Revisiting the blurry boundaries of schizophrenia: Spectrum disorders in psychometrically identified schizotypes

P. Kevin Bolinsky a, b, *, Alison V. James a, Dianna Cooper-Bolinsky b, Jonathan H. Novi a, Helen K. Hunter a, Daniel V. Hudak a, Kelly M. Schuder a, Kevin R. Myers a, Carina A. Iati c, Mark F. Lenzenweger d

a Department of Psychology, Indiana State University, Terre Haute, IN, USA
b Department of Social Work, Indiana State University, Terre Haute, IN, USA
c Massachusetts Mental Health Center, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, USA
d Department of Psychology, State University of New York at Binghamton, Binghamton, NY USA

ABSTRACT

Certain Personality Disorders (PDs) have been found to be present in the prodromal phase of schizophrenia at a higher rate than other personality disorders. Although schizotypal, paranoid, and schizoid PDs are traditionally viewed as spectra for schizophrenia, research suggests that avoidant PD should be included in this group (e.g., Fogelson et al., 2007). The present study examines whether a sample of psychometrically identified schizotypes (SZT) have higher incidence of schizophrenia-spectrum PDs, as well as more symptoms of these PDs, in general, than does a matched comparison (MC) sample. Eighty-five SZT and 78 MC participants were administered the Personality Disorder Interview for DSM-IV (PDI-IV) to assess PD symptoms and diagnoses. Results indicate that the SZT group evidenced significantly more symptoms of avoidant, schizoid, paranoid, and schizotypal PDs than did the MC group. Further, there were significant differences in the incidence of these PDs between the groups.

1. Introduction

A long history of research into premorbid personality indicators has supported the notion that there are differences in individuals with increased liability to schizophrenia related illnesses (SRIs) compared to those without increased liability. For example, Bleuler, (1911/1950) noted that individuals who develop SRIs demonstrated oddities in personality from childhood and were likely to be withdrawn from others. Hoch (1910), noting a relationship between a detached personality type and schizophrenia development, referred to a “shut-in” personality. Likewise, Niemi et al. (2005) found that the presence of emotional problems and social inhibition in children predicted later psychotic symptoms.

As far back as the time of Kraepelin (1909/1971), it has been noted that symptoms of SRIs appear to aggregate within families, as relatives of individuals with the disorder exhibit a number of anomalies, including eccentric personality. Further, family studies of schizophrenia have indicated a relationship between schizophrenia and personality disorders such as schizotypal personality disorder (Kendler et al., 1993; Asarnow et al., 2001; Hans et al., 2004). Certain personality disorders have also been found to be present in the prodromal phase of schizophrenia. Indeed, the “Cluster A” disorders (Schizotypal, Paranoid, and Schizoid) are viewed as being related to schizophrenia (Braff et al., 2007). For example, data from the New York High-Risk Project demonstrated that as many as 16–20% of schizophrenia offspring may develop “Cluster A” personality disorders (Erlenmeyer-Kimling et al., 1995).

Research, however, has suggested that avoidant personality disorder be included in this group of schizophrenia-related personality disorders. For example, Solano and De Chávez (2000) found that 85% of their sample of patients with schizophrenia had premorbid personality disorders, with avoidant (32.5%), schizoid (27.5%), paranoid (20%), dependent (20%), and schizotypal (12.5%) were the most common; they noted, however, that the generalizability of their findings may be limited by their relatively small ($N=40$) sample. Likewise, Keshavan et al., 2005 found that “Cluster C” dimensional scores on a semi-structured personality interview schedule, particularly avoidant personality scores, were higher for patients with schizophrenia than for patients with non-schizophrenia psychoses or healthy participants. Such findings have been extended to individuals deemed to be at risk for schizophrenia, as Fogelson et al.
(2007) have demonstrated that a relations exists between avoidant personality disorder and liability to schizophrenia even after statistically accounting for paranoid and schizotypal personality disorders, a finding that was supported by Gooding et al. (2007), Bolinskey and Gottesman (2010) found higher rates of reported avoidant personality disorder symptoms among individuals classified as hypothetically psychosis prone compared to a matched control sample, although their study relied on self-report of symptoms. Fogelson et al. (2010) have extended these findings into the neurocognitive realm by demonstrating that avoidant personality disorder symptoms can predict performance on neurocognitive measures associated with schizophrenia liability even after accounting for symptoms of other spectrum disorders. This link between avoidant personality and the schizophrenia spectrum is not surprising given the similar patterns of social withdrawal witnessed among the disorders; indeed (Millon, 1990; Millon et al., 2004) have conceptualized schizoid, schizotypal, and avoidant personalities as falling in the detached interpersonal spectrum, with schizoid personality reflecting an entirely passive adaptation style, avoidant personality reflecting an active adaptation style, and schizotypal reflecting a mixed adaptation style.

