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Neuropsychological predictors of performance-based measures of functional capacity and social skills in individuals with severe mental illness

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Abstract

Neuropsychological abilities may underlie successful performance of everyday functioning and social skills. We aimed to determine the strongest neuropsychological predictors of performance-based functional capacity and social skills performance across the spectrum of severe mental illness (SMI). Unemployed outpatients with SMI (schizophrenia, bipolar disorder, or major depression; n=151) were administered neuropsychological (expanded MATRICS Consensus Cognitive Battery), functional capacity (UCSD Performance-Based Skills Assessment-Brief; UPSA-B), and social skills (Social Skills Performance Assessment; SSPA) assessments. Bivariate correlations between neuropsychological performance and UPSA-B and SSPA total scores showed that most neuropsychological tests were significantly associated with each performance-based measure. Forward entry stepwise regression analyses were conducted entering education, diagnosis, symptom severity, and neuropsychological performance as predictors of functional capacity and social skills. Diagnosis, working memory, sustained attention, and category and letter fluency emerged as significant predictors of functional capacity, in a model that explained 43% of the variance. Negative symptoms, sustained attention, and letter fluency were significant predictors of social skill performance, in a model explaining 35% of the variance. Functional capacity is positively associated with neuropsychological functioning, but diagnosis remains strongly influential, with mood disorder participants outperforming those with psychosis. Social skill performance appears to be positively associated with sustained attention and verbal fluency

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Contributors

Zanjbeel Mahmood designed the study, completed the data analyses, and wrote the first draft of the manuscript. Cynthia Z. Burton and Lea Vella assisted with data interpretation and manuscript writing. Elizabeth W. Twamley designed the study, oversaw the data analyses, and assisted with data interpretation and manuscript writing. All authors approved the final manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

regardless of diagnosis; however, negative symptom severity strongly predicts social skills performance. Improving neuropsychological functioning may improve psychosocial functioning in people with SMI.

Keywords

schizophrenia; bipolar disorder; major depressive disorder; cognition; functioning

Introduction

The mounting economic burden associated with severe mental illnesses (SMI) is evidenced not only in the direct costs of hospital inpatient stays and prescription medications, but also in the ever-increasing indirect costs (e.g., need for caregivers, loss of productivity) associated with functional disability among people with schizophrenia, bipolar disorders, and major depressive disorder (Cloutier et al., 2016; Greenberg et al., 2015; Miller et al., 2014). Cognitive deficits are a prominent feature of psychiatric disorders and are considered to play a significant role in functional outcomes of people with SMI (Millan et al., 2012), underscoring the importance of interventions targeting cognitive impairments to improve psychosocial functioning.

An extensive body of research has demonstrated impairments in such cognitive domains as speed of processing, attention/vigilance, learning and memory, and executive functioning within people with schizophrenia (Fioravanti et al., 2012; Keefe and Harvey, 2012), depression (Rock et al., 2014; Roiser et al., 2012), and bipolar disorder (Bora and Pantelis, 2015; Depp et al., 2012). As evidenced by the extant literature, assessment of cognitive functioning has been largely conducted in line with current diagnostic categories (e.g., DSM-5). However, recent work investigating transdiagnostic factors suggests shared influences on cognitive impairment across disorders (Harvey et al., 2016). Several studies have demonstrated cognitive impairments to be associated with deficits in functional capacity and social cognition across these disorders (Baune and Malhi, 2015; Bowie et al., 2008; Brüne, 2005; Depp et al., 2012; Green, 2006; Jaeger et al., 2006; McIntyre et al., 2013; Schretlen et al., 2000; Wolf et al., 2010; Zobel et al., 2010), and have suggested that neurocognitive abilities may be stronger predictors of psychosocial functioning than are clinical symptoms or demographic variables. Although increased understanding of relationships between cognition and everyday functioning has led to several studies examining the impact of different neurocognitive abilities on everyday functional skills and social cognition within these psychiatric populations (Allen et al., 2015; Baune and Malhi, 2015; Mucci et al., 2017; Zobel et al., 2010), no study to date has examined the predictive utility of neurocognitive variables in explaining functional ability and social skills in schizophrenia, bipolar disorder, and major depressive disorder simultaneously.

Considering the transdiagnostic presentation of cognitive impairments, and associated deficits in psychosocial functioning, understanding the differential relationship of individual neuropsychological abilities with functional capacity and social skills can lead to targeted cognitive remediation within people with SMI. As such, the current study aimed to

determine the strongest neuropsychological predictors of performance-based functional capacity and social skills performance across the spectrum of SMI.

Material and Methods

Participants

The University of California, San Diego Institutional Review Board approved study procedures and participants signed informed consent forms before participation. The investigation was carried out in accordance with the latest version of the Declaration of Helsinki. 151 unemployed outpatients with SMI were enrolled as part of a supported employment study (56 with schizophrenia or schizoaffective disorder, 37 with bipolar disorder, and 58 with major depressive disorder). Inclusion criteria were: 1) ≥ 18 years old; 2) literate and fluent in English; 3) DSM-IV diagnosis confirmed via Structured Clinical Interview for DSM-IV (First et al., 2002) or Mini International Neuropsychiatric Interview (Sheehan et al., 1997); 4) unemployed and interested in working. Table 1 provides the demographic and clinical characteristics of the sample. Data from these participants have been used in prior publications (Puig et al., 2016; Thomas et al., 2017; Twamley et al., 2017); however, the multiple regression analyses presented in this paper have not been published previously. The following assessments were conducted at the beginning of the supported employment study, prior to any interventions.

