



The five-factor model in schizotypal personality disorder

Citation

Gurrera, Ronald J., Chandlee C. Dickey, Margaret A. Niznikiewicz, Martina M. Voglmaier, Martha E. Shenton, and Robert W. McCarley. 2005. "The Five-Factor Model in Schizotypal Personality Disorder." *Schizophrenia Research* 80 (2-3) (December): 243–251. doi:10.1016/j.schres.2005.08.002.

Published Version

doi:10.1016/j.schres.2005.08.002

Permanent link

<http://nrs.harvard.edu/urn-3:HUL.InstRepos:28623949>

Terms of Use

This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at <http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA>

Share Your Story

The Harvard community has made this article openly available.
Please share how this access benefits you. [Submit a story](#).

[Accessibility](#)

Published in final edited form as:

Schizophr Res. 2005 December 15; 80(2-3): 243–251. doi:10.1016/j.schres.2005.08.002.

The five-factor model in schizotypal personality disorder

Ronald J. Gurrera^{a,b,*}, Chandlee C. Dickey^{a,b,c}, Margaret A. Niznikiewicz^{a,b,d}, Martina M. Voglmaier^{a,e}, Martha E. Shenton^{a,b,c}, and Robert W. McCarley^{a,b}

Ronald J. Gurrera: ronald.gurrera@med.va.gov; Chandlee C. Dickey: chandlee_dickey@hms.harvard.edu; Margaret A. Niznikiewicz: margaret_niznikiewicz@hms.harvard.edu; Martina M. Voglmaier: martina_voglmaier@hms.harvard.edu; Martha E. Shenton: martha_shenton@hms.harvard.edu; Robert W. McCarley: robert_mccarley@hms.harvard.edu

^a Harvard Medical School, Department of Psychiatry, USA

^b VA Boston Healthcare System, 940 Belmont Street (116A), Brockton MA 02301, USA

^c Brigham Behavioral Neurology Group, Brigham and Women's Hospital, Boston MA, USA

^d Massachusetts Mental Health Center, Boston MA, USA

^e Cambridge Health Alliance, Department of Psychiatry, 1493 Cambridge Street, Cambridge MA 02139, USA

Abstract

Studies of the five-factor model of personality in schizotypal personality disorder (SPD) have produced inconsistent results, particularly with respect to openness. In the present study, the NEO-FFI was used to measure five-factor personality dimensions in 28 community volunteers with SPD and 24 psychiatrically healthy individuals. Standard multivariate statistical analyses were used to evaluate personality differences as a function of diagnosis and gender. Individuals with SPD had significantly higher levels of neuroticism and significantly lower levels of extraversion, agreeableness and conscientiousness than those without SPD. Female, but not male, SPD subjects had significantly higher openness levels than their healthy counterparts, and this gender-specific group difference persisted when SPD symptom severity was statistically controlled. These findings suggest that gender-associated differences in openness may account for prior inconsistent findings regarding this dimension, and they further underscore the importance of examining gender effects in future studies of SPD.

Keywords

Schizotypal personality disorder; Five-factor model; Openness; Gender

1. Introduction

1.1. The five-factor model

Personality description and classification systems can be grouped into those that delineate distinct categorical entities based upon specific features, and those that attribute individual differences to variation along one or more continuous dimensions. Axis II of the DSM-IV exemplifies the former approach, and the five-factor model is a widely known example of the latter. The five-factor model is well replicated across instruments and over time (John and Srivastava, 1999), and posits that variation along broad personality dimensions (the so-called 'Big Five') accounts for most inter-individual personality differences (Digman, 1990). Until

*Corresponding author. 940 Belmont Street (116A), Brockton, MA 02301, USA. Tel.: +1 508 583 4500x62482; fax: +1 508 586 0894.

recently, investigations of categorical and dimensional personality models have proceeded along mutually independent lines of research, reflecting their origins in clinical psychiatry and academic psychology, respectively (Lenzenweger and Clarkin, 1996).

