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Functional Outcomes, Functional Capacity, and Cognitive Impairment in Schizotypal Personality Disorder

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Abstract

Background—Individuals with schizotypal personality disorder (SPD) exhibit impaired cognitive functioning in a pattern similar to that found in schizophrenia; less clear is the extent to which these individuals also share schizophrenia patients' impairments in functional capacity and real-world functioning.

Method—We evaluated 46 SPD patients, as well as 38 individuals with avoidant personality disorder (AvPD) and 55 healthy controls (HC) on: cognitive functioning, real-world functioning (employment and residential status), and functional capacity (indexed by the UPSA, a performance-based skills assessment).

Results—We found that individuals with SPD exhibited worse performance on both the cognitive battery and the UPSA than the other groups; they were also less likely to be employed and to be living independently. Additionally, cognitive and UPSA performance in the SPD group was intercorrelated to a degree comparable to what has been found in schizophrenia, and this relationship was not present in the AvPD group. Finally, real-world functioning was related to UPSA performance for both patient groups.

Conclusions—SPD patients exhibit impaired real-world functioning suggesting that these deficits extend across the schizophrenia spectrum. In addition, there is supportive evidence for the

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Contributors

Dr. McClure oversaw data collection, analyzed the data and wrote the manuscript. Drs. Harvey and Siever designed the study; they also helped write and revise the manuscript. Drs. Bowie and Iacoviello assisted in overseeing the data collection and revised the manuscript.

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validity and importance of performance-based measures such as the UPSA to predict everyday outcomes across the schizophrenia spectrum.

Keywords

schizophrenia spectrum; cognition; functional outcome; performance-based assessments; schizotypal personality disorder

Schizophrenia patients exhibit impairments in a wide range of domains of everyday functioning, including social and occupational functioning, residential maintenance, medication management, and basic self-care (Wiersma et al., 2000). These impairments begin before illness onset, occur even following successful treatment of clinical symptoms, and persist after psychotic symptoms remit (Harvey, 2012), suggesting that psychosis does not fully account for functional impairments in schizophrenia. While functional impairment has been demonstrated to be strongly associated with cognitive impairment in chronic schizophrenia, it is much less clear whether functional impairment accompanies the more modest cognitive impairment seen in schizophrenia spectrum conditions and whether functional disability is worsened by medication status, history of psychosis, and broad and severe cognitive deficits of schizophrenia. Functional outcomes of schizophrenia patients are closely linked to impairments in cognitive performance (Green, 1996; Green et al., 2011), although other features of the illness clearly contribute (Bowie et al., 2010; Bowie et al., 2008a). One critical test for the hypothesis that functional impairment is intrinsically related to cognitive impairment would be evaluation of the functional relevance of cognition in a non-psychotic schizophrenia spectrum disorder with significant cognitive impairment.

Patients with Schizotypal Personality Disorder (SPD), a schizophrenia spectrum disorder that is phenomenologically and biologically related to schizophrenia (Siever et al., 1993), have impairments in several areas of cognitive functioning, such as episodic memory (Cadenhead et al., 1999), inhibition (Moritz and Mass, 1997), abstraction (Vogelmaier et al., 1997), sustained attention (Roitman et al., 1997), working memory (Mitropoulou et al., 2005; Roitman et al., 2000) and context processing (McClure et al., 2008). These deficits are qualitatively similar but less severe than those seen in schizophrenia. Working memory in particular seems to be specifically impaired in individuals with SPD, relative to their other cognitive deficits (Mitropoulou et al., 2005), and may account for the other cognitive deficits of this disorder.

Individuals with SPD have well-documented deficits in interpersonal functioning, many of which are necessary to qualify for the DSM-IV diagnosis (American Psychiatric Association. and American Psychiatric Association. Task Force on DSM-IV., 2000). However, although individuals with this disorder demonstrate cognitive deficits similar to what is seen in schizophrenia, much less is known about their everyday functioning in other domains such as independent living, educational attainment, and employment status. Recent research in schizophrenia and bipolar disorder has also focused on the identification of impairments in the functional skills that underlie everyday functioning, referred to as “functional capacity”. These skills have been found to be more proximal to real-world functioning than cognitive impairments and may mediate the correlation between cognition deficits and everyday disability. Performance-based assessments are routinely used as co-primary outcomes measures in treatment studies aimed at cognition in schizophrenia (Bowie et al., 2012) and have been the subject of systematic comparative studies to identify those measures most closely linked to neuropsychological performance (Green et al., 2011). Despite the qualitative similarity in cognitive performance of people with SPD to those with schizophrenia and the acknowledgment that SPD produces disability, there has never been a study of functional capacity performance in SPD and there has been remarkably little

research on impairments in everyday functioning beyond acknowledgements of the social limitations that contribute to the diagnosis. Such a study could be important for pharmacological cognitive enhancement and cognitive remediation.

