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Cognition, Functional Capacity, and Self-reported Disability in Women with Posttraumatic Stress Disorder: Examining the Convergence of Performance-Based Measures and Self-Reports

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Abstract

Individuals with posttraumatic stress disorder (PTSD) experience cognitive impairments and disability in everyday activities. In other neuropsychiatric disorders, impairments in cognition and functional capacity (i.e., the ability to perform everyday tasks) are associated with impairments in real-world functioning, independent of symptom severity. To date, no studies of functional capacity have been conducted in PTSD. Seventy-three women with moderate to severe PTSD underwent assessment with measures of cognition (MATRICS Consensus Cognitive Battery: MCCB), functional capacity (UCSD Performance-Based Skills Assessment-Brief: UPSA-B), PTSD (Clinician-Administered PTSD Scale and PTSD Symptom Scale–Self-report (PSS-SR)), and depression (Montgomery Asberg Depression Rating Scale). Patients also reported their

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Contributors

Drs. Harvey and Dunlop were involved in the original study design. They also edited the paper and supervised the data analyses. Ms. Kaye organized the data and wrote the paper, editing subsequent drafts. Drs. Iosifescu and Mathew edited the paper and provided general scientific input. Dr. Kelley performed statistical analyses and edited the manuscript.

subjective level of disability (Sheehan Disability Scale). Over-reporting of symptom severity was assessed using six validity items embedded within the PSS-SR. Results indicated that on average PTSD patients manifested mild impairments on the functional capacity measure, performing about 1/3 standard deviation below healthy norms, and similar performance on the MCCB. Both clinician-rated and self-rated PTSD symptom severity correlated with self-reported disability but not with functional capacity. Self-reported disability did not correlate with functional capacity or cognition. Greater self-reported disability, depression, and PTSD symptoms all correlated with higher scores on the PSS-SR validity scale. The divergence between objective and subjective measures of disability suggests that individuals' distress, as indexed by symptom validity measures, may be impacting self-reports of disability. Future studies of disability should incorporate objective measures in order to obtain a broad perspective on functioning.

Keywords

PTSD; depression; neuropsychology; psychiatric status rating scales; functional outcome; employment

INTRODUCTION

Disability in multiple everyday functional domains (e.g., social, vocational, and residential) is common across various neuropsychiatric conditions. People with severe mental illness often show impairments in neurocognition and the ability to perform functional tasks, often referred to as functional capacity (FC). Now recognized as an important predictor of everyday functioning, functional capacity is measured by standardized tests that assess the ability to perform everyday living skills, including simple tasks such as paying bills and making appointments. However, ability variables such as FC or neurocognition do not fully equate to real-world functioning due to the moderating influences of psychiatric symptoms and social and environmental factors (e.g., disability compensation and opportunities). It is now clear that thorough assessment of everyday functioning and its determinants needs to consider not only what one can do, but also what one actually does. Separation of the *capacity* to complete most everyday activities (functional capacity) from actually *performing* those activities (real-world functioning) outside of a standardized testing environment allows for more complete quantification of what leads to real-world disability.

Individuals with bipolar disorder and schizophrenia with substantial real-world disability score lower on both neurocognitive tests and FC measures (Depp et al., 2008; Leifker et al., 2009; Martínez-Arán et al., 2004; Simonsen et al., 2008). Strong correlations between neurocognitive and FC scores have been found consistently in both schizophrenia (Bowie et al., 2006; McKibbin et al., 2004; Twamley et al., 2002) and bipolar disorder (Bowie et al., 2010; Depp et al., 2009; Gildengers et al., 2007). Interestingly, however, these performance-based measures of cognition and functional capacity are generally only minimally related to symptom severity and to self-reports of everyday functioning (Bowie et al., 2006; 2010; Depp et al., 2009; Gildengers et al., 2007; Sabbag et al., 2011).

Although intercorrelations of cognition and functional capacity with symptom severity are modest, performance on NP and FC indices and symptom severity (particularly depressive

symptoms) independently predict real-world disability measured through informant reports and milestone functional achievements (residential independence and educational/academic achievement; Bowie et al., 2008; 2010; Mausbach et al., 2010). Moreover, self-reports of cognitive ability or disability in schizophrenia (Bowie et al., 2007; McKibbin et al., 2004; Sabbag et al., 2011; 2012), bipolar disorder (Burdick et al., 2005), Multiple Sclerosis (Carone et al., 2005), and Traumatic Brain Injury (TBI; Spikman & van der Naalt, 2010) converge poorly with objective performance. However, the studies that have examined self-reported mood symptoms found that these reports correlated with informant reports of impaired everyday functioning. Thus, while people with neuropsychiatric conditions may estimate their abilities in ways that are unrelated to informant-rated real-world functioning and objective performance data, their subjective mood symptoms appear to be related to objective indices of everyday functioning.

