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Fort Detrick, Maryland 21702-5012

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14. ABSTRACT The study was a 12-month randomized controlled trial comparing supported employment plus Cognitive Symptom Management and Rehabilitation Therapy (SE-Cog) to enhanced supported employment (ESE) for OEF/OIF veterans with mild to moderate traumatic brain injury (TBI) who are unemployed and want to return to work. CogSMART is a manualized, 12-week compensatory cognitive training intervention designed to provide: a) psychoeducation, b) strategies to address sleep problems, fatigue, headaches, and stress, and c) strategies to improve prospective memory, attention, learning/memory, and executive functioning. Assessments of cognition, post-concussive symptoms, psychiatric symptoms, functional skills, and quality of life were administered at baseline, and at 3, 6, and 12 months following study enrollment. Work outcomes (i.e., weeks and hours worked; wages earned) were measured weekly during the 12-month study. Results indicated that CogSMART had robust effects on post-concussive symptoms ($F=6.48$, $p=.016$). Veterans who received CogSMART were also more likely to obtain competitive employment in the course of supported employment (60% vs. 48%). These results suggest that CogSMART, in the context of supported employment, may improve post-concussive symptoms and work outcomes.					
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INTRODUCTION:

The study was a 12-month randomized controlled trial comparing supported employment plus Cognitive Symptom Management and Rehabilitation Therapy (SE-Cog) to enhanced supported employment (ESE) for OEF/OIF veterans with mild to moderate traumatic brain injury (TBI) who are unemployed and want to return to work. CogSMART is a manualized, 12-week compensatory cognitive training intervention designed to provide: a) psychoeducation, b) strategies to address sleep problems, fatigue, headaches, and stress, and c) strategies to improve prospective memory, attention, learning/memory, and executive functioning. Fifty (50) participants were randomized to one of two conditions: SE-Cog or ESE. SE-Cog and ESE were delivered by the supported employment specialists during the first 3 months of the 12-month study. Assessments of cognition, post-concussive symptoms, psychiatric symptoms, functional skills, and quality of life were administered at baseline, and at 3, 6, and 12 months following study enrollment. Work outcomes (i.e., weeks and hours worked; wages earned) were measured weekly during the 12-month study. The results of the study will reveal whether supported employment services for this population can be improved by adding cognitive rehabilitation.

BODY:

The original Statement of Work presents the project timeline as follows:

Project timeline	
Time	Tasks
Year 1	Month 1-3: Submit IRB application, hire and train staff, begin recruitment Month 4-12: Enroll 32 participants (3-4 participants per month)
Year 2	0-9 months: Enroll 32 participants (3-4 participants per month) Month 9: Final participant enrolled
Year 3	9 months: Final participant completes study 9-12 months: Data analyses, manuscript writing, preparation of finalized CogSMART manual for dissemination in other settings

Difficulties in recruitment and enrollment in Year 1 and 2 resulted in continued recruitment and enrollment into Year 3. In Year 1, our enrollment total was 19 out of the targeted 32 participants (59% of target). Main reasons for lower than expected recruitment in Year 1 were: a) delay in funding arriving so positions could be posted and filled; b) delays in the hiring process and difficulties obtaining computer access for the new staff members; c) long wait times for neuropsychological evaluations (required for entrance into the study if not already completed). None of these issues were problematic in Year 2 or Year 3. Enrollment in Year 2 was also 19 out of the targeted 32 participants (59% of target). Many veterans have chosen to attend college rather than work (and rightly so). Thus, our primary difficulty in recruitment and enrollment has been the high level of veteran participation in the Post 9/11 GI Bill, which provides a living stipend of \$2,200 per month in San Diego while veterans attend college. In Year 2, we began targeting veteran groups at local colleges and universities to offer the supported employment services of the study, to help these veterans obtain valuable paid work experience while they earn their degrees. We have been successful in placing many veterans in paid work-study experiences as well as in federal employment. Enrollment in Year 3 was 11 participants, 4 of whom were part-time or full-time college students, resulting in $n = 49$ (77% of target N). A no-cost extension was granted to continue recruitment and enrollment efforts and to be able to follow participants through to the end of their study participation and wrap-up the project as originally intended. Unfortunately, we were only able to recruit one additional participant by our recruitment cut-off (2/29/12), resulting in a total sample size of 50.

Multiple abstracts were presented during the funding period:

First, we examined the assessments of the first 20 veterans enrolled in the study. Participants were all male, 85% non-Caucasian, with a mean age of 32 and mean education of 13 years. Their TBIs occurred a mean of 4 years before study enrollment, and their mean losses of consciousness lasted 4 minutes. Sixty-nine percent met criteria for post-traumatic stress disorder. Their mean baseline scores were low-average to average on tests of attention, processing speed, learning, delayed recall, prospective memory, and executive functioning. However, their mean performance on one processing speed task (Digit Symbol) was below average (mean SS=6.6). Repeated measures ANOVA using baseline and three-month scores showed that, compared with the ESE group, SE-Cog participants reported more improvement in post-concussive symptoms ($F=10.5$, $df=1$, $p=.014$); there was also a significant improvement in verbal fluency, a measure of verbal processing speed ($F=8.4$, $df=1$, $p=.023$). There were trends toward improvement in depressive symptom severity and quality of life. These results suggest that CogSMART, in the context of supported employment, may improve post-concussive symptoms, cognitive performance, and more distal outcomes such as depressive symptoms, quality of life, and potential work outcomes. The abstract reporting these data was presented at the VA Mental Health Conference in July 2010, and has been appended to this document as Appendix 3.

We have also examined relationships between neuropsychological performance, psychiatric symptom severity, and post-concussive symptom severity among the first 28 participants with baseline assessment data. The demographics of the sample are similar to those presented above. We found that neuropsychological performance was related to psychiatric symptom severity (PTSD and depressive symptoms), but was not related to self-reported post-concussive symptoms in this population. Specifically, lower processing speed performance was correlated with higher PTSD symptom severity ($r=-.47$, $p=.012$; $r=-.43$, $p=.023$) and higher depressive symptom severity ($r=-.41$, $p=.030$; $r=-.43$, $p=.021$). The abstract reporting these results, presented at the International Society of Neuropsychology, has been appended as Appendix 5.