In this study we sought to systematically examine the everyday functioning of individuals with SPD, as well as two comparison samples: patients with Avoidant Personality Disorder (AvPD) and healthy controls (HC), by administering a clinical interview eliciting information about employment, education, and living situation. The AvPD patients were selected as a control for the possibility of nonspecific deficits on the part of SPD cases. We chose a personality-disordered comparison sample instead of a psychotic schizophrenia spectrum comparison group because we expected participants with SPD to be less impaired than schizophrenia patients, the assessment of whom would not provide any information about more moderate nonspecific impairments. Thus, we selected a comparison sample without psychosis in order to control for generalized impairments on the part of SPD patients that were less than those known to occur in schizophrenia but still relevant to a comparison with healthy people. We complemented this assessment with information from medical records, and informants when available, leading to a best-estimate milestone oriented assessment. In addition, we administered a battery of cognitive tests, as well as the UCSD Performance-Based Skills Assessment, a laboratory-based assessment of functional capacity that is gaining widespread popularity as a reliable and valid indicator of functional abilities that is markedly superior to patient self-report (Green et al., 2011; Leifker et al.; Sabbag et al., 2011). We hypothesized that individuals with SPD would demonstrate reductions in everyday functioning compared to comparison samples (healthy and personality disordered). We also hypothesized that impaired performance on both our cognitive battery and the UPSA. Most important, we anticipated finding that these impairments in cognition and functional capacity would be correlated with each other and possibly related to real-world functioning in a manner consistent with that seen in schizophrenia. Thus, this is a comprehensive study of cognition, functional capacity and everyday outcomes in a population that shares characteristics with schizophrenia but without secondary factors (e.g., medication) that might modify these relationships, but has never been studied in this regard.

Materials and methods

Participants

Participants were 46 individuals with DSM-IV Schizotypal Personality Disorder (SPD), 38 with Avoidant PD (AvPD), and 55 healthy controls (HC). All participants were recruited from the community and resided within the New York City metro area. Recruitment, diagnosis, and exclusion criteria for the SPD and HC participants in our program of research have been presented in previous publications (Mitropoulou et al., 2005), and participants with AvPD were recruited with similar strategies. Consensus diagnoses were reached in a meeting of all raters with an expert diagnostician after administration of structured psychiatric interviews. All participants were without abuse of illicit substances or alcohol within the past 6 months or a past history of substance dependence and had been free of psychotropic medication for at least 2 weeks. Participants with lifetime histories of psychosis or head trauma with significant neurological sequelae (unconscious >10 minutes) were also excluded from participation. Demographic characteristics as well as scores on everyday functioning variables are presented in Table 1. All participants signed informed consent in accordance with the IRB approvals of this study at both the James J. Peters VAMC and Mt. Sinai School of Medicine.

Procedure

Following enrollment, participants met with a clinical psychologist who assessed current real-world functioning (living situation, social and educational history, employment status, wages earned) using a structured interview, which required detailed questions and substantive examples in answering questions. Participants who received clinical services at either of the research sites also released their medical records for confirmation of their self-report. Participants were administered the cognitive assessment battery and the UCSD Performance-Based Skills Assessment (UPSA) by a trained research technician within three weeks of enrollment and the everyday functioning assessment. This assessment technician was unaware of the results of the other assessments.

Cognitive Assessments

This cognitive assessment was developed on the basis of previous work in schizotypal personality disorder. As a result, it is focused on processing speed and working memory, two of the abilities previously found (Mitropoulou et al. 2005) to be most impaired in this condition. As this study was initiated prior to the finalization of the MATRICS Consensus cognitive battery (MCCB), we were not able to select a battery that was informed by these developments.

Wechsler Abbreviated Scale of Intelligence—The WASI is a brief measure of overall intelligence (Wechsler, 1999). We administered three subtests of the 4-subtest version: Vocabulary, Block Design, and Matrix Reasoning. Dependent variables were age-adjusted scaled scores for these three subtests.

