Title

Modifiable Predictors of Supported Employment Outcomes Among People With Severe Mental Illness

Journal

Psychiatric Services, 70(9)

ISSN

1075-2730

Authors

Mahmood, Zanjbeel
Keller, Amber V
Burton, Cynthia Z
et al.

Publication Date

2019-09-01

DOI

10.1176/appi.ps.201800562

Peer reviewed

Published in final edited form as:

Psychiatr Serv. 2019 September 01; 70(9): 782–792. doi:10.1176/appi.ps.201800562.

Modifiable predictors of supported employment outcomes in people with severe mental illness

Zanjbeel Mahmood, B.A.[a,b], **Amber V. Keller, B.A.**[b], **Cynthia Z. Burton, Ph.D.**[a,1], **Lea Vella, Ph.D.**[a,2], **Georg E. Matt, Ph.D.**[c], **Susan R. McGurk, Ph.D.**[d], **Elizabeth W. Twamley, Ph.D.**[e,f,†]

[a]SDSU/UC San Diego Joint Doctoral Program in Clinical Psychology

[b]Research Service, VA San Diego Healthcare System

[c]Department of Psychology, San Diego State University, San Diego, CA

[d]Department of Occupational Therapy and Psychological and Brain Sciences; Center for Psychiatric Rehabilitation, Boston University, Boston, MA

[e]Department of Psychiatry, University of California San Diego

[f]Center of Excellence for Stress and Mental Health, VA San Diego Healthcare System

Abstract

Objective: In people with severe mental illnesses, neuropsychological abilities may contribute to vocational outcomes, such as job attainment, job tenure, and wages earned. The current study aimed to determine the strongest neuropsychological and other modifiable predictors of work outcomes in 153 people with severe mental illness (38% schizophrenia, 24% bipolar disorder, 38% major depression) who participated in a two-year supported employment study.

Methods: Assessments of neuropsychological performance, functional capacity, social skills, and psychiatric symptom severity were administered at baseline; work outcomes (job attainment, weeks worked, and wages earned) were collected weekly for two years.

Results: Independent of education, diagnosis, and estimated intellectual functioning, more recent work history and less severe negative symptoms significantly predicted job attainment during the two-year study. Among the 47% who obtained jobs, better global neuropsychological performance (i.e., lower global deficit score) was a significant predictor of greater weeks worked. Both global neuropsychological performance and more recent work history predicted higher wages earned.

Conclusion: Modifiable predictors of supported employment outcomes included cognitive functioning and negative symptom severity; thus, interventions to improve these factors may improve work outcomes and decrease the loss of productivity associated with severe mental illness.

† Corresponding Author: Elizabeth W. Twamley, PhD, Department of Psychiatry, University of California San Diego, 140 Arbor Drive (0851), San Diego, CA 92103, etwamley@ucsd.edu, Phone: 619-543-6684.

[1]Dr. Burton is now at University of Michigan, Department of Psychiatry

[2]Dr. Vella is now at University of California San Francisco Health, Department of Quality

Declarations of interest: None

Keywords

schizophrenia; bipolar disorder; major depressive disorder; cognition; work; vocational outcomes

Introduction

Unemployment is common among individuals with severe mental illnesses and is associated with high economic costs, the largest being lost productivity[1–5]. Evidence-based supported employment, also known as Individual Placement and Support (IPS), is an evidence-based practice to assist people with severe mental illness in returning to work; multiple studies and meta-analyses have shown IPS to be more effective than conventional vocational rehabilitation at improving work outcomes such as job acquisition, job tenure, and wages[6–9]. IPS principles include: eligibility based on client choice (zero exclusion), attention to client preferences, competitive employment as the goal, rapid job search, integration of mental health treatment and supported employment, individualized, time-unlimited job support, systematic job development, and benefits counseling[10].

A growing body of research has addressed predictors of work outcomes in people with severe mental illness, both in general and within individuals receiving supported employment. Predictors of better work outcomes in general include higher education[11,12], stronger or more recent work history[1,13–16], and absence of psychosis[17]. The relationship between age and work outcomes remains uncertain[6,7,10,17,18]. Similarly, the link between ethnicity and work outcome remains inconclusive; some studies have found an association between Hispanic ethnicity and better work outcomes[15,18] while others have not[19].

Ascertaining individual predictors of work outcomes in the context of IPS may help providers in addressing modifiable client factors for IPS service users. A landmark meta-analysis of four large IPS trials found the effects of IPS on work outcomes were robust even when accounting for most demographic, clinical, and employment characteristics[7]. Another study of 2055 Social Security Disability Insurance beneficiaries showed that work history was the strongest predictor of supported employment outcomes[15]. These and other studies have concluded that IPS should be offered to anyone with severe mental illness who wants to work[9,20]. However, the search for modifiable predictors of work outcomes continues in order to improve the typical 61% job acquisition rate in IPS programs[10].

Many studies have suggested that neurocognitive and functional abilities may be strong predictors of work outcome[11,21,22], but relatively few IPS studies have included comprehensive neuropsychological and functional assessments. Better performance on measures of verbal learning[13,18], working memory[23], executive functioning[11,13], and processing speed[16] have been linked to better vocational outcomes. Additionally, greater baseline functional capacity[14] and better social skills[12] have been associated with better work outcomes.

Much of the prior research on the relationship between neuropsychological ability and work outcomes has been limited by small sample size, short follow-up periods, reliance on samples of individuals with the same diagnosis or the same type of disability benefits,

limited neurocognitive test batteries, or clients not enrolled in supported employment. As such, the present study aimed to fill some of the gaps in the published literature by determining the strongest neuropsychological and other modifiable predictors of work outcomes in a large sample of IPS service users with varying diagnoses. Participants received IPS for up to two years and were assessed using a comprehensive neuropsychological battery and performance-based measures of functional and social skills, in addition to standard clinical measures.