A widely used measure of the Big Five dimensions is the NEO Personality Inventory (Costa and McCrae, 1992), which defines each dimension in terms of related attributes, or facets. Thus, individuals who score high on neuroticism are tense, irritable, dissatisfied, shy, moody and lacking self-confidence. High extraversion indicates an individual who is sociable, forceful (assertive), energetic, adventurous, enthusiastic, and outgoing. High openness individuals are curious, imaginative, artistic, excitable, unconventional, and have wide interests. High agreeableness individuals are forgiving, not demanding, warm, compliant (not stubborn), modest (not show-offs), and sympathetic. High conscientiousness indicates someone who is efficient, organized, dutiful (not careless), thorough, self-disciplined (not lazy), and deliberate (not impulsive).

1.2. The five-factor model and personality disorders

The conceptual gap between dimensional constructs of “normal” personality and clinically based categorical classifications of abnormal personality was bridged empirically by Wiggins and Pincus (1989), who demonstrated that the five-factor model accounts for much of the variance in personality disorder (PD) diagnoses. Similar results were obtained subsequently by others. For example, using several different PD measures in a community sample, Costa and McCrae (1990) concluded that the five-factor model accounts for the “major dimensions underlying personality disorder”. In another study (Blais, 1997), clinicians used five-factor model trait descriptions to rate their own patients who met DSM-IV diagnostic criteria for one or more PDs and obtained results similar to those reported by Wiggins and Pincus (1989).

Based upon a review of these and other studies, Dyce (1997) concluded that high neuroticism is typical of PDs generally, whereas openness may be elevated in some (e.g., narcissistic and histrionic) but low in others (e.g., schizoid). In undergraduates schizotypal personality disorder (SPD) scores were positively related to neuroticism and openness, and negatively related to extraversion and agreeableness (Dyce and O’Connor, 1998). Morey et al. (2002) examined the five-factor model in patients with borderline, avoidant, obsessive–compulsive, and schizotypal PDs and found that they shared a common pattern of above-average neuroticism and below-average extra-version, agreeableness and conscientiousness; openness was elevated in all subgroups except avoidant PD. A limitation of that study is that subjects with major mood disorders were not excluded.

1.3. The five-factor model in schizotypal personality disorder

Among clinical PDs, SPD is least accounted for by the five-factor model (Stone, 1993; Lynam and Widiger, 2001), possibly because it lacks a dimension related to aberrant cognition (Costa and McCrae, 1990). Studies of the relationship between five-factor model traits and SPD have also yielded inconsistent results, which may reflect differences in personality and PD measures, analytic methods, and types of populations sampled (Dyce, 1997).

Perhaps the most controversial issue in research on SPD and the five-factor model is the role of openness (Ross et al., 2002). Morey et al. (2002) found that openness was elevated in patients with SPD, but other studies found no relationship (Trull, 1992; Yeung et al., 1993; Blais, 1997). Schizotypy is positively correlated with openness in college students (Wiggins and Pincus, 1989; Coolidge et al., 1994), but Tien et al. (1992) reported that it is negatively related to openness in a community sample, and others (Costa and McCrae, 1990) found that openness is unrelated or negatively related to SPD depending on the PD measure used.

Generally, studies reporting a positive relation between openness and SPD symptoms have used college student samples, whereas those failing to find this relation have utilized psychiatric samples (Ross et al., 2002), suggesting that symptom severity may influence this relationship. In particular, Ross et al. (2002) have proposed that discrepant results are due to failures to control for negative SPD symptom severity within samples. Intelligence (Ashton et al., 2000) and cognitive performance (Demetriou et al., 2003) are other factors that might contribute to differences in openness scores. It is also possible that different ascertainment methods could influence reported openness levels. Some subject populations (e.g., college students or paid volunteers) might be more inclined than others (e.g., patients referred by a treating clinician) to report more openness characteristics. However, this theoretical bias does not appear to account for the pattern of findings that have been reported.

1.4. SPD, personality dimensions and gender

Although many potentially confounding variables have been implicated in these discrepant findings, gender has not been considered. Morey et al. (2002) compared personality dimension scores in their SPD subjects to mixed gender norms, possibly obscuring any contribution by gender. Gender effects may also have been obscured by the use of self-standardized scores in the study by Wiggins and Pincus (1989), because systematic gender effects on other personality traits could differentially affect self-standardized scores for openness in female and male subjects. However, Ross et al. (2002) reported that positive SPD symptoms were positively, and negative SPD symptoms negatively, related to openness after statistically removing gender effects, and previous work by Niznikiewicz et al. (2004) indicates that gender may be important in understanding SPD.

