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Running Head: POSITIVE AND NEGATIVE SYMPTOM SCHIZOTYPY

Abstract

The current study investigated the Five Factor Model in the concurrent prediction of positive symptom schizotypy as measured by the Magical Ideation (Eckblad & Chapman, 1983) and Perceptual Aberration (Chapman, Chapman, & Raulin, 1978) scales, and negative symptom schizotypy as measured by the Physical Anhedonia (Chapman, Chapman, & Raulin, 1976) and Revised Social Anhedonia (Eckblad, Chapman, Chapman, & Mishlove, 1982; Mishlove & Chapman, 1985) scales. Previous studies suggest that these measures reflect the core symptoms found in schizotypal and schizoid PD (Bailey, West, Widiger, & Freiman, 1993). Negative symptoms were significantly predicted by Neuroticism (+), Extraversion (-), Openness (-), and Agreeableness (-) domains of the NEO PI-R. Additionally, positive symptoms were significantly predicted by Neuroticism (+), Openness (+), and Agreeableness (-). In addition, we examined the validity of lower-order traits in describing these symptoms of character pathology. These findings lend further support for the use of domain and facet scales of the NEO PI-R in the identification of personality pathology.

Positive and Negative Symptom Schizotypy and the Five Factor Model

The 1980's and 90's have been marked by a resurgence in interest in the "Big-Five" personality traits (i.e., Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness) as a taxonomy to describe normal personality (Costa & McCrae, 1988a, 1988b; Digman & Takemoto-Chock, 1981; Goldberg, 1982, 1990). Proponents of the five factor model (FFM) argue that this model can be extended to personality pathology, as well (Costa & Widiger, 1994). The current study explores the FFM personality structure of persons with schizotypy or hypothetical psychosis-proneness. We depart from previous research on the FFM and personality disorder (PD) in that the two diagnostic categories of schizotypal and schizoid PDs are broken down into underlying dimensions that constitute core features of disorders. This approach allows for greater specificity of the relationship between aspects of the two disorders and domains of the FFM. We contend that the Chapman Psychosis Proneness scales (PPS; Chapman & Chapman, 1985) can be effectively used to assess the core features of schizoid and schizotypal PDs. We also present evidence to suggest that the theoretically specified and empirically validated relationships between the FFM and these two disorders (Widiger, Trull, Clarkin, Sanderson, and Costa, 1994) can be replicated and extended using the Chapman scales. In addition, our results suggest that inconsistencies in previous findings for some FFM traits (e.g., Openness to Experience) and schizotypal symptoms may be due, in part, to differences in the assessment and presence of certain core symptoms.

Meehl (1962) asserted that certain persons, who he referred to as schizotypes, possess a genetic vulnerability for the later development of schizophrenia. Persons with this personality type are thought to display certain premorbid signs that mark the presence of a diathesis or inherited vulnerability for the development of schizophrenia. In an effort to identify these individuals, Chapman and Chapman (1985) developed objective psychometric measures of

schizotypic beliefs, symptoms, and experiences. Commonly referred to as the Psychosis Proneness scales (PPS), these measures include the Magical Ideation scale (Eckblad & Chapman, 1983), Perceptual Aberration scale (Chapman, Chapman, & Raulin, 1978), Physical Anhedonia (PhysAn; Chapman, Chapman, & Raulin, 1976), and the Revised Social Anhedonia scales (SocAn; Eckblad, Chapman, Chapman, & Mishlove, 1982; Mishlove & Chapman, 1985). Several studies have indicated that high scorers on the PPS display a greater number of schizotypal characteristics than their low scoring counterparts (Chapman and Chapman, 1985, 1987). In addition, other studies suggest that high-scorers on the Magical Ideation Scale and Revised Social Anhedonia Scale have a greater propensity for psychosis at 10-year followup (Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994).

Some authors have advocated a two factor model of schizotypy, corresponding to the positive and negative symptoms found in schizophrenia (Kelley and Coursey, 1992; Raine and Allbutt, 1989; Venables et al, 1990). According to this view, negative symptom schizotypy reflects a pattern of social withdrawal and anhedonia that may later manifest itself as negative symptoms of schizophrenia. Similarly, positive symptom schizotypes are thought to possess idiosyncratic cognitive styles that may later deteriorate into the positive symptoms of schizophrenia which include hallucinations and delusions. The content of the Physical Anhedonia and Revised Social Anehedonia scales pertains largely to negative symptoms, whereas the content of the Perceptual Aberration and Magical Ideation scales reflects the positive symptoms of schizotypy.

Although the PPS were not intended to correspond with contemporary models of personality pathology as embodied in the Diagnostic and Statistical Manual of Mental Disorders (DSM), negative symptom schizotypy as measured by the Physical and Revised Social Anhedonia scales captures many of the core features associated with the DSM-IV diagnosis of

schizoid PD. Support for this assertion comes from research indicating that persons diagnosed with schizoid PD show elevations on the Physical and Revised Social Anhedonia scales, but not other PPS, in comparison to normal controls (Bailey, West, Widiger, & Freiman, 1993; Lyons et al., 1995). In addition, examination of the content of the Chapman scales and DSM-IV diagnostic criteria also convincingly links the Chapman scales to core symptoms of schizoid PD. Specifically, DSM-IV criteria for Schizoid PD including lack of enjoyment in and desire for close relationships, almost exclusive interest in solitary activities, indifference to interpersonal reinforcement, and lack of close friends or confidants (p. 641; American Psychiatric Association, 1994) is represented in the item content of the Revised Social Anhedonia Scale. Further, other diagnostic criteria of schizoid PD such as disinterest in sex, lack of pleasure in daily activities, and emotional detachment (p. 641; American Psychiatric Association) are well-represented in the content of the Physical Anhedonia Scale.