1.1. Schizotypy

Our concept of schizotypy has largely developed as a result of observations by individuals such as Kraepelin (1909/1971) and Rado (1953) who described individuals demonstrating schizophrenia-like, but non-psychotic symptoms. Rado offered the term schizotype as a condensation of schizophrenic phenotype to refer to these individuals and the term schizotypy to refer to the presence of the characteristics. He suggested that individuals with schizotypy have the genetic potential to develop overt signs and symptoms of schizophrenia. Meehl (1962, 1990) further refined the concept of schizotypy and suggested that liability to schizophrenia is associated with a number of characteristics including personality disturbance – which includes anhedonia, interpersonal aversiveness, and ambivalence – and cognitive slippage. Since the time of such observations, and with the advancement of psychological research, experimental psycho-pathologists have demonstrated that a meaningful relationship exists between schizotypic psychopathology and liability to schizophrenia (Lenzenweger, 2010). Thus, the presence of schizotypy can be used as an indicator of increase liability to SRPs. For example, the Maryland Longitudinal Study of Schizotypy (Blanchard et al., 2011) demonstrated that a community sample of individuals who reported social anhedonia had a greater number of schizophrenia-spectrum personality disorder characteristics, greater negative symptom characteristics, and lower global functioning than a healthy comparison sample. This finding serves to underscore the utility of schizotypy measurement as an indicator of schizophrenia related pathology.

1.1.1. Assessing schizotypy

Schizotypy can be identified clinically, which entails the assessment of psychiatric schizotypic psychopathology (Gooding et al., 2005; Lenzenweger, 2006). This identification could come from a diagnosis of one of the disorders in the schizophrenia spectrum, such as schizoid, paranoid, or schizotypal or avoidant personality disorder, all of which reflect a schizotypic personality organization and an increased level of underlying schizotypy. This method of identification represents the foundation of our understanding of schizotypy. One benefit to this method of liability identification is that it acknowledges that liability to SRPs is seen as continuous in nature, rather than a categorical identification, which allows clinicians to describe the severity of symptomology with an appropriate diagnosis.

Schizotypy can also be identified using reliable and valid psychometric measures that indicate liability to schizophrenia (Lenzenweger, 2006). With increased interest in identifying schizotypy, additional psychometric measures have been developed explicitly for this purpose. Among measures found to be effective in identifying psychosis-proneness, or schizotypy, are the Chapman Psychosis Proneness Scales (CPPS), which include the Perceptual Aberration Scale (PerAb; Chapman et al., 1978) which measures unusual sensory experiences, the Magical Ideation Scale (MagIde; Eckblad and Chapman, 1983) which measures unconventional belief systems, and the Revised Social Anhedonia Scale (SocAnh; Eckblad et al., 1982) which measures lack of desire for social engagement, among others. Studies have found higher incidence of SRP among individuals identified as schizotypic on the basis of CPPS scores relative to comparison groups at 10 year follow-up (Chapman et al., 1994; Kwapil, 1998), as well as more frequent and severe psychotic-like experiences at 5 year follow-up (Gooding et al., 2005; 2007). Lenzenweger, 1991; Lenzenweger and Korfine, 1992) found that high scores on PerAb were associated with schizotypic MMPI profiles. Lenzenweger and Loranger (1989b) found that high scores on PerAb were related not only to higher schizotypal and paranoid personality disorder symptoms in psychiatric patients, but to increased family loading for liability to schizophrenia, as well (Lenzenweger and Loranger, 1989a). Further, Lenzenweger (2014) has recently reported that at a 17-year follow-up of schizotypes from the Cornell Young Adult Development Study, higher PerAb scores at baseline (with no prior history of psychosis in any subject) were significantly associated with elevated schizotypal, paranoid, and avoidant PD symptoms, assessed using the International Personality Disorder Screener (IPDE-S; Lenzenweger et al., 1997); elevated total Schizotypal Personality Questionnaire (SPQ; Raine, 1991), SPQ-reality distortion, and SPQ-disorganization scores; and with higher levels of hallucinatory and delusional features, as assessed using the SCID-B Psychosis Module.