Neuropsychological measures

Premorbid intellectual ability was measured by the Wide Range Achievement Test-III (WRAT-III) – Reading subtest (Wilkinson, 1993). Neuropsychological functioning was measured by the cognitive subtests of the MATRICS Consensus Cognitive Battery (MCCB; Nuechterlein et al., 2008). The MCCB includes tests of processing speed (Trail Making Test, Part A [TMT-A]; Brief Assessment of Cognition in Schizophrenia Symbol-Coding [BACS-SC]; and Category Fluency), sustained attention (Continuous Performance Test—Identical Pairs [CPT-IP]), working memory (Wechsler Memory Scale-III Spatial Span [WMS-III SS] and University of Maryland Letter-Number Span [LNS]), verbal learning (Hopkins Verbal Learning Test—Revised [HVLT-R]), visual learning (Brief Visual Memory Test—Revised [BVMT-R]), and executive functioning (Neuropsychological Assessment Battery [NAB] Mazes). All T-scores were corrected for age and education. The MCCB provides mean T-scores for domains measured by more than one test; however, given the exploratory nature of our analyses, we examined the predictive utility of individual tests across domains in explaining functional capacity and social skills performance. Additional tests of executive functioning were included to more comprehensively measure this multidimensional construct: switching was measured by the Trail Making Test, Part B (TMT-B; Heaton et al., 2004) T-score; letter fluency was measured using the letters F, A, and S (FAS; Heaton et al., 2004) T-score; reasoning and set-switching were measured with the Wisconsin Card Sorting Test-64 card version (WCST-64; Kongs et al., 2000) T-score for total errors. The Memory for Intentions Screening Test (MIST) percentile score was used as a measure of prospective memory ability (Raskin, 2004).

Functional Skills and Symptom Severity

The University of California, San Diego Performance-Based Skills Assessment-Brief (UPSA-B; Mausbach et al., 2007) was used to measure performance-based functional capacity in the domains of financial management and communication; scores range from 0 to 100, with higher scores reflecting better performance. The Social Skills Performance Assessment (SSPA; Patterson et al., 2001) was used to measure social skills relevant to neutral and adversarial situations; scores range from 2 to 10, with higher scores reflecting better performance. The Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987) was used to measure the severity of positive and negative symptoms of psychosis, and depressive symptom severity was measured using the Hamilton Depression Rating Scale (HAM-D; Hamilton, 1967).

Statistical analyses

All variables were normally distributed. Independent samples *t*-tests and Chi-square tests were conducted to examine demographic and clinical characteristics between diagnosis groups (i.e., major depression, bipolar disorder, and schizophrenia-spectrum disorders; see Table 1). Bivariate Pearson correlations between individual tests of neuropsychological functioning (i.e., neuropsychological measures, including premorbid intellectual ability), psychiatric symptom severity, education, and the total UPSA-B score and average SSPA score were conducted. Neuropsychological tests that were significant at $p<0.05$ at the bivariate level were entered as predictors of UPSA-B and SSPA in forward selection stepwise regression models, along with associated psychiatric symptom severity variables and diagnostic category (major depression coded as 1; bipolar disorder coded as 2; schizophrenia-spectrum disorders coded as 3). Additionally, years of education was also included in the model given its demonstrated association with UPSA-B performance (Mausbach et al., 2010; Vella et al., 2017). There were significant demographic differences by diagnostic group in gender and racial/ethnic minority status (*p*s<0.05); however, these were not included within the regression models given the use of standardized t-scores. Prior to analyses, model assumptions were checked, including screening for outliers and evaluating for multicollinearity, with tolerance values of <0.40 and variance inflation factor values of >2.5 suggestive of multicollinearity (Allison, 2012). Analyses were conducted using SPSS version 24.0.

Results

Group comparison on neuropsychological variables and performance-based measures of functional capacity and social skills demonstrated that the mood disorders group (i.e., major depression and bipolar disorder) performed significantly better than did the schizophrenia-spectrum disorder group, except for specific measures within the executive function and working memory domains. Specifically, the groups did not differ on the NAB Mazes, Trail Making Test, Part B, and WMS-III Spatial Span tests. Moreover, the major depression group endorsed more depressive symptoms compared to the schizophrenia-spectrum disorders group and both mood disorder groups reported fewer positive and negative symptoms of psychosis compared to the schizophrenia-spectrum disorders group (all *p*s<0.05). Bivariate correlations determined significant positive associations between most neuropsychological

tests and UPSA-B and SSPA total scores (see Table 2 for correlation coefficients). For the UPSA-B, forward entry stepwise analysis found diagnosis, LNS, CPT-IP, Category Fluency, and FAS to be significant predictors of UPSA-B performance. Jointly, these variables accounted for 43% of the variance [$F(5, 139) = 20.69$, $p < .001$, $R^2 = .427$, $\eta^2 = .406$], with LNS uniquely accounting for 24% of the variance [$F(1,143) = 44.50$, $p < .001$, $R^2 = .237$], diagnosis 11% [$F(1,142) = 24.76$, $p < .001$, $R^2 = .113$], CPT-IP 3% [$F(1,141) = 7.74$, $p = .006$, $R^2 = .034$], Category Fluency 3% [$F(1,140) = 6.01$, $p = .015$, $R^2 = .025$], and FAS 2% [$F(1,139) = 4.11$, $p = .045$, $R^2 = .017$].