The ability of the Chapman scales to characterize schizotypal PD has been explored as well. Investigations by Bailey, West, Widiger, and Frieman (1993) have provided substantial support for the construct validity of the PPS when used as continuous measures of positive and negative schizotypic symptoms. Bailey et al. (1993) reported relationships between these scales and structured interview criteria for schizoid and schizotypal PD symptoms in a clinical sample. In addition to demonstrating convergence between schizoid symptoms and scores on the Revised Social Anhedonia and Physical Anhedonia scales, they found that schizotypal PD criteria sets showed strong positive correlations with the Magical Ideation and Perceptual Aberration scales as well as the Revised Social Anhedonia and Physical Anhedonia scales. These findings are consistent with the conceptualization of Schizotypal PD as reflecting both positive and negative symptoms (American Psychological Association, 1994). In addition, examination of the item content of the Chapman scales and DSM-IV diagnostic criteria also convincingly implicate the

role of the Chapman scales in the measurement of core symptoms of schizotypal PD. For example, schizotypal criteria indicating "...a pervasive pattern of social and interpersonal deficits marked by acute discomfort with, and reduced capacity for, close relationships..." (p. 645, American Psychiatric Association, 1994) is captured well by the Revised Social Anhedonia Scale while "...cognitive or perceptual distortions and eccentricities..." (p. 645, American Psychiatric Association, 1994) are reflected by the Magical Ideation and Perceptual Aberration scales. In particular, ideas of reference and odd beliefs or magical thinking are represented in the item content of the Magical Ideation Scale whereas unusual perceptual experiences of oneself and the environment are represented by the Perceptual Aberration Scale.

Advocates of the use of the FFM to describe personality disorders have specified hypothetical FFM profiles of persons with schizoid and schizotypal PD (Trull & Widiger, 1997; Widiger, et al., 1994). In particular, Widiger et al. believe that persons with schizoid PD are low in Extraversion. They cite many of the facets of Extraversion such as Warmth, Gregariousness, Excitement-seeking, and Positive Emotions as being low. Such persons are also predicted to be low in certain facets of Openness and Neuroticism. For example, restricted affective quality may manifest as low Feelings in Openness, and low Anger-Hostility and Self-Consciousness in Neuroticism (Trull & Widiger, 1997). However, Trull and Widiger (1997) suggest that schizotypal PD likely reflects elevated levels of Openness to Experience and Neuroticism, followed by lower levels of Extraversion and Agreeableness. Although they identify a number of facet scales subsumed under Openness and Neuroticism, they suggest that low levels of Trust (marking Agreeableness) and Warmth and Gregariousness (marking Extraversion) likely characterize schizotypal PD.

Research attempting to validate these hypothesized relationships between FFM domains and the DSM-IV PDs have yielded somewhat conflicting findings (Blais, 1997; Cloninger &

Svrakic, 1994; Costa & McCrae, 1990; Hyer et al., 1994; Trull, 1992; Wiggins & Pincus, 1989; Yeung et al., 1993). Despite differences across studies, schizoid PD has invariably been found to be related to low levels of Extraversion (Blais, 1997; Cloninger & Svrakic, 1994; Coolidge et al., 1994; Costa & McCrae, 1990; Hyer et al., 1994; Trull, 1992; Wiggins & Pincus, 1989; Yeung et al. 1993). However, some studies report finding high Neuroticism (Blais, 1997; Costa & McCrae, 1990) or low Neuroticism (Coolidge et al. 1994; Trull, 1992), low Openness (Cloninger & Svrakic, 1994; Hyer et al., 1994; Trull, 1992; Yeung et al., 1993) and low Agreeableness (Blais, 1997; Costa & McCrae, 1990). In addition, schizotypal PD was most frequently associated with high levels of Neuroticism (Blais, 1997; Cloninger & Svrakic, 1994; Costa & McCrae, 1990; Hyer et al., 1994; and, Yeung et al., 1993) and low levels of Extraversion and Agreeableness (Blais, 1997; Cloninger & Svrakic, 1994; Costa & McCrae, 1990; Trull, 1992; and, Yeung et al., 1993). The major controversy in research on schizotypal PD and the FFM surrounds the role of Openness to Experience. While some studies have reported a positive relationship between symptoms of schizotypal PD and Openness (Coolidge et al., 1994; Wiggins & Pincus, 1989), this finding has been difficult to replicate (see Blais, 1997; Cloninger & Svrakic, 1994; Costa & McCrae, 1990; Hyer et al., 1994; Trull, 1992; and Yeung et al., 1993).

Inconsistencies across studies may be due to differences in persons sampled (i.e., normal vs. psychiatric). For example, studies finding a positive relationship between Openness to Experience and schizotypal symptoms have been based on college student samples (Coolidge, 1994; Wiggins & Pincus, 1989) whereas those failing to find this relationship have invariably utilized psychiatric samples (Cloninger & Svrakic, 1994; Trull, 1992; West, 1999; Yeung et al., 1993). Another possibility—not exclusive to the first—is that variability in findings for Openness may be due in part to differences in the measures used to assess schizotypal PD symptoms (Dyce, 1997). One such difference between measures may be the specificity with

which particular symptoms or symptom types have been assessed. Almost without exception, past studies have used measures that provide a general index of schizotypal or schizoid PD symptoms rather than measures that quantify specific disorder-related symptoms. A study by West (1999), utilizing the Magical Ideation and Perceptual Aberration scales as measures of cognitive and perceptual aberration in schizotypal PD, is a clear exception to this trend.