Method

Participants

The study was registered as a clinical trial () and data were collected from June 2008 to February 2014. Study procedures were approved by the University of California, San Diego, Institutional Review Board and all participants provided written informed consent. 153 unemployed outpatients with severe mental illness (58 with schizophrenia/schizoaffective disorder, 37 with bipolar disorder, and 58 with major depressive disorder) enrolled in the trial. Inclusion criteria were: ≥18 years old; literate and fluent in English; DSM-IV diagnosis of schizophrenia, schizoaffective disorder, bipolar disorder, or major depressive disorder confirmed via Structured Clinical Interview for DSM-IV[24] or Mini International Neuropsychiatric Interview[25]; and unemployed for at least 30 days and interested in working. All participants received IPS for up to two years, based on their preference, and were randomized to also receive either Compensatory Cognitive Training (CCT; n=77) or additional supported employment sessions (Enhanced Supported Employment [ESE]; n=76) for the first 12 weeks of the trial (see Twamley et al. [26] for further details). Each group had its own employment specialist. Fidelity to supported employment was rated as “fair” during the study period. Because work outcomes associated with CCT and ESE did not differ[26], the groups were collapsed for all analyses. Table 1 provides the demographic and clinical characteristics of the sample.

Baseline neuropsychological, clinical, and functional assessments were used in the current analyses. Data from these participants have been used in prior publications[26–30]; however, the analyses presented in this paper have not been published previously.

Measures

The following assessments were administered at baseline, prior to randomization. All raters were trained to a high degree of inter-rater reliability (ICC≥.90).

Neuropsychological measures

Premorbid intellectual ability was estimated with the Wide Range Achievement Test-III (WRAT-III)–Reading subtest[31]. The cognitive subtests of the MATRICS Consensus Cognitive Battery (MCCB)[32] assessed neuropsychological functioning in the domains 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. Additional tests of executive functioning measured set-shifting (Trail Making Test, Part B [TMT-B][33]), letter fluency using the letters F, A, and S (FAS)[33], and reasoning and set-shifting (Wisconsin Card Sorting Test-64 card version [WCST-64][34] total errors). Additionally, prospective memory ability was measured using the Memory for Intentions Screening Test (MIST)[35]. We calculated a global deficit score (GDS) by transforming individual neuropsychological test scores (i.e., T-scores) to deficit scores ranging from zero (no impairment) to five (severe impairment), which were then averaged across all tests to create the GDS[36].

Functional Skills and Symptom Severity

The University of California, San Diego Performance-Based Skills Assessment-Brief (UPSA-B)[37] assessed performance-based functional capacity in the domains of financial management and communication. The Social Skills Performance Assessment (SSPA)[38] measured social skills relevant to neutral and adversarial situations. Positive and negative symptom severity and general psychopathology were measured with the Positive and Negative Syndrome Scale (PANSS)[39], and depressive symptom severity was measured using the Hamilton Depression Rating Scale (HAM-D)[40].

Work Outcomes

Work outcomes (competitive job attainment, total weeks of competitive employment, and wages earned) were gathered weekly during the two-year study by the employment specialist (if engaged in weekly contact with the participant) or a research assistant; work participation and earnings were corroborated with paystubs. Competitive work was defined as employment paying at least minimum wage and not set aside for a person with a disability. Participants who dropped out of the study prior to obtaining a job were assumed not to have worked.

Statistical analyses

One-way ANOVA and Chi-square tests were conducted to examine differences in characteristics between diagnostic groups (see Table 1). 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[41]. Job attainment during the two-year study period (0=No; 1=Yes) was analyzed using a logistic regression model. Examination of variable distributions for competitive weeks worked and wages earned showed positively-skewed distributions, with excess zeroes. Thus, these variables were log-transformed before being included in all analyses and modeled using a zero-altered count regression approach, known as a hurdle model. Hurdle models are two-part models, in which all the zeroes are modeled with a probit regression, and non-zero counts are modeled by a truncated count regression (i.e., truncated because it does not include zero)[42]. Our hurdle models reflected the two-stage process resulting in the observed distributions of competitive weeks worked and wages earned. That is, participants first had to attain a job (i.e., pass the “hurdle”) to report weeks

of employment and wages earned. Thus, the probit regression component of the hurdle model examined the predictors of job attainment, while the count regression in the hurdle models examined weeks worked and wages earned for those who attained a job (n=72; see Table 2 for characteristics of this subset). Analyses were conducted using SPSS version 24.0, except for hurdle models, which were conducted using STATA/IC version 15.0.

Bivariate Pearson and Point-Biserial correlations between individual tests of neuropsychological functioning (i.e., neuropsychological measures, including premorbid intellectual ability), GDS, psychiatric symptom severity, performance-based functional capacity and social skills, demographic variables, and work outcomes were conducted (see Table 3). Bivariate-significant correlates of job attainment ($p<0.05$) were entered as predictors of job attainment in the logistic regression model as well as the probit component of the hurdle models. Similarly, for the subset of participants who attained a job, bivariate-significant variables were entered as predictors of weeks of competitive work and wages earned for the count regression models. (Although work history was not significantly associated with weeks worked, it was entered in the model due to computational requirements of hurdle model, i.e., algorithm limitations. Including work history did not affect model estimates. Our model excluding work history converged using an alternative linear maximum likelihood model [i.e., zero-inflated negative binomial model], and had similar results, thereby bolstering the robustness of the hurdle models.) There were significant demographic differences by diagnostic group in years of education and premorbid IQ estimate (ps<0.05), which were controlled for in subsequent analyses.

Results

Bivariate correlations (n=153) determined significant associations between several participant characteristics and job attainment, including education, racial/ethnic minority status, work history, diagnosis, and psychiatric symptom severity (Table 3). Furthermore, better functional capacity, greater estimated intellectual functioning, and better performance on BACS-SC, LNS, and WCST-64 were associated with job attainment. As such, these variables were entered in the logistic regression model and the probit regression component of the hurdle models.

Forward entry likelihood ratio (LR) stepwise analysis found work history and negative symptom severity to be significant predictors of job attainment during the two-year study period. Jointly, these variables improved model fit by 26% ($\chi^2 = 32.92$, N=151, df=2, p<0.001, Nagelkerke R^2=0.26), with less severe negative symptoms [OR=.910, Wald z=5.90, df =1, p=0.015, CI: 0.843, 0.982] and more recent work history [OR=.971, Wald z=13.25, df=1, p<0.001, CI: 0.956, 0.987] associated with increased odds of obtaining employment.

