Characteristics Associated with Occupational Performance in Veterans Who Have Sustained a Traumatic Brain Injury

Submitted to the Faculty of the
College of Health Sciences
University of Indianapolis

In partial fulfillment of the requirements for the degree
Doctor of Health Science
By: Jamie K. Basch

Approved by:

Laura Santurri, PhD, MPH, CPH _____
Committee Chair

Steven Wheeler, PhD, OTR/L, FAOTA, CBIS _____
Committee Member

Elizabeth S. Moore, PhD _____
Committee Member

Accepted by:

Laura Santurri, PhD, MPH, CPH _____
Director, DHSc Program
Chair, Interprofessional Health & Aging Studies
University of Indianapolis

Stephanie Kelly, PT, PhD _____
Dean, College of Health Sciences
University of Indianapolis

Characteristics Associated with Occupational Performance in Veterans Who Have Sustained a Traumatic Brain Injury

Jamie Basch

Cincinnati VA Medical Center

Abstract

Traumatic brain injury (TBI) is a significant health concern in the United States and is often considered the signature injury of Operations Enduring and Iraqi Freedom. The majority of individuals who sustain a mild TBI ultimately recover completely, though some have lasting deficits. For occupational therapy to effectively develop and implement intervention plans, more knowledge is necessitated regarding the characteristics associated with occupational performance in veterans who have sustained a TBI. Using a non-experimental retrospective correlational design, this study examined five primary objectives to examine the relationship between different characteristics and occupational performance in veterans with TBI. A total of 21 veterans were included over five years. Statistically significant correlations were found between community participation and life satisfaction and between future anticipated role participation and adjustment and ability subscales of MPAI-4. Increased awareness and understanding of occupational therapy's role in the development of client-centered and goal-directed intervention to address community participation, ability, and adjustment following TBI is indicated to enhance veteran quality of care and life.

Keywords: traumatic brain injury, veteran, occupational performance, retrospective

Table of Contents

Introduction 5
Literature Review 8
Method 13
Study Design 13
Instruments 15
Procedures 18
Data Analysis 19
Results 19
Discussion and Conclusion 22
Appendix: Criteria for TBI Severity 46

List of Tables

Table 1: Descriptive Statistics for Demographics and Participant Characteristics..... 40
Table 2: Correlations Between Participant Characteristics and Occupational Performance..... 42
Table 3: Correlations Between Community Integration and Occupational Performance 43
Table 4: Correlations Between Role Participation and Occupational Performance 44
Table 5: Correlations Between Satisfaction with Life and Occupational Performance 45

Characteristics Associated with Occupational Performance in Veterans Who Have Sustained Traumatic Brain Injury

Traumatic brain injury (TBI) is a significant health care concern in the United States, with nearly 3 million associated hospital encounters in 2014 (Centers for Disease Control and Prevention [CDC], 2015) and almost 61,000 deaths annually (CDC, 2021a). Traumatic brain injury may result in long-standing and chronic deficits in behavior and cognition (McKee & Robinson, 2014). As many as 19.6% (Theeler, Flynn, & Erickson, 2010) to 30% (McRea et al., 2008) of service members returning from conflicts in Iraq and Afghanistan have sustained a TBI. This has resulted in TBI being considered the signature injury in this generation of veterans (Bagalman, 2011). In 2011 alone, 32,591 service members sustained a TBI (Bagalman, 2011). Of Operation Iraqi and Enduring Freedom veterans enrolled in care within the Veterans Health Administration in 2009, 6.7% were diagnosed with TBI (Taylor et al., 2012). In the past twenty years, over 430,000 military service members have sustained a TBI (CDC, 2021b). Care for these veterans costs at least four times that of non-TBI veterans and increased based on the complexity of the diagnosis and number of co-morbid conditions (Taylor et al., 2012). Although a large majority of individuals who sustained a mild TBI recover completely, there is a subset of individuals who have persistent difficulty with returning to pre-injury occupational performance levels and prior valued work roles capacity (Cooksley et al., 2018).

Problem Statement

Occupational therapy (OT) is a fundamental rehabilitation service with a primary aim to restore and optimize participation in meaningful occupations following TBI. Occupational therapy is uniquely equipped to address and mitigate the lasting impact on psychosocial,

behavioral, and emotional wellbeing following a TBI (Wheeler, Acord-Vira, & Davis, 2016). Although occupational therapists treat veterans with TBI, little is known about what factors are related to decreased occupational performance in this population.

Purpose Statement

The purpose of this study was to determine characteristics associated with occupational performance in veterans who have sustained a TBI.

Research hypotheses. The following hypotheses were addressed by this study:

- Ho: There is no relationship between veteran's characteristics and occupational performance following TBI.
    - H_A: There is a relationship between veteran's characteristics and occupational performance following TBI.
- Ho: There is no relationship between veteran's perceptions of community integration and occupational performance.
    - H_A: There is a relationship between veteran's perceptions of community integration and occupational performance.
- Ho: There is no relationship between veteran's perceptions of role participation and occupational performance.
    - H_A: There is a relationship between veteran's perceptions of role participation and occupational performance.
- Ho: There is no relationship between veteran's perceptions of life satisfaction and occupational performance.
    - H_A: There is a relationship between veteran's perceptions of life satisfaction and occupational performance.

- Ho: There is no relationship between veteran's productive engagement and occupational performance.
    - H_A: There is a relationship between veteran productive engagement and occupational performance.

Significance of the Study

The findings of this study will assist the OT field, rehabilitation professionals, and the health care system in establishing a greater understanding of occupational patterns and factors contributing to occupational performance following TBI. Results from this study may influence future research pursuits, such as understanding how veterans with TBI compare to the general population or the civilian population with TBI, which may result in a higher quality of care and tailored treatment specific to the veteran population. Ultimately, this study has broad potential implications for decreasing health care costs, increasing quality of life, and decreasing caregiver burden by equipping OTs with the knowledge base required to ensure the veteran's return to valued roles in work, learning, and home.