Thus, there is adequate evidence to support the utility of the CPPS in identifying schizotypic individuals well before the onset of clinically significant symptoms. This is especially important as although the single best predictor of developing SRP remains having an identical twin with the disorder (Meehl, 1990), it has been noted that 45% of individuals determined to be at risk via psychometric means had no family history of psychosis (Chapman and Chapman, 1985), which suggests that reliance on genetic relatedness for determination of increased liability to SRP may lead researchers to overlook a significant subset of individuals having increased liability, but no family history of the disorder. An additional benefit of the CPPS is that they are intended to measure liability to SRP in a population of sub-threshold individuals who are unlikely to exhibit overt symptoms of psychosis, and in some cases may have no easily observable signs of schizotypy. By investigating liability factors in this population, investigators may be more likely to detect aspects of the disorder that may be obscured in the fully decompensated illness (Lenzenweger, 2010).

1.2. Present study

The current study examined the relationship between psychometrically-identified schizotypy and spectrum personality disorders in a sample of college students who have never met diagnostic criteria for schizophrenia, or a related psychotic disorder. Given that the results of previous research have consistently presented two findings: A) these disorders are truly associated with liability to schizophrenia, and B) the CPPS identifies individuals with increased liability to schizophrenia, two hypotheses were indicated. Specifically, we hypothesized the following:

1. Individuals who were identified as schizotypic would endorse a greater number of symptoms of spectrum personality disorders, regardless of whether they met diagnostic criteria, than would a matched comparison sample of non-schizotypes.
2. Individuals who were identified as schizotypic would have a higher incidence of meeting diagnostic criteria for spectrum personality disorders than would a matched comparison sample of non-schizotypes.

2. Methods

2.1. Participants

2.1.1. Initial participant pool

Participants were drawn from a sample of 835 (221 men, 614 women) college students between the ages of 18 and 25 years who received course credit for their participation. The current study is part of a larger, ongoing study of psychosis proneness that is currently in the third of 4 years of baseline data collection. In addition to the measures included in the present investigation, individuals who participate in the study complete a number of measures related to psychosis proneness including a self-report questionnaire regarding personal and family mental health history, measures of neurocognitive functioning, emotion recognition and handedness. For inclusion in the larger study’s final sample, participants’ responses had to meet validity criteria for additional measures beyond those included in the current study. In addition to the CPPS, validity measures of the MMPI-2 and PDQ-IV were utilized.