In addition to the general hypothesis that differences in findings for Neuroticism and Openness with respect to schizotypal PD may be partly a function of the measures utilized to assess schizotypal PD, we further hypothesized that variability in findings for Openness and schizotypal PD may be partly a function of differences in the level of negative symptoms assessed by scales or other criteria measuring schizotypal PD. For example, review of DSM-IV criteria indicates that schizotypal PD is composed of not only the positive symptoms which are consistent with the item content of the Magical Ideation and Perceptual Aberration scales, but also negative symptoms reflected in the Revised Social Anhedonia scale. However, an investigation by Bailey et al. (1993) suggests that schizotypal PD symptoms are moderately to highly related to not only the Revised Social Anhedonia scale, but the Physical Anhedonia scale, as well. Further, although the Physical Anhedonia scale seems to correctly reflect the negative symptoms of schizoid PD, it does not appear to reflect the kinds of negative symptoms which typify schizotypal PD. Given this apparent disparity and the fact that Openness is also inconsistently found to be related to symptoms of schizoid PD, we sought to further examine the relationship between Openness and negative symptoms characteristic of schizotypal and schizoid PD. Specifically, we offer that compounding of negative symptoms is associated with lower levels of Openness. Consequently, differences in the measurement of negative symptoms for both schizoid and schizotypal PD may lead to differences in the observed relationships between FFM Openness and these personality disorder symptoms that have been reported across past studies.

Taking the approach of West (1999), we extend previous investigations on the FFM and schizotypal PD by examining both positive and negative symptoms as conceptualized and measured by the Chapman Psychosis Proneness scales. In addition, we examine FFM traits in relation to core symptoms of schizoid PD. Finally, we also consider the validity of lower-order traits in describing schizotypal and schizoid personality pathology. Theoretical predictions of the relationship between the FFM and these disorders have been offered (Costa & Widiger, 1994). However, with the exception of Trull, Burr, and Widiger (1999), previous studies of the FFM and personality disorder have focused on higher-order FFM traits and have not examined the importance of lower-order traits in characterizing personality pathology.

Method

Participants and Procedure:

The study sample (N = 476) included male (30.7%) and female (68.5%) participants who had been recruited from introductory psychology classes over two semesters at a Canadian university. The average age was 20.1 (SD = 3.4). Their racial composition was White (80.8), Black (6.9), Asian (7.4), or other (4.9).

All participants completed the Revised NEO Personality Inventory (form S of the NEO-PI-R; Costa & McCrae, 1992) and an Interest and Preference Inventory consisting of the Magical Ideation Scale, Perceptual Aberration Scale, the Revised Social Anhedonia Scale and Physical Anhedonia Scale, and measures of symptom over-reporting and defensiveness. Participants were instructed that their responses had no right or wrong answers and were asked to respond honestly.

Measures

Positive Symptom Schizotypy. The Magical Ideation Scale (MagId; Eckblad & Chapman, 1983) and the Perceptual Aberration Scale (PerAb; Chapman, Chapman, & Raulin, 1978) were used to assess positive symptom schizotypy. The Magical Ideation Scale is a 30-item scale

designed to measure idiosyncratic beliefs about cause and effect relationships (e.g., "I have worried that people on other planets may be influencing what is happening on earth" and "I have sometimes felt that strangers were reading my mind "). The Perceptual Aberration Scale is a 35-item scale designed to measure distortions in the perception of one's own body and external objects (e.g., "I have sometime felt that my body does not belong to me" and "It has seemed at times as if my body was melting into my surroundings ").

Negative Symptom Schizotypy. The Revised Social Anhedonia Scale (RSocAn; Eckblad, Chapman, Chapman, & Mishlove, 1982) and the Physical Anhedonia Scale (PhysAn; Chapman, Chapman, & Raulin, 1976) were used to assess negative symptom schizotypy. The Physical Anhedonia Scale is a 61-item scale that measures lack of pleasure derived from various physical domains such as eating, touching, and feeling (e.g., "The beauty of sunsets is greatly overrated" and "The sounds of a parade have never excited me"). The Revised Social Anhedonia Scale is a 40-item scale that measures lack of interest or pleasure in interpersonal relationships (e.g., "I attach very little importance to having close friends" and "People sometimes think that I am shy when I really just want to be left alone").

Five Factor Model. The Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992) was used to assess the "Big-Five" personality traits of neuroticism, extraversion, openness, agreeableness, and conscientiousness. The NEO-PI-R consists of 240 items that measures these five basic personality domains. In addition, each factor trait or domain scale is composed of six lower-order traits or facet scales that are subsumed under each domain scale. For example, the domain of neuroticism is composed of facet scales of anxiety, depression, angry-hostility, self-consciousness, impulsiveness, and vulnerability.

Response Bias. The F (Infrequency), K (Correction), and L (Lie) scales of the MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) were used to assess response biases.

These scales have been used in schizotypy research to screen for potential biases in responding (Balogh & Merritt, 1996).

Results

In order to minimize the potential effect of response bias in this study, persons with extreme scores on MMPI-2 L, F, or K scales were excluded from further analyses. Based on suggestions by Butcher, Graham, and Ben-Porath (1995) for the use of MMPI-2 validity scales as screening measures in psychological research, cases obtaining scores that were greater than or equal to 120 T on the F scale, or greater than or equal to 80 T on either the L or K scales were excluded from further analyses. This resulted in a final sample of 463 cases.