Definition of Terms

To promote understanding of the study purpose and research hypotheses, the following terms are defined:

- Traumatic brain injury: a "blow or jolt" to the brain that impairs normal function. Severity can range from mild to severe or even penetrating; however, it is determined based on factors at the time of injury (Centers for Disease Control and Prevention, 2015).
- Veteran: any individual who served actively in any military branch and was discharged with any characterization other than dishonorable (Department of Veterans of Affairs, 2015).

- Occupation: purposeful and meaningful activities that people may engage individually, in families, or within communities (American Occupational Therapy Association, Inc., 2019; World Federation of Occupational Therapy, 2019).
- Occupational performance: the dynamic experience of engaging in daily occupations within contexts (Baum & Law, 1997)
- Veteran characteristics: gender, age, race, etiology of TBI, branch of service, severity of TBI, number of TBIs sustained, amputee status, co-morbid mental health conditions (e.g., depression, generalized anxiety disorder, post-traumatic stress disorder), employment status, education level, availability of social supports (including marital status, family, friends), drug and alcohol use.

Literature Review

Since the onset of the Global War on Terror in 2001, 402,899 service members have sustained a TBI (Defense and Veterans Brain Injury Center, 2020). The cohort of service members deployed in recent operations in Iraq and Afghanistan is unique from others in that this is the first time in United States history that sustained and prolonged combat operations have not relied on a conscription (draft), resulting in multiple individual deployments and cycles of reintegration (Plach & Sells, 2013; Sollinger, Fisher, & Metscher, 2008). Unlike their civilian counterparts, service members who deployed in support of recent combat operations lacked immediate medical attention, standardized protocol for treatment, and faced delays in medical care (Cogan, Haines, Devore, Lepore, & Ryan, 2019; Davenport, 2016). Veterans of conflicts in support of Operations Iraqi and Enduring Freedom are more likely to be diagnosed with mild TBI due to blast exposure (Davenport, 2016). As a result, these veterans are predisposed to

experience an increase in psychological stress and chronic difficulties within areas of occupation (Cogan et al., 2016).

Occupational Therapy

Occupational therapy is a fundamental rehabilitation service that uses a holistic and individualized approach to remediate, restore, or compensate for illness or injury in order to optimize participation in meaningful daily activities, known as occupations (American Occupational Therapy Association [AOTA, 2021]). Following TBI, occupational therapists can specifically facilitate return to an individual's pre-injury life roles, function, and overall quality of life (Pogoda, Levy, Helmick, & Pugh, 2017). As part of an interdisciplinary team, occupational therapists can optimize care of individuals with mild TBI through the identification of impacted performance domains (Harris et al., 2019) which may include valued occupations, contexts, performance patterns, performance skills, and client factors (AOTA, 2020).

There has been an influx of veterans and service members experiencing TBI as a result of conflicts in Iraq and Afghanistan. Despite this, the literature is scant as to which factors contribute to occupational performance in the veteran population. Further, veterans experience a constellation of symptoms related to physical, affective, cognitive, and emotional domains (Schneiderman, Braver, & Kang, 2008; Lippa, Pastorek, Benge, & Thornton, 2010). These symptoms are reliant on rehabilitation professionals to possess critical knowledge to develop targeted interventions focused on quality of life, community reintegration, and life satisfaction to maximize return to valued roles, occupations, and restoration of pre-injury independence (Radomski, Davidson, Voydetich, & Erickson, 2009).

Non-Veterans

Using a single case study of a non-veteran male, an OT intervention across all settings (hospital, home, and community) was explored using relevant evidence to restore the individual to his desired occupations following a severe TBI (Wheeler, Acord-Vira Arbesman, & Lieberman, 2017). The occupational therapist in this intervention utilized the Goal Attainment Scale, Canadian Occupational Performance Measure (COPM), and Satisfaction with Life Scale (SWLS) to identify patient self-directed goals and to assess progress toward these goals. The COPM and SWLS measures indicated persistent occupational performance deficits in communication, meal preparation, financial management, and motivation, resulting in decreased self-perceived life satisfaction (Wheeler et al., 2017). Doig, Fleming, Cornwell, and Kupers's (2009) qualitative study explored the importance of client-centered goal setting in community-based TBI intervention. The development of personalized goals was perceived to provide needed structure in the rehabilitation plan of care, increased motivation, goal-ownership, and increased self-awareness (Doig et al., 2009). Collaborative goal setting contributes to the development of individualized interventions that facilitate and support participation in meaningful occupations in individuals with TBI.

Pais, Ponsford, Gould, and Wong (2019) explored the perception of valued living in individuals who sustained a moderate-to-severe TBI. Perception of valued living remained low for the first three years following TBI (Pais, Ponsford, Gould, &Wong, 2019). However, this perception shifted more positively at three to five years post-injury. Occupational therapy intervention that focuses on adapting or modifying valued activities, contexts, and roles to the individual's capability has high yield potential, especially within the first three years following brain injury when the perception of valued living is lowest (Pais et al., 2019) and while the risk of suicide is elevated as compared to the non-TBI population (Mackelprang et al., 2014).

Veterans

Sustaining blast-related mild TBI may have confounding symptomology that influences the OT plan of care. Among service members hospitalized for TBI, as many as 25.2% may develop a long-term disability (Agimi, Marion, Schwab, & Stout, 2021). Persistent post-concussive (PPC) symptoms are highest in the cognitive domain and headaches. Persistent post-concussive symptoms appear significantly protracted in duration for veterans sustaining blast-related TBI compared to clinical expectation (Lippa et al., 2010) as rated on the Neurobehavioral Rating Scale. This deviation is potentially due to the overlap of PPC symptoms in untreated post-traumatic stress disorder (PTSD).

The OT professional must ensure the treatment of PTSD-related symptoms to optimize the individual's capability to participate in an OT intervention. Nonetheless, the occupational therapist is charged with treating both the individual despite diagnosis (Radomski et al., 2009) and understanding the myriad of contributing factors to occupational performance, including context, current function, and the varying psychosocial factors experienced by veterans. The overall demographics for blast and non-blast TBI exposure are predominantly male (96.2%), with a high school diploma (55.8%), and service in the U.S. Army (51.3%). Understanding such characteristics and their influence on occupational performance has potential utility in the creation of relevant OT interventions that are culturally sensitive, evidence-based, and effective.