Post-traumatic stress disorder (PTSD) is associated with substantial everyday disability, which is typically attributed to the influences of PTSD symptoms. Individuals with PTSD are more likely than their trauma-exposed counterparts without PTSD to be unemployed, have physical limitations, and engage in hazardous drinking (Zatzick et al., 1997; McDevitt-Murphy et al., 2010). As such, obtaining information about impairments in functioning is important for the treatment of individuals with PTSD. Such information can be obtained through self-reports, informant reports, and/or performance-based ability measures. However, there is minimal evidence that self-reports of everyday disability across every neuropsychiatric condition studied to date are reliable, as noted above. Thus, performance-based behavioral tests of cognition and functional capacity may be useful alternatives, suggesting that NP and FC tests merit further exploration as predictors of everyday disability in PTSD.

Individuals with PTSD show impairments in NP performance, with deficits in sustained attention, working memory, initial learning and processing speed (Barrett et al., 1996; Twamley et al., 2009; Vasterling et al., 2002; Yehuda et al., 1995). These aspects of cognitive functioning are the components most strongly correlated with disability in severe mental illness (Harvey, 2010) and other neuropsychiatric conditions. For instance, Heaton and Pendleton (1981) found that composite measures of similar cognitive performance domains were the best predictors of real-world disability across multiple neuropsychiatric conditions.

Although hundreds of studies have examined the contribution of NP impairment to disability in schizophrenia and bipolar illness (See Harvey et al., 2010b for a review), only one study has evaluated this association in patients with PTSD, finding that cognitive deficits were associated with poorer social and occupational outcomes (Geuze et al., 2009). However, in studies with severe mental illness, the contribution of cognition to disability is often fully mediated by functional capacity (Bowie et al., 2006; 2008; 2010). Functional capacity may be a more direct indicator of real-world impairments than cognition. However, to our knowledge, no study to date has examined functional capacity in PTSD, despite its potential clinical use. Additionally, no study has examined the correlations of objective measures of neurocognition and functional capacity with self-reported measures of real-world disability. Finally, no study has examined the simultaneous contributions of symptoms,

neurocognition, and functional capacity to lifetime estimates of everyday functioning in PTSD patients. Thus, this study has the potential to provide information on the extent to which self-reported everyday functioning in PTSD diverges from objective ability measures that have been previously validated as predictors of real-world functioning in residential and vocational domains. Understanding the relationships between objective data and subjective impressions is likely to be valuable for clinical treatment and disability reduction.

Here we report an initial study of cognition, functional capacity, psychiatric symptoms, and disability in adult women with PTSD. The women were participants in a clinical trial where safety issues with the pharmacological agent precluded the inclusion of male patients. We administered a comprehensive neuropsychological assessment battery and brief measure of functional capacity, assessed lifetime educational and vocational functioning, and collected measures of PTSD and depressive symptoms, and obtained self-reports on the current level of disability. We also administered questions that assessed the validity of self-reports of symptom severity. We then examined the relationships between performance in NP and FC domains, the degree of symptom severity, and self-reported disability in the sample. We hypothesized that NP and FC deficits would correlate with each other but not with measures of symptom severity, as seen in other neuropsychiatric conditions. In a final analysis, we examined the correlation between lifetime vocational attainment and symptomatic, cognitive, and functional capacity variables in order to examine whether cognitive and functional capacity variables were correlated with lifetime functional outcomes.

METHOD

Participants

Participants (n=73) were women, aged 18–65, in the pre-treatment screening phase of an ongoing phase-II clinical trial of an investigational treatment for PTSD (NCT01018992). All males were excluded from this trial because of safety concerns (i.e., a risk of testicular toxicity discovered during pre-clinical testing of the medication in male rats). They were recruited across three sites: Emory University School of Medicine, Atlanta; Mount Sinai School of Medicine, New York; and Michael E. DeBakey VA Medical Center/Baylor College of Medicine, Houston, via local media advertisements, posters, and clinic referrals. Forty-one cases came from Emory University, while 25 came from Mt. Sinai School of Medicine in New York, and 7 from the Baylor School of Medicine. Key inclusion criteria were a diagnosis of chronic PTSD according to the DSM-IV and at least moderately severe symptom severity, indicated by a Clinician-Administered PTSD Scale (CAPS) score ≥ 50 . Exclusion criteria included a diagnosis of a psychotic disorder, bipolar disorder, OCD, anorexia nervosa, bulimia, substance abuse or dependence (in the past 90 days), high current suicide risk, being pregnant or nursing, taking psychoactive medication (other than non-benzodiazepine hypnotics), active legal issues related to PTSD or trauma exposure, or participating in structured psychotherapy targeting PTSD symptoms. All study procedures were done in compliance with the Declaration of Helsinki and its amendments. The institutional review boards of each site approved the study, and all participants signed a written informed consent form prior to any study procedures being performed.