2.1.2. Final sample

The final sample consisted of 85 individuals (11 males, 74 females) identified as schizotypic (SZT group) on the basis of their CPPS scores and 78 individuals (11 males, 67 females) in a matched comparison (MC) group. Six individuals in the SZT group had a family history of schizophrenia; no members of the MC group reported a family history of schizophrenia. The Physical Anhedonia scale of the CPPS was omitted, as it has not been shown to be effective in longitudinal prediction of psychosis risk in college students (Kwapil et al., 2008). For males, the cutoff scores were $Z_{MagId} \geq 20$, $Z_{PerAb} \geq 19$; for females, the cutoff scores were $Z_{SocAnh} \geq 16$, $Z_{MagId} \geq 21$, or $Z_{PerAb} \geq 19$. Age among the males in the SZT group ranged from 18 to 21 years ($M=19.00, S.D.=1.19$); ethnic group membership consisted of 10 Caucasians and one Hispanic individual. Among the females in the SZT group age ranged from 18 to 22 years ($M=18.82, S.D.=0.81$); ethnic group membership consisted of 52 Caucasians, 20 African-Americans, one Hispanic individual, and one individual who listed “other” as her ethnicity.

In order to control for the possible effect of demographic variables on the variables of interest, the MC group was selected whose demographics aligned as closely as possible with the SZT group. Thus, for each SZT participant, an MC participant was matched on (in order) gender, ethnicity, age, and college major from the remaining participants with valid protocols. When a match was not possible on one of these criteria, the match was made with the participant closest to the SZT participant on that particular criterion. Age among the males ranged from 18 to 20 years ($M=18.66, S.D.=0.87$); age among the females in the MC group ranged from 18 to 21 years ($M=18.82, S.D.=0.85$). There were no significant differences in age by group, gender, or the interaction of group by gender.

2.2. Procedures

As noted above, participants completed the CPPS so that schizotypy status could be assessed. Individuals in the SZT group were matched with an MC participant by the primary author, who did not participate in data collection or have any contact with the participants. Participants were then invited to participate in a second phase of data collection, for which they were paid $20. In this phase of data collection, participants completed the Personality Disorder Interview for DSM-IV (PDI-IV; Widiger et al., 1995), a semi-structured interview to assess personality disorders. Each interview was conducted by one of eight master’s-level clinicians (seven psychology doctoral students and one professor of social work) who had been trained in the administration and scoring of the interview and who were blind to group membership. In addition, the scoring of each protocol was verified by one of the other administrators; in cases of discrepancy in the scoring of an item, the discrepancy was discussed at a lab meeting and a consensus was reached for that item’s scoring. A participant was judged to have met criteria for a particular personality disorder if their score reached the “threshold,” “moderate,” or “extreme” levels for that disorder, as directed in the PDI-IV manual.

Symptom levels by group were compared using a MANOVA, with group membership as the independent variable, and paranoid, schizoid schizotypal, and avoidant symptom scores serving as the dependent variables. Univariate ANOVAs were then utilized to compare differences on individual dependent variables and effect sizes were computed.

We also compared the distributions of meeting diagnostic criteria for each personality disorder by group membership. Since one of the four comparisons had at least one cell with an expected $N$ of less than five, chi square tests were not appropriate. Fisher’s exact test is commonly used in such situations, although there have been suggestions that it is overly conservative with small samples (Martín Andrés et al., 2004); thus, we chose to employ Barnard’s exact test to compare distribution differences, although we also report results of Fisher’s exact test. In addition to tests of significance, odds ratios were calculated for each comparison, when possible.

3. Results

3.1. Personality disorder symptoms

Correlations among the symptom levels for each personality disorder are shown in Table 1. Symptom levels were correlated, but not so highly correlated as to indicate redundancy among the variables. The results of the multivariate test revealed a significant difference between groups, $F(4, 158)=6.338, p<0.001$. Wilks’ lambda for the analysis was 0.856, which suggests that approximately 14% of the variance in the linear combination of symptom levels can be accounted for by group membership.