For the SSPA, forward entry stepwise regression analysis identified negative symptom severity, FAS, and CPT-IP to be significant predictors of SSPA performance. Together, these variables accounted for 35% of the variance [$F(3,141) = 25.79$, $p < .001$, $R^2 = .354$, $\eta^2 = .341$], with negative symptoms uniquely accounting for 25% of the variance [$F(1,143) = 47.71$, $p < .001$, $R^2 = .250$], FAS 7% [$F(1,142) = 14.89$, $p < .001$, $R^2 = .071$], and CPT-IP 3% [$F(1,141) = 7.20$, $p = .008$, $R^2 = .033$]. Table 3 presents the partial regression coefficients for each predictor of variance in UPSA-B and SSPA performance in all aforementioned models.

Discussion

The primary goal of the current study was to determine the strongest neuropsychological predictors of performance-based functional capacity and social skills performance in a sample of individuals with SMI. Considering the transdiagnostic presentation of cognitive impairments in psychiatric disorders, and associated deficits in psychosocial functioning, understanding the differential relationship of individual neuropsychological abilities with functional ability and social skills provides a means to target cognitive remediation within people with SMI.

The results demonstrated most cognitive domains to be positively correlated with UPSA-B and SSPA scores. Consistent with prior work, clinical symptoms did not emerge as important predictors of functional capacity (Schretlen et al., 2000). Regression analyses indicated a unique contribution of neuropsychological domains in predicting functional capacity as measured by the UPSA-B. Specifically, working memory, sustained attention, category fluency, and letter fluency emerged as significant predictors of functional capacity, along with diagnosis. This result suggests that the varied cognitive impairments seen within SMI provide additional predictive utility in explaining functional ability and that a diagnosis of schizophrenia predicts worst functional capacity compared to a diagnosis of a depression or bipolar disorder. Recent research suggests neuropsychological course to independently predict functional outcomes across major psychiatric conditions (Lee et al., 2015). As such, the predictive utility of diagnosis may be underscored by findings demonstrating shared cognitive impairments in schizophrenia and mood disorders to be generally less severe in mood disorders as compared to schizophrenia (Millan et al., 2012). Furthermore, these findings generate preliminary evidence in the identification of targets of neuropsychological interventions aimed at improving functional capacity.

Consistent with previous findings, negative symptoms (as assessed by the PANSS) emerged as the strongest predictor of social skills performance (Jackson et al., 1989; Robertson et al., 2014). However, regression analyses also indicated a unique, albeit minimal, contribution of neuropsychological domains in predicting social skills performance as measured by the SSPA, with letter fluency and sustained attention emerging as unique, significant neuropsychological predictors above and beyond diagnosis. These findings suggest that neuropsychological rehabilitation targeting these cognitive domains may improve social skills and, by extension, long-term functional outcomes in patients with SMI (Baune and Malhi, 2015; McIntyre et al., 2013; Mucci et al., 2017).

It is important to note that, unlike for UPSA-B, diagnosis did not emerge as an important predictor of SSPA performance; although negative symptoms did. The significance of negative symptoms in explaining social skills performance has been extensively supported within schizophrenia literature (Jackson et al., 1989; Robertson et al., 2014). Although not explicitly termed as negative symptoms, problems such as social withdrawal and apathy have been associated with poor social functioning in mood disorders as well (Kupferberg et al., 2016). Recent investigations of transdiagnostic models of negative symptom phenomenology further support the stronger role of these clinical symptoms over diagnosis by demonstrating the non-pathognomonic nature of negative symptoms (Strauss and Cohen, 2017), underscoring the importance of examining clinical phenotypes independently of diagnostic entities.

There are limitations to the current study that must be acknowledged. We used a test of reading ability to estimate premorbid IQ, which may be affected by multiple factors (Griffin et al., 2002). The study employed performance-based measures of functional capacity and social skills and did not directly assess work, educational, or psychosocial outcomes. Additionally, negative symptoms were assessed by the PANSS, which does not discriminate between primary and secondary negative symptoms (e.g., negative symptoms secondary to depression). The sample lacked a control comparison group and the use of the MCCB meant that the remaining neuropsychological abilities of sustained attention, verbal learning, and visual learning were only assessed using one test per domain; future studies may consider using additional measures of these constructs. Additionally, for domains tested by more than one measure, the lack of significance across all measures may be the result of differential psychometric properties, such as sensitivity to deficits (Gold and Dickinson, 2013). Although our results suggest a differential relationship between neuropsychological abilities and psychosocial outcomes, further research is needed to determine whether improvements in these cognitive domains contribute to change in functional outcomes. Despite these limitations, the study generates preliminary evidence for a transdiagnostic consideration of the role of neurocognitive deficits in predicting functional and social abilities in people with SMI.