Multivariate predictors of social functioning and quality of life were assessed among the first 43 participants. Ninety-five percent of participants were male, 63% Caucasian, with a mean age of 31 and mean education of 13 years. Seventy-two percent met PTSD criteria based on the Clinician Administered PTSD Scale (CAPS) and the mean level of depressive and post-concussive symptoms was in the moderate range. Mean age of worst TBI was 26, median length of loss of consciousness (LOC) was 1 min, median length of post traumatic amnesia (PTA) was 0 days. Mean number of blasts with LOC was .7 (2.3), mean number of blasts without LOC was 11.4 (33.7). We found that social functioning and quality of life (QOL) as assessed by the Quality of Life Interview were significantly associated with depressive and PTSD symptoms, but when both symptom scores were entered into a regression together, only depressive symptom severity ($p=.030$) predicted objective QOL, explaining 20% of the variance. Subjective QOL was significantly correlated with depressive and PTSD symptoms, as well as communication skills and general functional capacity. When these variables were entered into a multiple regression, depressive symptom severity ($p=.006$) and communication skills ($p=.044$) explained 39% of the variance in subjective QOL. In a multivariate context, only category fluency ($p=.001$) a measure of verbal processing speed, and number of blast exposures with loss of consciousness ($p=.017$) predicted frequency of social contact, together explaining 52% of the variance. These results suggest that verbal processing speed is a strong predictor of reduced social activity in veterans with histories of TBI. The abstract reporting these data was presented at the VA Mental Health Conference in August 2011, and has been appended to this document as Appendix 7.

Sleep disturbance, cognition, and psychiatric symptoms were also examined with the first 43 participants. Participants reported sleeping an average of 4.9 hours per night, with an average sleep deficit of 2.4 hours. Veterans reporting greater levels of sleep deficit had worse neuropsychological test performance

on measures of delayed recall ($r = -.39, p = .013$) and processing speed ($r = -.36, p = .021$). Greater sleep deficits were also associated with more severe depressive symptoms ($r = .37, p = .018$), but not with other measures of psychiatric symptom severity or TBI severity markers (length of loss of consciousness and length of post-traumatic amnesia). Self-reported total sleep time was not associated with any neuropsychological or symptom distress measures, however, subjective distress regarding sleep was associated with depressive symptom severity ($r = .61, p < .001$), post-concussive symptom severity ($r = .47, p = .002$), and PTSD symptom severity ($r = .61, p < .001$). These results suggest that interventions to improve sleep and reduce subjective distress regarding sleep may improve psychiatric symptom severity and some domains of objective neuropsychological performance. The abstract reporting these data was also presented at the VA Mental Health Conference in August 2011, and has been appended to this document as Appendix 8.

In our final sample ($n = 50$), on average, our participants were 32 years old, had 13 years of education, 96% were men, and 76% were members of a racial or ethnic minority group. The median length of loss of consciousness was one minute. Eight participants dropped out, four from each group (two decided not to pursue work, one moved, and five were lost to contact). ANCOVAs controlling for baseline levels of performance showed significant CogSMART-associated reductions in postconcussive symptoms. Compared with those who received enhanced supported employment, those receiving supported employment plus CogSMART reported significantly lower post-concussive symptoms on the Neurobehavioral Symptom Inventory from pre- to post-treatment ($F = 6.48, p = .016$; see figure). Veterans who received CogSMART were also more likely to obtain competitive employment in the course of supported employment (60% vs. 48%). These results are now being written up in two manuscripts to be submitted within the next 4 months.

This study was novel in that there has been no published research on enhancing supported employment with cognitive training for clients with TBI. The main outcomes of the study will be (1) Knowledge regarding the efficacy of combining compensatory cognitive training with supported employment for clients with TBI; (2) A finalized CogSMART manual that is available for other service settings at the study's completion; and (3) 50 veterans with TBI received high-fidelity supported employment to assist them in transitioning back to the workforce.

The CogSMART manual has been finalized and is available via email. It has been distributed to over 110 clinicians, mainly at VA and DoD facilities.

Two major manuscripts are in preparation, one focusing on the short-term effects of CogSMART, and one focusing on longer-term work outcomes.

KEY RESEARCH ACCOMPLISHMENTS:

- 50/64 participants enrolled (78% of target)
- All data collected and entered
- Preliminary analyses completed
- 8 abstracts presented; 11 talks given
- One manuscript in draft form, to be submitted to the Journal of Rehabilitation Research and Development
- One additional manuscript in preparation
- Data used in two applications for additional federal funding

REPORTABLE OUTCOMES:

Abstract presented at the VA Mental Health Conference 2009 (see Appendix 1):

- Twamley, E.W., Jak, A., Thomas, K., & Delis, D. (2009). Cognitive Symptom Management and Rehabilitation Therapy (CogSMART). VA National Mental Health Conference, Baltimore.

Abstract presented at the International Neuropsychological Society 2010 meeting (see Appendix 2):

- Thomas, K.R., Williams, R.E., Bondi, M.W., Delis, D.C., & Twamley, E.W. (2010). Supported Employment Plus Cognitive Training for Veterans with Traumatic Brain Injury. Journal of the International Neuropsychological Society, 16 (S1), 139. (International Neuropsychological Society).

Abstracts presented at VA Mental Health Conference 2010 (see Appendices 3 and 4):

- Twamley, E., Thomas, K., Williams, R., Bondi, M., & Delis, D. (July 2010). CogSMART Compensatory Cognitive Training and Supported Employment for Veterans with TBI. VA Mental Health Conference, Baltimore, MD.
- Twamley, E.W., Thomas, K.R., Williams, R.E., Bondi, M.W., & Delis, D.C. (July 2010). Improving Supported Employment Outcomes for Veterans with TBI. VA Mental Health Conference, Baltimore, MD.

Abstract presented at the International Neuropsychological Society 2011 meeting (see Appendix 5):

- Thomas, K.R., Gregory, A.M., Williams, R.E., Delis, D.C., Bondi, M.W. & Twamley, E.W. (2011). Cognitive Efficiency in Veterans with TBI is Reduced by Psychiatric Symptom Severity, Not Post-Concussive Symptoms. Journal of the International Neuropsychological Society, 17 (S1), 249. (International Neuropsychological Society).

Abstract presented at the Combat Operational Stress Control Conference 2011 (see Appendix 6):

- Twamley, E.W. (April 2011). CogSMART Compensatory Cognitive Training for Veterans with TBI. Combat Operational Stress Control, San Diego, CA.