Since the multivariate test was significant, univariate tests were performed for mean symptom level by group. Mean symptom levels for each group are displayed in Table 2, along with appropriate effect sizes. The results of each comparison were significant at $p<0.01$. Medium effect sizes were observed for schizoid ($d=0.66$) and avoidant ($d=0.58$) personality disorder symptoms, whereas small effects were

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Avoidant</th>
<th>Paranoid</th>
<th>Schizoid</th>
<th>Schizotypal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoidant</td>
<td>–</td>
<td>0.392**</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Paranoid</td>
<td>0.392**</td>
<td>–</td>
<td>0.423**</td>
<td>–</td>
</tr>
<tr>
<td>Schizoid</td>
<td>0.243**</td>
<td>0.423**</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Schizotypal</td>
<td>0.350**</td>
<td>0.582**</td>
<td>0.465**</td>
<td>–</td>
</tr>
</tbody>
</table>

Note: 
** $p < 0.001$
* $p < 0.01$
Table 2
Means and standard deviations for selected Personality Disorder Interview for DSM-IV scores by group membership, with associated F values and effect sizes.

<table>
<thead>
<tr>
<th>Scale</th>
<th>SZT (N = 85)</th>
<th>MC (N = 78)</th>
<th>F</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Avoidant PD sx</td>
<td>2.89 (2.33)</td>
<td>1.65 (1.86)</td>
<td>13.92**</td>
<td>0.58</td>
</tr>
<tr>
<td>Level of Paranoid PD sx</td>
<td>1.53 (1.78)</td>
<td>0.86 (1.20)</td>
<td>7.77*</td>
<td>0.44</td>
</tr>
<tr>
<td>Level of Schizoid PD sx</td>
<td>1.36 (1.49)</td>
<td>0.58 (0.78)</td>
<td>17.46**</td>
<td>0.66</td>
</tr>
<tr>
<td>Level of Schizotypal PD sx</td>
<td>2.14 (1.81)</td>
<td>1.40 (1.44)</td>
<td>8.37*</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Note: SZT = psychometrically-identified schizotype group; MC = matched comparison group; d = Cohen’s d.
** p < 0.01.  * p < 0.05.

Table 3
Number of individuals meeting, or not meeting, criteria for selected personality disorders by group, along with results of Barnard’s exact tests and odds ratio estimates.

<table>
<thead>
<tr>
<th>Criteria Met</th>
<th>Diagnosis Group</th>
<th>Barnard’s test</th>
<th>Fisher’s test</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
<td>test</td>
</tr>
<tr>
<td>Avoidant</td>
<td>SZT</td>
<td>36</td>
<td>49</td>
<td>p = 0.001</td>
</tr>
<tr>
<td>Paranoid</td>
<td>MC</td>
<td>15</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Schizoid</td>
<td>SZT</td>
<td>8</td>
<td>77</td>
<td>p = 0.006</td>
</tr>
<tr>
<td>Schizotypal</td>
<td>MC</td>
<td>0</td>
<td>78</td>
<td></td>
</tr>
</tbody>
</table>

Note: SZT = psychometrically-identified schizotypes. MC = matched control.
* An odds ratio could not be calculated for schizoid personality disorder, as none of the MC participants met diagnostic criteria.

Our first hypothesis was that members of the SZT group would evidence a greater number of symptoms of each of the spectrum disorders than would members of the MC group, without regard to the presence of a diagnosable disorder. Since our participants are drawn from a relatively high-functioning (i.e., college student) sample, we expected that they would not necessarily present with diagnosable disorders, but would evidence attenuated forms of the disorders. This hypothesis was fully supported for each of the disorders (avoidant, schizotypal, and schizoid personality disorders), with medium effect sizes observed for each between-groups comparison. These findings join a growing body of the literature that supports a relationship between schizophrenia spectrum personality characteristics and increased liability to schizophrenia (Erlenmeyer-Kimling et al., 1995; Solano and De Chávez, 2000; Braff et al., 2007).

Our second hypothesis was that SZT participant would have a higher incidence of meeting diagnostic criteria for spectrum personality disorders than would the MC participants. This hypothesis was considered secondary because we did not expect that many of the individuals in the SZT group would meet full criteria for a spectrum disorder at this early stage of the study; we expect, however, that the number of individuals meeting criteria will increase over the course of the study as the SZT group moves through the period of greatest risk for developing schizophrenia related illnesses. Our second hypothesis was fully supported for three of the disorders (avoidant, schizotypal, and schizoid personality disorders), whereas the significance of the results for paranoid personality disorder depends on which test is considered. The results for Barnard’s exact test were significant, although the results for Fisher’s exact test fell just short of significance at p = 0.05. As noted above, Fisher’s test has been criticized for being overly conservative with small samples; it is likely that with a larger sample, this comparison would have been significant. The results clearly indicate, however, a trend toward greater incidence of paranoid personality disorder within the SZT group.