Although there is evidence suggestive of a common determinant of neuropsychological abilities and functional capacity within schizophrenia and bipolar disorder (Harvey et al., 2016), our study aimed at conducting a fine-grained analysis of the relationship between these constructs in a sample of individuals diagnosed with schizophrenia, bipolar disorder, and major depression. Furthermore, there remains a lack of consensus regarding the factor

structure of neuropsychological and functional capacity tests in SMI (Czobor et al., 2007; Gladsjo et al., 2004; Schretlen et al., 2013). Nevertheless, Harvey et al (2016) remains the largest study to date to find a single factor structure in an investigation that excluded individuals with major depression.

This is the first study, to our knowledge, to examine the differential relationship between individual neuropsychological domains and functional capacity and social skills in MDD, BD, and SZ simultaneously. The varied cognitive deficits common to these psychiatric disorders complicates the task of discovering effective treatments (Millan et al., 2012), thus, contributing to the rising costs associated with SMI. The study findings coincide with prior investigations of cognitive impairment associated with functional ability and social cognition. The current study holds important clinical implications in its use of a transdiagnostic approach: data from this study offer neuropsychological targets for intervention across diagnostic categories, providing an attractive alternative to diagnosis-specific treatments that stretch limited resources in medical centers and outpatient facilities. Furthermore, our findings suggest that neuropsychological abilities, as well as diagnosis, play a significant role in predicting the functional abilities of individuals with differential diagnoses (i.e., mood versus psychosis), with neuropsychological abilities having greater predictive utility as compared to diagnosis in explaining social skills of people with SMI. These results suggest prioritization of cognitive deficits within working memory, category fluency, sustained attention, and verbal fluency domains in the evaluation and management of SMI. Although cognitive training programs have demonstrated efficacy in improving memory and attention (Twamley et al., 2012), as well as negative symptoms (Ventura et al., 2017), further research is necessary to determine efficacy of such programs in improving fluency performance, given its significance in psychosocial functioning. Verbal fluency is understood as a multifactorial construct, with underlying executive functioning, processing speed, and working memory components contributing to performance (Unsworth, Spillers, & Brewer, 2011). Therefore, the limited efficacy of cognitive training programs may be due to lack of identified mechanisms or insufficient targets to influence changes in this domain. Our findings highlight the clinical and scientific importance of determining targeted cognitive interventions to improve psychosocial functioning within psychiatric disorders.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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The funding source had no other role in the work.

References

Allison P. When can you safely ignore multicollinearity? Statistical Horizons. 2012 Last modified September 10, 2012.

Allen DN, Bello DT, Thaler NS. Neurocognitive predictors of performance-based functional capacity in bipolar disorder. J. Neuropsychol. 2015; 9:159–171. DOI: 10.1111/jnp.12042 [PubMed: 24635947]

Baune BT, Malhi GS. A review on the impact of cognitive dysfunction on social, occupational, and general functional outcomes in bipolar disorder. Bipolar Disord. 2015; 17:41–55. DOI: 10.1111/bdi.12341 [PubMed: 26688289]

Bora E, Pantelis C. Meta-analysis of cognitive impairment in first-episode bipolar disorder: Comparison with first-episode schizophrenia and healthy controls. Schizophr. Bull. 2015; 41:1095–1104. DOI: 10.1093/schbul/sbu198 [PubMed: 25616505]

Bowie CR, Leung WW, Reichenberg A, McClure MM, Patterson TL, Heaton RK, Harvey PD. Predicting Schizophrenia Patients' Real-World Behavior with Specific Neuropsychological and Functional Capacity Measures. Biol. Psychiatry. 2008; 63:505–511. DOI: 10.1016/j.biopsych.2007.05.022 [PubMed: 17662256]

Brüne M. Emotion recognition, "theory of mind," and social behavior in schizophrenia. Psychiatry Res. 2005; 133:135–47. DOI: 10.1016/j.psychres.2004.10.007 [PubMed: 15740990]

Cloutier M, Aigbogun MS, Annie G, Nitulescu R, Ramanakumar AV, Kamat SA, DeLucia M, Duffy R, Legacy SN, Henderson C, Francois C, Wu E. The Economic Burden of Schizophrenia in the United States in 2013. J. Clin. Psychiatry. 2016; 77:764–771. DOI: 10.4088/JCP.15m10278 [PubMed: 27135986]

Czobor P, Jaeger J, Berns SM, Gonzalez C, Loftus S. Neuropsychological symptom dimensions in bipolar disorder and schizophrenia. Bipolar Disord. 2007; 9:71–92. DOI: 10.1111/j.1399-5618.2007.00428.x [PubMed: 17391352]

Depp CA, Mausbach BT, Harmell AL, Savla GN, Bowie CR, Harvey PD, Patterson TL. Meta-analysis of the association between cognitive abilities and everyday functioning in bipolar disorder. Bipolar Disord. 2012; 14:217–226. DOI: 10.1111/j.1399-5618.2012.01011.x [PubMed: 22548895]

Fioravanti M, Bianchi V, Cinti ME. Cognitive deficits in schizophrenia: an updated metanalysis of the scientific evidence. BMC Psychiatry. 2012; 12:64.doi: 10.1186/1471-244X-12-64 [PubMed: 22715980]

First, MB., Spitzer, RL., Gibbon, M., Williams, J. Biometrics Research. New York State Psychiatric Institute; New York: 2002. Structured clinical interview for DSM-IV-TR axis I disorders, research version, patient edition. SCID-I/P.