Abstracts presented at VA Mental Health Conference 2011 (see Appendices 7 and 8):

- Twamley, E. W., Gregory, A.M., Colón, C., Orff, H.J., Jak, A., Twamley, E. W. (August 2011). Multivariate predictors of social functioning and quality of life in veterans with traumatic brain injuries. VA Mental Health Conference, Baltimore, MD.
- Gregory, A.M., Orff, H.J., Colón, C., Jak, A. (August 2011). Sleep Disturbance, Cognition, and Psychiatric Symptoms in Veterans with TBI. VA Mental Health Conference, Baltimore, MD.

Additional relevant conference presentations:

- Twamley, E.W. (September 2009) CogSMART: Cognitive Symptom Management and Rehabilitation Therapy. VA MIRECC Teleconference.
- Twamley, E.W. (November 2009). CogSMART: Cognitive Symptom Management and Rehabilitation Therapy. VA VISN 9 Polytrauma Conference, Nashville.
- Twamley, E.W. (May 2010). Counseling and Psychotherapy for Individuals with Traumatic Brain Injury. University Counseling Services for Returning Veterans Continuing Education Program, University of San Diego.
- Twamley, E.W. (June 2010). Compensatory Cognitive Training: Results from Psychosis and TBI Trials. Cognitive Remediation in Psychiatry, New York City.
- Twamley, E.W. (June 2010). CogSMART: Cognitive Symptom Management And Rehabilitation Therapy. VISN 22 Teleconference.

- Twamley, E.W. (June 2011). Compensatory Cognitive Training. Cognitive Remediation in Psychiatry, New York City.
- Twamley, E.W. (June 2011). TBI Rehabilitation. TBI Research and Care Consortium, University of California, San Diego and VA San Diego Healthcare System.
- Twamley, E.W. (September 2011). Cognitive Rehabilitation Following Traumatic Brain Injury. Naval Medical Center San Diego.
- Twamley, E.W. (November 2011). Combining Supported Employment with Cognitive Rehabilitation to Improve Outcomes Following TBI. Mindknit US-Japan Exchange Symposium on Veterans with PTSD and TBI, Honolulu.
- Twamley, E.W. (December 2011). Cognitive Rehabilitation. Trauma Spectrum Conference, Bethesda.
- Twamley, E.W. (June 2012). VHA Vocational Services and Supported Employment. New Horizons in Rehabilitation Care (VA Office of Rehabilitation Conference), Atlanta.

Additional research funding applied for using these data:

- CogSMART via Telehealth: Collaborative Research to Enhance and Advance Transformation and Excellence (CREATE); PI: Charles Levy, MD (Gainesville VA)
- Cognitive Rehabilitation of Veterans with Mild Cognitive Impairment: Merit Review; co-PIs: Elizabeth W. Twamley, PhD, Daniel Storzbach, PhD (Portland VA)

Staff receiving pay during the project period included the following:

Jeanette Greany
Kelsey Thomas
Laurie Arnold
Amber Gregory

CONCLUSION:

Our results suggest that CogSMART, in the context of supported employment, may improve post-concussive symptoms and more distal outcomes (employment). These results support further clinical use of CogSMART and further study of cognitive training in the delivery of supported employment for veterans with mild-to-moderate TBI. CogSMART may be appropriate as a standalone intervention to reduce post-concussive symptoms and improve cognition. CogSMART may also speed return to duty for military service members who have experienced a TBI.

REFERENCES:

None included in this report except those above.

APPENDICES:

Abstracts attached as Appendices 1-8.

SUPPORTING DATA:

None included in this report.

Appendix 1.

3rd Annual VA Mental Health Conference
July 21-23, 2009
Washington DC

Call for Presentations, Workshops, & Posters

Presenting Author(s) information			
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VISN/ Vet Center Region:	VISN 6, VISN 18, VISN 22, VACO	Service:	Mental Health, Research & Education, VACO Rehabilitation Services
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Submission information

Type of Proposal (choose one)							
<input type="checkbox"/>	Presentation	<input checked="" type="checkbox"/>	Workshop	<input type="checkbox"/>	Poster		
Content (choose one)							
<input type="checkbox"/>	Research study <input type="checkbox"/> This paper has been presented previously at:	<input checked="" type="checkbox"/>	Clinical demonstration	<input type="checkbox"/>	Education		
Topic(s) (select no more than 3; rank order if selecting more than one)							
<input type="checkbox"/>	Brief treatments	<input type="checkbox"/>	Community & rural MH care	<input type="checkbox"/>	Environments of care	<input type="checkbox"/>	Family services
<input type="checkbox"/>	Gender-specific MH treatment	<input type="checkbox"/>	Geriatric MH care	<input type="checkbox"/>	Homeless & RRT Programs	<input type="checkbox"/>	Implementing EB psychotherapies
<input type="checkbox"/>	Improving access to MH care	<input type="checkbox"/>	Justice-involved veterans	<input type="checkbox"/>	Primary Care-MH Integration	<input type="checkbox"/>	Program evaluation & metrics
<input type="checkbox"/>	Psychosocial rehabilitation & recovery	<input type="checkbox"/>	Substance use disorders	<input type="checkbox"/>	Suicide risk reduction & prevention	<input type="checkbox"/>	Tele-Mental Health
<input type="checkbox"/>	Transforming research into clinical practice	<input checked="" type="checkbox"/> 1	Traumatic brain injury	<input type="checkbox"/>	Traumatic stress (combat, MST), PTSD	<input checked="" type="checkbox"/> 2	Treatment for OEF/ OIF veterans

COMPLETE EITHER THE FIVE BOXES ON THE NEXT PAGE OR A ONE-PAGE ABSTRACT USING THE SAME HEADINGS

Note: Research studies should include a research design and outcome data. Clinical demonstrations should have at least one year of data and typically involve multiple sites. Education projects should include an evaluation and demonstrate a change in practice. The size of the boxes may be expanded but not beyond the bottom of the second page.

Title of Presentation/Poster/Workshop
Mild Traumatic Brain Injury Workshop: Assessment and Treatment of Cognitive Impairment

Background

Traumatic brain injury (TBI) has been called the 'signature' injury of the current conflicts. There is growing evidence that many Veterans have experienced one or more episodes of TBI during deployment. While most individuals with mild injuries can attain a complete recovery, some have residual cognitive and emotional problems that adversely affect their ability to function on a daily basis. The individual with a TBI can present with a myriad of cognitive deficits depending upon the cause and severity of the trauma, neuroanatomical locations impacted, age, length of time since trauma, and other factors. Common problems include decreased focus and concentration, impaired memory, decreased sleep, agitation, irritability, and inability to maintain employment or schooling. Treatment may be complicated by presence of psychiatric disorders, particularly post traumatic stress disorder (PTSD). 1-4

Cognitive rehabilitation is one component of a comprehensive brain injury rehabilitation program. It focuses upon the cognitive deficits of the brain injured individual, but also impacts social, communication, behavior, and academic/vocational issues. Some of the interventions used in cognitive rehabilitation include modeling, guided practice, distributed practice, errorless learning, direct instruction with feedback, paper and pencil tasks, manipulatives, neurofeedback (EEG biofeedback), communication skills, computer-assisted retraining programs, and behavioral modification. The interventions are usually provided one-on-one but some can be delivered in a small group setting.

