

ASSOCIATION OF POSITIVE, NEGATIVE, AND DISORGANIZED SCHIZOTYPY  
DIMENSIONS WITH AFFECTIVE SYMPTOMS AND EXPERIENCES

BY

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## ABSTRACT

Schizotypy offers a useful construct for investigating the etiology, development, and expression of schizophrenia-spectrum psychopathology, as well as the comorbid expression of mood and anxiety disorders across the schizophrenia spectrum. The present study examined the associations of positive, negative, and disorganized schizotypy with affective symptoms and experiences in a sample of MTurk workers and college students ( $n=575$ ). Participants completed the Multidimensional Schizotypy Scale (MSS) and measures of depression, anxiety, social phobia, hypomanic traits, and state affect. As expected, positive schizotypy was significantly associated with hypomanic traits, whereas negative schizotypy was associated with reduced positive affect and reduced hypomanic traits. Although prior research has emphasized the association of positive schizotypy with depression and anxiety, the current results demonstrate that disorganized schizotypy is more strongly associated with elevated negative affect (over-and-above positive schizotypy). As such, these findings highlight the importance of examining disorganization of affect, in addition to the cognitive-behavioral deficits traditionally associated with disorganized schizotypy. Finally, the MSS and MSS-Brief demonstrated closely comparable findings. The present results provide further support for the construct validity of the MSS and the three-factor model of schizotypy.

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## INTRODUCTION

### SCHIZOPHRENIA AND SCHIZOTYPY

Schizophrenia is a severe mental illness characterized by psychosis, negative symptoms, disordered thought and behavior, and marked functional deficits (American Psychiatric Association, 2013). Current models suggest that schizophrenia is the most extreme manifestation of a spectrum of clinical and subclinical impairment referred to as schizotypy (Kwapil and Barrantes-Vidal, 2015; Lenzenweger, 2010; Meehl, 1990). Schizotypy offers a useful construct as it encompasses subclinical manifestations, the psychosis prodrome, and schizophrenia-spectrum disorders. The construct also provides a framework for investigating the etiology, development, and expression of schizophrenia-spectrum psychopathology (Kwapil and Barrantes-Vidal, 2015) without many of the confounds associated with clinical disorders (e.g., medication effects; Lenzenweger, 2006). Schizotypy and schizophrenia are heterogeneous, and this heterogeneity can be captured in a multidimensional structure that includes positive, negative, and disorganized dimensions (Kwapil and Barrantes-Vidal, 2015; Mason and Claridge, 2006; Vollema and van den Bosch, 1995). Additionally, this multidimensional structure has been shown to be consistent across cultures (Fonseca-Pedrero et al., 2017; 2018). Positive schizotypy involves odd beliefs, unusual perceptual experiences, and suspiciousness. Negative schizotypy is characterized by diminished functioning such as affective flattening, anhedonia, avolition, anergia, and social withdrawal. Disorganized schizotypy is characterized by disturbances in thought, speech, and behavior. In addition to providing information about clinical manifestations of schizotypy, understanding the nature of this construct and its dimensions should enhance our identification of individuals at risk for developing schizophrenia-spectrum disorders.

## **SCHIZOTYPY AND AFFECTIVE EXPERIENCES**

Disruptions in the experience of emotion have been commonly implicated across the schizophrenia spectrum (as discussed below). Researchers have assessed affective symptoms in schizotypy, including the presence of depressive and anxious symptoms, as well as hypomanic traits. Further, differences in trait neuroticism and state affect have been observed. Assessment of these symptoms and experiences dimensionally in schizotypy provides information about patterns in the etiology and development of psychosis.

### **Depression and anxiety**

Depressive and anxious symptoms are commonly present in patients with schizophrenia (American Psychiatric Association, 2013; Sands and Harrow, 1999). Specifically, evidence suggests higher lifetime prevalence of depressive (Häfner et al., 2005) and anxious (Cosoff and Hafner, 1998) symptoms and episodes in patients with schizophrenia-spectrum disorders than in the general population. Although depressive symptoms share several characteristics with negative symptoms of schizophrenia (e.g., anhedonia, diminished motivation), research suggests that these affective symptoms are more strongly associated with positive, or psychotic-like, symptoms than with negative symptoms (Drake et al., 2004; Emsley et al., 1999; Lysaker et al., 1995).

Multidimensional models of schizotypy show similar associations with affective and anxious symptoms as seen in schizophrenia. For example, Lenzenweger and Loranger (1989) found that positive schizotypy was associated with higher levels of anxiety and depression. Lewandowski et al. (2006) further demonstrated that symptoms of depression and anxiety are

more strongly associated with positive schizotypy than with negative schizotypy. Other researchers have indicated that individuals with both depressive and schizotypal features tend to demonstrate higher levels of paranoid and suspicious symptoms (Spitznagel and Suhr, 2004), which are conceptualized as core components of positive schizotypy. Likewise, social anxiety (Brown et al., 2008) and obsessive-compulsive symptoms (Einstein and Menzies, 2004; Norman et al., 1996; Sobin et al., 2000) are more strongly associated with positive schizotypy than with negative schizotypy. This is consistent with the conceptualization that negative schizotypy is characterized by diminished affective expression and processing (Kerns, 2006), and is likely associated with reduced vulnerability to the high negative affect that is typically associated with depression and anxiety.