Gladsjo JA, McAdams LA, Palmer BW, Moore DJ, Jeste DV, Heaton RK. A Six-Factor Model of Cognition in Schizophrenia and Related Psychotic Disorders : Relationships With Clinical Symptoms and Functional Capacity. Schizophr. Bull. 2004; 30:739–754. [PubMed: 15957196]

Gold JM, Dickinson D. Generalized cognitive deficit in schizophrenia: Overused or underappreciated? Schizophr. Bull. 2013; 39:263–265. DOI: 10.1093/schbul/sbs143 [PubMed: 23211397]

Green MF. Cognitive impairment and functional outcome in schizophrenia and bipolar disorder. J. Clin. Psychiatry. 2006; 67:3–8. DOI: 10.4088/JCP.1006e12

Greenberg PE, Fournier A-A, Sisitsky T, Pike CT, Kessler RC. The Economic Burden of Adults With Major Depressive Disorder in the United States (2005 and 2010). J. Clin. Psychiatry. 2015; 2010:155–162. DOI: 10.4088/JCP.14m09298

Griffin SL, Mindt MR, Rankin EJ, Ritchie AJ, Scott JG. Estimating premorbid intelligence: Comparison of traditional and contemporary methods across the intelligence continuum. Arch. Clin. Neuropsychol. 2002; 17:497–507. DOI: 10.1016/S0887-6177(01)00136-6 [PubMed: 14592003]

Hamilton M. Development of a rating scale for primary depressive illness. Br. J. Clin. Psychol. 1967; 6(4):278–296.

Harvey PD, Aslan M, Du M, Zhao H, Siever LJ, Pulver A, Gaziano JM, Concato J. Factor structure of cognition and functional capacity in two studies of schizophrenia and bipolar disorder:

Implications for genomic studies. Neuropsychology. 2016; 30:28–39. DOI: 10.1037/neu0000245 [PubMed: 26710094]

Heaton, RK., Miller, SW., Taylor, MJ., Grant, I. Revised Comprehensive Norms foran Expanded Halstead-Reitan Battery: Demographically Adjusted Neuropsychological Norms for African American and Caucasian Adults. Psychological Assessment Resources, Inc; Lutz, Florida: 2004.

Jackson HJ, Minas IH, Burgess PM, Joshua SD, Charisiou J, Campbell IM. Negative symptoms and social skills performance in schizophrenia. Schizophr. Res. 1989; 2doi: 10.1016/0920-9964(89)90014-5

Jaeger J, Berns S, Uzelac S, Davis-Conway S. Neurocognitive deficits and disability in major depressive disorder. Psychiatry Res. 2006; 145:39–48. DOI: 10.1016/j.psychres.2005.11.011 [PubMed: 17045658]

Kay SR, Fiszbein A, Opler LA. The Positive and Negative Syndrome Scale for schizophrenia. Schizophr Bull. 1987; 13:261–276. DOI: 10.1093/schbul/13.2.261 [PubMed: 3616518]

Keefe, RSE., Harvey, PD. Cognitive Impairment in Schizophrenia. In: Geyer, MA., Gross, G., editors. Novel Antischizophrenia Treatments. Springer Berlin Heidelberg; Berlin, Heidelberg: 2012. p. 11-37.

Kongs, SK., Thompson, LL., Iverson, GL., Heaton, RK. Wisconsin card sorting test-64 card version (WCST-64). Odessa, FL: Psychological Assessment Resources; 2000.

Kupferberg A, Bicks L, Hasler G. Social functioning in major depressive disorder. Neurosci. Biobehav. Rev. 2016; 69:313–332. DOI: 10.1016/j.neubiorev.2016.07.002 [PubMed: 27395342]

Lee RSC, Hermens DF, Naismith SL, Lagopoulos J, Jones A, Scott J, Chitty KM, White D, Robillard R, Scott EM, Hickie IB. Neuropsychological and functional outcomes in recent-onset major depression, bipolar disorder and schizophrenia-spectrum disorders: A longitudinal cohort study. Transl. Psychiatry. 2015; 5:e555–10. [PubMed: 25918992]

Mausbach BT, Harvey PD, Goldman SR, Jeste DV, Patterson TL. Development of a brief scale of everyday functioning in persons with serious mental illness. Schizophr. Bull. 2007; 33:1364–1372. DOI: 10.1093/schbul/sbm014 [PubMed: 17341468]

Mausbach BT, Harvey PD, Pulver AE, Depp CA, Wolyniec PS, Thornquist MJ, Luke JR, McGrath JA, Bowie RTLP. Relationship of the brief UCSD performance based skills assessment- UPSA-B) to multiple indicators of functioning in people with schizophrenia and bipolar disorder. Bipolar Disord. 2010; 12:45–55. [PubMed: 20148866]

