were computed for all participants. MSS-B scores were derived from the 77-item MSS for participants from Kemp, Burgin, et al. (2020). The remaining participants completed the 38-item MSS-B. Thirteen infrequent responding items were intermixed with the MSS and MSS-B to identify invalid responders (Chapman & Chapman, 1983). Following the authors' recommendations, participants who endorsed more than two of the infrequency items were identified as invalid responders and thus omitted from analyses.

Subscales of several widely used personality inventories were administered in order to assess both adaptive and maladaptive openness. The NEO-Personality Inventory-3 (NEO-PI-3; McCrae & Costa, 2010) is a measure of FFM personality domains, and the NEO-PI-3 48-item Openness to Experience subscale contains six facets, each containing eight items: Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values. The HEXACO-PI (Lee & Ashton, 2004) is an alternative measure for evaluating the FFM; its 16-item Openness to Experience subscale has strong psychometric properties and assesses Aesthetic Appreciation, Inquisitiveness, Creativity, and Unconventionality. Two subscales from the Experiential Permeability Inventory (EPI; Piedmont et al., 2009) were included in order to assess maladaptive levels of openness to experience: the 16-item Odd and Eccentric subscale and the 11-item Unrestricted Self subscale. According to the scale creators, these subscales have acceptable psychometric properties. All four of these openness measures are rated on a Likert scale from 1 = strongly disagree to 5 = strongly agree. Finally, the Inventory of Personal Characteristics' (IPC; Tellegen & Waller, 1987) was developed to measure Tellegen's seven-factor model of personality, and its 24-item Unconventionality scale was included as an alternative measure for openness. This scale contains

three subscales that are rated from 1 = definitely false to 4 = definitely true: Imagination, Odd, and Traditionalism. Following our procedures in Kemp, Burgin, et al. (2020), we refer to the last subscale as (Un)Traditionalism for consistency with other subscale conceptualizations.

Procedures

Data Collection

Data collection was completed online using Qualtrics survey software. The study was approved by the university IRBs and all participants provided informed consent. Participants completed demographic questions followed by the MSS/MSS-B and infrequency items, which were intermixed and presented in five randomized blocks. Participants next completed the NEO-PI-3, HEXACO, and EPI in random order. Participants always completed the IPC last because it used a 4-point Likert scale rather than the 5-point scale in the other personality measures. MTurk participants received \$2, and undergraduates received course credit.

Analytic Plan

In order to investigate our hypotheses regarding the associations between multidimensional schizotypy and openness to experience, we completed a series of linear regression analyses in which the scores on the MSS-B positive, negative, and disorganized schizotypy subscales were entered simultaneously as predictors of each openness measure score, which included openness total scores (when applicable) and subscale scores. For example, MSS-B positive, negative, and disorganized schizotypy were entered as simultaneous predictors (i.e., at the same step) of the NEO-PI-3 Openness total score. This procedure provides information regarding the unique prediction of each MSSB subscale on openness measures, over and above the other two MSS-B subscale scores. The standardized regression coefficient (β), change in R^2 , effect size (f^2), and bivariate correlation (r) are reported for each predictor. Following Cohen (1992), f^2 values of .02, .15, and .35 are considered small, medium, and large effect sizes, respectively. Bivariate correlation values of .10, .30, and .50 are considered small, medium, and large effects, respectively. Note that change in R^2 and f^2 were computed for each predictor by rerunning the analyses with the specific MSS-B predictor entered at the second step, over and above the other two MSS-B subscales (entered at step 1).

In order to evaluate the factor structure of openness to experience, we followed the procedures outlined in Kemp, Burgin, et al. (2020) and computed a principal components analysis with promax rotation of the 15 facet scores of the NEO-PI-3, HEXACO-PI, IPC, and EPI for the entire sample. Parallel analysis and Kaiser's stopping rule were used to determine the ideal number of factors to derive from the data. Next, assuming an identifiable factor structure emerged, we planned to examine whether the openness factor structure identified in Kemp, Burgin, et al.'s sample ($n = 1,281$) was similar to that identified in the newly enrolled sample ($n = 955$). Specifically, we computed Tucker's congruence coefficient (Lorenzo-Seva & ten Berge, 2006), which provides an index of factor similarity. According to Lorenzo-Seva and ten Berge, a congruence coefficient above .95 indicates that two factors can reasonably be considered equal.