For competitive weeks worked, variables significantly associated with job attainment were entered into the probit regression component of the hurdle model. Simultaneously, variables significantly associated with competitive weeks worked (i.e., positive symptom severity and GDS; Table 3) for the subset of participants who attained a job (n=72) were entered in the count regression component of the hurdle model, along with work history. (Note that the

probit and count regression components of the hurdle model are separate, so including GDS in the count regression and individual test scores in the probit regression, respectively, did not introduce multicollinearity.) The hurdle model found more recent work history to be a significant predictor of job attainment, whereas lower levels of neuropsychological impairment (GDS) emerged as a significant predictor of greater competitive weeks worked (*p*s<0.05). Backward selection elimination of predictor variables with p>0.05 in the hurdle models was performed to determine the robustness of the findings and determine additional significant predictors that may not have been detected due to redundancies. This resulted in a more parsimonious final model, reported here, with additional significant predictors for job attainment. Specifically, consistent with the logistic regression model reported above, lower negative symptom severity emerged as an additional significant predictor of job attainment along with more recent work history (see Table 4). GDS remained the only significant predictor of weeks of competitive work, with the overall hurdle model improving model fit by 14% (LR χ^2 = 42.33, *N*=151, *df*=2, *p*<0.001, Pseudo R^2=0.14). Post-estimation analyses determined that higher GDS scores were related to fewer weeks worked; a participant with a GDS of 0 worked 33.67 weeks on average during the two-year study duration, whereas a participant with a GDS score of 2.5, indicating moderate impairment, worked an average of 9.23 weeks throughout the study duration, approximately four times less.

For wages earned, the results of the probit regression model were identical to the hurdle model reported above. For the count regression, variables significantly associated with wages earned (i.e., work history, positive symptom severity, and GDS; Table 3) for the subset of participants who obtained a job were entered into this component of the hurdle model. GDS emerged as a significant predictor of wages earned (*p*<0.05). Backward selection elimination determined work history as an additional significant predictor of wages earned, with the overall hurdle model improving model fit by 14% (LR χ^2 = 48.89, *N*=151, *df*=2, *p*<0.001, Pseudo R^2=0.14; Table 4). Further examination of these associations revealed that less neuropsychological impairment (GDS) was related to higher wages; on average, a participant with a GDS of 0 earned twice as much as a participant with a GDS of 1 ($7,942.28 vs. $3,387.44). Furthermore, more recent work history was related to higher wages; a participant who was unemployed for one month at study entry earned, on average, $9,331.54 over the two-year study as compared to $3,234.94 for participants unemployed for one year.

To further probe the relationship between neuropsychological abilities and work outcomes, we examined the predictive utility of individual tests across domains in explaining work outcomes. Specifically, GDS was replaced within the hurdle models with individual test scores significantly associated at the bivariate level with job attainment (BACS-SC, LNS, WCST-64), weeks worked (TMT-A, HVLT-R, BACS-SC, BVMT-R, TMT-B), and wages earned (FAS, TMT-A, HVLT-R, NAB Mazes, BVMT-R, WCST-64). All demographic and clinical variables previously entered were also included. Negative symptom severity and work history remained the only significant predictors of job attainment, whereas BVMT-R emerged as the only significant predictor of weeks worked in a model that improved model fit by 14% (LR χ^2 = 41.17, *N*=151, *df*=2, *p*<0.001, Pseudo R^2=0.14). For wages earned, in addition to work history, FAS and BVMT-R emerged as significant predictors, with the

overall hurdle model improving model fit by 15% (LR χ^2 = 52.77, N=151, df=2, p<0.001, Pseudo R^2=0.15).

Additional exploratory analyses were conducted to examine associations between cognitive functioning, psychiatric symptom severity, and work history. Better working memory (LNS), executive functioning (NAB Mazes; WCST-64), and visual learning (BVMT-R), and less severe positive symptoms were associated with more recent work history (all ps<0.05). There were no differences between the psychiatric diagnostic groups on work history.

Discussion

The current study examined the strongest neuropsychological and other modifiable predictors of vocational outcomes in a sample of individuals with severe mental illness. Considering the transdiagnostic presentation of cognitive impairments in psychiatric disorders, and poor associated work outcomes, understanding the differential relationship of neuropsychological abilities with vocational outcomes may reveal targets for cognitive training/remediation within people with severe mental illness.

Indeed, we found several neuropsychological abilities that were associated with work outcomes at the bivariate level, including processing speed (BACS-SC), working memory (LNS), premorbid IQ (WRAT-III), and global neuropsychological performance (GDS). However, our hurdle models showed that only overall neuropsychological ability (GDS) remained a significant predictor of weeks worked and wages earned. Significant predictors of job attainment included more recent work history and less severe negative symptoms. Among those who obtained jobs, better global neuropsychological functioning (i.e., lower GDS) predicted greater weeks worked, above and beyond demographic and clinical characteristics and work history, with visual learning driving the overall relationship. Controlling for demographic and clinical characteristics, better global neuropsychological functioning, driven by better visual learning and verbal fluency performance, also predicted greater wages earned over the two years, along with more recent work history. These findings are consistent with previous studies demonstrating cognitive functioning as a significant predictor of work outcomes even after controlling for work history, itself a robust predictor of work outcomes[18]. In the general population, cognitive ability is a strong predictor of work outcomes, and this association is partly mediated by better cognitive ability predicting better learning and job knowledge[43,44]. Our results suggest that, regardless of diagnosis, the cognitive impairments seen within severe mental illness, particularly in visual learning and verbal fluency, uniquely predict vocational outcomes.

Consistent with previous findings[15], diagnosis did not emerge as a significant predictor of work outcomes. Our results highlight the importance of negative symptoms in predicting employment outcomes, a significance which may be explained through transdiagnostic models of negative symptom phenomenology ascribing a stronger role to these clinical symptoms compared to diagnosis[45]. These findings underscore the importance of the independent examination of clinical phenotypes as discrete from diagnostic entities[46].

The current findings may hold practical significance for mental health clinicians and employment specialists who work with clients with severe mental illness; targeting negative symptoms and providing cognitive training/remediation may improve work outcomes in supported employment service users. Although cognitive training programs are associated with improvements in varied cognitive domains[26,47,48] as well as negative symptoms[26,49,50], further research is needed to investigate the efficacy of such programs in improving visual learning and fluency performance, given their significance in supported employment outcomes. Visual learning appears unresponsive to cognitive training programs[47,51]; however, few studies have examined this domain[47]. Similarly, the limited efficacy of cognitive interventions on verbal fluency, a multifactorial construct[52], may be due to limited investigations of treatment targets to influence, thereby underscoring the need for further investigations.