Measures

Clinician-rated PTSD symptom severity was assessed using the Clinician-Administered PTSD Scale (CAPS; Blake et al., 1995), a structured interview with established reliability and validity (Weathers et al., 2001). The CAPS determines the frequency and intensity of the seventeen PTSD symptoms outlined by the DSM-IV. **Self-reported PTSD symptom severity** was assessed using the PTSD Symptom Scale – Self-report version (PSS-SR; Foa et al., 1993), a 17-item questionnaire that reflects the DSM-IV PTSD symptoms. This assessment was selected to separate a purely self-report measure from a “filtered” measure where clinician judgment was applied to the answers to the queries regarding PTSD symptoms.

Symptom Validity Index. We used a version of the PSS-SR that included six items to test the validity of patient responses (Margolies et al., 2013). Each item is unrelated to PTSD symptoms as defined by the DSM-IV. Patient ratings of the frequency with which they experience each symptom assess the potential for general over-reporting of psychiatric symptoms. Examples include “Being acutely aware of smells, especially body odor?” and “Feeling emotionally transparent (for example, feeling like people are unable to see me)?” Patients filled out the first page of the Posttraumatic Diagnostic Scale (PDS; Foa et al., 1997) to relay **information about their trauma history**. On this measure, patients divulged the types of traumas they had experienced, the index trauma, and the time that had passed since the index trauma. **Depression severity** was measured with the Montgomery Asberg Depression Rating Scale (MADRS; Montgomery & Asberg, 1979) a clinician-rated scale consisting of 10 items. **Self-reported disability** was examined with the Sheehan Disability Scale (SDS; Sheehan & Raj, 1996), a self-report assessment developed to measure disability in work, social relationships, and family life. Scores for the total scale range from 0–30 based on three 10-point item ratings. **Lifetime vocational functioning** was rated on the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975) and focused on highest lifetime vocational achievement based on a structured rating of the quality and complexity of the job. This final measure was collected in order to obtain a reference point for highest levels of lifetime vocational functioning, prior to or after the development of PTSD, in order to validate the correlations between NP and FC performance with a measure of attainment of real-world functional milestones. **Comorbid conditions** were examined with the Structured Clinical Interview for the DSM-IV Axis I disorders (SCID-I; First et al., 1995).

Performance-based assessment

Neurocognition—We examined cognitive performance with a modified version of the MATRICS consensus cognitive battery (MCCB; Neuchterlein, et al., 2008). For this study, we did not include the MCCB’s social cognition measure, the Mayer–Salovey–Caruso Emotional Intelligence Test Managing Emotions (MSCEIT), because recent research suggests that social cognition measures have a different relationship with everyday outcomes than neurocognitive measures (Fett et al., 2011). This minor modification of the MCCB is consistent with our previous use of the MCCB that did not include social cognition measures (Bowie et al., 2008; Sabbag et al., 2011). We calculated a composite score, an average of nine age-corrected T-scores based on the MCCB normative program, as

our critical dependent variable and analyzed the nine T-scores on an exploratory basis. The norms program was developed with a comprehensive study of healthy individuals stratified across a wide range of age, sex, and ethnic characteristics.

Functional Capacity—Participants' functional abilities were assessed using the Brief version of the UCSD Performance-based Skills Assessment (UPSA-B; Mausbach et al., 2007). The UPSA-B is a measure of functional capacity in which patients are asked to perform everyday tasks related to communication and finances. During the *Communication* subtest, participants role-play exercises using an unplugged telephone (e.g., emergency call; dialing a number from memory; calling to reschedule a doctor's appointment). For the *Finance* subtest, participants count change, read a utility bill, and write and record a check for the bill. The UPSA-B requires approximately 10–15 minutes, and raw scores are converted into a total score ranging from 0–100, with higher scores indicating better functional capacity. Testers administering the MCCB and UPSA-B across all sites were trained in person by one of the authors (PH).

Statistical Analysis

We examined the level of severity of impairment on the cognition (MCCB) and the functional capacity (UPSA-B) measures compared to previous normative standards. Pearson product moment correlations were computed between performance on the MCCB and UPSA-B, as well as the MADRS and CAPS, and outcome measures with the Sheehan Disability Scale (SDS). We assessed for over-reporting of psychiatric symptoms through Pearson product moment correlations between the PSS-SR validity items and the self-reported measures of symptom severity and everyday disability. Because the Hollingshead measure queries for the highest level of lifetime vocational attainment, we cannot ascertain the temporal relationship between PTSD diagnosis and vocational attainment. As such, correlational analyses that included the Hollingshead measure were conducted on an exploratory basis in order to collect data on the cognition and functional capacity measures and their relationships between objective and subjective disability measures. We also conducted a correlational analysis to determine if there was a relationship between time since the index trauma and lifetime vocational attainment. We assessed this variable because we did not collect information on the age of the patient when experiencing her first trauma. We then used simultaneous entry regression analyses to examine the overall relationships between clinical symptoms, performance-based tests, and self-reported disability. The threshold for significance was set at an alpha level of $p < .05$.