Measurable Outcomes/Results

In this workshop, the team will present three programs from across the VHA healthcare system that are assessing and treating patients with mild TBI and cognitive deficits. Many of these patients have PTSD and other psychiatric diagnoses. The team will discuss successes, challenges, lessons learned, and opportunities for improvement. The programs to be discussed and presenters are:

Functional Adaptation & Cognitive reTraining (FACT) - David L. Butler PhD, Salisbury NC

This six week program utilizes individual and small group approaches to provide intensive cognitive rehabilitation for Veterans with mild TBI and psychiatric co-morbidities. The focus is on identifying symptoms, deficits, strengths, and strategies for the rehabilitation and education.

Brain Boosters - Kathleen Goren PhD and Mary Lu Bushnell PsyD, Phoenix AZ

This program provides a ten-week series of weekly small group sessions that assist Veterans in learning how to optimize strengths and enhance brain functioning. Didactic education, experiential cognitive rehabilitation activities and homework or "take-away assignments" are utilized to help veterans recognize their strengths, improve their deficits and generalize what is learned to real world situations.

Cognitive Symptom Management & Rehabilitation Therapy (CogSMART) - Elizabeth W. Twamley PhD, San Diego CA

This one-hour per week, manualized compensatory cognitive training program targets difficulties with concentration, memory, and problem-solving. It is designed to teach compensatory cognitive strategies and habits to help clients bypass their cognitive impairments.

After all VA stations have presented their programs, the **Expert Discussant – Micaela Cornis-Pop PhD (VACO Rehabilitation Services)** will lead an interactive panel dialogue with the audience.

Lessons Learned Implications for the Field

The lessons presented from these three different approaches to providing cognitive rehabilitation interventions for Veterans with residual cognitive and emotional problems due to TBI will help guide the development of new programs.

References and Related Information

1. Kennedy et al (2007) Posttraumatic stress disorder and posttraumatic stress disorder-like symptoms and mild traumatic brain injury. *J Rehabil Res Dev*, 44, 895-920; 2. Kim et al (2007). Neuropsychiatric complications of traumatic brain injury: a critical review of the literature. *J Neuropsychiatry Clin Neurosci*, 19, 106-127; 3. Schneiderman et al (2008). Understanding sequelae of injury mechanisms and mild traumatic brain injury incurred during the conflicts in Iraq and Afghanistan: Persistent postconcussive symptoms and posttraumatic stress disorder. *Am J Epidemiol*, 167, 1446-1452; 4. Taber KH, Hurley RA. PTSD and Combat Related Injuries: Functional Neuroanatomy *J Neuropsychiatry Clin Neurosci*, 2009 Winter; 21(1):iv-4

Please submit the completed form to Jan.kemp@va.gov by **March 13, 2009**.

Appendix 2.

INS Abstract for Acapulco Meeting, 2010

Supported Employment Plus Cognitive Training for Veterans with Traumatic Brain Injury

Kelsey R. Thomas, Rebecca E. Williams, Mark W. Bondi, Dean C. Delis, and Elizabeth W. Twamley

Traumatic brain injury (TBI) often results in residual cognitive and functional impairments. We examined the effects of Cognitive Symptom Management and Rehabilitation Therapy (CogSMART), a 12-week compensatory cognitive training intervention, on post-concussive symptoms, cognitive performance, and work outcomes in Iraq/Afghanistan veterans receiving supported employment services. CogSMART provides a) psychoeducation, b) strategies to address sleep problems, fatigue, headaches, and stress, and c) strategies to improve prospective memory, attention, learning/memory, and executive functioning.

13 unemployed veterans with mild-to-moderate TBI enrolled in a 12-month randomized controlled trial comparing supported employment plus CogSMART (SE-Cog) to enhanced supported employment (ESE). Participants were all male, 85% non-Caucasian, with a mean age of 32 and mean education of 13 years. Their TBIs occurred a mean of 4 years before study enrollment, and their mean losses of consciousness lasted 4 minutes. Sixty-nine percent met criteria for PTSD. Their mean baseline scores were average on tests of attention, processing speed, learning, delayed recall, prospective memory, and executive functioning. However, their mean performance on one processing speed task (Digit Symbol) was below average (mean SS=6.6).

Repeated measures ANOVA using baseline and three-month scores showed that, compared with the ESE group, SE-Cog participants reported more improvement in post-concussive symptoms ($F=36.6$, $df=1,5$, $p=.002$); there were also trends toward improvement in verbal fluency and quality of life. Forty-four percent of SE-Cog participants and none of the ESE participants have obtained work thus far.

These results suggest that CogSMART, in the context of supported employment, may improve post-concussive symptoms, cognitive performance, and work outcomes.

Appendix 3.

**4th Annual VHA Mental Health Conference
July 27-29, 2010
Baltimore, MD**

Oral Presentation Proposal

Oral presentations are didactic presentations for research studies, clinical demonstration projects, or educational interventions. Oral presentations are data-driven. Abstracts for research projects should include a research design and outcome data. Clinical projects should have at least one year of data and involve multiple sites. Educational projects should include evaluation data and demonstrate a change in practice. Generally, oral presentations are about 20 minutes, with 3 per breakout session. If you are proposing three presentations on a single theme/project for a full breakout session (90 minutes), be sure to indicate this and identify all presenters.