DOT Test—The Dot Test is an assessment of visuospatial working memory in wide research use (Silver et al., 2003). Subjects are presented a dot at a specific position on a standard size paper and then asked to reproduce it at the same location on a separate sheet after different periods of delay (no delay, 10, 20, or 30 sec delay). The distance error at the 30 sec delay minus the distance error at the immediate condition was the dependent variable of interest in the current study.

Paced Auditory Serial Addition Test (PASAT)—The PASAT is a test of auditory verbal working memory that has been well described and validated in general (Gronwall, 1977; Stuss et al., 1988), and in this population (Mitropoulou et al., 2005). Subjects listen to a tape-recorded voice presenting a series of numbers (50 numbers at a rate of one digit per two seconds) and are asked to add each adjacent pair of numbers and verbalize the sum. The total number of correct responses is the dependent variable.

Maryland Letter-Number Span (LNS)—This test requires subjects to listen to a list of intermingled letters and numbers (Gold et al., 1997). At the end of the presentation of the stimuli, subjects are asked to reproduce the information with the numbers in ascending order and the letters in alphabetical order, with numbers coming first. The test is discontinued after 4 failures at a single trial length. The number of trials correctly reproduced served as the dependent variable.

Trail-Making Test (TMT)—TMT has two conditions that combine to assess verbal/spatial perception, executive functioning, and psychomotor speed (Reitan and Wolfson, 1994). In Part A the subject must connect numbers presented on a standard sheet of paper in ascending order (1–2–3). In Part B the subject must alternate connecting numbers and letters (for example, 1-A, 2-B, 3-C, etc.). The amount of time to complete part A and part B were the two dependent variables.

UCSD Performance-Based Skills Assessment (UPSA)—The UPSA is an office-based test to measure schizophrenia patients' ability to perform day-to-day tasks (Patterson et al., 2001). This test was designed for outpatients and measures performance in a number of domains of everyday functioning through the use of props and standardized performance situations. In line with our previous research (Bowie et al.; Bowie et al., 2006; McClure et al., 2007) four domains of the UPSA were used. Comprehension/ Planning measures the patient's ability to comprehend written material that describe recreational outings and then plan the activities and list appropriate items necessary to bring to the outings. In the Finance domain, the patient must count out given amounts from real currency, make change and fill out a check to pay a utility bill. The Communication domain involves a series of role-play situations that require the patient make emergency calls, call directory assistance to request a telephone number, call the number, and then reschedule a medical appointment. In the Transportation/ Mobility domain, patients use information from bus schedules and maps to determine appropriate fare, state telephone numbers to answer relevant questions, decide which map to use to get to a certain location, and determine the appropriate route and transfers to reach a destination. Note that we developed locally specific stimuli for transportation/mobility and comprehension/planning, as the initial version of the UPSA had items based on San Diego activities. We also excluded the household chores subtest, because the analogue kitchen required was not portable enough to be used at field sites. We then re-standardized the scores to a 100-point scale, like the original 5-subtest UPSA.

Analysis

For the cognitive assessments, we calculated z-scores for each variable in the entire subject sample and then created a composite score using the mean of the z-scores for each cognitive variable. Group differences on our cognitive composite, as well as on the UPSA, were assessed with a series of univariate analyses of variance (ANOVAs). To evaluate group differences on our real-world variables, we performed chi-square tests for independent samples on our two clinical groups to assess group differences on current employment status (employed versus unemployed) and current living situation (living independently or not independently), and t-tests for hourly compensation rate. We then sought to explore the relationship between our assessments of performance-based skills and cognition using a series of Pearson and point biserial correlations.

We performed a power analysis to determine whether the differences in sample size would affect our ability to detect significant correlations. For the sample, correlations of a size of $r=.40$ could be detected at $p<.05$ with .80 power, while in the AvPD group, the similarly detectable correlation was $r=.43$. Thus, there were no major differences in power for correlational analyses across the two samples of PD patients and in both samples we were adequately powered to detect moderate, although not small, effects.

Results

Mean scores and standard deviations for the cognitive composite and UPSA are presented in Table 2. As hypothesized, the SPD group performed significantly worse on the cognitive composite ($F(2, 102)=10.39, p<.001$) than both the AvPD ($p=.006$) and HC ($p<.001$) groups, who did not differ ($p=.14$).