Given the significance of work history in predicting work outcomes, and that better cognitive performance is associated with more recent work, the inclusion of work history in our models may have served as a proxy for cognitive functioning. Thus, inclusion of individual cognitive tests as predictors may have had an insignificant effect on improving model fit when added along with work history. Despite these inter-correlations, our findings highlight the significance of overall cognitive performance for work success, as well as identify specific targets of neuropsychological interventions to improve supported employment outcomes.

There are limitations to the current study that must be acknowledged. The sample lacked a control group that did not receive supported employment and the results may be limited in generalizability to other samples given that our participants were community-dwelling, unemployed individuals with severe mental illness who received supported employment. Also, the use of PANSS to assess negative symptoms precluded the examination of the role of primary versus secondary negative symptoms (e.g., negative symptoms secondary to depression) in predicting work outcomes. Future research should incorporate these distinctions in their investigations. The MCCB includes limited assessment of attention, verbal learning, and visual learning (one test per domain); future studies should consider using additional measures of these constructs. Additionally, differential psychometric properties, such as sensitivity to deficits, may explain the lack of significance across all measures for domains assessed through multiple tests[53].

Conclusions

This study generates evidence for a transdiagnostic consideration of the role of neurocognitive deficits and negative symptom severity in predicting work outcomes in supported employment service users. The results suggest that improving negative symptom severity, visual learning, and verbal fluency may improve supported employment outcomes in people with severe mental illness.

Acknowledgment:

The authors gratefully acknowledge the contributions of the participants in this study.

Funding: This work was funded by the National Institutes of Health (R01MH080150; T32MH019934); the funding source had no other role in the work.

References

1. Marwaha S, Johnson S. Schizophrenia and employment: A review. Soc Psychiatry Psychiatr Epidemiol 2004;39(5):337–349. 10.1007/s00127-004-0762-4. [PubMed: 15133589]
2. Waghorn G, Saha S, Harvey C, et al. “Earning and learning” in those with psychotic disorders: The second Australian national survey of psychosis. Aust N Z J Psychiatry 2012;46(8):774–785. 10.1177/0004867412452015. [PubMed: 22718112]
3. Miller S, Dell’Osso B, Ketter TA. The prevalence and burden of bipolar depression. J Affect Disord 2014;169:S3–S11. 10.1016/S0165-0327(14)70003-5. [PubMed: 25533912]
4. 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(February):155–162. 10.4088/JCP.14m09298.
5. Cloutier M, Aigbogun MS, Annie G, et al. The Economic Burden of Schizophrenia in the United States in 2013. J Clin Psychiatry 2016;77(6):764–771. 10.4088/JCP.15m10278. [PubMed: 27135986]
6. Twamley EW, Jeste DV., Lehman AF. Vocational rehabilitation in schizophrenia and other psychotic disorders: A literature review and meta-analysis of randomized controlled trials. J Nerv Ment Dis 2003;191(8):515–523. 10.1097/01.nmd.0000082213.42509.69. [PubMed: 12972854]
7. Campbell K, Bond GR, Drake RE. Who benefits from supported employment: A meta-analytic study. Schizophr Bull 2011;37(2):370–380. 10.1093/schbul/sbp066. [PubMed: 19661196]
8. Modini M, Tan L, Brinchmann B, et al. Supported employment for people with severe mental illness: systematic review and meta-analysis of the international evidence. Br J Psychiatry 2016;209(1):14–22. 10.1192/bjp.bp.115.165092. [PubMed: 27103678]
9. Metcalfe JD, Drake RE, Bond GR. Economic, Labor, and Regulatory Moderators of the Effect of Individual Placement and Support among People with Severe Mental Illness: A Systematic Review and Meta-analysis. Schizophr Bull 2018;44(1):22–31. 10.1093/schbul/sbx132. [PubMed: 29036727]
10. Bond GR, Drake RE, Becker DR. An update on randomized controlled trials of evidence-based supported employment. Psychiatr Rehabil J 2008;31(4):280–290. 10.2975/31.4.2008.280.290. [PubMed: 18407876]
11. McGurk SR, Meltzer HY. The role of cognition in vocational functioning in schizophrenia. Schizophr Res 2000;45(3):175–184. 10.1016/S0920-9964(99)00198-X. [PubMed: 11042435]
12. Tsang HWH, Leung AY, Chung RCK, Bell M, Cheung WM. Review on vocational predictors: A systematic review of predictors of vocational outcomes among individuals with schizophrenia: An update since 1998. Aust N Z J Psychiatry 2010;44(6):495–504. 10.3109/00048671003785716. [PubMed: 20482409]
13. McGurk SR, Mueser KT, Harvey PD, LaPuglia R, Marder J. Cognitive and Symptom Predictors of Work Outcomes for Clients With Schizophrenia in Supported Employment. Psychiatr Serv 2003;54(8):1129–1135. 10.1176/appi.ps.54.8.1129. [PubMed: 12883141]
14. Twamley EW, Vella L, Burton CZ, Becker DR, Bell MD, Jeste DV. The Efficacy of Supported Employment for Middle-Aged and Older People with Schizophrenia. Schizophr Res 2012;135:100–104. 10.1080/10810730902873927. [PubMed: 22197080]
15. Metcalfe JD, Drake RE, Bond GR. Predicting Employment in the Mental Health Treatment Study: Do Client Factors Matter? Adm Policy Ment Heal 2017;44(3):345–353. 10.1007/s10488-016-0774-x.
16. Corbière M, Lecomte T, Reinharz D, et al. Predictors of acquisition of competitive employment for people enrolled in supported employment programs. J Nerv Ment Dis 2017;205(4):275–282. 10.1097/NMD.0000000000000612. [PubMed: 28212170]
17. Wewiorski NJ, Fabian ES. Association between demographic and diagnostic factors and employment outcomes for people with psychiatric disabilities: A synthesis of recent research. Ment Health Serv Res 2004;6(1):9–21. 10.1023/B:MHSR.0000011253.36712.15. [PubMed: 15002677]