1.5. Study aims

In the present study, men and women who met diagnostic criteria for SPD were recruited from the community and compared to a psychiatrically healthy community sample with respect to five-factor personality dimensions. Because SPD is thought to be genetically related to schizophrenia (Kendler et al., 1993; Battaglia and Torgersen, 1996), we hypothesized that personality profiles in SPD subjects would resemble those in patients with schizophrenia (Gurrera et al., 2000). Specifically, we predicted that SPD subjects would show elevated neuroticism, reduced extraversion and conscientiousness, and reduced or normal levels of openness and agreeableness. We were also interested in examining the SPD subjects for gender-related personality differences, which have not been described previously.

2. Materials and methods

2.1. Subjects

2.1.1. Recruitment—Subjects were recruited from the community for participation in ongoing research into the biology of SPD. Potential SPD subjects responded to advertisements such as the following: “Do you believe you have ESP, telepathy, or a ‘sixth sense’? Do you have anxiety or discomfort in situations with unfamiliar people? Do you have few close friends? Do you mistake noises for voices?” The advertisement sought volunteers for “a study concerned with personality traits and brain function.” Comparison group subjects were recruited with a different set of advertisements; any individual who responded to an SPD advertisement was automatically excluded from the comparison group. After a complete description of the study was provided, subjects gave written informed consent. This study was approved by the Human Studies Subcommittees of the VA Boston Healthcare System and the Harvard University School of Medicine.

2.1.2. Selection criteria—Subjects were right-handed, had an IQ greater than 79, and spoke English as a first language. Exclusion criteria included any history of neurological illness,

traumatic brain injury, or loss of consciousness greater than 1 h; personal history of an Axis I psychotic disorder or bipolar disorder, or prior treatment with antipsychotic medications; current Axis I mood disorder; any DSM-IV substance abuse during the previous year or any DSM-IV substance dependence disorder within the previous 5 years; exposure during the previous year to any drug or medication that impaired cognitive function; and current serious medical illness. Additional exclusion criteria for comparison group subjects were a personal history of an Axis I mental illness or Axis II personality disorder, and any Axis I disorder in a first-degree relative.

2.2. Clinical assessment

Semi-structured diagnostic interviews (SCID-I and SCID-II) were conducted by a licensed psychologist (MMV) or psychiatrist (CCD). Each SPD criterion was scored as present=3, subthreshold=2, or absent= 1. Thirteen men and 15 women met DSM-IV diagnostic criteria for SPD (i.e., at least five criteria scored as “present”). Subjects who responded to advertisements for the comparison group were included only if less than three SPD criteria were present (11 males, 13 females). Only two comparison group subjects (both male) had any SPD symptoms: one met the odd beliefs/magical thinking criterion, and the other evidenced suspicious/paranoid ideation, inappropriate/constricted affect, and subthreshold odd thinking and speech. These subjects were included to make the comparison group more representative of the general population.

2.3. Symptom scoring

The number of SPD positive symptoms (ideas of reference, odd beliefs/magical thinking, unusual perceptual experiences, odd thinking and speech, and suspicious/paranoid thinking) and negative symptoms (inappropriate/constricted affect, odd/eccentric/peculiar behavior or appearance, no close friends, and excessive social anxiety) scored as ‘present’ were summed to create positive and negative symptom subscales. Positive and negative SPD symptom subscales were summed to create a total SPD symptom score. Subjects in the SPD group were also evaluated with the SANS and SAPS (Andreasen, 1984a,b).

2.4. Demographic data

Age, years of education completed, subjects’ socioeconomic status (SES; Hollingshead, 1965), and subjects’ parental socioeconomic status (PSES) were recorded for each subject. Socioeconomic data were inversely scaled (higher scores indicate higher status). Intellectual function was assessed with either the WAIS-R or WAIS-III.

2.5. Personality measures

The NEO Five-Factor Inventory (NEO-FFI), Form S (Costa and McCrae, 1992), is a self-administered questionnaire consisting of 60 items rated on a 5-point response scale (‘strongly disagree’ to ‘strongly agree’). It measures five independent personality traits: neuroticism, extraversion, openness, agreeableness, and conscientiousness. Examples of questions relating to openness are “I don’t like to waste my time daydreaming”, “I am intrigued by the patterns I find in art and nature”, and “I often try new and foreign foods”. *T* scores were computed based on gender-specific normative data (Costa and McCrae, 1992).