Presenting Author(s) information							
Primary Presenter's Name:	Elizabeth W. Twamley, PhD						
Position/Title:	Psychologist, Co-Chief of Neuropsychology Unit, Center of Excellence for Stress and Mental Health						
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Email:	elizabeth.twamley@va.gov						
Co-presenters & Email:	Kelsey Thomas, BA (kelsey.thomas@va.gov); Rebecca Williams, PhD (rebecca.williams2@va.gov); Mark Bondi, PhD (mbondi@ucsd.edu); Dean Delis, PhD (ddelis@ucsd.edu)						
VISN/ Vet Center Region:	22	Service:	Psychiatry				
Submission information							
Type of Presentation (choose one)							
<input checked="" type="checkbox"/>	This submission is for a <u>single oral presentation</u> (with one or two speakers, up to 20 minutes)		<input type="checkbox"/>	This submission is for <u>two or three presentations that are grouped together</u> with multiple presenters (up to 90 minutes). In the form below, please include a brief description about each presentation in the group to allow for sufficient review. Please list the primary author(s) of the related presentation(s) above.			
Topic(s) (select no more than 3; rank order if selecting more than one)							
<input type="checkbox"/>	Implementation of the UMHS Handbook	<input type="checkbox"/>	PTSD and traumatic stress	<input type="checkbox"/>	Substance use disorder	<input type="checkbox"/>	Special populations (e.g., women, inpatient, rural, OEF/OIF, elderly, etc)
<input type="checkbox"/>	Families	<input type="checkbox"/>	Integrated approaches to Veteran-centered care (e.g., health psychology/behavioral health, PC-MH, MH in medical settings)	<input type="checkbox"/>	1 Community reintegration and support	<input type="checkbox"/>	Readjustment Counseling Service and outreach
<input type="checkbox"/>	Recovery oriented care	<input type="checkbox"/>	Co-morbid conditions	<input type="checkbox"/>	Wellness and resilience	<input type="checkbox"/>	Suicide Prevention
<input type="checkbox"/>	3 Evidence-based treatments	<input type="checkbox"/>	Ending homelessness	<input type="checkbox"/>		<input type="checkbox"/>	

Title of Presentation

CogSMART Compensatory Cognitive Training and Supported Employment for Veterans with TBI

Background

Traumatic brain injury (TBI) can result in cognitive impairments (e.g., slow information processing, poor concentration, and impairments in learning, memory, and problem-solving) that limit functional recovery, including cognitive readiness for civilian work. Post-concussive symptoms and post-traumatic stress disorder symptoms can further contribute to cognitive impairment. This study is a randomized controlled trial to investigate a combined cognitive and vocational rehabilitation intervention for OEF/OIF veterans with mild-to-moderate TBI. The combined intervention includes:

1. Supported employment, the evidence-based vocational rehabilitation model for individuals with TBI, and
2. CogSMART (Cognitive Symptom Management and Rehabilitation Therapy), a compensatory cognitive training program targeting difficulties with concentration, memory, and problem-solving.

Accumulating evidence demonstrates that cognitive impairments can interfere with getting and keeping jobs. Difficulty learning job tasks, distractibility, or slowness in job performance, for example, may lead to job failures. CogSMART is a one-hour per week, manualized treatment teaching compensatory cognitive strategies and habits to help clients bypass their cognitive impairments as they return to work. Combining supported employment with cognitive training could improve work outcomes by helping clients compensate for their cognitive deficits.

Methods & Results

Our ongoing study is a 12-month randomized controlled trial comparing supported employment plus CogSMART to enhanced supported employment. The sample includes OEF/OIF veterans with mild-to-moderate TBI and neuropsychological impairment who are unemployed and want to work. All participants receive high-fidelity supported employment services for 12 months. CogSMART and enhanced support are delivered by the employment specialists during the first 3 months of the study. Assessments of cognition, post-concussive symptoms, psychiatric symptoms, and quality of life are administered at baseline, 3, 6, and 12 months. Measures include assessments of processing speed, attention, verbal learning/memory, executive functioning, and prospective memory, as well as neurobehavioral, PTSD, and depressive symptoms, functional capacity, and quality of life. Work outcomes (i.e., weeks and hours worked; wages earned) are measured weekly during the 12-month study.

The initial results of the first 20 participants in our randomized controlled trial comparing enhanced supported employment to supported employment plus CogSMART are positive. Supported employment participants receiving CogSMART reported more improvement in post-concussive symptoms at three months ($F=10.5$, $df=1$, $p=.014$) and had more improvement in letter fluency, a speeded word generation task ($F=8.4$, $df=1$, $p=.023$); there were also trends toward improvement in depressive symptoms and quality of life. In addition, those receiving the CogSMART intervention were more likely to obtain competitive work.

Conclusions

These results suggest that CogSMART, in the context of supported employment, may improve post-concussive symptoms, cognitive performance, and work outcomes.

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Appendix 4.

Presenting Author(s) information			
Primary Presenter's Name:	Sandra Resnick, Ph.D., Associate Director NEPEC and Assistant Professor, Yale University School of Medicine will serve as Moderator to provide a brief overview and introductions		
Position/Title:	Implementation of Evidence-Based Supported Employment in PTSD, SCI and TBI		
Phone #:	Sandra Resnick, PhD 203-932-5711 X5106	Fax #:	203-937-3433
Email:	sandra.resnick2@va.gov		
Co-presenters & Email:	Lori Davis, MD Chief, Research and Development, VA Medical Center, Tuscaloosa, AL Lisa Ottomanelli, PhD Staff Psychologist, SCI Center, VA Medical Center, Dallas, TX and Assistant Professor of Psychology, University of Texas Southwest Medical School Elizabeth W. Twamley, PhD Co-Chief, Neuropsychology Unit, Center of Excellence for Stress and Mental Health VA San Diego Healthcare System, Associate Professor of Psychiatry University of California, San Diego		

VISN/ Vet Center Region:	VISN 1-7-17-22	Service:	OMHS
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Submission information

Type of Presentation (choose one)							
<input type="checkbox"/>	This submission is for a <u>single oral presentation</u> (with one or two speakers, up to 20 minutes)		<input checked="" type="checkbox"/>	This submission is for <u>two or three presentations that are grouped together</u> with multiple presenters (up to 90 minutes). In the form below, please include a brief description about each presentation in the group to allow for sufficient review. Please list the primary author(s) of the related presentation(s) above.			
Topic(s) (select no more than 3; rank order if selecting more than one)							
<input type="checkbox"/>	Implementation of the UMHS Handbook	<input type="checkbox"/>	PTSD and traumatic stress	<input type="checkbox"/>	Substance use disorder	<input type="checkbox"/>	Special populations (e.g., women, inpatient, rural, OEF/ OIF, elderly, etc)
<input type="checkbox"/>	Families	<input checked="" type="checkbox"/>	Integrated approaches to Veteran-centered care (e.g., health psychology/behavioral health, PC-MH, MH in medical settings (Ranked #2))	<input checked="" type="checkbox"/>	Community reintegration and support (Ranked #3)	<input type="checkbox"/>	Readjustment Counseling Service and outreach
<input type="checkbox"/>	Recovery oriented care	<input type="checkbox"/>	Co-morbid conditions	<input type="checkbox"/>	Wellness and resilience	<input type="checkbox"/>	Suicide Prevention
<input checked="" type="checkbox"/>	Evidence-based treatments (Ranked #1)	<input type="checkbox"/>	Ending homelessness	<input type="checkbox"/>		<input type="checkbox"/>	