### **Mania and hypomania**

In addition to co-occurrence of depression and anxiety with positive schizotypy, evidence supports associations of manic and hypomanic symptoms with positive schizotypy. For example, approximately 50% of patients with bipolar I disorder experience psychotic symptoms in their lifetime (Goodwin and Jamison, 2007). Furthermore, schizophrenia and bipolar disorder tend to co-occur within families (Cardno and Owen, 2014). Positive, but not negative, schizotypy appears to be associated with risk for bipolar disorder and with hypomanic personality traits. Kwapil et al. (2013) reported that positive, but not negative, schizotypy predicted the development of manic or hypomanic episodes in the Chapmans' ten-year longitudinal sample. In the derivation study of the Hypomanic Personality Scale (HPS), Eckblad and Chapman (1986) reported that scores on the HPS were significantly associated with positive schizotypy measures of magical ideation ( $r = .49$ ) and perceptual aberrations ( $r = .43$ ), but were inversely correlated

with a negative schizotypy measure of physical anhedonia ( $r = -.18$ ). Unpublished data from 1,594 college students assessed by our laboratory replicated these findings; scores on the HPS correlated .46 with positive schizotypy and -.10 with negative schizotypy (Kwapil and Kemp, 2018).

## **Neuroticism**

Models of personality traits, such as the Five-Factor Model, capture trait-like levels of emotional instability, depression, and anxiety in the personality dimension of neuroticism (McCrae and Costa, 2010). Neuroticism is elevated in patients with schizophrenia (Horan et al., 2008). Traits such as neuroticism have the potential to interact with schizotypy and may provide information about the relationship between affective and schizophrenic symptoms. For example, Meehl (1990) suggested that personality vulnerabilities such as neuroticism may increase the likelihood of people with schizotypy decompensating into full-blown psychosis. Much like the established relationship among mood, anxiety, and positive schizotypy, studies have reported that positive, but not negative, schizotypy is strongly associated with neuroticism (Barrantes-Vidal et al., 2009; Gross et al., 2014; Gross, Kwapil, Burgin et al., 2018; Kwapil et al., 2008; Kwapil, Gross, Burgin et al., 2018). Furthermore, neuroticism moderates the expression of schizotypy and may increase the likelihood of schizotypic individuals experiencing psychotic-like symptoms and transitioning into schizophrenia-spectrum disorders (Claridge and Davis, 2003). For example, Barrantes-Vidal et al. (2009) reported that neuroticism moderated the expression of positive, but not negative, schizotypy in the prediction of interview ratings of psychotic-like and schizotypal symptoms, as well as impaired functioning.

## **State affect**

In addition to examining trait-like affective experiences in schizotypy, studies have also assessed schizotypy in relation to state positive affect (PA) and negative affect (NA). For example, schizotypy is generally associated with lower levels of PA (Watson and Naragon-Gainey, 2010) and higher levels of NA than healthy controls (Miller and Lenzenweger, 2014). PA and NA have also been assessed in daily life studies of schizotypy using experience sampling methodology (ESM). These studies have shown that the schizotypy dimensions are differentiated by their experience of affect in daily life. Specifically, positive schizotypy is associated with increased NA, whereas negative schizotypy is primarily associated with decreased PA (Barrantes-Vidal et al., 2013; Kwapil et al., 2012;). This is consistent with the relationship of mood and anxiety symptoms with schizotypy discussed above.

Studies examining the association of affective symptoms and experiences with schizotypy have primarily focused on positive and negative schizotypy dimensions, but not disorganized schizotypy. Furthermore, studies that have examined disorganized schizotypy have often relied on measures that tap other constructs such as eccentricity or social anxiety. Disorganized schizotypy is presumed to involve disruptions in the ability to organize and regulate thoughts, affect, and behavior and is strongly associated with both neuroticism and positive schizotypy (e.g., Kwapil, Gross, Burgin et al., 2018). Therefore, it is essential to clarify the relationship of disorganized schizotypy and affective experiences.

## **PSYCHOMETRIC ASSESSMENT OF SCHIZOTYPY**

Questionnaire measures have been widely used for assessing schizotypic characteristics and examining risk for developing schizophrenia-spectrum psychopathology (see reviews by

Chapman et al., 1995; Kwapil and Chun, 2015; Mason, 2015; Mason et al., 1997). Widely used measures of schizotypy include the Wisconsin Schizotypy Scales (WSS), which consist of 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, the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), and the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE; Mason et al., 1995). Brief versions have also been derived for each of these measures including the WSS-B (Winterstein et al., 2011), SPQ-B (Raine and Benishay, 1995), and the O-LIFE-SV (Mason et al., 2005). Although these questionnaire measures of schizotypy have been widely employed, they suffer from a number of limitations including factor structures that are inconsistent with current conceptual models, outdated or biased items, and psychometric limitations.