2.6. Statistical analyses

SPD and comparison groups were initially compared using gender-specific *T* scores to control for possible gender effects on personality. Next, two-way MANOVA was performed with diagnosis and gender as between-subjects factors to examine whether personality dimensions varied as a function of those variables or their interaction. Correlations between demographic variables and personality scale scores were examined for potential sources of personality

variance other than diagnosis and gender; variables that showed statistically significant correlations with personality scale scores were partialled out, and residual personality scores were examined in a second two-way MANOVA.

3. Results

3.1. Descriptive statistics

Demographic data, by subgroup, are presented in Table 1. There were no significant subgroup differences for age, SES, PSES or IQ. The male comparison subgroup had significantly more education than other subgroups, which did not differ from one another (Table 1). Female SPD subjects had significantly higher mean total SPD scores than males (Table 2), but SPD subgroups did not differ on other symptom measures.

3.2. Diagnosis, personality and gender

T scores computed with gender-specific normative data (Costa and McCrae, 1992) differed significantly between SPD and comparison subjects on all personality dimensions (multivariate $F_{[5,46]} = 9.763, p < .001$). SPD subjects scored significantly higher on neuroticism and openness, and lower on extraversion, agreeableness and conscientiousness (Table 3). Gender subgroup *T* scores were consistent with group differences, except that female SPD subjects scored much higher on openness than their male counterparts, whose scores were similar to the male comparison subjects (Table 4). Also, female SPD subjects had somewhat lower conscientiousness scores than the male SPD subgroup. These subgroup differences were unexpected since *T* scores were computed using gender-specific normative data. In contrast, male and female comparison subjects had similar scores on all dimensions (Table 4).

To further evaluate the effects of gender and diagnosis on personality, two-way MANOVA with diagnosis and gender as between-subjects factors was performed using raw scores. This analysis confirmed a statistically significant main effect for diagnosis ($F_{[5,44]} = 9.528, p < .001$) and a significant gender \times diagnosis interaction ($F_{[5,44]} = 3.988, p = .005$), but only a weak trend for a main effect of gender ($F_{[5,44]} = 2.138, p = .079$). Post hoc univariate ANOVAs demonstrated that the effect of diagnosis was statistically significant for all personality dimensions ($F_{[1,48]} \geq 7.937, p \leq .007$), but only openness was significantly associated with gender ($F_{[1,48]} = 5.792, p = .020$) and a gender \times diagnosis interaction ($F_{[1,48]} = 17.342, p < .001$).

To identify possible sources of personality variance other than gender and diagnosis, product moment correlations were computed between personality dimensions and demographic variables, and between personality dimensions and symptom scales. A Bonferroni probability of .001, reflecting an alpha level of .05 applied to 50 comparisons, was used to evaluate the outcomes. In the total sample only education was significantly correlated with personality measures (for neuroticism, $r = -.531, p < .001$; for conscientiousness, $r = .452, p = .001$). Extraversion was correlated with SPD negative symptoms ($r = -.664, p < .001$), and there was a strong trend for a similar correlation with total SPD symptoms ($r = -.557, p = .002$). Thus, education differed between subgroups and was correlated with neuroticism and conscientiousness; and SPD symptoms differed between SPD subgroups and were correlated with extraversion. Openness was not correlated with any symptom measure in SPD subjects ($-.087 \leq r \leq .146, p \geq .460$) or SPD gender subgroups ($-.193 \leq r \leq .138, p \geq .526$).

To assess the possible contribution of differences in education and SPD symptom severity to personality differences between subgroups, a second MANOVA was performed on residual personality dimension scores after removing the variance due to educational achievement and SPD total symptoms. First, raw scores for each personality dimension were regressed on SPD total score (Table 5), and residual personality scores were saved. All personality dimensions

were significantly predicted by SPD total score. Next, because educational achievement remained correlated with residual neuroticism ($r = -.439, p = .001$) and residual conscientiousness ($r = .363, p = .008$), a second linear regression was carried out in which residual personality scores were regressed on educational achievement (Table 6). Note that only residual neuroticism and conscientiousness scores were significantly predicted by educational achievement (all other $F_{[1,50]} \leq .486, p \geq .489$), so only those residual scores from this second regression were saved separately.