McIntyre RS, Cha DS, Soczynska JK, Woldeyohannes HO, Gallaugher LA, Kudlow P, Alsuwaidan M, Baskaran A. Cognitive deficits and functional outcomes in major depressive disorder: Determinants, substrates, and treatment interventions. Depress. Anxiety. 2013; 30:515–527. DOI: 10.1002/da.22063 [PubMed: 23468126]

Millan MJ, Agid Y, Brüne M, Bullmore ET, Carter CS, Clayton NS, Connor R, Davis S, Deakin B, DeRubeis RJ, Dubois B, Geyer MA, Goodwin GM, Gorwood P, Jay TM, Joëls M, Mansuy IM, Meyer-Lindenberg A, Murphy D, Rolls E, Saletu B, Spedding M, Sweeney J, Whittington M, Young LJ. Cognitive dysfunction in psychiatric disorders: characteristics, causes and the quest for improved therapy. Nat. Rev. Drug Discov. 2012; 11:141–168. DOI: 10.1038/nrd3628 [PubMed: 22293568]

Miller S, Dell'Osso B, Ketter TA. The prevalence and burden of bipolar depression. J. Affect. Disord. 2014; 169:S3–S11. DOI: 10.1016/S0165-0327(14)70003-5 [PubMed: 25533912]

Mucci A, Galderisi S, Rocca P, Rossi A, Bertolino A, Maj M. Neurocognitive predictors of social cognition in subjects with schizophrenia and their first-degree relatives. Eur. Psychiatry. 2017; 41:S8–S52. DOI: 10.1016/j.eurpsy.2017.01.182

Nuechterlein KH, Green MF, Kern RS, Baade LE, Barch DM, Cohen JD, Essock S, Fenton WS, Frese FJ, Gold JM, Goldberg T, Heaton RK, Keefe RSE, Kraemer H, Mesholam-Gately R, Seidman LJ, Stover E, Weinberger DR, Young AS, Zalcman S, Marder SR. The MATRICS consensus cognitive battery, part 1: Test selection, reliability, and validity. Am. J. Psychiatry. 2008; 165:203–213. DOI: 10.1176/appi.ajp.2007.07010042 [PubMed: 18172019]

Patterson TL, Moscona S, McKibbin CL, Davidson K, Jeste DV. Social skills performance assessment among older patients with schizophrenia. Schizophr. Res. 2001; 48:351–60. DOI: 10.1016/S0920-9964(00)00109-2 [PubMed: 11295387]

Raskin S. Memory for intentions screening test. J. Int. Neuropsychol. Soc. 2004; 10(Suppl.1):110. [PubMed: 14751013]

Robertson BR, Prestia D, Twamley EW, Patterson TL, Bowie CR, Harvey PD. Social competence versus negative symptoms as predictors of real world social functioning in schizophrenia. Schizophr. Res. 2014; 160:136–141. DOI: 10.1016/j.schres.2014.10.037 [PubMed: 25468184]

Rock PL, Roiser JP, Riedel WJ, Blackwell AD. Cognitive impairment in depression: a systematic review and meta-analysis. Psychol. Med. 2014; 44:2029–2040. DOI: 10.1017/S0033291713002535 [PubMed: 24168753]

Roiser JP, Elliott R, Sahakian BJ. Cognitive mechanisms of treatment in depression. Neuropsychopharmacology. 2012; 37:117–136. DOI: 10.1038/npp.2011.183 [PubMed: 21976044]

Schretlen D, Jayaram G, Maki P, Park K, Abebe S, DiCarlo M. Demographic, clinical, and neurocognitive correlates of everyday functional impairment in severe mental illness. J. Abnorm. Psychol. 2000; 109:134–138. DOI: 10.1037//0021-843X.109.1.134 [PubMed: 10740944]

Schretlen DJ, Pena J, Aretouli E, Orue I, Cascella NG, Pearlson GD, Ojeda N. Confirmatory factor analysis reveals a latent cognitive structure common to bipolar disorder, schizophrenia, and healthy adults. Bipolar Disord. 2013; 15:422–433. DOI: 10.1111/bdi.12075 [PubMed: 23656284]

Sheehan DV, Lecrubier Y, Sheehan KH, Janavs J, Weiller E, Keskiner A, Schinka J, Knapp E, Sheehan MF, Dunbar GC. The validity of the Mini International Neuropsychiatric Interview (MINI) according to the SCID-P and its reliability. Eur. Psychiatry. 1997; 12:232–241. DOI: 10.1016/S0924-9338(97)83297-X

Strauss GP, Cohen AS. A Transdiagnostic Review of Negative Symptom Phenomenology and Etiology. Schizophr. Bull. 2017; 43:712–729. DOI: 10.1093/schbul/sbx066 [PubMed: 28969356]

Twamley EW, Savla GN, Zurhellen CH, Heaton RK, Jeste DV. Development and pilot testing of a novel compensatory cognitive training intervention for people with psychosis. Am. J. Psychiatr. Rehabil. 2008; 11:144–163. DOI: 10.1080/15487760801963678 [PubMed: 19198664]

Twamley EW, Thomas KR, Burton CZ, Vella L, Jeste DV, Heaton RK, Mcgurk SR. Compensatory cognitive training for people with severe mental illnesses in supported employment: A randomized controlled trial. Schizophr. Res. 2017; doi: 10.1016/j.schres.2017.08.005