18. McGurk SR, Drake RE, Xie H, et al. Cognitive Predictors of Work among Social Security Disability Insurance Beneficiaries with Psychiatric Disorders Enrolled in IPS Supported Employment. Schizophr Bull 2018;44(1):32–37. 10.1093/schbul/sbx115. [PubMed: 28981832]
19. Mueser KT, Bond GR, Essock SM, et al. The effects of supported employment in Latino consumers with severe mental illness. Psychiatr Rehabil J 2014;37(2):113–122. 10.1037/prj0000062. [PubMed: 24912060]
20. Becker DR, Drake RE. A Working Life for People with Severe Mental Illness; 2003 10.1093/acprof:oso/9780195131215.001.0001.
21. Ikebuchi E, Sato S, Yamaguchi S, et al. Does improvement of cognitive functioning by cognitive remediation therapy effect work outcomes in severe mental illness? A secondary analysis of a randomized controlled trial. Psychiatry Clin Neurosci 2017;71(5):301–308. 10.1111/pcn.12486. [PubMed: 27873453]
22. Metcalfe JD, Riley J, McGurk S, Hale T, Drake RE, Bond GR. Comparing predictors of employment in Individual Placement and Support: A longitudinal analysis. Psychiatry Res 2018;264(March):85–90. 10.1016/j.psychres.2018.03.050. [PubMed: 29627701]
23. Joseph J, Kremen WS, Franz CE, et al. Predictors of current functioning and functional decline in schizophrenia. Schizophr Res 2017;188:158–164. 10.1016/j.schres.2017.01.038. [PubMed: 28139356]
24. First M, Spitzer R, Gibbon M, Williams J. Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition SCID-I/P; 2002.
25. Sheehan DV, Lecrubier Y, Sheehan KH, et al. The validity of the Mini International Neuropsychiatric Interview (MINI) according to the SCID-P and its reliability. Eur Psychiatry 1997;12(5):232–241. 10.1016/S0924-9338(97)83297-X.
26. Twamley EW, Thomas KR, Burton CZ, et al.: Compensatory cognitive training for people with severe mental illnesses in supported employment: a randomized controlled trial. Schizophr Res 2019; 204:397–400 [PubMed: 30293693]
27. Burton CZ, Vella L, Twamley EW: Prospective memory, level of disability, and return to work in severe mental illness. Clin Neuropsychol 2018;4046:1–12
28. Thomas KR, Olga P, Twamley EW: Age as a moderator of change following compensatory cognitive training in individuals with severe mental illnesses. Psychiatr Rehabil J 2017; 40:70–78 [PubMed: 27547856]
29. Mahmood Z, Burton CZ, Vella L, et al.: Neuropsychological predictors of performance-based measures of functional capacity and social skills in individuals with severe mental illness. J Psychiatr Res 2018;102:201–206 [PubMed: 29689517]
30. Puig O, Thomas KR, Twamley EW: Age and improved attention predict work attainment in combined compensatory cognitive training and supported employment for people with severe mental illness. J Nerv Ment Dis 2016; 204:869–872 [PubMed: 27798543]
31. Wilkinson G. WRAT-3: Wide Range Achievement Test Manual San Antonio, TX: The Psychological Corporation; 1993.
32. Nuechterlein KH, Green MF, Kern RS, et al. The MATRICS consensus cognitive battery, part 1: Test selection, reliability, and validity. Am J Psychiatry 2008;165(2):203–213. 10.1176/appi.ajp.2007.07010042. [PubMed: 18172019]
33. Heaton R, Miller S, Taylor M, Grant I. Revised Comprehensive Norms for an Expanded Halstead-Reitan Battery: Demographically Adjusted Neuropsychological Norms for African American and Caucasian Adults Lutz, FL: Psychological Assessment Resources; 2004.
34. Kongs S, Thompson L, Iverson G, Heaton R. Wisconsin Card Sorting Test-64 Card Version (WCST-64) Odessa, FL: Psychological Assessment Resources; 2000.
35. Raskin S. Memory for Intentions Screening Test: Psychometric Properties and Clinical Evidence. Brain Impair 2009;10(1):23–33. 10.1375/brim.10.1.23.
36. Blackstone K, Moore DJ, Franklin DR, et al. Defining Neurocognitive Impairment in HIV: Deficit Scores versus Clinical Ratings. Clin Neuropsychol 2012;26:894–908. 10.1007/s10439-011-0452-9.Engineering. [PubMed: 22708483]