Raw score means and standard deviations and alpha estimates of reliability for positive and negative schizotypy symptoms and NEO-PI-R domain scales are reported in Table 1. Zero-order correlations revealed that positive symptoms of magical ideation and perceptual aberration were significantly correlated in both the male ($r = .79$, $p < .001$) and female ($r = .76$, $p < .001$) samples. However, correlations between negative symptoms of social anhedonia and physical anhedonia were notably lower in both male ($r = .35$, $p < .001$) and female ($r = .44$, $p < .001$) samples. Overall rates of endorsement of positive symptoms of magical ideation were not significantly different between males ($M = 9.61$) and females ($M = 9.26$; $t(2, 461) = .64$, $p > .05$) but were higher for perceptual aberration in males ($M = 6.33$) compared to females ($M = 5.18$; $t(2, 461) = 2.60$, $p < .01$). In addition, rates of endorsement of both negative symptoms differed between sexes. Physical anhedonia was higher in males ($M = 16.15$) compared to females ($M = 12.82$; $t(2, 461) = 4.77$, $p < .001$) as was social anhedonia between males ($M = 11.01$) and females ($M = 8.86$; $t(2, 461) = 4.16$, $p < .001$).

Insert Table 1 about here

Because we were interested in the correlations between FFM traits and positive and negative symptoms in males and females, respectively, we randomly drew a sample of 100 males and 100 females for analysis. We included equal sample sizes for comparison because differences in sample size alone could account for apparent differences in the size and significance of correlations between samples (Hays, 1988). The correlations between positive symptoms and NEO-PI-R domain and facet scales for males and females are reported in Table 2. Neuroticism domain and facet scales appeared to exhibiit stronger correlations with positive schizotypy symptoms for females than males. In contrast, Openness domains and facets were more related to positive symptoms in males than in females. Agreeableness domains and facets were also related to positive symptoms, demonstrating more significant correlations in females over males; Conscientiousness domains and facets, however, showed significance in females over males. In contrast, Extraversion domains and facets were unrelated to positive symptoms in either group.

Insert Table 2 about here

We also reported the correlations between negative symptoms and NEO-PI-R domain and facet scales for males and females in Table 3. Again, Neuroticism exbihibited more significant correlations with negative symptoms in females than in males. These were invariably in the positive direction. Probably most consistent across the sexes were negative correlations of Extraversion with negative symptoms. In addition, Openness domain and facet scales were all negatively correlated with physical anhedonia across males and females whereas Agreeableness appeared to exhibit more negative correlations with negative symptoms in females versus males.

Finally, only selected facet scales of Conscientiousness were related—negatively—with negative schizotypy symptoms in both groups.

Insert Table 3 about here

In order to examine unique contributions of specific five factor traits to positive and negative schizotypic symptoms, we used multiple regression with hierarchical entry where sex was entered in the first step, followed by the five NEO PI-R domains in the second step, as predictors of schizotypy symptoms. Because zero-order correlations between NEO-PI-R domains and facets revealed some notable differences between men and women in terms of schizotypy symptoms, we included sex in the first step where adjusted R^2 change values are reported in Table 4. A particular strength of this study is that we were able to examine different symptoms for these personality disorder types vis-a-vis the Chapman psychosis proneness scales. Consequently, we present Five Factor domain scales in the prediction of positive, negative, and positive and negative symptoms combined in Table 4. A composite of the PhysAn and RSocAn scales was used to assess symptoms of schizoid PD. MagId, PerAb, and RSocAn scales were combined to form a measure of schizotypal PD. Finally, all four scales were combined to test the hypothesis that the compounding of negative symptoms in schizotypal PD may lead to differences in observed relationships between schizotypal symptoms and Openness. In order that each scale received equal weighting in composite indices, we converted raw scores for each criterion scale to standard scores before obtaining a symptom composite.

Insert Table 4 about here

The FFM significantly predicted positive (Adj. $\underline{R}^2$ = .17, $\underline{p}$ < .01) and negative (Adj. $\underline{R}^2$ = .45, $\underline{p}$ < .001) schizotypic symptoms. However, the FFM better accounted for negative symptoms than positive symptoms (Fisher's r-to-z transformation, $\underline{z}$ = 7.09, $\underline{p}$ < .001; Hays, 1988). Positive symptoms were positively related to Openness to experience and Neuroticism, where a marginally significant negative relationship was found for Agreeableness. However, Extraversion was unrelated to either MagId or PerAb scores. In contrast, negative symptoms were significantly and negatively associated with Extraversion, Agreeableness, and Openness to experience but positively with Neuroticism. In particular, lower Extraversion was the best predictor of RSocAn whereas lower Openness was the best predictor of PhysAn. Conscientiousness played no unique role in predicting either positive or negative symptoms.

Although the RSocAn and PhysAn composite maps nicely on to schizoid PD, we examined the addition of RSocAn to the MagId and PerAb scales as our criterion for schizotypal PD. As noted earlier, RSocAn seems to characterize the negative symptoms of schizotypal PD both conceptually and empririically whereas the importance of PhysAn remains at issue. The FFM significantly predicted schizotypal PD symptoms (Adj. $\underline{R}^2$ = .21, $\underline{p}$ < .001) where Neuroticism and Openness were positively related whereas Extraversion and Agreeableness were negatively related to this characteristics. Further, when negative symptoms were compounded by adding PhysAn to the criterion, Openness was conspicuously reduced to nonsignificance in the multivariate model.