The Multidimensional Schizotypy Scale (MSS; Kwapil, Gross, Silvia, et al., 2018) and the Multidimensional Schizotypy Scale-Brief (MSS-B; Gross, Kwapil, Raulin et al., 2018) were developed to assess current conceptualizations of positive, negative, and disorganized schizotypy and to address the limitations associated with existing measures of schizotypy. Scale construction followed the recommendations of DeVellis (2012). Classical test theory, item response theory, and differential item functioning were employed to derive the 77-item MSS and the 38-item MSS-B. Both measures contain positive, negative, and disorganized schizotypy subscales. The MSS and MSS-B have good psychometric properties, good item discrimination, and minimal item bias for gender and race/ethnicity in large derivation ( $n = 6,265$ ) and cross-validation ( $n = 1,000$ ) samples. Coefficient alpha reliabilities range from .88 to .94 for the MSS subscales (Kwapil, Gross, Silvia et al., 2018) and .78 to .90 for the MSS-B subscales (Gross, Kwapil, Raulin et al., 2018), and both the MSS and MSS-B subscales demonstrate good to

excellent test-retest reliability (Kemp et al., 2019). Furthermore, initial studies support the construct validity of the schizotypy subscales (e.g., Gross, Kwapil, Burgin et al., 2018; Kwapil, Gross, Burgin et al., 2018) and indicate comparable findings for the full-length and brief versions of the scale. However, studies have not examined the association of the MSS and MSS-B schizotypy dimensions with measures of affective experiences.

## **GOALS AND HYPOTHESES**

The present study assessed the associations of positive, negative, and disorganized schizotypy with affective experiences including symptoms of depression, anxiety, social anxiety, hypomanic personality traits, and state positive and negative affect. To our knowledge, this is the first study to examine these associations using the MSS and the MSS-B positive, negative, and disorganized schizotypy subscales. We expected that the affective patterns in positive schizotypy and negative schizotypy would be comparable to those demonstrated in previous studies. Thus, we hypothesized that positive schizotypy would be strongly related to negative affect and symptoms of depression and anxiety, as well as hypomanic traits. Furthermore, we hypothesized that negative schizotypy would have a minimal relationship with negative affect and symptoms of depression and anxiety and would be inversely associated with hypomanic traits and positive affect. Although the relationship between disorganized schizotypy and affective experiences has not been widely examined, we expected that disorganized schizotypy would be moderately associated with measures of negative affect, depression, and anxiety due to the established relationship of disorganized schizotypy with neuroticism and positive schizotypy. Finally, we expected that the associations of the schizotypy dimensions and affective experiences would be closely comparable for the MSS and MSS-B. Specifically, we expected that magnitude of the

associations would not diminish when using the MSS-B relative to the MSS, as evidenced by the fact that the effect sizes for the correlations and regression coefficients from analogous analyses would be of the same magnitude for the MSS and MSS-B. Such findings would provide further support for the use of the MSS-B as an abbreviated form of the MSS.

## METHODS

### PARTICIPANTS

Participants were recruited from two sources and completed online surveys via Qualtrics software. A total of 359 participants were recruited from across the United States through Amazon Mechanical Turk (MTurk) and 334 participants were recruited from the University of Illinois at Urbana-Champaign's Psychology Department participant pool. All participants were at least 18 years of age. Participants were dropped for invalid responding or for completing the survey in less than 10 minutes. Usable data were retained for 293 MTurk participants ( $M$  age = 38 years,  $SD$  = 11.3; 57% female; 8% Black, 4% Asian/Pacific Islander, 81% Caucasian, 5% Hispanic/Latino, <1% Native American, 1% other; 98% Native English speakers) and 282 university participants ( $M$  age = 19.3 years,  $SD$  = 1.3; 62% female; 6% Black, 21% Asian/Pacific Islander, 51% Caucasian, 17% Hispanic/Latino, <1% Native American, 5% other; 83% Native English speakers). The total sample included 575 participants ( $M$  age = 28.8 years,  $SD$  = 12.4; 60% female; 7% Black, 12% Asian/Pacific Islander, 67% Caucasian, 11% Hispanic/Latino, <1% Native American, 3% other; 91% Native English speakers). Information was not obtained regarding psychiatric diagnoses or treatment.

### MEASURES

#### **Multidimensional Schizotypy Scale**

The MSS contains 77 true-false items and the MSS-B contains 38 items that assess positive, negative, and disorganized schizotypy. The items are presented in Kwapil, Gross, Silvia et al. (2018) and Gross, Kwapil, Raulin et al. (2018). Note that scores on the MSS-B were

derived from the full-length MSS. Following recommendations of Kwapil, Gross, Silvia et al. (2018), separate scores were computed for each schizotypy dimension, as opposed to computing a total schizotypy score.

### **Measures of affect and affective symptoms**

The 21-item Beck Depression Inventory-II (BDI; Beck et al., 1996) and the 21-item Beck Anxiety Inventory (BAI; Beck and Steer, 1993) assess the severity of recent depressive or anxiety symptoms, respectively. Note that one item assessing suicidal ideation was removed from the BDI at the request of the IRB. Items on the BDI and BAI share the same response format with responses ranging from 0 (no symptom endorsement) to 3 (severe symptom endorsement). The BDI has high coefficient-alpha reliability for patients with clinical depression (.92), as well as nonclinical individuals (.93; Beck, Steer, and Brown, 1996). The BAI has similarly high internal consistency (.92; Beck et al., 1988).