The second MANOVA therefore included twice-regressed (on SPD total score and educational achievement) residual neuroticism and conscientiousness scores, and once-regressed (on SPD total score only) extraversion, openness, and agreeableness residual scores. With variance due to SPD symptoms and educational achievement extracted from personality scores, there was no longer a significant main effect for diagnosis ($F_{[5,44]} = .513, p = .765$). However, a strong gender \times diagnosis interaction persisted ($F_{[5,44]} = 3.508, p = .009$). This interaction was evaluated by post hoc univariate analyses.

Post hoc one-way ANOVAs revealed that the gender \times diagnosis interaction was due entirely to openness ($F_{[3,48]} = 6.928, p = .001$; all other $F_{[3,48]} \leq 1.838, p \geq .153$). Subgroup contrasts by LSD showed that residual openness scores in female SPD subjects were significantly higher than those in female ($p = .023$) but not male ($p = .247$) comparison subjects, whereas male SPD subjects had lower residual openness scores than female SPD subjects ($p < .001$), male comparison ($p = .005$) and female comparison ($p = .051$) subjects. Thus, female and male SPD subjects differed not only from controls, but also from one another. In fact, after accounting for variance due to subgroup differences in SPD symptom severity, female and male SPDs actually had divergent openness scores. Of the four subgroups, male SPD subjects had the lowest, and female SPD subjects the highest, mean residual openness scores. Conversely, male comparison subjects scored higher than their female counterparts on openness, although this difference was not statistically significant.

4. Discussion

Individuals with SPD had elevated neuroticism and reduced mean extraversion, agreeableness and conscientiousness scores compared to psychiatrically healthy individuals. These results are generally consistent with those obtained in previous studies that sampled psychiatric populations (Trull, 1992; Blais, 1997; Morey et al., 2002), first-degree relatives of patients with psychosis (Yeung et al., 1993), community volunteers (Tien et al., 1992) and college students (Dyce and O'Connor, 1998; Coolidge et al., 1994). Exceptions include Yeung et al. (1993), who found no relationship with extraversion; Tien et al. (1992), who found no relationship with agreeableness or conscientiousness; and Trull (1992), Blais (1997), and Dyce and O'Connor (1998), who found no relationship with conscientiousness.

Contrary to our prediction, derived from previous results obtained in male schizophrenia patients (Gurrera et al., 2000), openness was significantly higher in SPD subjects. This difference was due entirely to the female SPD subgroup, whose relatively elevated openness scores remained after symptom severity was statistically controlled. These results replicate and extend those of Morey et al. (2002), in that they confirm openness is elevated in individuals who meet DSM-IV diagnostic criteria for SPD, but indicate this feature is specific to women. Moreover, it appears that men with SPD may have reduced levels of openness when variance due to symptom severity is controlled. This gender effect is unlikely related to positive and negative SPD symptoms because gender subgroups did not differ on these subscales, and openness was not correlated with any symptom measure.

The persistence of significantly altered openness levels in SPD subjects after controlling for symptom severity argues against a superficial relationship between this trait and SPD. If altered openness levels merely reflected the predisposition of all SPD individuals to harbor unconventional ideas and esoteric beliefs, group differences on this dimension would have diminished when variance due to SPD symptom severity was removed. In this sample, however, group differences increased after controlling for SPD symptom severity. Moreover, openness scores were elevated in female, but not male, SPD subjects. This finding is intriguing in light of recent evidence that verbal learning and abstraction are relatively preserved in women, but not men, with SPD (Voglmaier et al., 2005). Previous work (Ashton et al., 2000) has found that openness correlates more strongly with so-called “crystallized” intelligence, as measured by performance on tests of verbal ability (including vocabulary, information and similarities), than it does with measures of “fluid” intelligence. Notably, that sample was predominantly (74%) female. Thus, one possibility is that the neurocognitive processes serving verbal functioning are relatively more preserved in women with SPD, and this asymmetric effect on verbal functioning is in turn associated with comparatively higher levels of openness.