"Anxiety, irritability, sleep difficulty, forgetfulness, and headaches" (Mortera, Kinirons, Simantov, & Klingbeil, 2016, para. 7) were reported in a shocking 90% of Operation Enduring or Iraqi Freedom veterans enrolled in a VA Polytrauma Network Site. However, not all veterans in the sample had been formally diagnosed with TBI. Further associated factors posing a barrier to returning to productive occupation included race and depressive feelings (Mortera et al.,

2016). The need for increased awareness of factors contributing to occupational performance and return to valued roles is warranted in veterans who have sustained a TBI.

In a predominantly male younger strata (ages 20-29 years old) of veterans (N = 30), Plach and Sells (2013) used a mixed-methods design to explore daily life challenges, health challenges, and motivation for participation in occupations using the COPM. Although TBI was diagnosed in an unspecified number of veterans, it was not specifically an inclusion criterion even though a consideration alongside PTSD, depression, and alcohol use (Plach & Sells, 2013). Plach and Sells (2013), using COPM results, identified the following top five performance challenges: relationships (77%), school (70%), physical health (50%), sleeping (37%), and driving (33%). The authors suggested that understanding contributing factors to occupational performance, as well as perceived occupational challenges, can assist OT clinicians in developing manualized approaches to intervention in the veteran population (Plach & Sells, 2013).

Despite combat trauma, some veterans with PTSD have a higher level of function than other combat veterans. McCaslin et al. (2019) explored modifiable factors that contributed to these higher levels of function. Although the study by McCaslin et al. (2019) focused primarily on veterans diagnosed with PTSD, it is widely accepted that TBI and PTSD are co-morbid conditions (Tanev, Pentel, Kredlow, & Charney, 2014). Factors contributing to increased performance and functional capacity include sleep, optimistic outlook, high level of social support, and decreased alcohol intake (Tanev et al., 2014). Understanding contributory factors in PTSD veterans may assist the occupational therapist in understanding, developing, and justifying targeted interventions that increase social interaction, promote sleep hygiene, optimize emotional regulation, and ensure stress and anxiety reduction.

Following eight weeks of residential treatment for PTSD and TBI utilizing an interdisciplinary approach including occupational therapy, vocational rehabilitation, and neuropsychology, significant improvements in both occupational performance and satisfaction were noted (Speicher, Walter, & Chard, 2014). In conjunction, a reduction in depressive and post-traumatic symptoms was obtained (Speicher, Walter, & Chard, 2014).

Conclusion

The lasting effects of TBI on occupational participation and performance patterns in the veteran population are complex and, at present, are not well understood. Despite rehabilitation efforts, veterans with TBI describe having an average of three unmet rehabilitation needs (Caplan et al., 2021). By identifying correlations between varied factors (e.g., the severity of TBI, time since injury) and veteran self-perception in such domains as life satisfaction, role and community participation, and community integration, the OT profession will be better equipped to develop targeted assessments and interventions to enhance occupational participation and meet veteran needs. Further, this study will set the foundation for more focused research on the efficacy of OT interventions for the veteran TBI population.

Method

Study Design

This study was non-experimental using a retrospective correlational design. The correlational design was appropriate (Cottrell & McKenzie, 2011) as the study's primary aim was to further explain the characteristics of veterans who have sustained a TBI and their relationship to community integration, role participation, and life satisfaction using clinically indicated measures. The study was conducted over four months following approval from the Institutional

Review Board (IRB) of the University of Cincinnati and the Cincinnati Veterans Affairs Medical Center (VAMC), IRB #2020-1027.

Setting

The Cincinnati VAMC is level 1(b) complexity and consists of a two-division campus in Cincinnati, Ohio, and Fort Thomas, Kentucky. Together, these two divisions serve a total of 15 counties in Ohio, Kentucky, and Indiana. The facility is a regional referral center for PTSD. The campus at Fort Thomas, Kentucky, houses a PTSD residential program for men and women and a PTSD/TBI residential program.

Participants and Recruitment

Participants. Cohort lists of veterans currently or previously enrolled in care at the Cincinnati VAMC Fort Thomas Trauma Recovery Center (TRC) between the years 2016 to 2021 were considered for inclusion in the study. To be considered for inclusion in the study, veterans had to have a history of TBI as established during their initial clinical interview with a psychologist or neuropsychologist upon admission to the TRC. Individuals were excluded if they had a diagnosis of dementing disorder at the time of assessment (as established through chart review). A dementing disorder included a diagnosis of any of the following conditions: Alzheimer's disease, vascular dementia (vascular neurocognitive disorder), and/or frontotemporal lobar degeneration (frontotemporal dementia; Hugo & Ganguli, 2014).

An a priori sample size estimation was conducted using G*Power, version 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). The calculation was based on conducting a Spearman rho correlation between life satisfaction and occupational performance. The following parameters were used for the calculation, two-tailed test, alpha of .05, power of .80, and a large effect size of

0.50. From the calculation, it was estimated that a minimum sample size of 29 participants was needed.

Data Collection

The following demographic and participant characteristic data were extracted from the charts of veterans who met the inclusion criteria, including age, gender, branch of service, nature of TBI (severity, mechanism of injury, and service-relation), and education level. On admission to the TRC, all veterans with TBI complete the Mayo-Portland Adaptability Inventory, version 4 (MPAI-4), Community Integration Questionnaire (CIQ), Role Checklist, and Satisfaction with Life Scale (SWLS), for the primary purpose of gathering clinically-pertinent information as part of standard clinical care while participating in vocational rehabilitation programming.

Defining and operationalizing variables. Traumatic brain injury severity was established based on criteria outlined by O'Neil et al. (2013; see Appendix). MPAI-4 scores measured occupational performance. Community integration was operationalized using CIQ scores, role limitation using the Role Checklist, life satisfaction with SWLS scores, and productive integration using the CIQ Productive Activities subscale and employment status.