The Social Phobia Scale (SPS) assesses the severity of social anxiety symptoms. It has good coefficient alpha reliability (.89; Mattick and Clarke, 1998). Responses are on a Likert scale ranging from 1 (“strongly disagree”) to 7 (“strongly agree”). The Positive and Negative Affect Schedule (PANAS; Watson, Clark, and Tellegen, 1988) contains 20 words that describe positive or negative emotions (e.g., “Excited”). Participants are instructed to indicate the extent to which they experienced the emotion within the last week on a scale of 1 (very slightly or not at all) to 5 (extremely). The PANAS has demonstrated high coefficient-alpha reliabilities in its assessment of both positive (.88) and negative affect (.87).

The Hypomanic Personality Scale (HPS; Eckblad and Chapman, 1986) is a self-report questionnaire that contains 48 true-false items that assess hypomanic personality traits. The HPS

has good coefficient-alpha reliability (.87) and test-retest reliability (.81). High scorers on the scale are at elevated risk for hypomanic and manic episodes (Kwapil et al., 2000; Walsh et al., 2015).

### **Infrequency Questionnaire**

A 13-item infrequency questionnaire (Chapman and Chapman, 1983) was included to screen out invalid responders. Following Chapman and Chapman, participants who endorsed more than two infrequency items were excluded from the analyses.

### **PROCEDURES**

Participants were recruited through MTurk and the university subject pool. All participants completed the questionnaires using the Qualtrics online survey system. The project received IRB approval from the University of Illinois at Urbana-Champaign and participants provided informed consent prior to completing the surveys. The survey began with demographic questions (age, sex, race/ethnicity, and English as first language). The MSS, HPS, and the infrequency questionnaire items (all true-false response) were intermixed and divided into five blocks. These five blocks were presented in random order after the demographic questionnaires. The remaining questionnaires (BDI, BAI, SPS, and PANAS) were then administered in random order. MTurk participants received \$1 for completing the survey and university participants received course credit.

## **RESULTS**

### **DESCRIPTIVE STATISTICS**

Descriptive statistics for the questionnaires are presented in Table 1. Note that descriptive statistics and coefficient alpha reliabilities from the MSS and MSS-B are comparable to results from previous samples. Likewise, the intercorrelations of the MSS and MSS-B subscales (presented in Table 2) are comparable to previous findings (Gross, Kwapil, Burgin et al., 2018; Kwapil, Gross, Burgin et al., 2018; Kwapil, Gross, Silvia et al., 2018). In general, each measure exhibited good to excellent internal consistency reliability. A total of 37 participants failed to complete 1 questionnaire item (out of 219 possible items), and 8 participants failed to complete 2 items. The remaining 530 participants completed all of the items.

### **ASSOCIATION OF MSS/MSS-B AND AFFECTIVE EXPERIENCES**

Table 2 presents the zero-order correlations of the MSS and MSS-B subscales and the measures of affective experiences (depressive and anxious symptoms, hypomanic personality, state PA and NA). Given the large sample size and number of analyses for this study, alpha was set to .001 in order to minimize Type I error and avoid interpreting miniscule effects as statistically significant. Effect sizes are noted in the tables following Cohen (1992). The correlations were closely comparable for the analogous MSS and MSS-B subscales. The measures of affective experiences tended to have their strongest association with disorganized schizotypy at the level of a medium or large effect.

In order to examine the unique association of the MSS and MSS-B schizotypy subscales with affective symptoms and experiences, we regressed each of the affective measure scores on

the three MSS and three MSS-B subscales (see Tables 3 and 4). Each row in the tables represent a separate regression analysis in which the three MSS or MSS-B subscales were entered simultaneously to examine their unique prediction of each of the affective experience scores. The standardized regression coefficient ( $\beta$ ), change in  $R^2$ , and effect size  $f^2$  are reported for each predictor in the linear regressions. Following Cohen (1992),  $f^2$  values above .15 are medium effect sizes, and above .35 are large effect sizes. Note that  $R^2$  and  $f^2$  were computed for each predictor by rerunning the analyses with the specific MSS predictor entered at the second step, over and above the other two MSS subscales. In order to examine the impact of multicollinearity, variance inflation factor (VIF) was computed for the three MSS and three MSS-B predictors, following Aiken et al. (2003). All VIF values were less than 1.3, indicating that multicollinearity did not adversely impact either set of regression analyses.

The MSS and MSS-B positive schizotypy dimensions were significantly associated with hypomanic traits (medium effect size) and PA (small effect). The zero-order associations of positive schizotypy with measures of depressive and anxious symptoms and NA were better accounted for by disorganized than positive schizotypy in the regression analyses. Furthermore, the association of positive schizotypy with PANAS PA in the regression analysis (compared to the nonsignificant zero-order relation) appears to represent a suppression effect due to disorganized schizotypy, not negative schizotypy. Note that post hoc examination of the partial correlations of positive schizotypy and PA with disorganized schizotypy partialled out and negative schizotypy partialled out revealed that the suppression effect only occurred when partialing disorganized schizotypy.