RESULTS

Demographic Features

The sample included 73 adult females, ranging in age from 21–64 with a mean of $41.05(\pm 12.18)$. Forty-eight percent of the women were Caucasian, 48 percent African-American, and four percent of other races. Eleven percent endorsed Hispanic ethnicity. As measured by the Hollingshead Four Factor Index of Social Status, the mean level of educational attainment was $5.26(\pm 1.19)$: "Some College" and mean highest level of occupation was $5.45(\pm 2.35)$: "Sales and clerical workers". Thus, the lifetime achievement in

terms of educational and vocational attainment was quite congruent within the sample. The most common primary traumas endorsed in the sample were non-sexual assault by a family member or someone known to the patient (28%) and sexual assault by a family member or someone known to the patient (23%). We determined that 91.5% of the sample had experienced multiple traumas, with a mean number of criterion A traumatic experiences found to be 3.73 (SD=1.91). Time since the index trauma was over 5 years for 62% of the sample.

Symptomatic and performance-based features of the sample are presented in Table 1. PTSD and depression severity were both moderately severe. MCCB cognitive tests were performed 0.4 to 0.9 standard deviations (SD) below normative standards (see Figure 1). Table 2 presents correlations between cognitive test performance, functional capacity, depression, PTSD, self-reported current disability, and the validity items of the self-reported PTSD scale. PTSD symptom severity, both clinician-rated (CAPS) and self-reported (PSS), was associated with the severity of depression and with self-reported disability. Clinician-rated PTSD severity was negatively associated with the composite score on the MCCB. In contrast, self-reported PTSD severity was not associated with the MCCB composite scores. There was no significant correlation between UPSA-B scores and PTSD severity measured with either self-report or clinician ratings. Depression severity rated with the MADRS was correlated with self-reported disability, but was not related to the performance-based measures. However, the PSS-SR validity items demonstrated high correlations with self-reported and clinician-rated PTSD symptom severity, depression severity, and self-reported disability. Higher endorsement of the PSS-SR validity items was associated with poorer performance on the MCCB but unrelated to measures of functional capacity. The correlation between MCCB composite scores and the UPSA-B was statistically significant. We do not show correlations between individual cognitive tests and the other variables because no correlations were larger than the correlation between the composite score and any other variable.

When we examined relationships between lifetime vocational attainment and other variables, several interesting correlations were revealed. Greater lifetime vocational attainment was associated with higher total scores on the UPSA-B ($r=.40$, $p<.001$) and higher composite scores on the MCCB ($r=.25$, $p<.05$). However, lifetime vocational attainment was unassociated with CAPS, PSS-SR, MADRS, and SDS scores (all $r<.15$). Interestingly, there was no relationship between the time that had passed since the index trauma and lifetime vocational attainment ($r=0.10$, $p=.43$), arguing against early trauma suppressing vocational attainment.

A linear regression model was computed, predicting the self-reported disability (SDS) total score as the dependent variable. The model included the following variables: MCCB total scores, UPSA-B scores, MADRS, and PSS-SR. Since a CAPS score ≥ 50 is an inclusion criterion of the study, the range of CAPS scores is limited; we thus chose to include the PSS-SR in lieu of the CAPS in this regression. The overall model fit was significant, [$F(4,67)=8.54$, $p<.001$, $R^2=.34$] and only the PSS-SR score emerged as a significant predictor ($t=3.43$, $\beta=.45$, $p=.001$). Figure 2 presents the associations between PSS-SR and UPSA-B scores with the self-reported level of functioning on the SDS. PSS-SR scores were

significantly correlated with SDS scores, whereas UPSA-B scores were unrelated to SDS scores.

DISCUSSION

We found that women with PTSD show cognitive performance similar to previous reports of mild but definite cognitive impairment in PTSD (Vasterling et al., 2002; 2012). On tests of functional capacity, women with PTSD showed impairments that were similarly different from normative standards to their cognitive test performance. Consistent with findings from patients with bipolar disorder and schizophrenia and older healthy controls, cognitive and functional capacity scores were inter-correlated. Impairments in both cognition and functional capacity are not correlated with the current severity of clinician-rated depression or self-reported PTSD severity. Clinician-rated PTSD symptom severity was not related to functional capacity measures, consistent with research in bipolar illness and schizophrenia that indicates that functional capacity predicts functional outcomes but is not related to symptom severity (Bowie et al., 2008; 2010). In contrast, self-reported PTSD symptoms are strongly associated with self-reported disability, neither of which were associated with cognitive or FC performance. Thus, self-report measures are strongly intercorrelated and unrelated to objective test data. Measures that are reliant in part on patient reports, including the CAPS and the MADRS, are more strongly correlated with each other than with purely performance-based measures.