Given these findings for the domain scales of the NEO PI-R in the prediction of positive and negative symptoms representing schizotypal PD and negative symptoms representing schizoid PD, we examined the facet scale contributions to standing on the FFM for each disorder

type. Although Trull and Widiger (1997) and Widiger et al. (1994) have predicted FFM facet scale relationships to these disorders, we used a mixed model (hierarchical and stepwise) with sex entered in the first step, and stepwise entry of facet scales within each significant domain in the second step, to best predict standing on core symptoms of schizotypal and schizoid PD. Stepwise multiple regression may result in models that are biased by sampling error and lack generalizability. However, the size of the current sample is sufficiently large in size to warrant use of a stepwise procedure (Tabachnik & Fidell, 1996). Further, with the exception of Trull, Burr, and Widiger (1999), there is little empirical evidence which points to particular facet scales in the prediction of schizotypal or schizoid PD. We first report results for positive symptoms (see Table 5) and then for negative symptoms (see Table 6), respectively. For positive symptoms, Depression and Impulsiveness facets accounted for the positive relationship with Neuroticism. Fantasy and Aesthetics facets of Openness were found to signficantly predict schizotypal symptoms. Further, Trust and Straightforwardness had a negative relationship whereas Tendermindedness had a positive relationship to positive symptoms. For negative symptoms representing schizoid PD, Warmth, Gregariousness, and Positive Emotions accounted for the negative relationship to Extraversion whereas Aesthetics, Feelings, and Actions accounted for the negative relationship to Openness. In addition, Trust, Altruism, and Tendermindedness accounted for the negative relationship of schizoid symptoms to the domain of Agreeableness. Notably mixed findings were found for Neuroticism. Although Hostility and Self-Consciousness positively predicted negative symptoms, Anxiety and Impulsiveness were negatively predictive of negative symptoms. These findings were in keeping with zero-order correlations for negative symptoms and did not indicate the presence of a suppressor variable.

Insert Table 5 and 6 about here

In addition, we included an analysis of facet scales contributing to domain scale predictions of positive symptoms (MagId and PerAb) and negative symptoms (RSocAn) which characterize schizotypal PD (see Table 7). We found that facets of Depression and Self-Consciousness accounted for the positive relationship to Neuroticism. For Extraversion, however, Excitement-Seeking was positively whereas Warmth and Gregariousness were negatively related to Schizotypal PD symptoms. The Ideas and Aesthetics facets accounted for the positive relationship with Openness. Trust, Straighforwardness, and Tendermindedness accounted for the negative relationship with Agreeableness.

Insert Table 7 about here

Discussion

The results of the current study are notably consistent with predictions made by Trull and Widiger (1997), and Widiger et al. (1994). In terms of FFM domains, both schizoid and schizotypal PD symptoms were negatively associated with Extraversion and Agreeableness. Further, Openness was the trait that distinguished the two disorder types from each other. Specifically, higher levels of schizotypal symptoms were related to higher levels of Openness whereas higher levels of schizoid symptoms were related to lower levels of Openness. However, facets of Neuroticism demonstrated mixed relationships with negative or schizoidal symptoms with facets uniformly positively related to positive symptoms. An examination of the simple correlations between the five personality traits and the Chapman scales suggest that Physical

Anhedonia primarily accounted for the negative relationship between negative or schizoid symptoms and Openness. Likewise, positive symptoms appeared to account for the negative relationship between schizotypal PD and Openness. Nonetheless, the ability of the FFM to predict positive symptoms was modest and significantly lower than when predicting negative symptoms where the relationship was rather strong. These findings suggest that positive symptoms, as continuous indicators of psychotic-like experiences, are not adequately assessed using the NEO-PI-R.

In addition, sex differences for the relationships of positive and negative schizotypy symptoms to NEO-PI-R domain and facet scales were apparent. For positive symptoms, differences in Openness, Agreeableness, and Conscientiousness were most notable. Stronger relationships of Openness and Conscientiousness in men and Agreeableness with positive symptoms in females were found. For negative symptoms, differences in Neuroticism and, to a lesser extent, Agreeableness were found between sexes, with both domains playing a greater role in females.

Our results contribute to previous findings on the FFM and Cluster A personality disorders in a number of important ways. First, rather than using a categorical approach to the assessment of schizotypal and schizoid personality disorder symptoms, we attempted to capture the underlying dimensions of each disorder. More recently developed measures of personality pathology such as the Schedule for Nonadaptive and Adaptive Personality (SNAP; Clark, 1993) and the Personality Assessment Inventory (PAI; Morey, 1991) include measures of specific attributes that define each disorder dimension. Although the use of the FFM to describe personality disorders is, in itself, an attempt to capture the dimensions that comprise each disorder category, few studies have attempted to link the FFM dimensions of normal personality to specific pathological dimensions of personality disorder. In the current study, we were able to

utilize measures of specific symptom types. The latter approach allowed us to determine which symptom sets within each disorder accounted for the relationships between the FFM and schizoid and schizotypal dispositions. For example, we found that physical anhedonia but not social anhedonia appeared to account for the negative relationship between schizoid PD and Openness, as noted above.

Another important contribution of this study was that we found evidence for the central role of Openness in distinguishing between schizoid and schizotypal PDs. Although this is theoretically predicted by some proponents of the FFM (Widiger et al., 1994), only a few studies have reported a positive relationship between Openness and schizotypal PD (Wiggins & Pincus, 1989; Costa & Widiger, 1994b). In a recent study by West (1999), the Magical Ideation and Perceptual Aberration scales were administered to psychiatric inpatients along with measures of the FFM. He found that although scores on both scales were positively related to Neuroticism, no relationship was found between these scales and Openness. Of importance, however, is that negative symptoms were not assessed in this sample.