As expected, MSS and MSS-B negative schizotypy had significant inverse associations with hypomanic traits and PA. MSS negative schizotypy also had modest significant associations

with depression and social anxiety, whereas MSS-B negative schizotypy was not associated with social anxiety. In order to better understand the association of negative schizotypy and BDI scores, we examined the correlation of the individual BDI items with the MSS negative schizotypy score. Not surprisingly, the strongest correlations were with the BDI items “loss of interest” ( $r=.45$ ), “loss of pleasure” ( $r=.43$ ), and “loss of interest in sex” ( $r=.35$ ). Note that when positive and disorganized schizotypy were partialled out of this analysis, none of the NA items on the BDI remained significantly correlated with negative schizotypy. Thus, the association of negative schizotypy with the BDI appears largely driven by items tapping loss of pleasure and interest in the world, not items tapping increased NA (see Supplemental Table 1).

MSS disorganized schizotypy demonstrated the strongest association with affective experiences, over-and-above the other schizotypy dimensions. Specifically, it was associated with depressive and anxious symptoms (medium effect), social phobia symptoms (small effect), hypomanic traits (small effect), increased NA (medium effect), and decreased PA (small effect).

In order to examine whether the associations of the MSS and MSS-B positive, negative, and disorganized subscales with the measures of affective symptoms and experiences differed in the MTurk and college student sample groups, we computed the positive schizotypy x group, negative schizotypy x group, and disorganized schizotypy x group interactions for each of the outcome measures. None of the interactions for the MSS (Supplemental Table 2) or the MSS-B (Supplemental Table 3) was significant, indicating that the associations of schizotypy and affect were comparable in the MTurk and college student samples.

Although we did not offer specific hypotheses regarding sex differences in these associations, we recomputed the regression analyses with sex as a moderator variable. However, none of the sex by schizotypy dimension score interactions significantly predicted any of the

affect measures, indicating that the association of schizotypy dimensions with affect is invariant across sex (see Supplemental Tables 2 and 3).

## DISCUSSION

Evidence suggests that mood and anxiety symptoms often co-occur with schizophrenia-spectrum disorders (Cosoff and Hafner, 1998; Goodwin and Jamison, 2007; Häfner et al., 2005; Sands and Harrow, 1999) and this comorbidity can be observed across the continuum from subclinical schizotypy to clinically-identified schizophrenia (Brown et al., 2008; Eckblad and Chapman, 1986; Lenzenweger and Loranger, 1989; Lewandowski et al., 2006; Norman et al., 1996; Spitznagel and Suhr, 2004). The presence of affective and anxiety symptoms has further implications for the presentation and course of schizophrenia-spectrum psychopathology. For example, positive symptoms in schizophrenia are often accompanied by mood and anxiety symptoms and are associated with better prognosis than negative symptoms in schizophrenia (Oosthuizen et al., 2002). Similarities in expression from schizotypy to schizophrenia suggest that studying affective symptoms in schizotypy can provide information about comorbidity in schizophrenia without the confounds of clinical populations.

Previous research has assessed the relationship between schizotypy and affective experiences (e.g., Brown et al., 2008; Lewandowski et al., 2006), but these studies suffer from a number of limitations including outdated schizotypy measures and either exclusion of disorganized schizotypy or inclusion of problematic measures of disorganization. The present study is the first to examine the association of schizotypy with affective symptoms and experiences using the MSS and MSS-B. These measures offer the advantage of measuring positive, negative, and disorganized schizotypy based upon current conceptualizations of these dimensions. Although relatively new, the MSS and MSS-B have demonstrated good to excellent internal consistency, test-retest reliability, and initial construct validity.

Our findings indicate several themes characterizing the relationship between the schizotypy dimensions and affective symptoms and experiences. First, disorganized schizotypy showed the strongest associations with affective and anxious symptoms and increased NA. Of note, however, hypomanic traits were strongly associated with positive schizotypy. This is consistent with current models that view positive symptoms and mania as overlapping constructs (Murray et al., 2004). The relationship between disorganized schizotypy and these experiences aligns with the conceptualization of disorganized schizotypy, as well as disorganized symptoms of schizophrenia. Specifically, disorganization is comprised of both cognitive and emotional dysregulation, though the former tends to be more typically emphasized (Bleuler, 1950; Kerns, 2006). The experience of NA and related symptoms may be a direct response to cognitive dysregulation, and thus may be an important and overlooked aspect of disorganized schizotypy.

Second, disorganized schizotypy was associated with all experiences characterized by elevated NA (i.e., measures of affective symptoms and PANAS NA) over-and-above positive schizotypy. Previous studies have suggested that positive schizotypy is strongly associated with depression and anxiety (e.g., Brown et al., 2008; Lewandowski et al., 2006); however, the present study suggests that those zero-order findings are better explained by disorganized schizotypy. Note again that the measures used in previous studies failed to capture disorganized schizotypy. Therefore, these prior findings may be due to the moderate zero-order correlation between positive and disorganized schizotypy. Given this correlation, the factor linking these two dimensions may be affective dysregulation.

Thinking further about these relationships, it is important to consider how positive and disorganized schizotypy may be associated through features that perpetuate NA. Positive schizotypy is characterized by unusual thought content, odd perceptual experiences, and

suspiciousness, which may produce NA and associated experiences (as well as being driven or exacerbated by NA). For example, suspiciousness of other people may result in increased symptoms of social anxiety and distress. On the other hand, disorganized schizotypy involves disruptions in the ability to organize and regulate thought and affect that often may be conflated with positive schizotypy. Kerns (2005) noted that positive schizotypy was associated with reduced clarity of emotions. However, this study only assessed the positive dimension of schizotypy; therefore, the findings may have been driven by the association between positive and disorganized schizotypy. Furthermore, deficits in clarity of emotion are associated with more cognitive difficulties under stress (Gohm et al., 2001). In this regard, affective dysregulation may link positive and disorganized schizotypy through cognitive difficulties in coping with stress, such as that generated from suspiciousness.