Instruments

Mayo Portland Adaptability Inventory. The MPAI-4 was designed to measure the long-term effects of problems associated with an acquired brain injury (Malec & Lezak, 2008). It consists of 30-items scored on a five-point Likert-like scale ranging from 0 to 4 and three subscales: Ability Index, Adjustment Index, and Participation Index (Malec & Lezak, 2008). The MPAI-4 has been found to have a moderate convergent validity when compared to cognitive measures, $r_s > .40$ (Malec & Thompson, 1994) and strong internal consistency and reliability (Cronbach's $\alpha = .86$; Rasch person reliability = .88, Rasch item reliability = .99; between ability

and full scale) in a geographically diverse sample of adults with acquired brain injury (Malec & Lezak, 2008).

MPAI-4 scores are converted to a T score (mean = 50, standard deviation = 10). A T score less than 30 indicates a good outcome, and a score above 60 indicates severe limitations (Malec & Lezak, 2008). Through Rasch analysis, in a sample of predominantly mild TBI military personnel (N = 404), a 21-question military version of the assessment was proposed, eliminating items related to physical abilities and some elements of community participation (Kean, Malec, Cooper, & Bowles, 2013). This measure may be completed by the provider, patient, or significant other; however, the veteran will be the sole entity completing the measure for this study.

Community Integration Questionnaire. The CIQ is the most widely used and studied measure of community integration in the TBI population (Reistetter & Abreu, 2005; Stiers et al., 2012; Zhang et al., 2002). The CIQ contains 15 questions, with a total score ranging from 0 to 29 (Dijkers, 2000). A score of 29 indicates maximum community integration. There are three subscales including home integration, social integration, and productive activities (Dijkers, 2000). The CIQ can be completed through self-administration, telephone, or in-person interview (Zhang et al., 2002).

Normative data on the CIQ was established by Zhang et al. (2002) across subscales with a total mean (standard deviation) score of 11.95 (4.31). The CIQ has excellent interrater reliability for patients and family members across all three subscales (r = .74 to .96, p < .01) and is generally deemed both a reliable and valid measure (Willer, Ottenbacher, & Coad, 1994). Willer et al. (1994) established strong test-retest reliability (N = 16) when the CIQ was initially administered to TBI patients and their respective families and/or caregivers and then re-

administered 7 to 10 days later (patients r = .91, family r = .97). Zhang et al. (2002) also found strong test-retest with interclass correlation coefficients (ICC) ranging from .83 to .93 in a predominantly severe TBI sample (N = 70), while Ocampo, Dawson, and Colantonio (1997) found the overall ICC to be .68 in a TBI sample, with the highest ICC score of = .84 in the productivity domain. Responsiveness was established in a TBI population (age 18-50 years) at initial discharge from an acute hospital setting and at one year; the smallest detectable difference was 6.18 with a percentage possible range of 20.6 (van Baalen et al., 2006).

The Role Checklist. The Role Checklist consists of two parts. The first part ascertains whether the individual ever performed 1 of 10 roles in the past, performs them presently, or anticipates participation in the future. The second portion of the Checklist is a subjective assessment of whether the role is "not valuable at all" to "very valuable" (Scott, McKinney, Perron, Ruff, & Smiley, 2019). In a non-TBI population consisting of occupational therapists and occupational therapy students, utilizing Cohen's kappa, the measure demonstrated strong (k = .74) to excellent (k = .94) test-retest reliability (Scott et al., 2019). For the purposes of this study, the number of past, present, and anticipated future roles will be totaled for each respective category. Only the first part of the Role Checklist was used in the analysis.

Satisfaction with Life Scale. The SWLS is a subjective self-report of wellbeing that consists of five items ranked on a seven-point Likert-like scale (Diener, Emmons, Larsen, & Griffin, 1985) and is generally considered a valid and reliable measure (Jacobsson & Lexell, 2016). A score of 20 indicates neutral satisfaction with life. A meta-analysis of 60 studies related to the reliability of the SWLS indicates an overall mean Cronbach's α =.78 across the literature (Corrigan et al., 2013). The SWLS was found to have strong convergent validity (r = -.72) when compared to the Beck Depression Inventory in prisoners and individuals in psychiatric distress

(Pavot & Diener, 1993). This measure has also demonstrated strong convergent validity with the Life Satisfaction Index-A (r = .81) and moderate to strong convergent validity with the Philadelphia Geriatric Center Morale Scale (r = .65 - .75) (Pavot, Diener, Colvin, & Sandvik, 1991).

Strong internal consistency and test-retest reliability at two months were established in a non-TBI sample, Cronbach's α = .87 and test-retest reliability correlation = .82 (Diener et al., 1985). In a predominantly geriatric (mean age = 74 years, SD = 8.97), low income sample, Pavot, et al. (1991) found strong test-retest reliability r = .84 with good internal consistency Cronbach's α = .85. Though, as time since administration increased, test-retest reliability decreased at five year-intervals (r = .51, p < .001) (Fujita & Diener, 2005).

Procedures

Data entry and storage. Archival and demographic data were extracted from charts of veterans who met inclusion criteria. All data were deidentified by randomly-generated participant numbers. Paper copies of assessments were stored in a locked file cabinet accessible only to individuals involved in the study, located in a locked room at Fort Thomas Division. At the end of the study, data were deidentified and held by the Cincinnati VAMC in room B139. The final data set did not include any identifying information. Names of individuals identified for this archival study and code numbers are kept in a separate electronic file on the institution's S drive in a password-protected file and folder, only accessible by study staff. Destruction of all research records pertaining to this study will be in accordance with the Department of Veterans Affairs and University of Cincinnati record retention schedule. No electronic copies of assessments were used for this study.

Data Analysis

Data were analyzed using IBM SPSS Statistics for Macintosh, Version 28 (IBM Corp., Armonk, NY). The Shapiro-Wilk test was used to analyze normality. In addition, data distributions were assessed using P-P plots, histograms, and skewness and kurtosis values. All tests were two-tailed, and an alpha level of less than .05 was considered to be statistically significant. Descriptive statistical analyses were conducted to describe the sample, including demographic data such as gender, age, source TBI, and military service-connection of TBI, education level, and severity of TBI. In addition, descriptive statistics were conducted for all outcome measures. Nominal and ordinal data are reported as frequencies and percentages, while normally distributed interval and ratio data are reported as means and standard deviations. Non-normally distributed interval and ratio data are reported as medians and interquartile ranges.