There are a number of explanations for the inconsistency in finding a relationship between Openness and schizotypal PD symptoms in our study compared to other studies. One possibility is that, like Coolidge et al. (1994) and Wiggins and Pincus (1989), we used a college student sample. A number of studies that fail to find a relationship between Openness and schizotypal PD relied on a psychiatric population (Cloninger & Svrakic, 1994; Trull, 1992; West, 1999; Yeung et al., 1993). However, this explanation may be incomplete because studies utilizing a student sample have found varying results. Although Coolidge et al. (1994) failed to find such a relationship, Wiggins and Pincus (1989) did. Nonetheless, it is possible that the endorsement of items on the Magical Ideation and Perceptual Aberration scales by participants in non-clinical samples more likely reflects a willingness to entertain non-traditional beliefs than to

reflect a proneness to schizophrenia. A more intriguing explanation, however, which was partially supported by results from the current study, is that the amount or kind of negative symptoms plays a substantial role in dispositional levels of Openness to experience.

A final contribution of the current study is that it is one of the few empirical demonstrations of the utility of NEO-PI-R facet scales in the description of Cluster A PD symptoms. The fact that we used stepwise multiple regression procedures yet found theoretically predicted relationships between facet scales and PD symptoms is a testament to the robust validity of these scales. With the notable exception of Trull et al. (1999), we know of no other studies examining facet scale contributions to the prediction of personality disorder symptoms. Some have argued that this is an important consideration because only lower-order traits within Openness may account for the predicted relationships between Openness and schizotypal PD (Costa & Widiger, 1994b). However, our study also supports the utility of relying on domain scales of the NEO-PI-R in identifying and describing maladaptive personality styles. Nonetheless, when facet scales were examined, the facets of Depression and Self-Consciousness best accounted for the positive relationship between Neuroticism and symptoms reflecting schizotypal PD, suggesting that persons with more symptoms experience more depression and self-focused anxiety. In addition, social introversion was also reflected in negative relationships with Warmth and Gregariousness which are consistent with the aloof and detached disposition consistent with the interpersonal deficits found in schizotypal PD. However, a tendency to engage in thrill-seeking was found in the positive relationship to Excitement-Seeking. In addition, an appreciation for ideas and sensitive, artistic values was reflected in positive relationships with facet scales of Aesthetics and Ideas for Openness. Finally, a propensity to distrust others, prevaricate or cheat to avoid interpersonal conflict, and a sensitivity to human

suffering was indicated by negative associations with Trust and Straightforwardness, but a positive relationship with the Tendermindedness facet of Agreeableness.

Facet scales of the NEO-PI-R were also helpful in characterizing schizoidal symptoms. Although the domain scale of Neuroticism was useful in describing negative schizotypy symptoms, heterogeneity within this trait was discovered when examining lower-order FFM traits. For example, Hostility and Self-Consciousness were positively associated with schizoidal symptoms, indicating a propensity for self-focus in social situations but also a tendency to externalize blame for current failures. In contrast, negative relationships with Anxiety and Impulsiveness suggest that persons higher in schizoidal symptoms feel less ego-dystonic distress and are less sensitive to external cues of reinforcement and gratification. Additionally, negative relationships with Warmth, Gregariousness, and Positive Emotions were consistent with the interpersonal detachment and constricted affect typical of schizoid PD. Facet scales of Aesthetics, Emotions, and Activity from Openness were also indicative of constricted affect and behavior. Finally, facet scales of Agreeableness were also consistent with conceptualizations of schizoid PD as suspicious of others, self-centered, and hard-hearted. These findings lend further support to previous findings indicating that negative symptom schizotypy is a construct that is highly consistent with contemporary diagnostic formulations of schizoid personality disorder as embodied in the DSM-IV. Not only were Extraversion, Openness, and Agreeableness negatively related in the prediction of schizoid PD symptoms, but relationships to lower-order FFM traits were generally consistent, as well. Although not theoretically predicted, Agreeableness was also negatively related to schizoidal symptoms, which is consistent with previous findings (Blais, 1997; Costa & McCrae, 1990; Yeung et al., 1993). Specifically, facets of Trust, Altruism, and Tender-mindedness predicting higher negative symptoms are consistent with characterizations of schizoid PD as uncaring and mistrustful. It is worthy to note that the majority of facets within

these larger domains significantly contributed to schizoidal tendencies. Not only do these findings lend further support to the validity of the NEO PI-R in the measurement of personality pathology, they highlight the use of specific measures of core PD symptoms and the utility of lower-order FFM traits in the evaluation of personality pathology.

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Table 1

Means, Standard Deviations, and Alpha Estimates of Reliability for Raw Scores of Positive and Negative Schizotypy Symptoms and NEO-PI-R Domain and Facet Scales (N = 465)

Scale	M	SD	Cronbach's α
Schizotypy			
Magical Ideation	9.37	5.58	.83
Perceptual Aberration	5.62	5.60	.89
Physical Anhedonia	13.83	7.08	.83
Social Anhedonia	9.50	5.22	.79
NEO-PI-R			
Neuroticism	97.84	21.78	.91
Anxiety	17.85	5.17	.75
Angry hostility	15.44	5.11	.74
Depression	16.70	5.81	.80
Self-consciousness	17.13	4.83	.68
Impulsiveness	17.85	4.58	.63
Vulnerability	12.78	4.59	.73
Extraversion	119.56	19.09	.88
Warmth	22.95	4.33	.73
Gregariousness	19.15	5.33	.73
Assertiveness	16.55	5.23	.76
Activity	17.87	4.01	.55
Excitement-seeking	21.08	4.53	.60
Positive emotions	21.43	4.62	.71
Openness	116.78	18.27	.87
Fantasy	19.75	5.33	.77
Aesthetics	19.13	5.88	.80
Feelings	22.20	4.43	.71
Actions	15.64	3.67	.57
Ideas	18.79	5.07	.75
Values	20.70	3.77	.62
Agreeableness	112.88	19.55	.89
Trust	17.43	5.01	.78
Straightforwardness	18.27	5.13	.72
Altruism	23.32	4.26	.72
Compliance	15.79	5.00	.69
Modesty	17.59	5.45	.78
Tender-mindedness	20.10	3.65	61

Conscientiousness	110.41	19.35	.88
Competence	20.05	3.89	.65
Order	17.15	4.75	.68
Dutifulness	20.34	3.99	.60
Achievement-striving	18.64	4.45	.71
Self-discipline	17.34	5.11	.78
Deliberation	16.54	4.54	.71

Note. M = Mean. SD = Standard Deviation. NEO-PI-R = Revised NEO Personality Inventory.