Finally, negative schizotypy was strongly associated with reduced PA in the present study. This is in line with conceptualizations that anhedonia is a core component of negative schizotypy (e.g., Kwapil and Barrantes-Vidal, 2015). This finding is also consistent with previous work assessing state affect in daily life, which has indicated inverse relationships between negative schizotypy and state PA (e.g., Kwapil et al., 2012). Although negative schizotypy demonstrated a modest relationship with symptoms characterized by NA (i.e., depressive symptoms), follow-up analyses demonstrated that this association was relatively specific to items tapping anhedonic experiences of depression (i.e., reductions in PA) rather than NA itself. Thus, the relationship between negative schizotypy and depression may be best understood in terms of how negative schizotypy is traditionally conceptualized—as a diminution of affective expression and processing, including the experience of pleasure.

Given that current conceptualizations of schizotypy include the three dimensions of

positive, negative, and disorganized schizotypy, the current study supports the use of the MSS and MSS-B in evaluating the differential associations of these dimensions. The alignment of these associations with current conceptualizations of schizotypy traits and deficits serves to further validate the MSS and MSS-B subscales. Furthermore, the results did not considerably differ between the MSS and MSS-B in either the zero-order correlations or the regression analyses, and the magnitude of effect sizes was comparable for all of the analogous analyses for the two versions of the scale. The correspondence of the findings between the MSS and MSS-B provides additional support for the validity of the MSS-B as a short form of the original MSS and builds upon previous validation studies that found comparable findings for the scales (e.g., Gross, Kwapil, Burgin et al., 2018; Kwapil, Gross, Burgin et al., 2018).

Limitations of the current study include the use of retrospective self-report and a cross-sectional design. However, given the personal nature of items that are unlikely to be observed by others (e.g., Occasionally I have felt as though my body did not exist), self-report provides an effective method for capturing these experiences. Note that schizotypy studies often are limited to only using college student samples. The inclusion of the MTurk subsample, along with the college student subsample, provided a more diverse sample in which to examine schizotypic characteristics and their relations with affective experiences. The present study used a cross-sectional design to assess schizotypy and affective experiences; therefore, we are unable to determine the direction of causality in the reported relationships. Nevertheless, establishing a pattern of associations at one time provides information about the manifestation of these symptoms on the schizotypy continuum. Future studies should examine the developmental nature of these relationships using longitudinal study designs to establish temporal precedence.

In summary, this is the first study to our knowledge assessing relationships among the

MSS and MSS-B subscales and affective experiences and symptoms. In contrast to prior research evaluating schizotypy and these affective experiences, the current study provides evidence that disorganized schizotypy may better explain the relationship between positive schizotypy and NA and its associated symptoms. Although disorganized schizotypy is traditionally conceptualized as a cognitive-behavioral deficit in the schizophrenia spectrum, our research suggests that disorganization of affect may be a central and overlooked aspect of disorganized schizotypy and schizophrenia. The MSS and MSS-B demonstrated sensitivity in detecting the distinct associations of the schizotypy dimensions and affective experiences without conflating positive and disorganized schizotypy. Thus, the present study also provides support for use of both the MSS and MSS-B as valid measures of the construct schizotypy.

## TABLES

**Table 1:** Descriptive Statistics for the Multidimensional Schizotypy Scale, Multidimensional Schizotypy Scale-Brief, Beck Anxiety Inventory, Beck Depression Inventory, Social Phobia Scale, Hypomanic Personality Scale, and Positive and Negative Affect Schedule

<u>Criterion</u>	<u>Mean</u>	<u>S.D.</u>	<u>Range</u>	<u>Coefficient Alpha</u>	<u>Skew</u>	<u>Standard Error</u>	<u>Kurtosis</u>	<u>Standard Error</u>
Multidimensional Schizotypy Scale								
Positive Schizotypy	2.53	3.46	0 – 26	.85	2.26	0.10	6.64	0.20
Negative Schizotypy	3.83	4.66	0 – 26	.89	1.88	0.10	3.89	0.20
Disorganized Schizotypy	3.61	5.28	0 – 25	.93	1.80	0.10	2.72	0.20
Multidimensional Schizotypy Scale-Brief								
Positive Schizotypy	1.30	1.80	0 – 13	.71	2.13	0.10	6.11	0.20
Negative Schizotypy	1.73	2.38	0 – 13	.80	1.98	0.10	4.10	0.20
Disorganized Schizotypy	1.56	2.61	0 – 12	.88	2.01	0.10	3.46	0.20
Beck Depression Inventory	10.71	11.03	0 – 54	.94	1.24	0.10	1.04	0.20
Beck Anxiety Inventory	10.01	10.38	0 – 56	.94	1.45	0.10	1.97	0.20
Social Phobia Scale	61.74	25.83	19 – 130	.95	0.35	0.10	-0.69	0.20
Hypomanic Personality Scale	14.24	8.39	0 – 41	.89	0.61	0.10	-0.13	0.20
PANAS Positive Affect	30.05	8.28	10 – 50	.91	-0.05	0.10	-0.50	0.20
PANAS Negative Affect	19.37	8.19	10 – 46	.91	0.88	0.10	0.11	0.20