Following evaluation of an identifiable factor structure, we examined the MSS-B schizotypy subscales' unique prediction of each openness factor. For these analyses, we followed the same procedures described previously (i.e., linear regression analyses with MSS-B subscales as simultaneous predictors) for evaluating the association between the schizotypy subscales and individual measures of openness to experience. Finally, we evaluated whether the associations

between the MSS-B subscales and openness measures and factors differed between samples (i.e., between participants who had MSS-B subscale scores derived from the full-length MSS versus those who completed the MSS-B). Specifically, we recomputed the aforementioned linear regression analyses, with sample entered at Step 2 and Schizotypy \times Sample interaction terms entered at Step 3.

Results

Descriptive statistics for the questionnaires are in Table 1. Participants scored across the full range on the MSS-B positive (0–13), negative (0–13), and disorganized (0–12) schizotypy subscales. Due to the large sample and number of analyses, alpha was set to .001 to minimize Type I error and avoid interpreting minuscule effects as statistically significant. Consistent with previous findings (e.g., Gross, Kwapil, Raulin, et al., 2018), the correlations among the MSS-B subscales were positive-negative, $r = .23$; positive-disorganized, $r = .51$, negative-disorganized, $r = .32$.

Results from the linear regression analyses are reported in Table 2, and each row in the table represents a separate regression analysis in which the scores on the three MSS-B subscales were entered simultaneously as predictors of openness measures. Note that variance inflation values were all below 1.5, indicating that multicollinearity did not appreciably impact the regression analyses.

Consistent with Kemp, Burgin, et al. (2020), MSS-B positive schizotypy was associated with the majority of the measures of openness to experience and was most strongly associated with measures tapping maladaptive variants of openness. MSS-B negative schizotypy was generally inversely associated with openness (especially feelings and aesthetics), although it was positively associated with measures of eccentricity. MSS-B disorganized schizotypy was broadly unassociated with openness but was associated with measures capturing eccentricity.

Factor Structure of Openness

Following computation of a principal components analysis with promax rotation of the 15 facet scores of openness measures (Electronic Supplementary Material, ESM 1, Table E1), both parallel analysis and Kaiser's stopping rule supported the interpretation of four factors accounting for 64% of the total variance. The loadings suggest that the four factors are best characterized as Fantasy/Feelings, Eccentricity, Nontraditionalism, and Ideas. Note that these are comparable to the factors identified in Kemp, Burgin, et al. (2020), although the ordering of the factors differed. Furthermore, Tucker's congruence coefficients for "Fantasy/Feelings," "Eccentricity," "Nontraditionalism," and "Ideas," were .981, .969, .980, and .983, respectively. Thus, we successfully replicated the factor structure in Kemp, Burgin, et al. (2020).

Next, we examined the MSS-B schizotypy subscales' unique prediction of each openness factor (see Table 3). Consistent with Kemp, Burgin, et al. (2020), MSS-B positive schizotypy was significantly associated with the Eccentricity (medium effect size) and Fantasy/Feelings (small effect size) factors, but was unassociated with the Nontraditionalism and Ideas factors. MSS-B negative schizotypy was inversely associated with Fantasy/Feelings and directly associated with Eccentricity and, surprisingly, Ideas (all small effects). MSS-B disorganized schizotypy was only associated with Eccentricity (small effect).

Table 1. Descriptive statistics for the Multidimensional Schizotypy Scale-Brief and measures of openness (n = 2,236)

Criterion	Mean	SD	Range	Coefficient α
Multidimensional Schizotypy Scale-Brief				
Positive Schizotypy	2.53	2.59	0–13	.77
Negative Schizotypy	1.54	2.14	0–13	.77
Disorganized Schizotypy	2.18	3.02	0–12	.88
NEO Openness Total	164.01	19.76	77–230	.89
NEO Openness to Fantasy	26.56	4.95	8–40	.74
NEO Openness to Aesthetics	26.42	5.85	8–40	.81
NEO Openness to Feelings	29.96	4.54	9–40	.73
NEO Openness to Actions	23.90	3.62	11–40	.55
NEO Openness to Ideas	28.86	5.28	8–40	.80
NEO Openness to Values	29.34	4.59	12–40	.74
HEXACO-PI Openness Total	50.88	9.32	17–80	.81
HEXACO-PI Aesthetic Appreciation	12.74	3.44	4–20	.67
HEXACO-PI Inquisitiveness	11.44	3.40	4–20	.67
HEXACO-PI Creativity	13.44	3.35	4–20	.73
HEXACO-PI Unconventionality	13.26	2.42	5–20	.48
IPC Unconventionality Total	59.33	8.83	28–87	.83
IPC (Un)Traditionalism	21.56	4.34	9–34	.75
IPC Imagination	15.16	2.66	5–20	.74
IPC Odd	14.41	3.88	6–24	.87
EPI Odd and Eccentric	28.08	10.31	16–78	.87
EPI Unrestricted Self	37.68	5.35	20–54	.70