Title of Presentation

Implementation of Evidence-Based Supported Employment in PTSD, SCI and TBI

Background

Since 2004, under the direction of Dr. Sandra Resnick and Dr. Anthony Campinell, VA has successfully implemented Evidence-Based Supported Employment (EBSE) for Veterans with psychosis in 168 Compensated Work Therapy (CWT) programs nationally. Subsequent to CWT's implementation of EBSE for Veterans with SMI, three research studies were funded to measure the effects of EBSE for Veterans with Post Traumatic Stress Disorder (PTSD), Spinal Cord Injury (SCI) and Traumatic Brain Injury (TBI). The presentation by Dr. Lori Davis, Dr. Lisa Ottomanelli and Dr. Elizabeth W. Twamley will cover findings from three randomized trials that used EBSE as a treatment strategy for Veterans with PTSD, SCI and TBI.

Dr. Lori Davis will discuss the findings from a large prospective randomized study that evaluates the impact of SE compared to standard vocational rehabilitation program on occupational and psychiatric outcomes in Veterans with chronic PTSD. Dr. Davis will discuss how PTSD symptoms can intrude on occupational function and how best to manage these symptoms in the workplace in order to contribute to recovery and to attain the highest possible functioning in persons with PTSD. Dr. Lisa Ottomanelli will discuss the findings of a randomized multi-center clinical trial called Spinal Cord Injury-Vocational Integration Program (SCI-VIP) that implemented and evaluated EBSE in a spinal cord injured population. Dr. Ottomanelli will provide a current overview of the relationships between employment and health among persons with SCI and review existing empirical support for the use of SE with this population as contrasted to a more conventional vocational rehabilitation approach. Dr. Elizabeth W. Twamley will review the current status of traumatic brain injury (TBI) on Veterans injured in Operation Enduring Freedom and Operation Iraqi Freedom (OEF-OIF). Dr. Twamley will discuss existing research findings that incorporate EBSE with Cognitive Symptom Management and Rehabilitation Therapy (CogSMART). CogSMART provides psychoeducation regarding TBI and compensatory strategies to address post-concussive symptoms and cognitive impairments. The results suggest that CogSMART, in the context of supported employment, may improve post-concussive symptoms, cognitive performance, and work outcomes.

Methods & Results

To date, the three independent studies looking at the use of EBSE in PTSD, SCI and TBI are either in implementation phase, gathering empirical data to support or refute the assumption that Evidence-Based SE improves employment outcomes and quality of life measures or, in the case of SCI-VIP, are analyzing and publishing the outcome findings. During "Implementation of Evidence-Based Supported Employment in PTSD, SCI and TBI" Dr's. Davis; Ottomanelli and Twamley will review their respective methods and approaches and discuss resulting data findings.

Conclusions

Following implementation of EBSE in VA's Office of Mental Health Services, the findings of three independent studies using EBSE in PTSD, SCI and TBI research tend to support the assumption that the Evidence-Based SE model for provision of employment services is potentially disability neutral. Current data and findings resulting from the three empirical studies in PTSD, SCI and TBI generally appear consistent with outcomes realized from VA's implementation of EBSE for Veterans with psychosis. Employment outcomes for Veterans with mental illness and physical disabilities are enhanced through incorporation of evidence based practice and utilization of EBSE Principles. Considering the strength of outcomes derived through implementation of these three studies, the hope would be that the EBSE model can be incorporated as a practice standard in the PTSD, SCI and TBI continuum of care.

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- Thomas, K.R., Williams, R.E., Bondi, M.W., Delis, D.C., & Twamley, E.W. (in press). Supported Employment Plus Cognitive Training for Veterans with Traumatic Brain Injury. *Journal of the International Neuropsychological Society* (International Neuropsychological Society).

Improving Supported Employment Outcomes for Veterans with TBI

Elizabeth W. Twamley, Kelsey R. Thomas, Rebecca E. Williams, Mark W. Bondi, and Dean C. Delis

Approximately 20% of OEF/OIF veterans have sustained a mild traumatic brain injury (TBI), considered the hallmark injury of OEF/OIF. TBI can result in cognitive impairments (e.g., slow information processing, poor concentration, and impairments in learning, memory, and problem-solving) that limit functional recovery, including cognitive readiness for civilian work. Post-concussive symptoms and post-traumatic stress disorder symptoms can further contribute to cognitive impairment. Thus, while most OEF/OIF veterans are young adults at a developmental stage emphasizing work and career development, many are experiencing unemployment and concomitant mental health challenges that may contribute toward their unemployment. In the VA San Diego Healthcare System, approximately 30% of OEF/OIF veterans being referred for vocational services have experienced a TBI.

Supported employment is the evidence-based practice for assisting people with TBI to return to the workforce. In San Diego, we are examining the effects of augmenting supported employment with Cognitive Symptom Management and Rehabilitation Therapy (CogSMART), a 12-week, manualized, compensatory cognitive training intervention. CogSMART provides a) psychoeducation, b) strategies to address sleep problems, fatigue, headaches, and stress, and c) strategies to improve prospective memory, attention, learning/memory, and executive functioning. Combining supported employment with cognitive training could improve work outcomes by helping clients compensate for their cognitive deficits and increase their length of employment.

The initial results of our randomized controlled trial comparing enhanced supported employment to supported employment plus CogSMART are positive. Supported employment participants receiving CogSMART reported more improvement in post-concussive symptoms at three months ($F=10.5$, $df=1$, $p=.014$) and had more improvement in letter fluency, a speeded word generation task ($F=8.4$, $df=1$, $p=.023$); there were also trends toward improvement in depressive symptoms and quality of life. In addition, those receiving the CogSMART intervention were more likely to obtain competitive work. These results suggest that CogSMART, in the context of supported employment, may improve post-concussive symptoms, cognitive performance, and work outcomes.

Appendix 5.

Abstract presented at the International Neuropsychological Society, 2011

Cognitive Efficiency in Veterans with TBI is Reduced by Psychiatric Symptom Severity, Not Post-Concussive Symptoms

Kelsey R. Thomas, Amber M. Gregory, Rebecca E. Williams, Mark W. Bondi, Dean C. Delis, and Elizabeth W. Twamley

Traumatic brain injury (TBI) is frequently co-morbid with psychiatric symptoms. We examined the correlations between neuropsychological performance and post-concussive symptoms (PCS), post-traumatic stress disorder (PTSD) symptoms, and depressive symptom severity in returning veterans with mild-to-moderate TBIs.