The results of the validity item analyses raise several questions about self-reports of symptoms and functioning in PTSD. Patients who produced scores suggestive of over-endorsement of implausible symptoms also had higher severity scores on all self-report measures and measures that rely on patient-reported information, such as the MADRS and CAPS. The cognitive test performance of these patients also correlates inversely with these endorsements. It is possible that such over-endorsement stems more from subjective distress than over-reporting, as indicated by research examining the Infrequency-Psychopathology scale of the Minnesota Multiphasic Personality Inventory-2 in PTSD (Franklin et al., 2002). Whether the over-endorsements are a cry for help or evidence of distress, they call into question the usefulness of self-reports of current functioning as objectively verifiable reports of functioning. These data suggest that, similar to patients with schizophrenia, MS, and TBI, such self-reports of functioning may be related to poorer cognitive test performance. Incorporating performance-based measures may be an important method to bypass these response biases, as they are not subject to the same bias that is associated with performance-based measures and provide a different perspective from self-reports of functioning because they remove one's interpretation of his or her disability and focus instead on objective, standardized observations of performance.

The relationship between PTSD and cognition in general is likely to be different than with functional capacity, consistent with the suggestion that cognitive impairments are vulnerability factors for PTSD (Macklin et al., 1998). It is not clear from this cross-sectional analysis whether cognitive impairments would improve with successful treatment of PTSD symptoms, as reported by some previous studies (Vermetten et al., 2003). A recent large study assessing the efficacy of prolonged exposure therapy for veterans with PTSD (Schnurr

et al., 2007; Schnurr & Lunney, 2012) found that successful treatment of symptoms did not yield improvement in quality of life or vocational outcomes. Taken together, these results suggest that ability is a greater contributor to functional outcomes in PTSD than symptom burden, particularly as evaluated by self-report. In reference to our exploratory analyses, performance-based measures (cognition and functional capacity) seem to correlate with lifetime vocational attainment, which is consistent with research in bipolar illness and schizophrenia that found performance-based measures to predict real-world outcome variables (Bowie et al., 2008; 2010; Mausbach et al., 2010). In contrast, all self-report measures failed to correlate with lifetime vocational and educational attainment. Future research should explore the relationship between performance-based measures and real-world functioning in PTSD using objective measures of current, as opposed to lifetime, disability.

Interestingly, self-reported current disability did not correlate with performance-based measures. Findings from other diseases ranging from TBI and multiple sclerosis to mood and psychotic disorders, indicate that self-assessment of functioning is typically unreliable (Sabbag et al., 2011). In fact, in the Sabbag et al. study, self-reported disability was uncorrelated with any performance-based measures. Our study found high correlations between self-reported PTSD severity validity items and self-reported PTSD severity, depression severity, and self-reported everyday disability. Additionally, the CAPS, a clinician-rated measure of PTSD severity which is only partially reliant on patient report, predicted objectively-measured NP performance whereas the fully self-reported PSS-SR did not. In previous research in schizophrenia (Bowie et al., 2007; Sabbag et al., 2012), self-report accuracy had a U-shaped relationship with depression severity, with overestimation of functioning at low levels of depression, underestimation at high levels, and accuracy in individuals with moderate depression severity.

There are several limitations of this study. The research participants were all female, and the sample size was only moderate, although with sufficient power to detect “small” correlations at $p < .05$. As noted above, there were no objective data or independent confirmations collected on participants’ real-world everyday functioning.

In conclusion, this first study examining both cognition and functional capacity in PTSD finds impairments consistent with other neuropsychiatric conditions. This research demonstrates relationships between cognition, functional capacity, symptom severity, and objective and subjective reports of real-world disability that are similar to those found with other psychiatric illnesses, deserving further exploration of these variables and a systematic comparison of these variables in PTSD and other disorders. Our findings emphasize the unreliable nature of self-report measures of disability, including the finding that patients with PTSD endorse exaggerated symptomatic experiences, affirming the potential usefulness of performance-based measures of functional capacity in predicting real-world impairments.