To determine if there were relationships between occupational performance and veteran characteristics, Spearman rho and eta correlations were conducted. Spearman rho correlations were also used to determine associations between occupational performance and perceptions of community integration, role participation, life satisfaction, and productive activity engagement. Eta correlation was used to determine the relationship between occupational performance and productive activity engagement as measured by employment status. Correlation coefficients were interpreted based on criteria established as by Schober, Boer, and Schwarte (2018): negligible (0 to .09), weak (.10 to .39), moderate (.40 to .69), strong (.70 to .89), and very strong (.90 to 1.00).

Results

Over a five-year period from 2016 to 2021, a total of 21 veterans met the criteria for inclusion in the study. Participants were predominantly male Army veterans who sustained a mild TBI with a mean age of 49.38 years old. Participant demographics and characteristics

details can be found in Table 1. Due to COVID-19 constraints in cohort residential programming, groups were limited to six individuals per cohort.

Hypothesis 1: Participant Characteristics and Occupational Performance

Correlations were conducted to explore the relationship between veteran characteristics and occupational performance. Details of all correlation tests are presented in Table 2. Spearman rho correlations were used to determine the relationship between age and MPAI subscales and total score. Positive correlations indicate that as age increases, occupational performance limitations increase. Correlations ranged from negligible (r = .02) to moderate (r = .45), with MPAI-Ability being the highest and MPAI-Participation being the lowest. Age accounted for 20% of the variance in MPAI-Ability.

Eta coefficient tests were used to look at the relationship between education, mechanism of injury, service related, and occupational performance. For education, the eta coefficient was highest (η = .44) for MPAI-Adjustment and lowest (η = .04) for MPAI-Ability. Results indicate that as education level increases, MPAI-Adjustment limitations increase. The highest correlation coefficient for mechanism of injury was with MPAI-Adjustment (η = .39). Correlation coefficients for service-related were negligible to weak.

Hypothesis 2: **Perceptions on Community Integration and Occupational Performance**

Spearman rho correlations were run to determine the relationship between CIQ scores and MPAI-4 subscale and overall total scores. No statistically significant correlations were found, with correlations ranging from moderate (r = -.49) between CIQ Home and MPAI-Adjustment to negligible (-.01 > r < .01) between CIQ Social Integration and MPAI-Overall Score. Better CIQ Home Integration is associated with a decrease in MPAI-Adjustment

limitations, accounting for 24% of the variance. Correlation coefficients for all relationships are found in Table 3.

Hypothesis 3: Perceptions on Role Participation and Occupational Performance

Spearman rho correlations were conducted to determine the relationship between veterans' number of past, present, and anticipated roles and MPAI-4 scores. As can be seen in Table 4, the results were mixed. All correlation coefficients between anticipated roles and MPAI scores were negative and strong in contrast to positive weak correlations between past roles and MPAI-4 scores. For present roles, with the exception of MPAI-Ability (r = .04), the other three correlations were positive and weak. These results suggest that the number of past roles is weakly associated with greater limitations in occupational performance. The number of anticipated roles are strongly associated with less limitations in occupational performance.

Hypothesis 4: **Perceptions on Satisfaction with Life and Occupational Performance**

As determined by Spearman rho correlation tests, there were moderate to strong negative correlations between SWLS scores and MPAI-4 scores, ranging from r_s = -.57 to -.79, as shown in Table 5. These results suggest that satisfaction with life is associated with less limitations in occupational performance.

Hypothesis 5: Engagement in Productive Activities and Occupational Performance

Correlation tests (Spearman rho and eta coefficients) were conducted to determine the strength and direction of the relationship between productive engagement (CIQ Productive Activities score and employment status) and occupational performance. As shown in Table 3, the correlations between CIQ Productive Activities and MPAI-4 scores were weak with all but MPAI-Participation being positive. There was a weak positive correlation between employment

status and MPAI-Ability ($\eta = .21$), MPAI-Adjustment ($\eta = .03$), MPAI-Participation ($\eta = .09$), and MPAI-Total ($\eta = .17$).

Discussion and Conclusion

Due to enhanced medical care in the austere combat environment and improvements in body and vehicle armor technologies, more service members are surviving injuries sustained on the battlefield. This increased survivability in recent conflicts in Iraq and Afghanistan has resulted in an increased prevalence of TBI in the military population. Following TBI, service members and veterans face challenges to returning to satisfying occupations.

This non-experimental retrospective correlational study explored the relationships between veteran characteristics, self-perceived occupational performance, role participation, community integration, and life satisfaction. The constructs of community integration, role participation, and life satisfaction are interwoven yet distinct contributors to occupational performance. In this study, these constructs were evaluated using the CIQ, Role Checklist, and SWLS. The primary aim of this study was to expand the body of knowledge on how these relationships may influence occupational performance among veterans who have sustained a TBI. It was hypothesized that relationships would exist between specific veteran demographic characteristics and self-perceived occupational performance (including role participation, community integration, and life satisfaction).

The veteran demographic characteristics examined in this study included: age, gender, employment status, severity of TBI, mechanism of injury, service-connected status (whether or not the TBI occurred in the line of duty), and education level. The sample of veterans was predominantly male (95.2%), with at least a high school diploma (47.62%) and the majority

served in the U.S. Army, a finding consistent with existing literature involving military service members (Radomski et al., 2009).

Predictors of post-TBI functional outcomes have been studied in both veteran and non-military populations, including age, socioeconomic status, pre-injury education level, and cognitive ability (Holland & Schmidt, 2015). In this sample of veterans, participant demographic characteristics (Table 2) were examined compared to subscale and total scores on the MPAI-4. The MPAI-4 was initially developed to increase understanding of rehabilitation outcomes in the acquired brain injury population and consists of three subscales (ability, adjustment, and participation; Malec, 2008).

Findings from this study indicated a moderate positive relationships between age and MPAI Ability scores, ($r_s(21) = .45$. Increased age was associated with greater self-perceived impairment in the MPAI-Ability subscale score. This finding suggests that older veterans who have sustained a TBI may perceive themselves to have functional impairment in memory and executive functioning skills, bimanual tasks, mobility, visuospatial, and have subjective feelings of vestibular impairment (e.g., dizziness). Although some of the self-perceived impairment in ability may be attributed to the natural aging process, older age at the time of TBI is associated with poorer functional outcomes (Ponsford et al., 2014).