Twamley EW, Vella L, Burton CZ, Heaton RK, Jeste DV. Compensatory Cognitive Training for psychosis: Effects in a randomized controlled trial. J. Clin. Psychiatry. 2012; 73:1212–1219. DOI: 10.4088/JCP.12m07686 [PubMed: 22939029]

Vella L, Patterson TL, Harvey PD, McClure MMN, Mausbach BT, Taylor MJ, Twamley EW. Exploratory analysis of normative performance on the UCSD Performance-Based Skills Assessment-Brief. Psychiatry Res. 2017; 256:150–155. DOI: 10.1016/j.psychres.2017.06.025 [PubMed: 28633056]

Ventura J, Subotnik KL, Gretchen-Doorly D, Casaus L, Boucher M, Hellemann GS, Nuechterlein KH. Cognitive remediation can improve negative symptoms and social functioning in first-episode schizophrenia: A randomized controlled trial. Schizophr. Res. 2017; doi: 10.1016/j.schres.2017.10.005

Wilkinson, GS. WRAT-3: Wide Range Achievement Test Manual. The Psychological Corporation; San Antonio, TX: 1993.

Wolf F, Brune M, Assion HJ. Theory of mind and neurocognitive functioning in patients with bipolar disorder. Bipolar Disord. 2010; 12:657–666. DOI: 10.1111/j.1399-5618.2010.00854.x [PubMed: 20882710]

Zobel I, Werden D, Linster H, Dykierek P, Drieling T, Berger M, Schramm E. Theory of mind deficits in chronically depressed patients. Depress. Anxiety. 2010; 27:821–828. DOI: 10.1002/da.20713 [PubMed: 20577984]

Highlights

- Neuropsychological abilities are correlated with functional capacity and social skills performance in people with severe mental illnesses.
- Working memory performance was the strongest predictor of functional capacity.
- Negative symptom severity was the strongest predictor of social skills performance.

Table 1

Participant demographics and group statistics

	Total sample Mean/% (SD) (*N* = 151)	MD Mean/% (SD) (*n* = 58)	BD Mean/% (SD) (*n* = 37)	SS Mean/% (SD) (*n* = 56)	*F* or χ^2	*p*-value	LSD post-hoc comparison
Demographic & Clinical Characteristics							
Age	43.68 (11.75)	45.05 (11.75)	44.78 (11.20)	41.54 (12.00)	1.50	.226	
Education	13.46 (2.79)	13.79 (2.76)	14.22 (2.42)	12.61 (2.88)	4.60	**.012**	MD, BD > SS
Female, %	43.7%	58.6%	40.5%	30.4%	χ^2= 9.45	**.009**	MD > SS
Racial/ethnic minority, %	37.7%	34.5%	13.5%	57.1%	χ^2= 18.48	**< .001**	MD > BD; SS >MD, BD
Duration of illness, years	24.37 (14.23)	24.78 (14.38)	28.95 (14.01)	20.93 (13.54)	3.70	**.027**	BD > SS
Functioning & Symptom Severity							
PANSS positive[a]	12.47 (5.00)	11.33 (3.51)	11.86 (5.08)	14.05 (5.86)	4.83	**.009**	SS > MD, BD
PANSS negative[a]	13.17 (5.00)	12.07 (3.95)	11.89 (4.45)	15.16 (5.73)	7.67	**.001**	SS > MD, BD
HAM-D[a]	12.97 (6.86)	15.16 (6.82)	13.14 (7.07)	10.52 (6.00)	6.92	**.001**	MD > SS
UPSA-B	78.39 (10.79)	82.49 (7.74)	83.24 (8.30)	70.94 (10.97)	29.28	**< .001**	MD, BD > SS
SSPA	4.18 (0.65)	4.38 (.58)	4.27 (.44)	3.91 (0.76)	8.72	**< .001**	MD, BD > SS
Neuropsychological Functioning							
Processing speed							
TMT-A	42.15 (11.22)	44.91 (9.80)	42.32 (10.76)	39.16 (12.28)	3.90	**.022**	MD > SS
BAC-SC	39.16 (10.90)	41.55 (10.61)	42.41 (10.321)	34.54 (10.14)	8.93	**<.001**	MD, BD > SS
Category fluency	44.74 (9.27)	46.67 (9.61)	46.81 (8.57)	41.38 (8.51)	6.28	**.002**	MD, BD > SS
Sustained attention							
CPT-IP	43.00 (12.75)	46.11 (10.77)	45.78 (12.34)	38.16 (13.49)	7.07	**.001**	MD, BD > SS
Working memory							
WMS-III SS	46.75 (9.64)	47.41 (9.64)	47.30 (10.06)	45.70 (9.42)	0.53	.590	
LNS	44.42 (10.62)	47.10 (9.13)	48.03 (10.49)	39.27 (10.28)	12.16	**<.001**	MD, BD > SS
Verbal learning							
HVLT-R	46.44 (10.89)	48.69 (10.55)	49.24 (10.42)	42.25 (10.42)	7.15	**.001**	MD, BD > SS
Visual learning							
BVMT-R	44.36 (10.94)	44.81 (11.74)	47.51 (10.47)	41.80 (9.90)	3.21	**.043**	BD > SS
Executive function							