37. 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(6):1364–1372. 10.1093/schbul/sbm014. [PubMed: 17341468]
38. Patterson TL, Moscona S, McKibbin CL, Davidson K, Jeste DV. Social skills performance assessment among older patients with schizophrenia. Schizophr Res 2001;48(2–3):351–360. 10.1016/S0920-9964(00)00109-2. [PubMed: 11295387]
39. Kay SR, Fiszbein A, Opler LA. The Positive and Negative Syndrome Scale for schizophrenia. Schizophr Bull 1987;13(2):261–276. 10.1093/schbul/13.2.261. [PubMed: 3616518]
40. Hamilton M. Development of a rating scale for primary depressive illness. Br J Soc Clin Psychol 1967;6(4):278–296. [PubMed: 6080235]
41. Allison P. When can you safely ignore multicollinearity? Statistical Horizons Last modified 9 10, 2012.
42. Atkins DC, Baldwin SA, Zheng C, Gallop RJ, Neighbors C. A tutorial on count regression and zero-altered count model for longitudinal substance use data. Psychol Addict Behav 2013;27:166–177. 10.1037/a0029508. [PubMed: 22905895]
43. Hunter JE. Cognitive ability, cognitive aptitudes, job knowledge, and job performance. J Vocat Behav 1986;29:340–362. 10.1016/0001-8791(86)90013-8.
44. Morris TW, Levinson EM. Relationship Between Intelligence and Occupational Adjustment and Functioning: A Literature Review. J Couns Dev 1995;73:503–514. 10.1002/j.1556-6676.1995.tb01786.x.
45. Strauss GP, Cohen AS. A Transdiagnostic Review of Negative Symptom Phenomenology and Etiology. Schizophr Bull 2017;43(4):712–729. 10.1093/schbul/sbx066. [PubMed: 28969356]
46. Insel T, Cuthbert B, Garvey M, et al. Research Domain Criteria (RDoC): Toward a new classification framework for research on mental disorders. Am J Psychiatry 2010;167(7):748–751. 10.1176/appi.ajp.2010.09091379. [PubMed: 20595427]
47. Wykes T, Huddy V, Cellard C, Mcgurk SR, Czobor P. A Meta-Analysis of Cognitive Remediation for Schizophrenia: Methodology and Effect Sizes. Am J Psychiatry 2011;168(5):472–485. 10.1176/appi.ajp.2010.10060855. [PubMed: 21406461]
48. Vella L, Patterson TL, Harvey PD, et al. Exploratory analysis of normative performance on the UCSD Performance-Based Skills Assessment-Brief. Psychiatry Res 2017;256(February):150–155. 10.1016/j.psychres.2017.06.025. [PubMed: 28633056]
49. Ventura J, Subotnik KL, Gretchen-Doorly D, et al. Cognitive remediation can improve negative symptoms and social functioning in first-episode schizophrenia: A randomized controlled trial. Schizophr Res 2017 10.1016/j.schres.2017.10.005.
50. Mahmood Z, Clark JMR, Twamley EW. Compensatory Cognitive Training for psychosis: Effects on negative symptom subdomains. Schizophr Res 2018;10.1016/j.schres.2018.09.024.
51. McGurk SR, Twamley EW, Sitzer DI, McHugo GJ, Mueser KT. A Meta-Analysis of Cognitive Remediation in Schizophrenia. Am J Psychiatry 2007;164:1791–1802. [PubMed: 18056233]
52. Unsworth N, Spillers GJ, Brewer GA. Variation in verbal fluency: A latent variable analysis of clustering, switching, and overall performance. Q J Exp Psychol 2011;64(3):447–466. 10.1080/17470218.2010.505292.
53. Gold JM, Dickinson D. Generalized cognitive deficit in schizophrenia: Overused or underappreciated? Schizophr Bull 2013;39(2):263–265. 10.1093/schbul/sbs143. [PubMed: 23211397]

Highlights:

- Understanding the differential relationship of neuropsychological abilities with vocational outcomes provides a means for targeted cognitive training/ remediation within people with severe mental illness.
- Our results showed that the varied cognitive impairments seen within severe mental illness provide additional predictive utility in explaining vocational outcomes and that more recent work history predicts better work outcomes, regardless of diagnosis.

Table 1

Participant demographics and group statistics (n = 153)

	Total sample (*N* = 153)		MD (*n* = 58)		BD (*n* = 37)		SS (*n* = 58)		*F* or χ^2	*df*	*p*	Pairwise comparisons
	Mean±SD	%	Mean±SD	%	Mean±SD	%	Mean±SD	%				
Demographic & Clinical Characteristics												
Age, years	43.70±11.69		45.05±11.75		44.78±11.20		41.66±11.84		1.44	2,150	.240	
Education, years	13.46±2.78		13.84±2.77		14.22±2.42		12.60±2.83		4.91	2,150	**.009**	MD, BD > SS
Female (N)	66	43.1	34	58.6	15	40.5	17	29.3	10.29	2	**.006**	MD > SS
Race/Ethnicity									22.05	6	**.001**	MD, BD > SS
White (N)	124	81	52	89.7	35	94.6	37	63.8				
Black (N)	21	13.7	4	6.9	0	0	17	29.3				
Asian (N)	5	3.3	1	1.7	1	2.7	3	5.2				
Native American (N)	3	2	1	1.7	1	2.7	1	1.7				
Hispanic ethnicity	31	20.3	14	24.1	3	8.1	14	24.1	4.46	2	.107	
Duration of illness, years	24.37±14.16		24.78±14.38		28.95±14.01		21.03±13.3		3.69	2,150	**.027**	BD > SS
Work History/Outcomes												
Work history (months since last employment)	35.27±53.46		35.28±63.70		20.84±21.68		44.63±55.40		2.26	2,148	.108	
Attained competitive work (N)	72	47	31	53	23	62	18	31	10.32	2	**.006**	MD, BD > SS
Weeks worked in two years	21.75±33.38		22.41±31.09		36.59±41.42		11.62±25.94		6.83	2,150	**.001**	MD, BD > SS
Wages earned in two years, $	7640.76±15005.65		7880.94±12209.82		14460.25±22882.26		3050.22±8304.99		7.06	2,150	**.001**	MD, BD > SS
Symptom Severity												
PANSS positive[a]	12.53±5.03		11.33±3.51		11.86±5.08		14.16±5.86		5.30	2,150	**.006**	SS > MD
PANSS negative[a]	13.20±5.00		12.07±3.95		11.89±4.45		15.16±5.67		7.84	2,150	**.001**	SS > MD, BD
HAM-D[a]	12.94±6.82		15.16±6.82		13.14±7.07		10.52±5.89		7.15	2,148	**.001**	MD > SS
Neuropsychological Functioning												
Premorbid IQ	103.00±9.66		104.62±8.36		106.51±7.97		99.14±10.62		8.70	2,150	**<.001**	MD, BD > SS