Higher levels of educational attainment at the time of injury were moderately associated with decreased self-perception of adjustment and occupational performance. These findings were unexpected as higher education and cognitive functioning at the time of injury are often considered predictive factors for more favorable rehabilitation outcomes (Holland & Schmidt, 2015). The adjustment subscale contains a gamut of complex interrelationships that may impact occupational performance, and that may also be included within the constellation of PPC

symptoms. These symptoms include anxiety, depression, and headaches which are especially prevalent in the veteran TBI population (Lippa et al., 2010). The MPAI-Adjustment subscale also contains overlapping components of the MPAI-Participation subscale, such as initiation (difficulty getting started with an activity; Malec, 2008), recreational and leisure interests, and social contact. Both of these domains are established in the literature as being overwhelmingly pervasive in the TBI population. For example, one study reported 84.6% of its participants to have self-perceived deficits in initiation and 76.9% in leisure (Bar-Haim Erez et al., 2009), which implies that regardless of educational attainment, the majority of individuals who have sustained a TBI may have greater perceived impact on the adjustment subscale. It is also important to note that the veteran population generally has a higher level of educational attainment than non-veterans (U.S. Bureau of Labor Statistics, 2017).

Consistent with the literature, this study's findings suggested that higher levels of community integration, specifically social integration, are associated with increased occupational performance. There was a moderate inverse relationship between the CIQ Home subscale and overall MPAI total scores, with greater self-perceived performance in home integration associated with improved overall occupational performance. Essential components of the CIQ Home subscale include the ability to engage in crucial tasks such as grocery shopping, meal preparation, housework, care of children, and elements critical to social interaction. These findings support community-based occupational therapy interventions that foster positive social interactions and establish healthy relationships and support within the home and the community. Occupational therapy plays a central role in life skills training interventions to facilitate independence in home management and engagement in productive activities (Wheeler, Lane, & McMahon, 2007).

The current study found a weak relationship between the number of past roles (as indicated on the Role Checklist) and self-perceived occupational performance. In addition, there was a relationship between the number of anticipated future roles and positive self-perception of overall occupational performance (see Table 4). These findings suggest that the loss of meaningful and valued life roles may contribute to overall feelings of decreased life satisfaction and quality of life which has been supported extensively in the literature (Dainter, McKinlay, & Grace, 2019; Juengst et al., 2015); while forward, goal-directed thinking may have a positive impact on perception of occupational performance. Collaborative goal setting, self-efficacy, and expectations for future role acquisition, may positively impact perceptions of occupational performance.

The study findings were consistent with the literature in that self-perceived life satisfaction was associated with increased community participation (Wheeler et al., 2017). Better occupational performance was associated with increased perceived life satisfaction in this sample of veterans. The MPAI-4 Participation Index includes perceived ability to initiate (start activities without prompting), engage in social contact, participation in age normal leisure and recreational pursuits, independence with self-care, responsibilities of independent living (including meal preparation, homemaking, home repairs and maintenance, and personal health maintenance), transportation, work and school participation, and managing money and finances. In addition, this study found that greater perceived levels of home integration were moderately associated with greater perceived levels of successful occupational performance.

Study Limitations

The sample size in the study was markedly limited due to COVID-19 restrictions that temporarily halted residential treatment programming. Upon re-opening, cohort capacity was

decreased to six veterans, not all of which have a past medical history of TBI. Power analysis indicated a minimum sample size of 35 veterans, who completed all four standard of care instruments, for optimal statistically significant analysis and generalizability of the study findings. Only six veterans in the study completed all four instruments while the remaining 15 participants completed a combination of one to three instruments. Due to homogeneity in participant characteristics, analysis of gender, TBI severity, and branch of service, and their impact on occupational performance was unable to be conducted.

It is also important to consider that CIQ scores can be influenced by age and level of education; older individuals generally have lower CIQ scores and those with higher educational attainment tend to score higher on the CIQ (Kaplan, 2001). The perceived stress of quarantine and subsequent social isolation surrounding the COVID-19 global pandemic may have influenced life satisfaction, community and role participation, and ability to engage fully in daily occupations. Lastly, the study relied on self-reported instruments versus clinically observed measures, that may be subjectively or situationally biased due to their administration at a single point in time and based on self-perception versus actual performance.

Future Research

The results of this study have broad implications to serve as the foundation for future research endeavors related to occupational therapy. Further research aimed at understanding the OT intervention and efficacy as it relates to role acquisition, role loss, and collaborative goal setting in the veteran population is indicated. Research directed toward increasing understanding of OT's role in social and home integration may have the potential to increase overall veteran life satisfaction and perceived successful occupational performance.

Conclusion

Understanding recovery rehabilitation needs for the veteran population who has sustained a TBI is critical to overcoming the potential barriers to occupational performance. Contributors to occupational performance in this study were found to be increased perceived life satisfaction, anticipated role participation, and higher levels of perceived social and home integration. Occupational therapy practitioners are positioned to foster therapeutic relationships that maximize engagement and participation in meaningful and satisfying daily occupations. The involvement of veterans in collaborative goal-setting and interventions to establish meaningful life roles can increase perceived life satisfaction.

Occupational therapists are rehabilitation professionals that play a central role in assisting veterans into the community and facilitate participation in everyday life following TBI. Through a combination of client-centered and directed intervention, OTs are positioned to create targeted and contextualized interventions to maximize independence in everyday activity (AOTA, 2016). Group and individualized opportunities should be provided to ensure veterans have the ability to engage in daily activities within a safe environment during rehabilitation. More research is necessitated regarding occupational therapy's role in goal-directed individualized and group-centered contextualized intervention.