Table 2

Zero-Order Correlations of Positive Symptoms with NEO-PI-R Domain and Facet Scales in Males (n = 100) and Females (n = 100)

	Magical Ideation		Perceptual Aberration	
NEO-PI-R Domain or Facet	Males	Females	Males	Females
Neuroticism	.25[a]	.38[c]	.22[a]	.32[c]
Anxiety	.21[a]	.24	.17	.17
Angry hostility	.07	.24	.06	.20
Depression	.29[b]	.36[c]	.25[a]	.34[c]
Self-consciousness	.08	.27[b]	.10	.24[a]
Impulsiveness	.21[a]	.32[c]	.20[a]	.17
Vulnerability	.21[a]	.26[b]	.17	.27[b]
Extraversion	.03	-.08	-.05	-.04
Warmth	.13	-.18	-.04	-.15
Gregariousness	.04	-.05	-.08	.00
Assertiveness	-.02	.01	-.05	.05
Activity	-.15	.04	-.14	.03
Excitement-seeking	.01	.02	.06	.09
Positive emotions	.11	-.16	.06	-.18
Openness	.39[c]	.18	.34[c]	.18
Fantasy	.39[c]	.07	.40[c]	.08
Aesthetics	.34[c]	.29[b]	.27[b]	.28[b]
Feelings	.31[b]	.17	.14	.17
Actions	.11	-.11	.12	.02
Ideas	.22[a]	.23[a]	.25[a]	.15
Values	.11	-.02	.10	-.05
Agreeableness	.03	-.24[a]	-.03	-.22[a]
Trust	-.21[a]	-.24[a]	-.22[a]	-.27[b]
Straightforwardness	-.01	-.29[b]	-.02	-.21[a]
Altruism	.08	-.18	-.01	-.14
Compliance	.11	-.09	.03	-.06
Modesty	-.07	-.10	-.02	-.08
Tender-mindedness	.23[a]	-.03	.10	-.06
Conscientiousness	-.21[a]	.01	-.27[b]	-.05
Competence	-.11	-.14	-.14	-.17
Order	-.04	.26[b]	-.14	.10
Dutifulness	-.22[a]	-.03	-.18	-.05

Achievement-striving	-.23[a]	.04	-.30[b]	-.02
Self-discipline	-.18	-.06	-.26[b]	-.07
Deliberation	-.17	-.06	-.19	-.01

Note. NEO-PI-R = Revised NEO Personality Inventory. [a]$p < .05$. [b]$p < .01$. [c]$p < .001$.

Table 3

Zero-Order Correlations of Negative Symptoms with NEO-PI-R Domain and Facet Scales in Males (n = 100) and Females (n = 100)

	Revised Social Anhedonia		Physical Anhedonia	
NEO-PI-R Domain or Facet	Males	Females	Males	Females
Neuroticism	.10	.32[c]	.10	.29[b]
Anxiety	-.01	.06	-.07	.18
Angry hostility	.26[b]	.44[c]	.27[b]	.25
Depression	.06	.28[b]	.01	.27[b]
Self-consciousness	.17	.33[c]	.18	.33[c]
Impulsiveness	-.06	.09	-.00	-.11
Vulnerability	.00	.18	.06	.33[c]
Extraversion	-.51[c]	-.48[c]	-.31[b]	-.30[b]
Warmth	-.42[c]	-.59[c]	-.21[a]	-.34[c]
Gregariousness	-.56[c]	-.42[c]	-.23[a]	-.08
Assertiveness	-.22[a]	-.13	-.13	-.21[a]
Activity	-.26[b]	-.11	-.18	-.14
Excitement-seeking	-.21[a]	-.15	-.07	-.13
Positive emotions	-.44[c]	-.52[c]	-.45[c]	-.34[c]
Openness	-.16	-.23[a]	-.59[c]	-.64[c]
Fantasy	-.05	-.31[b]	-.40[c]	-.47[c]
Aesthetics	-.13	-.04	-.61[c]	-.54[c]
Feelings	-.31[b]	-.28[b]	-.50[c]	-.40[c]
Actions	-.24[a]	-.10	-.28[b]	-.43[c]
Ideas	.11	.02	-.27[b]	-.34[c]
Values	-.07	-.22[a]	-.22[a]	-.27[b]
Agreeableness	-.26[b]	-.50[c]	-.21[a]	-.33[c]
Trust	-.33[c]	-.47[c]	-.11	-.41[c]
Straightforwardness	-.15	-.40[c]	-.12	-.18
Altruism	-.28[b]	-.55[c]	-.12	-.34[c]
Compliance	-.15	-.28[b]	-.20	-.14
Modesty	-.02	-.17	.01	-.07
Tender-mindedness	-.19	-.16	-.31[b]	-.20[a]
Conscientiousness	-.01	-.01	-.14	.03
Competence	-.11	-.22[a]	-.19	-.20[a]
Order	-.04	.16	-.22[a]	.26[a]
Dutifulness	.09	-.15	-.01	-.19

Achievement-striving	-.15	.07	-.08	-.02
Self-discipline	.01	.04	-.11	.07
Deliberation	.13	.01	-.01	.12

Note. NEO-PI-R = Revised NEO Personality Inventory. [a]$p < .05$. [b]$p < .01$. [c]$p < .001$.