Twenty-eight unemployed Iraq/Afghanistan veterans with a history of mild-to-moderate TBI and diagnosed Cognitive Disorder NOS were administered a battery of neurocognitive measures and psychiatric interviews. Participants were mostly male ($n=27$), 85% non-Caucasian, with a mean age of 32 and mean education of 13 years. On average, their TBIs occurred 5 years before study enrollment, and their length of loss-of-consciousness was 72 minutes. Eighty-two percent met criteria for PTSD, with moderate-to-severe PTSD symptom severity and moderate depressive symptom severity. Their mean scores were average on tests of attention, processing speed, learning, delayed recall, prospective memory, and executive functioning. However, their mean performance on one processing speed task (Digit Symbol) was below average (mean $SS=6.9$).

Pearson correlations showed no significant correlation between PCS severity and neuropsychological performance. However, performance on two measures of processing speed (D-KEFS Trails Visual Scanning and Number Sequencing) was significantly correlated with both PTSD symptom severity ($r=-.47$, $p=.012$; $r=-.43$, $p=.023$) and depressive symptom severity ($r=-.41$, $p=.030$; $r=-.43$, $p=.021$).

These results suggest that more severe PTSD and depressive symptoms are associated with worse processing speed performance, whereas PCS severity showed no such association. Psychiatric symptom severity may play a role in reducing cognitive efficiency in returning veterans with remote histories of mild-to-moderate TBI. Evidence-based treatment of psychiatric symptoms may, therefore, improve neuropsychological performance.

Appendix 6.

COSC April 2011 – CogSMART Compensatory Cognitive Training for Veterans with TBI

TBI can result in cognitive impairments (e.g., slow information processing, poor concentration, and impairments in learning, memory, and problem-solving) that limit functional recovery. Post-concussive symptoms and post-traumatic stress disorder symptoms can further contribute to cognitive impairment. About 20% of OEF/OIF veterans have sustained a mild or moderate traumatic brain injury (TBI), with frequent comorbid PTSD, but little is known about rehabilitation for this population. The CogSMART intervention has been developed to assist those with mild to moderate TBI in reducing their post-concussive symptoms and compensating for their cognitive impairments. Compensatory strategies and habit learning are used because they may be helpful regardless of the etiology of the impairments. CogSMART, a 12-session manualized intervention, provides:

1. Psychoeducation regarding TBI;
2. Strategies for addressing sleep problems, fatigue, and headaches;
3. Compensatory strategies to improve organization and prospective memory (the ability to remember to do things in the future), attention, learning and memory, and problem solving.

CogSMART is being implemented clinically in the VA Healthcare System and is being studied in the context of a randomized controlled trial. Initial results suggest that CogSMART treatment reduces post-concussive symptoms ($F=10.5$, $df=1$, $p=.014$) and may also improve cognitive processing, depressive symptoms, and quality of life. The CogSMART strategies will be described and general treatment considerations for providing other treatments to this population will be discussed.

Appendix 7.

**5th VHA Mental Health Conference
August 23-25, 2011**

Poster Presentation Proposal

Posters are for small projects or ongoing research, clinical, or educational projects focused on solving a problem. Evaluation data or preliminary findings are presented. Poster abstracts follow a format similar to that for oral presentations. Posters will be on display for one of two 45-minute sessions.

Presenting Author(s) information			
Primary Presenter's Name:	Elizabeth W. Twamley		
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VISN/ Vet Center Region:	22	Service:	Psychiatry
Co-presenters (only list name and email):	Amber M. Gregory (amber.gregory@va.gov), Candice Colón (candice.colon@va.gov), Henry Orff (horff@ucsd.edu), Amy Jak (amy.jak@va.gov)		

Submission information

Topic(s) (select no more than 3; rank order if selecting more than one)							
<input type="checkbox"/>	Best Practices in Mental Health Handbook Implementation	<input type="checkbox"/>	Ending Homelessness	<input type="checkbox"/>	Evidence-Based Psychopharmacology and Psychiatric Care	<input type="checkbox"/>	Evidence-Based Psychotherapy
<input type="checkbox"/>	Geriatrics and Mental Health	<input type="checkbox"/>	Integrated Approaches to care	<input type="checkbox"/>	Mental Health T21 Initiative (Op Plan)	<input type="checkbox"/>	PTSD and Traumatic Stress
<input type="checkbox"/>	Readjust Counseling Service	<input type="checkbox"/>	Recovery-oriented Care	<input type="checkbox"/>	Substance Use Disorder	<input type="checkbox"/>	Suicide Prevention
<input checked="" type="checkbox"/>	TBI Assessment and Treatment	<input type="checkbox"/>	Women and Families	<input type="checkbox"/>	Other Special Topics and Populations	<input type="checkbox"/>	Informatics

Abstracts should be limited to 500 words, excluding title and references

Title of Presentation
Multivariate predictors of social functioning and quality of life in veterans with traumatic brain injuries
Background
With approximately 20% of veterans deployed in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) having sustained a traumatic brain injury (TBI), outcomes for these veterans are of increasing importance. Determinants of social functioning and quality of life (QOL) are poorly understood in this population.
Methods & Results
<p>Forty-three unemployed OEF/OIF veterans with mild to moderate TBI and a diagnosis of Cognitive Disorder NOS based on comprehensive neuropsychological testing received interview assessments of sleep characteristics, psychiatric symptom severity, post-concussive symptoms, and quality of life (Quality of Life Interview). Participants were mostly non-Caucasian (79%) men (95%), with a mean age of 31, and a mean education level of 13 years. Seventy-two percent met PTSD criteria, and the mean level of depressive and post-concussive symptoms was in the moderate range. Participants reported sleeping an average of 4.9 hours per night, with an average sleep deficit of 2.4 hours. Pearson correlations and multiple regression were used to examine relationships between QOL indices and TBI severity markers, psychiatric and post-concussive symptom ratings, sleep variables, and neuropsychological performance. Frequency of social contact, objective QOL (i.e., daily functioning), and subjective QOL (i.e., life satisfaction) were the dependent variables of interest.</p> <p>Frequency of social contact was significantly correlated with number of blast exposures with loss of consciousness, sleep deficit, subjective distress regarding sleep, depressive symptom severity, PTSD symptom severity, and category fluency (a measure of verbal processing speed). However, in a multivariate context, only category fluency ($p=.001$) and number of blast exposures with loss of consciousness ($p=.017$) predicted frequency of social contact, together explaining 52% of the variance.</p> <p>Objective QOL was significantly associated with depressive and PTSD symptoms, but when both symptom scores were entered into a regression together, only depressive symptom severity ($p=.030$) predicted objective QOL, explaining 20% of the variance.</p> <p>Subjective QOL was significantly correlated with depressive and PTSD symptoms, as well as communication skills and general functional capacity. When these variables were entered into a multiple regression, depressive symptom severity ($p=.006$) and communication skills ($p=.044$) explained 39% of the variance in subjective QOL.</p>
Conclusions
These results suggest that verbal processing speed is a strong predictor of reduced social activity in veterans with histories of TBI. Worse general daily functioning and subjective life satisfaction are both associated with higher levels of depressive symptoms. Effective treatment of both neuropsychological impairment and depressive symptoms may improve social connectedness, daily functioning, and life satisfaction among these veterans.
References
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Appendix 8.