References

Agimi, Y., Marion, D., Schwab, K., & Stout, K. (2021). Estimates of long-term disability among US service members with traumatic brain injuries. *The Journal of Head Trauma Rehabilitation*, *36*(1), 1-9. doi: 10.1097/HTR.0000000000000573

American Occupational Therapy Association. (2021). What is occupational therapy? Retrieved from https://www.aota.org/conference-events/otmonth/what-is-ot.aspx

American Occupational Therapy Association. (2020). Occupational therapy practice framework: Domain and process (4th ed.). *American Journal of Occupational Therapy*, *74*(Suppl. 2), Article 7412410010. https://doi.org/10.5014/ajot.2020.74S2001

American Occupational Therapy Association. (2016). Occupational therapy and community reintegration of persons with brain injury. Retrieved from https://www.aota.org/-/media/Corporate/Files/AboutOT/Professionals/WhatIsOT/RDP/Facts/Community%20Reintegration%20fact%20sheet.pdf

Andelic, N., Howe, E. I., Hellstrøm, T., Sanchez, M. F., Lu, J., Løvstad, M., & Røe, C. (2018). Disability and quality of life 20 years after traumatic brain injury. *Brain and Behavior*, *8*(7), 1-10. https://doi.org/10.1002/brb3.1018

Bagalman, E. (2011). *Traumatic brain injury among veterans*. Report prepared for Members and Committees of Congress. Washington, DC: Congressional Research Service, Library of Congress. Retrieved from https://www.everycrsreport.com/files/20110505_R40941_0fe691306b0dedafdf6cd9c8985848260dda9ee5.pdf

Bar-Haim Erez, A., Rothschild, E., Katz, N., Tuchner, M., & Hartman-Maeir, A. (2009). Executive functioning, awareness, and participation in daily life after mild traumatic

brain injury: A preliminary study. *American Journal of Occupational Therapy*, *63*(5), 634-640. https://doi.org/10.5014/ajot.63.5.634

Baum, C. M., & Law, M. (1997). Occupational therapy practice: Focusing on occupational performance. *American Journal of Occupational Therapy*, *51*(4), 277-288.

Bureau of Labor Statistics, U.S. Bureau of Labor Statistics. (2017, November). *A closer look at veterans in the labor force*. Retrieved from https://www.bls.gov/careeroutlook/2017/article/veterans.htm

Burleigh, S. A., Farber, R. S., & Gillard, M. (1998). Community integration and life satisfaction after traumatic brain injury: Long-term findings. *American Journal of Occupational Therapy*, *52*(1), 45-52. doi:10.5014/ajot.52.1.45

Caplan, B., Bogner, J., Brenner, L., Malec, J., Mahoney, E. J., Silva, M. A., ... & Nakase-Richardson, R. (2021). Rehabilitation needs at 5 Years post-Traumatic brain injury: A VA TBI Model Systems study. *Journal of Head Trauma Rehabilitation*, *36*(3), 175-185. https://doi.org/10.1097/HTR.0000000000000629

Centers for Disease Control and Prevention. (2010, March). *Traumatic brain injury in the United States: Emergency department visits, hospitalizations, and deaths (2002-2006)*. Atlanta, GA: U.S. Department of Health and Human Services. Retrieved from https://www.cdc.gov/traumaticbraininjury/pdf/blue_book.pdf

Centers for Disease Control and Prevention. (2015). R*eport to Congress on traumatic brain injury in the United States: Epidemiology and rehabilitation*. Atlanta, GA: National Center for Injury Prevention and Control; Division of Unintentional Injury Prevention.

Centers for Disease Control and Prevention. (2021a). *TBI among service members and veterans*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved from https://www.cdc.gov/traumaticbraininjury/military/index.html

Centers for Disease Control and Prevention. (2021b). *TBI data*. Atlanta, GA: National Center for Injury Prevention and Control. Retrieved from https://www.cdc.gov/traumaticbraininjury/data/index.html

Cogan, A. M., Haines, C. E., Devore, M. D., Lepore, K. M., & Ryan, M. (2019). Occupational challenges in military service members with chronic mild traumatic brain injury. *American Journal of Occupational Therapy*, *73*(3), 7303205040p1-7303205040p9. https://doi.org/10.5014/ajot.2019.027599

Cooksley, R., Maguire, E., Lannin, N. A., Unsworth, C. A., Farquhar, M., Galea, C., ... & Schmidt, J. (2018). Persistent symptoms and activity changes three months after mild traumatic brain injury. *Australian Occupational Therapy Journal*, *65*(3), 168-175. https://doi.org/10.1111/1440-1630.12457

Corrigan, J. D., Kolakowsky-Hayner, S., Wright, J., Bellon, K., & Carufel, P. (2013). The satisfaction with life scale. *The Journal of Head Trauma Rehabilitation*, *28*(6), 489-491. doi:10.1097/HTR.0000000000000004

Cottrell, R. R., & McKenzie, J. F. (2011). *Health promotion & education research methods: Using the five chapter thesis/dissertation model* (2nd ed.). Sudbury, MA: Jones and Bartlett Publishers.

Dainter, K. M., McKinlay, A., & Grace, R. C. (2019). Change in life roles and quality of life for older adults after traumatic brain injury. *Work*, *62*(2), 299-307. doi:10.3233/WOR-192864

Doig, E., Fleming, J., Cornwell, P. L., & Kuipers, P. (2009). Qualitative exploration of a client-centered, goal-directed approach to community-based occupational therapy for adults with traumatic brain injury. *American Journal of Occupational Therapy, 63*(5), 559-568. https://doi.org/10.5014/ajot.63.5.559

Davenport, N. D. (2016). The chaos of combat: An overview of challenges in military mild traumatic brain injury research. *Frontiers in Psychiatry, 7*(85), 1-6. https://doi.org/10.3389/fpsyt.2016.00085

Defense and Veterans Brain Injury Center. (2020, April 10). *DoD worldwide numbers for TBI*. Retrieved from https://dvbic.dcoe.mil/dod-worldwide-numbers-tbi

Department of Veterans Affairs. (2019, March). *Reports.* Retrieved from https://www.va.gov/vetdata/report.asp

Diener, E., Emmons, R., Larsen, R., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*(1), 71-75.

Dijkers, M. (2000). The Community Integration Questionnaire. *The Center for Outcome Measurement in Brain Injury.* Retrieved from http://www.tbims.org/combi/ciq

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.