Note: PANAS = Positive and Negative Affect Schedule

**Table 2:** Correlations of the Multidimensional Schizotypy Scale, the Multidimensional Schizotypy Scale-Brief, Beck Depression Inventory, Beck Anxiety Inventory, Social Phobia Scale, Hypomanic Personality Scale, and Positive and Negative Affect Schedule ( $n = 575$ )

	NegSz	DisSz	BDI	BAI	SPS	HPS	PA	NA
Multidimensional Schizotypy Scale;								
Multidimensional Schizotypy Scale-Brief								
Positive Schizotypy (PosSz)	.17*/.16*	<b>.38*/.34*</b>	.22*/.17*	.23*/.20*	.20*/.18*	<b>.47*/.45*</b>	.01/.04	.22*/.16*
Negative Schizotypy (NegSz)		<b>.34*/.36*</b>	<b>.36*/.33*</b>	.16*/.14	.29*/.26*	-.06/-.11	<b>-.39*/-.36*</b>	.16*/.15*
Disorganized Schizotypy (DisSz)			<b>.59*/.55*</b>	<b>.46*/.44*</b>	<b>.43*/.42*</b>	<b>.37*/.34*</b>	<b>-.33*/-.32*</b>	<b>.47*/.44*</b>
Beck Depression Inventory (BDI)				<b>.65*</b>	<b>.46*</b>	.24*	<b>-.50*</b>	<b>.68*</b>
Beck Anxiety Inventory (BAI)					<b>.44*</b>	.29*	<b>-.30*</b>	<b>.71*</b>
Social Phobia Scale (SPS)						.03	-.29*	<b>.41*</b>
Hypomanic Personality Scale (HPS)							.16*	.29*
PANAS Positive Affect (PA)								-.28*
PANAS Negative Affect (NA)								

\* $p < .001$

Note: Multidimensional Schizotypy Scale correlations on left, Multidimensional Schizotypy Scale-Brief correlations on right  
 Medium effect sizes in bold, large effect sizes in bold and italics  
 PANAS = Positive and Negative Affect Schedule

**Table 3:** Linear Regressions Examining Prediction by the Multidimensional Schizotypy Scale Factors ( $n = 575$ )

Criteria:	MSS-Positive Schizotypy			MSS-Negative Schizotypy			MSS-Disorganized Schizotypy			Total $R^2$
	$\beta$	$\Delta R^2$	$f^2$	$\beta$	$\Delta R^2$	$f^2$	$\beta$	$\Delta R^2$	$f^2$	
BAI	.063	.003	.004	-.006	.000	.000	<b>.437*</b>	<b>.147</b>	<b>.187</b>	.214*
BDI	-.018	.000	.000	.181*	.029	.046	<b>.531*</b>	<b>.218</b>	<b>.350</b>	.373*
SPS	.038	.001	.001	.163*	.023	.030	.358*	.099	.125	.209*
HPS	<b>.395*</b>	<b>.133</b>	<b>.193</b>	-.229*	.046	.067	.298*	.069	.100	.310*
PANAS PA	.181*	.028	.036	-.315*	.087	.112	-.294*	.067	.085	.221*
PANAS NA	.049	.002	.003	-.001	.000	.000	<b>.451*</b>	<b>.157</b>	<b>.202</b>	.222*

\* $p < .001$

Note: medium effect sizes ( $f^2$ ) in bold

BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; SPS = Social Phobia Scale; HPS = Hypomanic Personality Scale;

PANAS PA/NA = Positive and Negative Affect Schedule Positive Affect/Negative Affect

Each row represents a separate regression analysis in which the three MSS factors were entered simultaneously as predictors to examine their unique prediction of each affective measure score

**Table 4:** Linear Regressions Examining Prediction by the Multidimensional Schizotypy Scale-Brief Factors ( $n = 575$ )

Criteria:	MSS-Positive Schizotypy			MSS-Negative Schizotypy			MSS-Disorganized Schizotypy			Total $R^2$
	$\beta$	$\Delta R^2$	$f^2$	$\beta$	$\Delta R^2$	$f^2$	$\beta$	$\Delta R^2$	$f^2$	
BAI	.061	.003	.004	-.020	.000	.000	<b>.426*</b>	<b>.144</b>	<b>.179</b>	.197*
BDI	-.026	.001	.001	.155*	.021	.031	<b>.505*</b>	<b>.202</b>	<b>.300</b>	.326*
SPS	.042	.002	.002	.123	.013	.017	.357*	.101	.124	.188*
HPS	<b>.383*</b>	<b>.130</b>	<b>.177</b>	-.170*	.025	.034	.271*	.058	.079	.266*
PANAS PA	.179*	.028	.035	-.292*	.074	.092	-.273*	.059	.074	.199*
PANAS NA	.017	.000	.001	-.008	.000	.000	<b>.435*</b>	<b>.150</b>	<b>.186</b>	.193*

\* $p < .001$

Note: medium effect sizes ( $f^2$ ) in bold

BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; SPS = Social Phobia Scale; HPS = Hypomanic Personality Scale; PANAS PA/NA = Positive and Negative Affect Schedule Positive Affect/Negative Affect

Each row represents a separate regression analysis in which the three MSS factors were entered simultaneously as predictors to examine their unique prediction of each affective measure score

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## APPENDIX A: SUPPLEMENTAL TABLES

The supplementary file “Supplemental Tables” includes tables of additional results from exploratory analyses.