	Total sample Mean/% (SD) (*N* = 151)	MD Mean/% (SD) (*n* = 58)	BD Mean/% (SD) (*n* = 37)	SS Mean/% (SD) (*n* = 56)	*F* or χ^2	*p*-value	LSD post-hoc comparison
NAB Mazes	44.44 (10.09)	45.31 (10.52)	43.78 (9.15)	43.96 (10.33)	0.35	.703	
TMT-B	43.91 (11.37)	44.52 (10.67)	43.86 (10.63)	43.29 (12.66)	0.16	.850	
WCST-64	44.09 (10.82)	46.79 (10.83)	44.46 (10.84)	41.05 (10.17)	4.21	**.017**	MD > SS
Prospective memory							
MIST, %ile	45.05 (32.06)	49.84 (32.57)	50.86 (32.32)	36.23 (29.90)	3.49	**.033**	MD, BD > SS
Letter fluency							
FAS	46.41 (10.03)	49.38 (8.53)	46.43 (10.34)	43.32 (10.49)	5.51	**.005**	MD > SS
Premorbid IQ	103.07 (9.64)	104.62 (8.36)	106.51 (7.97)	99.20 (10.65)	8.38	< **.001**	MD, BD > SS

[a]Denotes measure in which lower scores are better. Bold font denotes $p < 0.05$.

SS=schizophrenia-spectrum disorders; HAM-D=Hamilton Depression Rating Scale; PANSS=Positive and Negative Syndrome Scale; UPSA-B=University of California, San Diego Performance-based Skills Assessment-Brief; SSPA=Social Skills Performance Assessment; TMT-A=Trail Making Test, Part A; BACS-SC=Brief Assessment of Cognition in Schizophrenia, Symbol-Coding; CPT-IP=Continuous Performance Test—Identical Pairs; WMS-III SS=Wechsler Memory Scale-III Spatial Span; LNS=Letter-Number Span; HVLT-R=Hopkins Verbal Learning Test— Revised; BVMT-R=Brief Visual Memory Test—Revised; NAB Mazes= Neuropsychological Assessment Battery; TMT-B=Trail Making Test, Part B; WCST-64=Wisconsin Card Sorting Test-64 card version; MIST=Memory for Intentions Screening Test; premorbid IQ (Wide Range Achievement Test-III [WRAT-III] – Reading subtest).

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Table 2

Pearson correlations between UPSA-B, SSPA, and neuropsychological measures (N = 151)

	UPSA-B	SSPA
SSPA	.407**	-
Education (years)	.278**	.185*
PANSS positive	−.228**	−.123
PANSS negative	−.318**	−.491**
HAM-D	.091	.103
TMT-A	.282**	.167*
BACS-SC	.370**	.283**
Category Fluency	.374**	.299**
CPT-IP	.449*	.366**
WMS-SS	.270**	.183*
LNS	.479**	.254**
HVLT-R	.335**	.221**
BVMT-R	.247**	.095
NAB Mazes	.144	−.004
TMT-B	.259**	.180*
WCST-64	.302**	.180*
MIST	.210**	.175*
FAS	.171*	.361**
Premorbid IQ	.380**	.193*

* $p < .05$;

** $p < .01$

UPSA-B=University of California, San Diego Performance-based Skills Assessment-Brief; SSPA=Social Skills Performance Assessment; TMT-A=Trail Making Test, Part A; BACS-SC=Brief Assessment of Cognition in Schizophrenia, Symbol-Coding; CPT-IP=Continuous Performance Test—Identical Pairs; WMS-III SS=Wechsler Memory Scale-III Spatial Span; LNS=Letter-Number Span; HVLT-R=Hopkins Verbal Learning Test—Revised; BVMT-R=Brief Visual Memory Test—Revised; NAB Mazes= Neuropsychological Assessment Battery; TMT-B=Trail Making Test, Part B; WCST-64=Wisconsin Card Sorting Test-64 card version; MIST=Memory for Intentions Screening Test; premorbid IQ (Wide Range Achievement Test-III [WRAT-III] – Reading subtest).

Table 3

Significant predictors of functional capacity (UPSA-B) and social skills performance (SSPA)

UPSA-B				
	b	**t**	**p-value**	**95% CI**
LNS	.23	2.78	**.006**	.066, .390
Diagnosis	−3.99	−4.64	**<.001**	−5.690, −2.288
CPT-IP	.20	3.05	**.003**	.071, .333
Category Fluency	.28	3.11	**.002**	.101, .453
FAS	−.18	−2.03	**.045**	−.354, −.004
SSPA				
	b	**t**	**p-value**	**95% CI**
PANSS negative	−.05	−5.79	**<.001**	−.072, −.035
FAS	.01	2.86	**.005**	.004, .024
CPT-IP	.01	2.68	**.008**	.003, .018

Bold font denotes $p < 0.05$. UPSA-B=University of California, San Diego Performance-based Skills Assessment-Brief; SSPA=Social Skills Performance Assessment; LNS=Letter-Number Span; Diagnosis (Major Depression [1]; Bipolar Disorder [2]; Schizophrenia-spectrum Disorders [3]); CPT-IP=Continuous Performance Test—Identical Pairs.