Table 4

Adj. $\underline{R}^2$ Δ and Beta (β) Weights in Hierarchical Multiple Regression Equations for NEO PI-R Domain Scales Predicting Chapman Scale Combinations of Positive and Negative Schizotypy Symptoms after Controlling for Sex

			NEO PI-R Domain Scale				
Chapman Scales	$\underline{R}$	Adj. $\underline{R}^2$ Δ	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
MagId + PerAb (Positive symptoms)	.42	.17	.26 [c]	-.01	.26 [c]	-.16	-.04
PhysAn + RsocAn[1] (Negative Symptoms)	.67	.45	.13 [b]	-.39 [c]	-.28 [c]	-.32 [c]	.06
MagId + PerAb + RsocAn[2]	.46	.21	.24 [c]	-.23 [c]	.23 [c]	-.27 [c]	.01
MagId + PerAb + RsocAn + PhysAn	.51	.26	.27 [c]	-.25 [c]	.01	-.32 [c]	.01

Note. NEO PI-R = Revised NEO Personality Inventory. All Adj $\underline{R}^2$ values are significant at $\underline{p} <$ .001. [a]$p < .05$. [b]$\underline{p} < .01$. [c]$\underline{p} < .001$. MagId = Magical Ideation Scale. PerAb = Perceptual Aberration Scale. PhysAn = Physical Anhedonia Scale. RSocAn = Revised Social Anhedonia Scale. [1]Represents schizoid PD using DSM-IV criteria. [2]Represents schizotypal PD using DSM-IV criteria.

Table 5

Mixed Model Multiple Regression Equations for NEO PI-R Neuroticism, Openness, and Agreeableness Facet Scales Predicting Positive Symptom Schizotypy (MagId and PerAb) after Controlling for Sex (N = 463)

NEO PI-R Domain	Facet Scale	β	t	p
Neuroticism	Depression[b]	.251	5.330	.000
	Impulsiveness	.134	2.842	.005
Openness	Fantasy[a,b,c]	.150	2.950	.003
	Aesthetics[a]	.248	5.027	.000
Agreeableness	Trust[a,b]	-.170	-3.456	.001
	Straightforwardness	-.179	-3.593	.000
	Tender-mindedness	.152	3.115	.002

Note. NEO PI-R = Revised NEO Personality Inventory. [a]hypothesized by Trull and Widiger (1997) to be related to schizotypal PD. [b]hypothesized by Widiger, Trull, Clarkin, Sanderson, and Costa (1994) to be related to schizotypal PD. [c]reported by Trull, Burr, and Widiger (1999) to significantly predict schizotypal PD.

Table 6

Mixed Model Multiple Regression Equations for NEO PI-R Extraversion, Openness, and Agreeableness Facet Scales Predicting Negative Symptom Schizotypy (RSocAn and PhysAn) after Controlling for Sex (N = 463)

NEO PI-R Domain	Facet Scale	β	t	p
Neuroticism	Anxiety	-.123	-2.288	.023
	Hostility	.347	7.380	.000
	Self-Consciousness	.227	4.246	.000
	Impulsiveness	-.172	-3.597	.000
Extraversion	Warmth[a,b,c]	-.250	-5.041	.000
	Gregariousness[a,b,c]	-.169	-3.767	.000
	Positive Emotions[a,b,c]	-.293	-6.398	.000
Openness	Aesthetics	-.195	-3.795	.000
	Feelings[a,b]	-.335	-6.722	.000
	Actions	-.154	-3.468	.001
Agreeableness	Trust	-.318	-6.652	.000
	Altruism	-.217	-4.492	.000
	Tender-mindedness	-.103	-2.186	.029

Note. NEO PI-R = Revised NEO Personality Inventory. [a]hypothesized by Trull and Widiger (1997) to be related to schizoid PD. [b]hypothesized by Widiger, Trull, Clarkin, Sanderson, and

Costa (1994) to be related to schizoid PD. [c]reported by Trull, Burr, and Widiger (1999) to significantly predict schizoid PD.

Table 7

Mixed Model Multiple Regression Equations for NEO PI-R Neuroticism, Extraversion, Openness, and Agreeableness Facet Scales Predicting Schizotypal Symptoms (MagId, PerAb, and RSocAn) after Controlling for Sex (N = 463)

NEO PI-R Domain	Facet Scale	β	t	p
Neuroticism	Depression[b]	.238	5.215	.000
	Self-Consciousness[a,b,c]	.208	4.560	.000
Extraversion	Warmth[b]	-.189	-3.678	.000
	Gregariousness[a,b]	-.258	-4.534	.000
	Excitement-Seeking	.199	3.918	.000
Openness	Aesthetics	.178	3.509	.000
	Ideas[a,b,c]	.154	3.053	.002
Agreeableness	Trust[a,b,c]	-.283	-5.924	.000
	Straightforwardness	-.176	-3.660	.000
	Tendermindedness	.115	2.447	.015

Note. NEO PI-R = Revised NEO Personality Inventory. [a]hypothesized by Trull and Widiger (1997) to be related to schizotypal PD. [b]hypothesized by Widiger, Trull, Clarkin, Sanderson, and Costa (1994) to be related to schizotypal PD. [c]reported by Trull, Burr, and Widiger (1999) to significantly predict schizotypal PD.