In addition, SPD participants demonstrated significantly worse performance on the UPSA total score ($F(2, 133)=13.99, p=.001$) than both other samples ($p<.001$). In fact, SPD participants performed worse than the HC group on all domain scores as well (all $ps <.03$). SPD participants also performed worse than the AvPD group on all domain scores (all $ps <.001$) other than Communication ($p=.70$).

Results of our assessments of real world functioning are presented in Table 2. SPD participants were less likely to be currently living independently ($\chi^2(2)=12.73, p=.002$) and were also less likely to have earned a bachelor's degree or higher ($\chi^2(2)=17.43, p=.002$) than the other two groups. Although there was no statistically significant difference in the proportion of SPD participants who were currently employed ($\chi^2(2)=3.11, p=.21$), individuals with SPD who were employed earned a significantly lower hourly wage ($F(2, 42)=5.38, p=.008$), than HC (See Table 2). Interestingly, individuals with AvPD also earned significantly less than HC ($p=.04$), and the difference between the SPD and AvPD was not significant ($p=.39$).

The correlations between UPSA subscales and total scores were similar in both patient groups, suggesting good internal consistency of the assessments. We found that our performance-based measure of functional capacity was correlated with cognitive performance in our SPD group in a degree similar to what has been found in schizophrenia patients (See Table 3). The correlation between UPSA scores and NP performance was quite consistent with that seen in multiple prior studies of schizophrenia (Leifker et al.) and the correlation for the AvPD group was smaller. The difference between these two correlations approached statistical significance: $p=.06$. However, the correlations between NP performance and UPSA scores and real world employment and independent living were not statistically significant for the SPD group. The correlation with UPSA total scores and independent living was statistically significant for the AvPD sample, but the correlation with employment was ($r=.41, p=.01$). The correlation between work and UPSA scores was not significantly higher in the AvPD group compared to SPD ($p=.09$).

Discussion

This is the first study of everyday functioning, functional capacity, and NP deficits in a critically important schizophrenia-related condition. We found that the SPD group demonstrated impaired performance on assessments of functional capacity, as well as NP performance, and they also exhibited impairments in real-world functioning. They were less likely to be living independently or to have earned more than a HS diploma than AvPD participants or HC. In addition, the functional impairments found in this sample are comparable to previously reported results in schizophrenia patients. For example, Mausbach et al. (2011) reported that 53% of their sample of schizophrenia patients was living independently, 61% were unemployed, and 40% had earned a bachelor's degree or higher; these rates are comparable to the current results for our SPD group. Additionally, our SPD group demonstrated UPSA scores comparable to previously reported results in schizophrenia (Leifker et al., 2010; UPSA mean = 72.2, SD = 18.3). Furthermore, the correlations in the SPD group between functional capacity and NP performance were essentially identical to that seen in studies of schizophrenia and bipolar illness. Thus, functional capacity deficits in previous studies of people with schizophrenia and their correlation with NP deficits are not an artifact of severe global cognitive deficits, the age of onset and course of symptoms, and medications. Functional capacity scores were not related to everyday functioning as seen in previous studies of people with schizophrenia (Bowie et al., 2008a; Gold et al., 2012), but in those studies everyday functioning was measured with structured rating scales and not with milestone achievements.

Overall, this study suggests that the UPSA is sensitive to functional capacity deficits in SPD and other personality disorders. Although interpersonal deficits in the SPD population are widely documented, further examination of other domains of functioning in this group is clearly warranted as a first step to identifying effective ways to improve real-world outcomes of all schizophrenia spectrum patients.

There are some limitations in this study. These samples are smaller than previous studies of schizophrenia, but these patients are also less common in psychiatric and research settings. This sample size precludes performing mediation analyses, which could provide a more definitive answer about the role of cognitive impairment and functional capacity in the prediction of real-world outcomes. Our power analysis suggests that we could not have detected significant small correlations, but at the same time, many of the group differences were in fact significant. However, the consistent differences between the subject samples on cognition, UPSA scores, and everyday functioning suggest that the study is not underpowered overall for examining group differences in performance-based assessments. Finally, as noted above, the assessment of everyday functioning was based on achievement of milestones and not on a comprehensive, interview-based assessment of multiple domains of everyday functioning. Those comprehensive interview based measures have been found to most strongly relate to performance on ability-based measures (Harvey et al., 2009; Harvey et al., 2011; Leifker et al.), although even in those studies the correlations between the UPSA and everyday functioning were not much larger than seen in the current study (see for example Bowie et al., 2006, & Bowie et al., 2008, where the partial correlations between UPSA total scores and clinically rated everyday functioning were .40 and .29 respectively compared to .21 in this study).