Table 2. Linear regressions examining prediction by the Multidimensional Schizotypy Scale-Brief subscales (n = 2,236)

Criteria	MSS-B Positive Schizotypy				MSS-B Negative Schizotypy				MSS-B Disorganized Schizotypy				Total R^2
	r	β	ΔR^2	f^2	r	β	ΔR^2	f^2	r	β	ΔR^2	f^2	
NEO Openness Total	.18*	.197*	.029	.031	-.13*	-.189*	.032	.034	.08*	.045	.001	.002	.063
NEO Openness to Fantasy	.27*	.223*	.036	.041	.00	-.095*	.008	.009	.21*	.127	.011	.012	.086
NEO Openness to Aesthetics	.23*	.241*	.043	.047	-.08*	-.151*	.020	.023	.13*	.057	.002	.003	.076
NEO Openness to Feelings	.08*	.151*	.017	.020	-.35*	-.400	.142	.0167	-.01	.046	.002	.002	.152
NEO Openness to Actions	.00	.042	.001	.001	-.13*	-.129*	.015	.015	-.05	-.032	.001	.001	.018
NEO Openness to Ideas	.10*	.129*	.012	.012	.00	-.013	.000	.000	.01	-.056	.002	.002	.012
NEO Openness to Values	-.02	-.029	.001	.001	.00	-.006	.000	.000	.01	.027	.000	.001	.001
HEXACO-PI Openness Total	.14*	.157*	.018	.018	.01	-.041	.001	.001	.05	-.016	.000	.000	.021
HEXACO-PI Aesthetic Appreciation	.15*	.147*	.016	.016	.00	-.044	.002	.002	.08*	.025	.000	.000	.024
HEXACO-PI Inquisitiveness	-.02	.000	.000	.000	.07	.096*	.008	.008	-.05	-.082	.005	.005	.011
HEXACO-PI Creativity	.15*	.179*	.024	.024	-.11*	-.154*	.021	.022	.04	.004	.000	.000	.043
HEXACO-PI Unconventionality	.15*	.147*	.016	.016	.02	-.015	.000	.000	.08*	.013	.000	.000	.023
IPC Unconventionality Total	.24*	.140*	.014	.015	.13*	.044	.002	.002	.25*	.170*	.020	.022	.082
IPC (Un)Traditionalism	-.01	-.074	.004	.004	.04	.016	.000	.000	.09*	.125*	.011	.011	.013
IPC Imagination	.24*	.264*	.051	.056	-.07	-.130*	.015	.016	.10*	.006	.000	.000	.072
IPC Odd	.33*	.203*	.030	.035	.20*	.091*	.007	.008	.33*	.201*	.028	.033	.151
EPI Odd and Eccentric	.61*	.544*	.218	.350	.19*	.024	.001	.000	.40*	.112*	.009	.014	.378
EPI Unrestricted Self	.31*	.258*	.049	.055	.13*	.040	.001	.002	.22*	.078	.004	.006	.102

Note. Medium effect sizes (f^2) in bold; large effect sizes in bold and italics. * $p < .001$.

Table 3. Linear regressions examining prediction of openness factors by Multidimensional Schizotypy Scale-Brief subscales (n = 2,236)

Openness factors	MSS-B Positive Schizotypy				MSS-B Negative Schizotypy				MSS-B Disorganized Schizotypy				Total R^2
	r	β	ΔR^2	f^2	r	β	ΔR^2	f^2	r	β	ΔR^2	f^2	
Fantasy/Feelings	.25*	.282*	.058	.067	-.17*	-.250*	.055	.063	.11*	.046	.001	.002	.117
Eccentricity	.51*	.409*	.123	.175	.23*	.087*	.007	.010	.40*	.160*	.018	.025	.293
Nontraditionalism	-.04	-.057	.002	.003	-.05	-.053	.003	.003	.01	.059	.002	.003	.006
Ideas	.07	.080	.005	.005	.08*	.084*	.006	.006	.00	-.067	.003	.003	.012

Note. Medium effect sizes (f^2) in bold; large effect sizes in bold and italics. * $p < .001$.

Finally, Tables E2 and E3 in ESM 1 present the regression analyses listed above with the three MSS-B Schizotypy Subscales \times Sample interaction terms. Note that only 2 of the 96 interaction terms were statistically significant, indicating that the associations of the MSS-B with the openness measures were consistent across the two samples and the two methods of deriving MSS-B scores.