	Total sample (N = 153)		MD (n = 58)		BD (n = 37)		SS (n = 58)		F or χ^2	df	p	Pairwise comparisons
	Mean±SD	**%**	**Mean±SD**	**%**	**Mean±SD**	**%**	**Mean±SD**	**%**				
GDS	0.64±0.67		0.45±0.53		0.50±0.65		0.91±0.73		8.42	2,150	**<.001**	SS > MD, BD
Processing speed												
TMT-A	42.31±11.33		44.91±9.80		42.32±10.76		39.71±12.61		3.15	2,150	**.046**	MD > SS
BACS-SC	38.98±10.94		41.55±10.61		42.41±10.32		34.22±10.11		9.94	2,150	**<.001**	MD, BD > SS
Category fluency	44.81±9.30		46.67±9.61		46.81±8.57		41.67±8.71		5.64	2,150	**.004**	MD, BD > SS
Sustained attention												
CPT-IP	42.79±12.80		46.11±10.77		45.78±12.34		37.78±13.41		7.97	2,146	**.001**	MD, BD > SS
Working memory												
WMS-III SS	46.75±9.57		47.41±9.64		47.30±10.06		45.72±9.26		.53	2,150	.590	
LNS	44.37±10.59		47.10±9.13		48.03±10.49		39.29±10.19		12.43	2,150	**<.001**	MD, BD > SS
Verbal learning												
HVLT-R	46.51±10.85		48.69±10.55		49.24±10.42		42.59±10.42		6.60	2,150	**.002**	MD, BD > SS
Visual learning												
BVMT-R	44.44±10.91		44.81±11.74		47.51±10.47		42.10±9.93		2.90	2,150	.058	
Executive function												
NAB Mazes	44.56±10.16		45.31±10.52		43.78±9.15		44.31±10.52		.28	2,150	.755	
TMT-B	44.05±11.38		44.52±10.67		43.86±10.63		43.70±12.66		.08	2,148	.924	
WCST-64	44.24±10.84		46.79±10.83		44.46±10.84		41.55±10.39		3.51	2,150	**.032**	MD > SS
Prospective memory												
MIST, %ile	44.90±31.88		49.84±32.57		50.86±32.32		36.16±29.38		3.65	2,150	**.028**	MD, BD > SS
Letter fluency												
FAS	46.41±9.98		49.38±8.53		46.43±10.34		43.41±10.34		5.49	2,150	**.005**	MD > SS
Functional Capacity												
UPSA-B	78.43±10.73		82.49±7.74		83.24±8.30		71.31±10.96		27.96	2,150	**<.001**	MD, BD > SS
SSPA	4.18±0.65		4.38±0.58		4.27±0.44		3.91±0.76		8.72	2,146	**<.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 (Possible scores range from 0 to 52, with higher scores indicating greater depression severity); PANSS=Positive and Negative Syndrome Scale (Possible scores for each scale range from 7 to 49, with higher scores indicating greater symptom severity); UPSA-B=University of California, San Diego Performance-based Skills Assessment-Brief (Possible scores range from 0 to 100, with higher scores indicating better functioning); SSPA=Social Skills Performance Assessment (Possible scores range from 1 to 5, with higher scores indicating better functioning). GDS=Global Deficit Score (0=no impairment; 1=mild; 2=mild-to-moderate; 3=moderate; 4=moderate-to-severe; 5=severe). The following neuropsychological measures are expressed as T-Scores ($\bar{X} = 50$, SD=10, Range: 20–80), with the exception of Premorbid IQ which is

expressed a standard score ($\bar{X} = 100$, SD=15): 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 2

Demographics and group statistics for participants who attained work during two-year study period (n = 72)

	Total sample (*N* = 72)		MD (*n* = 31)		BD (*n* = 23)		SS (*n* = 18)		*F* or χ^2	*df*	*p*	Pairwise comparisons
	Mean±SD	%	Mean±SD	%	Mean±SD	%	Mean±SD	%				
Demographic & Clinical Characteristics												
Age, years	42.50±11.48		44.81±11.69		42.57±11.94		38.44±9.91		1.79	2,69	.175	
Education, years	13.99±2.62		14.16±3.01		14.48±1.86		13.06±2.65		1.63	2,69	.203	
Female (N)	33	46	18	58	9	39	6	33	3.42	2	.181	
Race/Ethnicity												
White (N)	63	88	28	91	21	92	14	78	3.67	6	.721	
Black (N)	3	4	1	3	0	0	2	11				
Asian (N)	3	4	1	3	1	4	1	5.5				
Native American (N)	3	4	1	3	1	4	1	5.5				
Hispanic ethnicity (N)	12	17	6	19	3	13	3	17	0.38	2	.828	
Duration of illness, years	24.60±13.74		25.84±13.59		27.17±13.96		19.17±12.94		1.99	2,69	.144	
Work History/Outcomes												
Work history (months since last employment)	16.18±18.73		12.50±13.43		22.2 ±21.72		14.56±21.20		1.91	2,68	.156	
Weeks worked in two years	46.22±35.19		41.94±31.48		58.87±37.90		37.44±35.11		2.36	2,69	.102	
Wages earned in two years, $	16236.62±18453.18		14744.98± 13366 .67		23262.15±25353.17		9828.49±12677.64		3.02	2,69	.056	
Symptom Severity												
PANSS positive[a]	11.61±4.53		11.68±3.81		10.83±4.13		12.50±6.04		.688	2,69	.506	
PANSS negative[a]	12.06±4.49		11.74±3.89		11.17±4.34		13.72±5.39		1.80	2,69	.174	
HAM-D[a]	12.68±6.57		14.81±6.13		11.70±7.11		10.12±5.63		3.39	2,68	**.040**	MD > SS
Neuropsychological Functioning												
Premorbid IQ	104.99±9.39		107.29±6.95		106.74±7.62		98.78±12.38		6.01	2,69	**.004**	MD, BD > SS
GDS	0.54±0.58		0.46±0.61		0.39±0.48		0.87±0.54		4.29	2,69	**.017**	SS > MD, BD
Processing speed												
TMT-A	42.42±11.05		43.48±9.00		43.74±10.35		38.89±14.52		1.24	2,69	.297	