Taken together, these results indicate that there are subthreshold expressions of symptoms of schizophrenia spectrum personality disorders among those identified through psychometric means to be at increased risk for developing schizophrenia. An additional, and not unimportant, implication is the additional support that these results provide for the psychometric assessment of schizotypy by means of self-report. This is especially noteworthy, as the majority of previous research has focused on individuals deemed “at risk” for schizophrenia via different means, such as genetic predisposition or family history (Kendler et al., 1993; Asarnow et al., 2001; Hans et al., 2004).

Finally, the current results add to the literature (e.g. Solano and De Chávez, 2000; Keshavan et al., 2005; Gooding et al., 2007; Fogelson et al., 2007, 2010; Bolinskey and Gottesman, 2010) demonstrating a relationship between avoidant personality disorder and liability to schizophrenia. Social withdrawal and detachment have long been noted to be a hallmark feature of liability to schizophrenia (cf. Hoch, 1910; Bleuler, 1911/1950; Meehl, 1962, 1990) and both the diagnostic and phenomenological overlap between avoidant and schizoid personality disorders have been represented in commentary and research (e.g., Trull et al., 1987; Thompson-Pope and Turkat, 1993), as well as models of personality disorders (Millon, 1990; Millon et al., 2004). Fogelson et al. (2007) suggested that with...
avoidant personality disorder – specifically, its associated social withdrawal and interpersonal sensitivity – represents a separable indicator of schizophrenia liability, but one consistent with Gottesman and Shields (1982) epigenetic liability model. We concur with that assessment, but suggest that avoidant personality disorder may reflect a somewhat attenuated form of schizophrenia liability than schizoid personality in which this social detachment and sensitivity is not yet associated with ambivalence. Thus, from this perspective, the ambivalence associated with schizoid personality represents increased liability to schizophrenia.

A major strength of this study is our use of psychometrically identified schizotypy as a dependent variable; further, we incorporated a matched comparison sample for our criterion group, rather than using convenience samples or relying on sometimes unreliable family history information to determine risk status. Our design allows for a direct analysis of the relationship between spectrum personality disorders and schizotypy without the influence of selection bias or demographic influence. Further, our study incorporated measures of personality disorder symptoms and personality disorder diagnoses that were obtained through semi-structured interviews administered by trained clinicians and subjected to review by at least one other trained administrator, rather than relying on self-report, as in the Bolinskey and Gottesman (2010) study, or chart diagnoses that are often notoriously unreliable (cf., Garb, 1998; Jensen & Weisz, 2002).

A weakness of the present study is the relatively small sample size resulting in a small number of individuals exhibiting fully developed personality disorders. This is particularly notable when considering low base rate characteristics like paranoid or schizoid personality disorders. As noted above, however, it was not expected that we would find a large number of individuals with fully developed personality disorders at baseline, given both the age of the individuals (late teens) and their relatively high functioning at the present time. In addition, it should be considered that the present sample overrepresented females and therefore results should be interpreted with caution as it is unclear to what degree the present results might be influenced by the gender distribution in our sample.

We have recently completed collecting baseline data for a 10-year prospective study; we also gathered baseline data on processes such as eye-tracking, working memory, executive functioning, and additional measures of personality. Since the project from which the current study comes is a prospective study we will be able to follow these individuals through most of their highest risk period (approximately 18–35 years old) for developing further symptoms of spectrum disorders or SRP. We expect that, over time, we will see an even greater disparity in the number of personality disorder symptoms and the number of individuals meeting criteria for personality disorder between the two groups.


References