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References

- Barrett DH, Green ML, Morris R, Giles WH, Croft JB. Cognitive functioning and posttraumatic stress disorder. *The American Journal of Psychiatry*. 1996; 153:1492–4. [PubMed: 8890689]
- Blake DD, Weathers FW, Nagy LM, Kaloupek DG, Gusman FD, Charney DS, et al. The development of a clinician-administered PTSD scale. *Journal of Traumatic Stress*. 1995; 8:75–90. [PubMed: 7712061]
- Bowie CR, Depp C, McGrath JA, Wolyniec P, Mausbach BT, Thornquist MH, et al. Prediction of real-world functional disability in chronic mental disorders: a comparison of schizophrenia and bipolar disorder. *The American Journal of Psychiatry*. 2010; 167:1116–24. [PubMed: 20478878]
- Bowie CR, Leung WW, Reichenberg A, McClure MM, Patterson TL, Heaton RK, et al. Predicting schizophrenia patients' real world behavior with specific neuropsychological and functional capacity measures. *Biological Psychiatry*. 2008; 63:505–11. [PubMed: 17662256]
- Bowie CR, Reichenberg A, Patterson TL, Heaton RK, Harvey PD. Determinants of real-world functional performance in schizophrenia subjects: correlations with cognition, functional capacity, and symptoms. *The American Journal of Psychiatry*. 2006; 163:418–25. [PubMed: 16513862]
- Bowie CR, Twamley EW, Anderson H, Halpern B, Patterson TL, Harvey PD. Self-assessment of functional status in schizophrenia. *Journal of Psychiatric Research*. 2007; 41:1012–8. [PubMed: 17014866]
- Burdick KE, Endick CJ, Goldberg JF. Assessing cognitive deficits in bipolar disorder: are self-reports valid? *Psychiatry Research*. 2005; 136:43–50. [PubMed: 16024090]
- Carone DA, Benedict RH, Munschauer FE 3rd, Fishman I, Weinstock-Guttman B. Interpreting patient/informant discrepancies of reported cognitive symptoms in MS. *Journal of the International Neuropsychological Society*. 2005; 11:574–83. [PubMed: 16212684]
- Depp CA, Cain A, Palmer B, Moore D, Eyler L, Lebowitz B, et al. Assessment of medication management ability in middle-aged and older adults with bipolar disorder. *Journal of Clinical Psychopharmacology*. 2008; 28:225–9. [PubMed: 18344736]
- Depp CA, Mausbach BT, Eyler LT, Palmer BW, Cain AE, Lebowitz BD, et al. Performance-based and subjective measures of functioning in middle-aged and older adults with bipolar disorder. *The Journal of Nervous and Mental Disease*. 2009; 197:471–5. [PubMed: 19597353]
- Fett AK, Viechtbauer W, Dominguez MD, Penn DL, van Os J, Krabbendam L. The relationship between neurocognition and social cognition with functional outcomes in schizophrenia: A meta-analysis. *Neuroscience & Biobehavioral Reviews*. 2011; 35:573–88. [PubMed: 20620163]
- Foa EB, Cashman L, Jaycox L, Perry K. The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psychological Assessment*. 1997; 9:445–51.
- Foa EB, Riggs DS, Dancu CV, Rothbaum BO. Reliability and validity of a brief instrument for assessing post-traumatic stress disorder. *Journal of Traumatic Stress*. 1993; 6:459–73.
- First, MB.; Spitzer, RL.; Gibbon, M.; Williams, JBW.; Benjamin, LS. User's guide for the Structured Clinical Interview for DSM-IV Axis I (SCID-I). Washington, DC: American Psychiatric Press; 1995.
- Franklin CL, Repasky SA, Thompson KE, Shelton SA, Uddo M. Differentiating overreporting and extreme distress: MMPI-2 use with compensation-seeking veterans with PTSD. *Journal of Personality Assessment*. 2002; 79:274–85. [PubMed: 12425391]
- Geuze E, Vermetten E, de Kloet CS, Hijman R, Westenberg HGM. Neuropsychological performance is related to current social and occupational functioning in veterans with posttraumatic stress disorder. *Depression and Anxiety*. 2009; 26:7–15. [PubMed: 18800372]
- Gildengers AG, Butters MA, Chisholm D, Rogers JC, Holm MB, Bhalla RK, et al. Cognitive functioning and instrumental activities of daily living in late-life bipolar disorder. *American Journal of Geriatric Psychiatry*. 2007; 15:174–9. [PubMed: 17272739]
- Harvey PD. Cognitive functioning and disability in schizophrenia. *Current Directions in Psychological Science*. 2010; 19(4):249–54.