Discussion

Schizotypy provides a useful framework for investigating a continuum of subclinical and clinical expressions of schizophrenia-spectrum psychopathology. Authors dating back to Meehl (1962) have stressed the need for valid and easily administered measures of schizotypy. Although there are several widely used measures that have contributed greatly to our understanding of schizotypy, these measures have limitations, including inconsistent factor structures. Furthermore, many schizotypy questionnaires are prohibitively long, thereby reducing their practical utility. Therefore, there is a clear need for psychometrically sound, brief measures of schizotypy. The MSS was developed to address many of the psychometric and conceptual limitations of prior measures, and the MSS-B offers a useful alternative to the full-length version. Prior studies evaluating the MSS-B indicated that it has good psychometric properties and concordance with the full-length MSS. However, Smith et al. (2000) warn that evidence of validity in a full-length scale does not automatically extend to its brief form. Therefore, a series of the questionnaire (e.g., Kwapil, Gross, Burgin, et al., 2018), interview (Kemp, Bathery, et al., 2020), and laboratory (e.g., Sahakyan et al., 2020) studies have demonstrated comparable construct validity for the MSS-B as in the full-length MSS.

The present study extended these validation efforts by examining the association of MSS-B positive, negative, and disorganized schizotypy with multiple measures of openness. We compared these findings with those from Kemp, Burgin, et al. (2020), which measured schizotypy using the full-length MSS. The present study followed a method consistent with prior studies examining the construct validity of the MSS-B (e.g., Gross, Kwapil, Burgin, et al., 2018). Specifically, we examined the performance of the MSS-B using two samples: one sample in which the MSS-B scores were derived from the full-length MSS, and an independent sample in which participants completed the MSS-B. The MSS-B performed comparably in both samples.

Models of normal personality, such as the FFM (Costa & McCrae, 1992), are useful for understanding the dimensional representation of psychopathology, and openness to experience is especially promising for evaluating schizotypy. Historically, openness has been differentially associated with positive and negative schizotypy. However, personality traits are multifaceted, and relying on the domain level measures of openness is insufficient for understanding complex psychopathology. Furthermore, researchers have argued that traditional measures of openness do not adequately capture maladaptive facets of openness (e.g., Crego & Widiger, 2017; Widiger & Crego, 2019) that may be especially relevant to schizotypy. Some evidence for this argument comes from findings that traditional measures of openness do not consistently align with models of psychopathology that (1) were specifically conceptualized to align with the FFM of personality and (2) share conceptual overlap with schizotypy. Indeed, Widiger and Crego note that how openness is conceptualized and measured impacts the strength of associations between openness and schizotypy and related constructs. Therefore, it is necessary to evaluate comprehensively the expression of openness in multidimensional schizotypy using a facet level approach that captures the full range of adaptive and maladaptive expressions of this personality trait.

Based upon findings from Kemp, Burgin, et al. (2020) and the present study, positive schizotypy is generally associated with elevated openness to experience. In particular, positive schizotypy is associated with increased openness to fantasy and eccentricity, which aligns with the core components of positive schizotypy (i.e., unconventional beliefs and experiences). Negative schizotypy is inversely associated with openness to experience, especially feelings, aesthetics, and creativity, consistent with the conceptualization of negative schizotypy as a diminution of affect, thoughts, and interest in the world. Our findings for positive and negative schizotypy are consistent with Widiger and Crego's (2019) review of studies examining the association between HiTOP Thought Disorder and DSM-5 Psychoticism with openness to experience. For example, prior research similarly found that alternative measures of openness demonstrate the most consistent associations with psychoticism and that NEO Openness to Fantasy subscale demonstrates the strongest relationship with schizotypal experiences (e.g., Moorman & Samuel, 2018). Additionally, positive and negative schizotypy were associated with openness in opposite directions in prior studies beyond Kemp, Burgin, et al.'s study (e.g., Chmielewski et al., 2014; Ross et al., 2002). Finally, disorganized schizotypy is broadly unassociated with openness to experience, except with measures of eccentricity. Note that at the zero-order level, disorganized schizotypy was associated with eccentricity at the level of a medium effect. Although residualized disorganized schizotypy was still associated with these subscales, it appears that much of the variance is better accounted for by positive schizotypy. Note that current and historical conceptualizations of psychoticism only capture one facet of schizotypy – the positive schizotypy dimension. However, schizotypy (and by extension schizophrenia) is a multidimensional construct with negative and disorganized dimensions, too. As nicely demonstrated in Kemp, Bathery, et al.'s (2021) interview study, all three schizotypy dimensions are uniquely associated with impairment and have distinct associations with schizophrenia-spectrum symptoms and disorders. The fact that psychoticism only partially captures schizotypic symptoms and impairments represents a major limitation of such models.