These results enhance our understanding of the relationship between personality and schizophrenia spectrum pathology. Like individuals with schizophrenia, SPD individuals have higher scores on neuroticism and lower scores on extraversion, agreeableness and conscientiousness. Also, like men with schizophrenia, men with SPD have normal or reduced openness levels compared to healthy individuals, but female SPD individuals have comparatively elevated openness scores. This is the first report of a relationship between gender and openness in SPD. These results are in line with emerging evidence that gender may be an important, and mitigating, factor in schizophrenia (Goldstein, 1988) and SPD (Niznikiewicz et al., 2004; Voglmaier et al., 2005).

There is considerable evidence that SPD is genetically related to schizophrenia, although more recent work suggests it is the negative/odd symptom component that is more closely linked to schizophrenia, whereas positive symptoms may instead overlap genetically with mood disorders (Vollema and van den Bosch, 1995; Battaglia and Torgersen, 1996). Some studies (Vollema and van den Bosch, 1995; Ross et al., 2002) have found that positive schizotypy is associated with high openness and negative schizotypy is related to low openness, but male and female SPD subgroups did not differ with respect to positive and negative symptoms, so the gender effect observed here is likely mediated in some other way. Notably, openness is also substantially genetically determined (Plomin and Caspi, 1999), but it does not appear to be associated with gender (Costa and McCrae, 1992).

The present finding of a significant gender effect on openness levels in SPD is not likely related to methodological factors. Many previous studies used the same personality assessment instrument, or its lengthier equivalent, the NEO PI-R. Exclusive reliance on a self-report instrument to measure personality is a potential limitation of this and some previous studies, but observer-based personality measures are subject to similar sorts of bias (Ozer, 1999). The present study is limited by relatively small sample size, so its results need to be confirmed in a larger sample and using other assessment methods and instruments.

Underlying heterogeneity in the pathogenesis of SPD (Vollema and van den Bosch, 1995; Cadenhead et al., 2002) is another possible explanation for inconsistencies between the present results and previous work. The present results suggest that a previously unrecognized source of heterogeneity may reside in gender, and that the contribution of gender to SPD phenomenology should be examined in future studies.

Acknowledgments

This work was supported by VA Merit and REAP Awards (RWM, PI), MH R01 52801 (RWM, PI), K02 award MH001110 (MES), and a VA Advanced Career Development Award (CCD).

References

- Andreasen, NC. Scale for the Assessment of Negative Symptoms (SANS). University of Iowa; Iowa City: 1984a.
- Andreasen, NC. Scale for the Assessment of Positive Symptoms (SAPS). University of Iowa; Iowa City: 1984b.
- Ashton MC, Lee K, Vernon PA. Fluid intelligence, crystallized intelligence, and the openness/intellect factor. *J Res Pers* 2000;34:198–207.
- Battaglia M, Torgersen S. Schizotypal disorder: at the crossroads of genetics and nosology. *Acta Psychiatr Scand* 1996;94:303–310. [PubMed: 9124076]
- Blais MA. Clinician ratings of the five-factor model of personality and the DSM-IV personality disorders. *J of Nerv Ment Dis* 1997;185:388–393. [PubMed: 9205425]
- Cadenhead KS, Light GA, Geyer MA, McDowell JE, Braff DL. Neurobiological measures of schizotypal personality disorder: defining an inhibitory endophenotype? *Am J Psychiatry* 2002;159:869–871. [PubMed: 11986147]
- Coolidge FL, Becker LA, DiRito DC, Durham RL, Kinlaw MM, Philbrick PB. On the relationship of the five-factor personality model to personality disorders: four reservations. *Psychol Rep* 1994;75:11–21. [PubMed: 7984716]
- Costa PT Jr, McCrae RR. Personality disorders and the five-factor model of personality. *J Pers Disord* 1990;4:362–371.
- Costa, PT., Jr; McCrae, RR. NEO PI-R: Professional Manual (Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI). Psychological Assessment Resources, Inc; Odessa, FL: 1992.
- Demetriou A, Kyriakides L, Avraimidou C. The missing link in the relations between intelligence and personality. *J Res Pers* 2003;37:547–581.
- Digman JM. Personality structure: emergence of the five-factor model. *Annu Rev Psychol* 1990;41:417–440.
- Dyce JA. The big five factors of personality and their relationship to personality disorders. *J Clin Psychol* 1997;53:587–593. [PubMed: 9316813]
- Dyce JA, O'Connor BP. Personality disorders and the five-factor model: a test of facet-level predictions. *J Pers Disord* 1998;12:31–45. [PubMed: 9573518]
- Goldstein JM. Gender differences in the course of schizophrenia. *Am J Psychiatry* 1988;145:684–689. [PubMed: 3369553]
- Gurrera RJ, Nestor PG, O'Donnell BF. Personality traits in schizophrenia: comparison with a community sample. *J of Nerv Ment Dis* 2000;188:31–35. [PubMed: 10665458]
- Hollingshead, AB. Two Factor Index of Social Position. Yale University Press; New Haven, CT: 1965.
- John, OP.; Srivastava, S. The Big Five trait taxonomy: history, measurement, and theoretical perspectives. In: Pervin, LA.; John, OP., editors. *Handbook of Personality: Theory and Research*. Vol. 2. The Guilford Press; New York: 1999. p. 102-138.
- Kendler KS, McGuire M, Gruenberg AM, O'Hare A, Spellman M, Walsh D. The Roscommon family study. I Methods, diagnosis of probands, and risk of schizophrenia in relatives. *Arch Gen Psychiatry* 1993;50:527–540. [PubMed: 8317947]
- Lenzenweger, MF.; Clarkin, JF. The personality disorders: history, classification, and research issues. In: Clarkin, JF.; Lenzenweger, MF., editors. *Major Theories of Personality Disorder*. The Guilford Press; New York: 1996. p. 1-35.
- Lynam DR, Widiger TA. Using the five-factor model to represent the DSM-IV personality disorders: an expert consensus approach. *J Abnorm Psychology* 2001;110:401–412.