- Harvey PD, Reichenberg A, Bowie CR, Patterson TL, Heaton RK. The course of neuropsychological performance and functional capacity in older patients with schizophrenia: Influences of previous history of long-term institutional stay. *Biological Psychiatry*. 2010a; 67:933–39. [PubMed: 20202624]
- Harvey PD, Wingo AP, Burdick KE, Baldessarini RJ. Cognition and disability in bipolar disorder: lessons from schizophrenia research. *Bipolar disorders*. 2010b; 12:364–75. [PubMed: 20636633]
- Heaton RK, Pendleton MG. Use of neuropsychological tests to predict adult patients' everyday functioning. *Journal of Consulting and Clinical Psychology*. 1981; 49:807–21. [PubMed: 7309951]
- Hollingshead, AB. Four factor index of social status. New Haven, CT: Department of Sociology, Yale University; 1975.
- Leifker FR, Bowie CR, Harvey PD. Determinants of everyday outcomes in schizophrenia: the influences of cognitive impairment, functional capacity, and symptoms. *Schizophrenia Research*. 2009; 115:82–7. [PubMed: 19775869]
- Macklin ML, Metzger LJ, Litz BT, McNally RJ, Lasko NB, Orr SP, et al. Lower precombat intelligence is a risk factor for posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology*. 1998; 66:323–6. [PubMed: 9583335]
- Margolies SO, Rybarczyk B, Vrana SR, Leszczyszyn DJ, Lynch J. Efficacy of a cognitive-behavioral treatment for insomnia and nightmares in Afghanistan and Iraq veterans with PTSD. *Journal of Clinical Psychology*. 2013:1026–1042. [PubMed: 23629959]
- Martínez-Arán A, Vieta E, Reinares M, Colom F, Torrent C, Sánchez-Moreno J, et al. Cognitive function across manic or hypomanic, depressed, and euthymic states in bipolar disorder. *The American Journal of Psychiatry*. 2004; 161:262–70. [PubMed: 14754775]
- Mausbach BT, Harvey PD, Goldman SR, Jeste DV, Patterson TL. Development of a brief scale of everyday functioning in persons with serious mental illness. *Schizophrenia Bulletin*. 2007; 33:1364–72. [PubMed: 17341468]
- Mausbach BT, Harvey PD, Pulver AE, Depp CA, Wolyniec PS, Thornquist MH, et al. Relationship of the Brief UCSD Performance-based Skills Assessment (UPSA-B) to multiple indicators of functioning in people with schizophrenia and bipolar disorder. *Bipolar disorders*. 2010; 12:45–55. [PubMed: 20148866]
- McDevitt-Murphy ME, Williams JL, Bracken KL, Fields JA, Monahan CJ, Murphy JG. PTSD symptoms, hazardous drinking, and health functioning among U.S. OEF/OIF veterans presenting to primary care. *Journal of Traumatic Stress*. 2010; 23:108–11. [PubMed: 20104586]
- McKibbin C, Patterson TL, Jeste DV. Assessing disability in older patients with schizophrenia: results from the WHODAS-II. *The Journal of Nervous and Mental Disease*. 2004; 192:405–13. [PubMed: 15167403]
- Montgomery SA, Asberg M. A new depression scale designed to be sensitive to change. *The British Journal of Psychiatry*. 1979; 134:382–9. [PubMed: 444788]
- Neuchterlein KH, Green MF, Kern RS, Baade LE, Barch D, Cohen J, et al. The MATRICS Consensus Cognitive Battery: Part 1. Test selection, reliability, and validity. *The American Journal of Psychiatry*. 2008; 165:203–13. [PubMed: 18172019]
- Sabbag S, Twamley EW, Vella L, Heaton RK, Patterson TL, Harvey PD. Assessing everyday functioning in schizophrenia: not all informants seem equally informative. *Schizophrenia Research*. 2011; 131:250–5. [PubMed: 21620682]
- Sabbag S, Twamley EW, Vella L, Heaton RK, Patterson TL, Harvey PD. Predictors of the accuracy of self assessment of everyday functioning in people with schizophrenia. *Schizophrenia Research*. 2012; 137:190–5. [PubMed: 22386735]
- Schnurr PP, Friedman MJ, Engel CC, Foa EB, Shea MT, Chow BK, et al. Cognitive behavioral therapy for posttraumatic stress disorder in women: A randomized controlled trial. *JAMA: The Journal of the American Medical Association*. 2007; 297:820–30. [PubMed: 17327524]
- Schnurr PP, Lunney CA. Work-related outcomes among female veterans and service members after treatment of posttraumatic stress disorder. *Psychiatric Services*. 2012; 63:1072–9. [PubMed: 22983600]