We (Harvey et al., 2011) have recently argued that performance-based assessments of functional capacity may reflect a central, measurable endophenotype in the schizophrenia spectrum. This argument is based on findings that in schizophrenia disability is consistent across different locations and cultures (Harvey et al., 2009; McIntosh et al., 2011), that it is familial (Kendler et al., 1995; McGrath et al., 2009), that cognitive deficits are intrinsically linked related to functional deficits (Harvey et al., 2011) and that cognitive deficits are heritable and related to genetic variation (Greenwood et al., 2007; Gur et al., 2007). These findings support parts of that argument. In a population related to schizophrenia in various ways, we find that functional capacity manifests similar relationships to NP deficits to those seen in schizophrenia and manifests some evidence of association with real-world disability. This population is unconfounded by other more molar causes of disability such as psychosis and the association between slightly attenuated functional capacity deficits and similarly attenuated NP deficits is essentially identical to that seen in people with schizophrenia. Thus, deficits in functional capacity in the schizophrenia spectrum extend beyond schizophrenia and support the argument that they may reflect cross-diagnosis, potentially genetically transmitted, processes that are associated with impairments in cognition and have the potential to reduce everyday functioning.

Future directions could include interventions aimed at cognitive enhancement in SPD. This could consist either of pharmacological or cognitive-remediation oriented cognitive enhancement therapy or skills-based training. Genetic studies of cognitive and functional endophenotypes currently conducted in psychotic individuals could be expanded to include cases from the schizophrenia spectrum as well. Finally, studies of disability in SPD could take a more fine-grained approach such as has been applied in schizophrenia, with structured interviews aimed at assessment of the components of disability rather than global achievement of milestones, which may be more broadly influenced by extrinsic factors (Rosenheck et al., 2006).

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Table 1

Sample Characteristics

	SPD Group N=46	AvPD Group N=38	HC Group N=55
Age (M(SD) in years)	37.5 (11.8)	31.2 (9.6)	32.3 (9.8)
Sex (% male)	60.9%	52.6%	37%
Living Independently (%)	43.6%	52.9%	72.1%
Employed (%)	52.6%	69.7%	67.5%
Earned bachelor's degree or higher (%)	39.4%	64.5%	83.8%

Table 2

UPSA and Cognitive Composite Scores.

	SPD Group <i>N</i> =46	AvPD Group <i>N</i> =38	HC Group <i>N</i> =55
	M (SD)	M (SD)	M (SD)
UPSA Total	78.3 (11.5)	86.3 (8.5)	89.3 (5.7)
Comprehension	20.3 (3.6)	22.2 (2.8)	22.9 (2.9)
Finance	17.9 (4.6)	20.4 (2.7)	20.5 (2.3)
Communication	19.0 (4.8)	20.1 (4.0)	22.2 (3.7)
Transportation	21.1 (5.2)	23.5 (3.8)	23.8 (2.7)
Cognitive Composite (z-score)	-2.2 (4.4)	.39 (2.8)	1.7 (3.7)
Average hourly wage (\$)	14.2 (7.1)	18.1 (10.1)	28.3 (17.7)

Table 3

Correlations between cognitive performance, and UPSA scores for SPD and AvPD participants.

SPD Participants						
	Cognition	UPSA Total	Comp.	Finance	Comm.	Employment#
Independent Living #						
UPSA Total	.56**					.09
Comprehension	.23	.48**				-.21
Finance	.17	.67**	.05			.06
Communication	.43*	.72**	.18	.37*		-.10
Transportation	.36*	.77**	.22	.36*	.33*	.16
						-.09
AvPD Participants						
	Cognition	UPSA Total	Comp.	Finance	Comm.	Employment#
Independent Living #						
UPSA Total	.27					.41*
Comprehension	.31	.52**				.36*
Finance	.26	.54**	.07			.13
Communication	.12	.65**	.05	.14		.27
Transportation	.07	.77**	.26	.31	.28	.28

**

p<.01

*

p<.05

point-biserial