- Morey LC, Gunderson JG, Quigley BD, Shea MT, Skodol AE, McGlashan TH, Stout RL, Zanarini MC. The representation of borderline, avoidant, obsessive-compulsive, and schizotypal personality disorders by the five-factor model. *J Pers Disord* 2002;16:215–234. [PubMed: 12136679]
- Niznikiewicz MA, Friedman M, Shenton ME, Voglmaier M, Nestor PG, Frumin M, Seidman L, Sutton J, McCarley RW. Processing sentence context in women with schizotypal personality disorder: an ERP study. *Psychophysiology* 2004;41:367–371. [PubMed: 15102121]
- Ozer, DJ. Four principles for personality assessment. In: Pervin, LA.; John, OP., editors. *Handbook of Personality: Theory and Research*. Vol. 2. The Guilford Press; New York: 1999. p. 671-686.
- Plomin, R.; Caspi, A. Behavioral genetics and personality. In: Pervin, LA.; John, OP., editors. *Handbook of Personality: Theory and Research*. Vol. 2. The Guilford Press; New York: 1999. p. 251-276.
- Ross SR, Lutz CJ, Bailey SE. Positive and negative symptoms of schizotypy and the five-factor model: a domain and facet level analysis. *J Pers Assess* 2002;79:53–72. [PubMed: 12227668]
- Stone, MH. *Abnormalities of Personality: Within and Beyond the Realm of Treatment*. W.W. Norton & Co; New York: 1993.
- Tien AY, Costa PT, Eaton WW. Covariance of personality, neurocognition, and schizophrenia spectrum traits in the community. *Schizophr Res* 1992;7:149–158. [PubMed: 1515376]
- Trull T. DSM-III-R personality disorders and the five-factor model of personality: an empirical comparison. *J Abnorm Psychology* 1992;101:553–560.
- Voglmaier MM, Seidman LJ, Niznikiewicz MA, Dickey CC, Shenton ME, McCarley RW. A comparative profile analysis of neuropsychological function in men and women with schizotypal personality disorder. *Schizophr Res* 2005;74:43–49. [PubMed: 15694753]
- Vollema MG, van den Bosch RJ. The multidimensionality of schizotypy. *Schizophr Bull* 1995;21:19–31. [PubMed: 7770738]
- Wiggins J, Pincus A. Conceptions of personality disorders and dimensions of personality. *Psychol Assess* 1989;1:305–316.
- Yeung AS, Lyons MJ, Waternaux CM, Faraone SV, Tsuang MT. The relationship between DSM-III personality disorders and the five-factor model of personality. *Compr Psychiatry* 1993;34:227–234. [PubMed: 8348800]