- Sheehan DV, Raj BA. The measurement of disability. *International Clinical Psychopharmacology*. 1996; 11:89–95. [PubMed: 8923116]
- Simonsen C, Sundet K, Vaskinn A, Birkenaes AB, Engh JA, Hansen CF, et al. Neurocognitive profiles in bipolar I and bipolar II disorder: differences in pattern and magnitude of dysfunction. *Bipolar disorders*. 2008; 10:245–55. [PubMed: 18271903]
- Spikman JM, van der Naalt J. Indices of impaired self-awareness in traumatic brain injury patients with focal frontal lesions and executive deficits: implications for outcome measurement. *Journal of Neurotrauma*. 2010; 27:1195–202. [PubMed: 20380551]
- Twamley EW, Allard CB, Thorp SR, Norman SB, Cissell SH, Berardi KH, et al. Cognitive impairment and functioning in PTSD related to intimate partner violence. *Journal of the International Neuropsychological Society*. 2009; 15:879–87. [PubMed: 19703324]
- Twamley EW, Doshi RR, Nayak GV, Palmer BW, Golshan S, Heaton RK, et al. Generalized cognitive impairments, ability to perform everyday tasks, and level of independence in community living situations of older patients with psychosis. *The American Journal of Psychiatry*. 2002; 159:2013–20. [PubMed: 12450950]
- Vasterling JJ, Brailey K, Proctor SP, Kane R, Heeren T, Franz M. Neuropsychological outcomes of mild traumatic brain injury, post-traumatic stress disorder and depression in Iraq-deployed US Army soldiers. *British Journal of Psychiatry*. 2012; 201:186–92. [PubMed: 22743844]
- Vasterling JJ, Duke LM, Brailey K, Constans JJ, Allain AN, Sutker PB. Attention, learning, and memory performances and intellectual resources in Vietnam veterans: PTSD and no disorder comparisons. *Neuropsychology*. 2002; 16:5–14. [PubMed: 11853357]
- Vermetten E, Vythilingam M, Southwick SM, Charney DS, Bremner JD. Long-term treatment with paroxetine increases verbal declarative memory and hippocampal volume in posttraumatic stress disorder. *Biological Psychiatry*. 2003; 54:693–702. [PubMed: 14512209]
- Weathers FW, Keane TM, Davidson JRT. Clinician-Administered PTSD Scale: A review of the first ten years of research. *Depression and Anxiety*. 2001; 13:132–56. [PubMed: 11387733]
- Yehuda R, Keefe RSE, Harvey PD, Levengood RA, Gerber DK, Geni J, et al. Learning and memory in combat veterans with post traumatic stress disorder. *The American Journal of Psychiatry*. 1995; 152:137–9. [PubMed: 7802106]
- Zatzick DF, Marmar CR, Weiss DS, Browner WS, Metzler TJ, Golding JM, et al. Posttraumatic stress disorder and functioning and quality of life outcomes in a nationally representative sample of male Vietnam veterans. *The American Journal of Psychiatry*. 1997; 154:1690–5. [PubMed: 9396947]

Highlights

1. Impairments in functional capacity are detected in women with PTSD
2. Self reported disability was uncorrelated with objective test performance
3. Items assessing infrequent responding were correlated with self reported symptoms

Figure 1.

T scores based on MCCB norms.

MCCB, MATRICS Consensus Cognitive Battery.

Note: T-scores have a population mean of 50 and a standard deviation of 10.

Figure 2.

Correlations between PSS-SR and UPSA-B with SDS.

** $p < .01$.

PSS-SR, PTSD Symptom Scale – Self-report version; SDS, Sheehan Disability Scale; UPSA-B, UCSD Performance-Based Skills Assessment – Brief.

Table 1

Scores on Clinical and Performance-Based Measures

	M	SD	Range
Clinician-Administered PTSD Scale (CAPS)	80.18	15.38	54.00–115.00
PTSD Symptom Scale – Self-report version (PSS-SR)	31.22	8.43	5.00–47.81
PSS-SR Validity Items	5.39	3.37	0.00–15.00
Montgomery Asberg Depression Rating Scale (MADRS)	26.59	8.13	10.00–43.00
Sheehan Disability Scale (SDS)	18.85	6.62	2.00–30.00
UCSD Performance-based Skills Assessment-Brief (UPSA-B)	83.04	11.33	42.00–100.00
MATRICES Consensus Cognitive Battery (MCCB) composite t-score	44.11	10.76	34.00–59.00

Table 2

Intercorrelations of Variables

	CAPS	PSS-SR	SDS	UPSA-B	MCCB	PSS-Validity
MADRS	0.69***	0.64***	0.46***	0.08	-.10	0.29**
CAPS	-	0.68***	0.51***	-.08	-.36**	0.43***
PSS-SR		-	0.55***	0.04	-.19	0.47***
SDS			-	-.06	-.11	0.32**
UPSA-B				-	0.48***	-.11
MCCB Composite					-	-.31**

* p<.05;
** p<.01;
*** p<.001

CAPS, Clinician-Administered PTSD Scale; MADRS, Montgomery Asberg Depression Rating Scale; MCCB Composite, MATRICS Consensus Cognitive Battery, composite score; PSS-SR, PTSD Symptom Scale – Self-report version; SDS, Sheehan Disability Scale; UPSA-B, UCSD Performance-Based Skills Assessment-Brief