In addition to replicating associations of schizotypy and openness, the present study replicated the factor structure of openness to experience identified in Kemp, Burgin, et al. (2020). These findings are especially relevant given the ongoing concerns regarding replication in psychological studies (e.g., Diener & Biswas-Diener, 2019). Although the ordering of the openness factors differed between the two samples, the same four factors emerged in each sample: Fantasy/Feelings, Eccentricity, Nontraditionalism, and Ideas. Both studies demonstrated similar patterns of association between the schizotypy subscales and openness factors. Positive schizotypy was directly associated with Fantasy/Feelings, and negative schizotypy was inversely associated with this factor. All three schizotypy subscales were associated with elevated Eccentricity, suggesting that this factor of openness links the three dimensions. As discussed in Kemp, Burgin, et al., the Eccentricity factor shares similarities with Eysenck's (1992) psychoticism, Watson et al.'s (2008) oddity, Knezevic et al.'s (2017) disintegration, and the DSM-5 dimensional psychoticism trait model (Krueger et al., 2012). Furthermore, there appear to be important similarities with HiTOP's Thought Disorder factor, which “describes individual differences that range from conventional and uncreative thinking to perception and cognition that are only tenuously based in reality” (Kotov et al., 2020, p. 152).

Despite the aforementioned similarities, there were two differences between the present study and Kemp, Burgin, et al. (2020) in the association of positive and negative schizotypy with openness factors. First, positive schizotypy was inversely associated with Nontraditionalism in Kemp, Burgin, et al. (2020), whereas they were not associated in the present study. Second,

negative schizotypy was newly associated with Ideas in the present study. Nonetheless, these results provide support for understanding and evaluating openness to experience as a complex, multi-faceted construct with both adaptive and maladaptive manifestations. Restricting conceptualization and assessment of openness to traditional measures of the construct and to the domain level results in a loss of information, especially with respect to evaluating multidimensional schizotypy.

The present study provides additional support for schizotypy as a multidimensional construct with positive, negative, and disorganized dimensions. Schizotypy encompasses a broad range of subclinical and clinical expressions and thereby provides a useful framework for investigating the heterogeneous expression and etiology of schizophrenia-spectrum psychopathology. Examining dimensions of normal personality, especially openness, provides a relevant method for evaluating the schizotypy dimensions. The results of this study provide further support for the use of alternative openness measures, and for the evaluation of facets of openness to experience in order to obtain a more nuanced assessment of the trait than that provided by the larger personality domain. Future research should expand this assessment by including measurements of HiTOP Thought Disorder and DSM-5 Psychoticism; although evaluation of these other taxonomic systems was outside of the scope of this study, Kemp, Kaczorowski, et al. (2021) found that the full-length MSS subscales are differentially associated with the domains and facets of the Personality Inventory for DSM-5 (Krueger et al., 2013), a measure that captures DSM-5 Psychoticism. The generalizability of the study is enhanced by the inclusion of student and MTurk participants, although future studies should examine these associations in more diverse samples and should employ methods beyond self-report (e.g., informant report). Finally, these results provide support for the construct validity of the MSS-B as a brief form of the full-length MSS and build upon a series of validation studies that have found comparable results between the scales. The MSS and MSS-B appear to offer a useful family of measures for evaluating schizotypy, and the MSS-B offers a brief alternative to the MSS with comparable validity and minimal reduction of psychometric properties.

Electronic Supplementary Material

The electronic supplementary material is available with the online version of the article at <https://doi.org/10.1027/1614-0001/a000348>.

ESM 1. Factor Loadings for the Principal Components Analysis of 15 Facet Scores from the NEO-PI-3, HEXACO, IPC, and EPI (Table E1); Multidimensional Schizotypy Scale-Brief Subscale by Sample Interaction Analyses for Openness Measures (Table E2); Multidimensional Schizotypy Scale-Brief Subscale by Sample Interaction Analyses for Openness Factors (Table E3)

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History

Received October 27, 2020

Revision received April 7, 2021

Accepted April 14, 2021

Published online June 7, 2021

Open Data

Data is available on Open Science Framework at

https://osf.io/7pdtk/?view_only=5e297a2fe69f4b7b87d9a0a6feacf682

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