**Supplemental Table 1:** Correlations and Partial Correlations of the MSS Negative Schizotypy Subscale with the Beck Depression Inventory Items

<u>BDI Item</u>	<u>Zero-order correlation</u>	<u>Partial correlation</u>
BDI 01 Sadness	.25*	.11
BDI 02 Pessimism	.30*	.21*
BDI 03 Past Failure	.28*	.17*
BDI 04 Loss of Pleasure	.43*	.33*
BDI 05 Guilty Feelings	.21*	.08
BDI 06 Punishment Feelings	.24*	.12
BDI 07 Self-Dislike	.25*	.15
BDI 08 Self-Criticalness	.18*	.06
BDI 10 Crying	.11	-.01
BDI 11 Agitation	.18*	.08
BDI 12 Loss of Interest	.45*	.36*
BDI 13 Indecisiveness	.23*	.06
BDI 14 Worthlessness	.30*	.17*
BDI 15 Loss of Energy	.33*	.20*
BDI 16 Changes in Sleeping Pattern	.17*	.05
BDI 17 Irritability	.24*	.14
BDI 18 Changes in Appetite	.11	-.02
BDI 19 Concentration Difficulty	.20*	-.01
BDI 20 Tiredness or Fatigue	.28*	.13
BDI 21 Loss of Interest in Sex	.35*	.30*

\* $p < .001$

Partial correlations of MSS Negative Schizotypy subscale and BDI items with MSS Positive and Disorganized Schizotypy subscales partialled out

**Supplemental Table 2: Multidimensional Schizotypy Scale Subscale by Sample Group Interaction Analyses**

	Step 1			Step 2	Step 3		
	MSS Positive	MSS Negative	MSS Disorganized	Group	Pos x Group	Neg x Group	Dis x Group
<u>Criteria:</u>	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$
BAI	.063	-.006	.437*	-.189*	-.034	.079	.036
BDI	-.018	.181	.531*	-.110	-.021	.049	.006
SPS	.038	.163*	.358*	.032	.005	.048	.054
HPS	.395*	-.229*	.298*	-.186*	.041	-.015	.026
PANAS PA	.181*	-.315*	-.294*	.062	.034	-.091	-.033
PANAS NA	.049	-.001	.451*	-.351*	-.024	.064	.000

\* $p < .001$

**Supplemental Table 3:** Multidimensional Schizotypy Scale-Brief Subscale by Sample Group Interaction Analyses

	Step 1			Step 2	Step 3		
	MSS-B Positive	MSS-B Negative	MSS-B Disorganized	Group	Pos x Group	Neg x Group	Dis x Group
<u>Criteria:</u>	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$
BAI	.061	-.020	.426*	-.203*	-.032	.023	.069
BDI	-.026	.155	.505*	-.122*	-.017	.035	.021
SPS	.042	.123	.357*	.027	.024	.035	.031
HPS	.383*	-.170*	.271*	-.224*	.034	-.028	.045
PANAS PA	.179*	-.292*	-.273*	.056	.024	-.115	-.005
PANAS NA	.017	-.008	.435*	-.364*	-.023	.057	.006

\* $p < .001$

**Supplemental Table 4:** Multidimensional Schizotypy Scale Subscale by Sex Interaction Analyses

	Step 1			Step 2	Step 3		
	MSS Positive	MSS Negative	MSS Disorganized	Sex	Pos x Sex	Neg x Sex	Dis x Sex
<u>Criteria:</u>	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$
BAI	.063	-.006	.437*	.141*	.010	-.014	.042
BDI	-.018	.181	.531*	.072	.034	-.005	.005
SPS	.038	.163*	.358*	.193*	-.025	-.019	.005
HPS	.395*	-.229*	.298*	-.079	.015	.058	.000
PANAS PA	.181*	-.315*	-.294*	-.080	-.025	.067	.002
PANAS NA	.049	-.001	.451*	.123*	.055	-.006	-.015

\* $p < .001$

**Supplemental Table 5:** Multidimensional Schizotypy Scale-Brief Subscale by Sex Interaction Analyses

	Step 1			Step 2	Step 3		
	MSS-B Positive	MSS-B Negative	MSS-B Disorganized	Sex	Pos x Sex	Neg x Sex	Dis x Sex
<u>Criteria:</u>	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$	$\beta$
BAI	.061	-.020	.426*	.144*	.008	-.006	.038
BDI	-.026	.155	.505*	.077	.050	-.001	.000
SPS	.042	.123	.357*	.192*	.002	-.024	.013
HPS	.383*	-.170*	.271*	-.081	-.011	.079	-.019
PANAS PA	.179*	-.292*	-.273*	-.087	-.047	.087	-.004
PANAS NA	.017	-.008	.435*	.128*	.057	.021	-.025

\* $p < .001$