Table 1

Mean (S.D.) demographic data by subgroup

Variable	SPD-m	SPD-f	C-m	C-f	$F_{(3,48)p}$
N	13	15	11	13	
Age (years)	37.6(11.8)	33.1(10.4)	31.2(10.4)	28.0(9.9)	1.844.152
Education (years)	15.3(2.6)	16.5(1.8)	19.0(3.4)	16.8(1.3)	5.042.004 ^a
SES	2.8(1.3)	2.5(1.6)	2.8(1.6)	2.3(1.8)	.342.795
PSES	4.1(1.1)	4.0(1.1)	4.2(1.0)	4.0(1.0)	.078.971
Full scale IQ	114.8(10.1)	119.1(13.8)	121.1(15.9)	119.7(8.9)	.601.618

^aMale comparison subgroup (C-m) had significantly more years of education than did female comparison (C-f) ($p = .030$), male SPD (SPD-m) ($p < .001$) and female SPD (SPD-f) ($p = .011$) subgroups (post hoc contrasts by Least Significant Difference method). Other subgroups did not differ from one another ($p \geq .101$).

Table 2

Mean (S.D.) clinical symptom measures for SPD subgroups

Symptom measure	SPD-m	SPD-f	t^b_p
SANS total score	4.38 (3.40)	4.00 (1.48)	.35.732
SAPS total score	5.00 (1.08)	4.73 (1.95)	.43.670
SPD negative symptoms	2.00 (0.82)	2.47 (0.92)	-1.41.169
SPD positive symptoms	3.46 (0.66)	3.67 (0.82)	-.72.476
SPD total score	5.46 (0.78)	6.13 (0.92)	-2.08.048

^b Degrees of freedom=22 for SANS and SAPS comparisons due to missing data for 4 female SPD subjects; $df=26$ for SPD symptom comparisons.

Table 3Personality *T* scores^c, by diagnostic group

Personality dimension	SPD group	Comparison group	$F_{[1,50]}$	<i>p</i>
Neuroticism	57.7 (12.8)	39.8 (9.2)	32.554	<.001
Extraversion	43.4 (13.0)	57.2 (8.5)	19.873	<.001
Openness	67.0 (10.9)	57.0 (7.9)	13.772	.001
Agreeableness	41.4 (11.4)	56.5 (9.0)	27.288	<.001
Conscientiousness	41.3 (13.0)	51.3 (12.0)	8.172	.006

^c *T* scores computed from gender-specific normative data reported by Costa and McCrae (1992).

Table 4Personality dimension mean (S.D.) *T* scores by subgroup

Personality dimension	SPD-m	SPD-f	C-m	C-f
Neuroticism	58.5 (15.1)	57.1 (10.9)	41.2 (8.4)	38.7 (10.1)
Extraversion	43.6 (15.0)	43.3 (11.5)	55.4 (9.1)	58.8 (8.0)
Openness	59.1 (10.3)	73.8 (5.6)	59.1 (7.7)	55.3 (7.9)
Agreeableness	41.1 (13.2)	41.6 (10.1)	56.1 (10.7)	56.8 (7.8)
Conscientiousness	46.3 (14.8)	37.0 (9.6)	52.3 (10.8)	50.5 (13.2)

Table 5

Linear regression of personality dimensions on SPD symptoms

Personality dimension	R	R ²	Sum of squares	df	Mean square	beta	F	p
NEO-N	.650	.422	2520.311	1	2520.311	.650	36.495	<.001
			3452.920	50	69.058			
NEO-E	.612	.375	1121.032	1	1121.032	-.612	30.018	<.001
			1867.276	50	37.346			
NEO-O	.513	.263	532.349	1	532.349	.513	17.842	<.001
			1491.881	50	29.838			
NEO-A	.592	.350	723.639	1	723.639	-.592	26.928	<.001
			1343.668	50	26.873			
NEO-C	.391	.153	467.167	1	467.167	-.391	9.038	.004
			2584.583	50	51.692			

Table 6

Linear regression of residual personality dimensions on educational achievement

Personality dimension	R	R ²	Sum of squares	df	Mean square	beta	Fp
NEO-N (resid.)	.439	.193	666.093	1	666.093	-.439	11.951.001
			2786.827	50	55.737		
NEO-C (resid.)	.363	.132	340.791	1	340.791	.363	7.594.008
			2243.793	50	44.876		