**5th VHA Mental Health Conference
August 23-25, 2011**

Poster Presentation Proposal

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Presenting Author(s) information			
Primary Presenter's Name:	Elizabeth W. Twamley		
Position/Title:	Psychologist		
Phone #:	858-642-3848	Fax #:	
Email:	Elizabeth.twamley@va.gov		
VISN/ Vet Center Region:	22	Service:	Psychiatry
Co-presenters (only list name and email):	Amber M. Gregory (amber.gregory@va.gov), Henry Orff (horff@ucsd.edu), Candice Colón (Candice.colon@va.gov), Amy Jak (amy.jak@va.gov)		

Submission information

Topic(s) (select no more than 3; rank order if selecting more than one)							
<input type="checkbox"/>	Best Practices in Mental Health Handbook Implementation	<input type="checkbox"/>	Ending Homelessness	<input type="checkbox"/>	Evidence-Based Psychopharmacology and Psychiatric Care	<input type="checkbox"/>	Evidence-Based Psychotherapy
<input type="checkbox"/>	Geriatrics and Mental Health	<input type="checkbox"/>	Integrated Approaches to care	<input type="checkbox"/>	Mental Health T21 Initiative (Op Plan)	<input type="checkbox"/>	PTSD and Traumatic Stress
<input type="checkbox"/>	Readjust Counseling Service	<input type="checkbox"/>	Recovery-oriented Care	<input type="checkbox"/>	Substance Use Disorder	<input type="checkbox"/>	Suicide Prevention
<input checked="" type="checkbox"/>	TBI Assessment and Treatment	<input type="checkbox"/>	Women and Families	<input type="checkbox"/>	Other Special Topics and Populations	<input type="checkbox"/>	Informatics

Abstracts should be limited to 500 words, excluding title and references

Title of Presentation
Sleep Disturbance, Cognition, and Psychiatric Symptoms in Veterans with TBI
Background
Approximately 20% of Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) veterans have sustained a traumatic brain injury (TBI), which can result in not only cognitive impairment, but also persistent post-concussive symptoms, such as sleep disturbance, irritability, and headaches. Many of these post-concussive symptoms overlap with symptoms of psychiatric disorders, such as PTSD and depression. Sleep disturbance is particularly common, occurring in 30-70% of the TBI population. Sleep deficit – the difference between amount of sleep obtained and amount of sleep desired – is associated with cognitive impairment and poorer quality of life.
Methods & Results
Forty-three unemployed OEF/OIF veterans with mild to moderate TBI and a diagnosis of Cognitive Disorder NOS based on comprehensive neuropsychological testing received interview assessments of sleep characteristics, psychiatric symptom severity, and post-concussive symptoms. Ninety-five percent of the participants were men, 21% were Caucasian, the mean age was 31, and the mean education level was 13 years. Seventy-two percent met PTSD criteria based on the Clinician Administered PTSD Scale (CAPS), and the mean level of depressive and post-concussive symptoms was in the moderate range. Participants reported sleeping an average of 4.9 hours per night, with an average sleep deficit of 2.4 hours. Pearson correlations were used to examine relationships between sleep variables, psychiatric and post-concussive symptom ratings, and neuropsychological performance. Veterans reporting greater levels of sleep deficit had worse neuropsychological test performance on measures of delayed recall ($r = -.39, p = .013$) and processing speed ($r = -.36, p = .021$). Greater sleep deficits were also associated with more severe depressive symptoms ($r = .37, p = .018$), but not with other measures of psychiatric symptom severity or TBI severity markers (length of loss of consciousness and length of post-traumatic amnesia). Self-reported total sleep time was not associated with any neuropsychological or symptom distress measures, however, subjective distress regarding sleep was associated with depressive symptom severity ($r = .61, p < .001$), post-concussive symptom severity ($r = .47, p = .002$), and PTSD symptom severity ($r = .61, p < .001$).
Conclusions
Sleep disturbance in this sample was related not only to worse cognitive performance, but also to higher levels of depressive symptoms. Subjective distress regarding sleep was associated with depressive, post-concussive, and PTSD symptom severity. These results suggest that interventions to improve sleep and reduce subjective distress regarding sleep may improve psychiatric symptom severity and some domains of objective neuropsychological performance. Such interventions, in combination with other evidence-based practices, may result in better quality of life.
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Cohen M, Oksneberg A, Snir D, Stern MJ, Groswasser Z. Temporally related changes of sleep complaints in traumatic brain injured patients. <i>J Neurol Neurosurg Psychiatry</i> . 1002;55(4):313-315 Orff HJ, Ayalon L, Drummond SPA. Traumatic brain injury and sleep disturbance: a review of current research. <i>J Head Trauma Rehabil</i> . 2009;24(3):155-165. Ouellet MC, Savard J, Morin CM. Insomnia following traumatic brain injury: a review. <i>Neurorehabil Neural Repair</i> . 2004;18(4):187-198. Mahmood O, Rapport LJ, Hanks RA, Fichtenberg NL. Neuropsychological performance and sleep disturbance following traumatic brain injury. <i>J Head Trauma Rehabil</i> . 2004;19(5):378-390. Saunders LL, Selassie AW, Hill EG, Nicholas JS, Horner MD, Corrigan JD, Lackland DT. A population-based study of repetitive traumatic brain injury among persons with traumatic brain injury. <i>Brain Injury</i> . 2009;23(11):866-872.

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