	Total sample (*N* = 72)		MD (*n* = 31)		BD (*n* = 23)		SS (*n* = 18)		*F* or χ^2	*df*	*p*	Pairwise comparisons
	Mean±SD	**%**	**Mean±SD**	**%**	**Mean±SD**	**%**	**Mean±SD**	**%**				
BACS-SC	41.15±10.62		42.29±10.17		45.13±10.05		34.11±9.02		6.67	2,69	**.002**	MD, BD > SS
Category fluency	45.06±10.06		46.45±10.73		46.74±9.33		40.50±8.79		2.58	2,69	.083	
Sustained attention												
CPT-IP	44.66±11.89		45.30±12.26		47.95±8.98		39.56±13.24		2.67	2,67	.077	
Working memory												
WMS-III SS	47.40±8.75		47.48±9.33		48.87±8.13		45.39±8.58		.796	2,69	.455	
LNS	46.93±9.83		47.23±9.88		48.48±8.88		44.44±10.90		.872	2,69	.423	
Verbal learning												
HVLT-R	47.57±10.83		48.32±11.53		49.48±9.15		43.83±11.24		1.53	2,69	.225	
Visual learning												
BVMT-R	45.32±10.77		45.19±11.70		49.04±8.34		40.78±10.58		3.16	2,69	**.049**	BD > SS
Executive function												
NAB Mazes	45.89±9.67		45.77±10.73		46.52±8.81		45.28±9.26		.09	2,69	.918	
TMT-B	43.43±10.20		43.74±10.79		43.65±10.23		42.61±9.62		.08	2,69	.927	
WCST-64	45.50±10.83		46.68±12.43		44.96±10.69		44.17±8.02		2.95	2,69	.059	
Prospective memory												
MIST, %ile	49.17±32.90		55.39±33.07		48.04±32.08		39.89±33.11		1.29	2,69	.281	
Letter fluency												
FAS	45.94±10.21		49.10±9.88		45.65±9.98		40.89±9.42		4.01	2,69	**.022**	MD > SS
Functional Capacity												
UPSA-B	80.77±9.32		82.52±8.42		83.49±7.38		74.30±10.34		6.83	2,69	**.002**	MD, BD > SS
SSPA	4.29±0.58		4.40±0.58		4.32±0.42		4.04±0.70		2.26	2,68	.112	

[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 (Possible scores range from 0 to 52, with higher scores indicating greater depression severity); PANSS=Positive and Negative Syndrome Scale (Possible scores for each scale range from 7 to 49, with higher scores indicating greater symptom severity); UPSA-B=University of California, San Diego Performance-based Skills Assessment-Brief (Possible scores range from 0 to 100, with higher scores indicating better functioning); SSPA=Social Skills Performance Assessment (Possible scores range from 1 to 5, with higher scores indicating better functioning). GDS=Global Deficit Score (0=no impairment; 1=mild; 2=mild-to-moderate; 3=moderate; 4=moderate-to-severe; 5=severe). The following neuropsychological measures are expressed as T-Scores ($\overline{X} = 50$, SD=10, Range: 20–80), with the exception of Premorbid IQ which is expressed a standard score ($\overline{X} = 100$, SD=15): 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).

Psychiatr Serv. Author manuscript; available in PMC 2020 September 01.

Table 3

Correlations between work outcomes, demographic and clinical characteristics, performance-based measures of functional capacity and social skills, and neuropsychological measures (n = 153)

	Job Attainment (*n* =153)	Competitive Weeks Worked (*n* = 72)	Competitive Wages Earned (*n* = 72)
Demographic & Clinical Characteristics			
Age	−.097	−.066	.016
Education (years)	.178*	−.100	−.063
Racial/ethnic minority status	−.197*	.017	.013
Gender	−.051	−.192	−.100
Illness duration (years)	.015	.012	.013
Work history (months since last employment	−.337**	−.215	−.310**
Diagnosis	−.196*	−.084	−.142
Symptom Severity			
PANSS positive	−.173*	−.259*	−.275*
PANSS negative	−.216**	−.139	−.193
HAM-D	−.037	−.039	−.011
Neuropsychological Functioning			
Premorbid IQ	.195*	−.049	.046
GDS	−.134	−.306**	−.356**
TMT-A	.009	.171	.160
BACS-SC	.188*	.228	.159
Category Fluency	.025	.105	.017
CPT-IP	.138	.042	.174
WMS-III SS	.065	.139	.103
LNS	.229**	−.078	−.027
HVLT-R	.092	.136	.191
BVMT-R	.076	.188	.216
NAB Mazes	.124	−.009	−.008
TMT-B	−.052	.226	.221
WCST-64	.151	.071	.074
MIST	.127	.181	.178
FAS	−.044	.044	.172
Functional Capacity			
UPSA-B	.206**	.042	.062
SSPA	.160	.173	.194

* $p < .05$

** $p < .01$

Racial/ethnic minority status (No [0]; Yes [1]); Diagnosis (Major Depression [1]; Bipolar Disorder [2]; Schizophrenia-spectrum Disorders [3]); UPSA-B=University of California, San Diego Performance-based Skills Assessment-Brief (Possible scores range from 1 to 5, with higher scores indicating better functioning); SSPA=Social Skills Performance Assessment (Possible scores range from 1 to 5, with higher scores indicating better functioning); PANSS= Positive and Negative Syndrome Scale (Possible scores for each scale range from 7 to 49, with higher scores indicating greater symptom severity); HAM-D=Hamilton Depression Rating Scale (Possible scores range from 0 to 52, with higher scores indicating greater depression severity). GDS=Global Deficit Score (0=no impairment; 1=mild; 2=mild-to-moderate; 3=moderate; 4=moderate-to-severe; 5=severe). The following neuropsychological measures are expressed as T-Scores $\bar{X} = 50$, SD=10, Range: 20–80), with the exception of Premorbid IQ which is expressed a standard score ($\bar{X} = 100$, SD=15): 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 4

Significant predictors of work outcomes (n=151)

Logistic Regression							
Job attainment	**Coef.**	**SE**	**z**	**df**	**p-value**	**OR**	**95% CI**
PANSS negative	−.094	.039	5.90	1	**.015**	.91	.84, .98
Work history (months since last employment)	−.029	.008	13.25	1	**<.001**	.97	.96, .99
Hurdle Model							
Job attainment (probit)							
PANSS negative	−.058	.023	−2.46	1	**.014**	--	−.10, −.01
Work history (months since last employment)	−.018	.005	−3.78	1	**<.001**	--	−.03, −.01
Competitive weeks							
Work history (months since last employment)	−.004	.003	−1.49	1	.135	--	−.01, .001
GDS	−.222	.090	−2.48	1	**.013**	--	−.40, −.05
Wages earned							
Work history (months since last employment)	−.009	.004	−2.38	1	**.017**	--	−.02, −.002
GDS	−.371	.122	−3.04	1	**.002**	--	−.61, −.13

Bold font denotes $p < 0.05$. PANSS=Positive and Negative Syndrome Scale (Possible scores for each scale range from 7 to 49, with higher scores indicating greater symptom severity); GDS=Global Deficit Score (0=no impairment; 1=mild; 2=mild-to-moderate; 3=moderate; 4=moderate-to-severe; 5=severe).