Fraga-Maia, H., Werneck, G., Dourado, I., Fernandes, R., & Brito, L. (2015). Translation, adaptation and validation of "community integration questionnaire". *Ciencia & Saude Coletiva, 20*(5), 1341-1352. doi:10.1590/1413-81232015205.08312014

Fujita, F., & Diener, E. (2005). Life satisfaction set point: stability and change. *Journal of Personality and Social Psychology*, *88*(1), 158-164. https://doi.org/10.1037/0022-3514.88.1.158

Hallett, J. D., Zasler, N. D., Maurer, P., & Cash, S. (1994). Role change after traumatic brain injury in adults. *American Journal of Occupational Therapy*, *48*(3), 241-246.

Harris, M. B., Rafeedie, S., McArthur, D., Babikian, T., Snyder, A., Polster, D., & Giza, C. C. (2019). Addition of occupational therapy to an interdisciplinary concussion clinic improves identification of functional impairments. *The Journal of Head Trauma Rehabilitation*, *34*(6), 425–432. https://doi.org/10.1097/HTR.0000000000000544

Holland, J. N., & Schmidt, A. T. (2015). Static and dynamic factors promoting resilience following traumatic brain injury: A brief review. *Neural Plasticity*. https://doi.org/10.1155/2015/902802

Hugo, J., & Ganguli, M. (2014). Dementia and cognitive impairment: Epidemiology, diagnosis, and treatment. *Clinics in Geriatric Medicine*, *30*(3), 421-442. doi:10.1016/j.cger.2014.04.001

Jacobsson, L., & Lexell, J. (2016). Life satisfaction after traumatic brain injury: Comparison of ratings with the Life Satisfaction Questionnaire (LiSat-11) and the Satisfaction with Life Scale (SWLS). *Health and Quality of Life Outcomes*, *14*(1), 1-5. doi:10.1186/s12955-016-0405-y

Juengst, S. B., Adams, L. M., Bogner, J. A., Arenth, P. M., O'Neil-Pirozzi, T. M., Dreer, L. E., Hart, T., Bergquist, T. F., Bombardier, C. H., Dijkers, M. P., & Wagner, A. K. (2015). Trajectories of life satisfaction after traumatic brain injury: Influence of life roles, age,

cognitive disability, and depressive symptoms. *Rehabilitation Psychology, 60*(4), 353–364. https://doi.org/10.1037/rep0000056

Juengst, S. B., Arenth, P. M., Raina, K. D., McCue, M., & Skidmore, E. R. (2014). Affective state and community integration after traumatic brain injury. *American Journal of Physical Medicine & Rehabilitation, 93*(12), 1086. https://dx.doi.org/10.1097%2FPHM.0000000000000163

Kersey, J., Terhorst, L., Wu, C. Y., & Skidmore, E. (2019). A scoping review of predictors of community integration following traumatic brain injury: A search for meaningful associations. *The Journal of Head Trauma Rehabilitation, 34*(4), E32-E41. doi:10.1097/HTR.0000000000000442

Lippa, S. M., Pastorek, N. J., Benge, J. F., & Thornton, G. M. (2010). Post-concussive symptoms after blast and nonblast-related mild traumatic brain injuries in Afghanistan and Iraq war veterans. *Journal of the International Neuropsychological Society, 16*(5), 856-866. doi:10.1017/S1355617710000743

Kaplan, C. P. (2001). The community integration questionnaire with new scoring guidelines: concurrent validity and need for appropriate norms. *Brain Injury, 15*(8), 725-731. https://doi.org/10.1080/02699050010005913

Kean, J., Malec, J. F., Cooper, D. B., & Bowles, A. O. (2013). Utility of the Mayo-Portland Adaptability Inventory-4 for self-reported outcomes in a military sample with traumatic brain injury. *Archives of Physical Medicine and Rehabilitation*, *94*(12), 2417-2424. http://dx.doi.org/10.1016/j.apmr.2013.08.006

Mackelprang, J. L., Bombardier, C. H., Fann, J. R., Temkin, N. R., Barber, J. K., & Dikmen, S. S. (2014). Rates and predictors of suicidal ideation during the first year after traumatic

brain injury. *American Journal of Public Health*, *104*(7), e100-e107. doi:10.2105/AJPH.2013.301794

Malec, J. (2005). The Mayo Portland Adaptability Inventory. *The Center for Outcome Measurement in Brain Injury.* Retrieved from http://www.tbims.org/combi/mpai

Malec, J. F., & Lezak, M. D. (2008). Manual for the Mayo-Portland Adaptability Inventory (MPAI-4) for adults, children and adolescent. *The Center for Outcome Measures in Brain Injury.* Retrieved from http://www.tbims.org/mpai/manual.pdf

Malec, J. F., Moessner, A. M., Kragness, M., & Lezak, M. D. (2000). Refining a measure of brain injury sequelae to predict postacute rehabilitation outcome: rating scale analysis of the Mayo-Portland Adaptability Inventory. *The Journal of Head Trauma Rehabilitation*, *15*(1), 670-682. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/10745183

Malec, J. F., & Thompson, J. M. (1994) Relationship of the Mayo-Portland Adaptability Inventory to functional outcome and cognitive performance measures. *The Journal of Head Trauma Rehabilitation*, *9*(4), 1-15. https://doi-org.ezproxy.findlay.edu/10.1097/00001199-199412000-00003

McCrea, M., Pliskin, N., Barth, J., Cox, D., Fink, J., French, L., ... Powell, M. (2008). Official position of the military TBI task force on the role of neuropsychology and rehabilitation psychology in the evaluation, management, and research of military veterans with traumatic brain injury. *The Clinical Neuropsychologist*, *22*(1), 10-26. https://doi.org/10.1080/13854040701760981

McKee, A. C., & Robinson, M. E. (2014). Military-related traumatic brain injury and neurodegeneration. *Alzheimer's & Dementia, 10*(3), S242-S253. doi:10.1016/j.jalz.2014.04.003

Mortera, M., Kinirons, S., Simantov, J., & Klingbeil, H. (2016). Patient profile: Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans suspected of traumatic brain injury. *American Journal of Occupational Therapy, 70*(4, Suppl 1). doi:10.5014/ajot.2016.70S1-PO5108

Ocampo, S., Dawson, D., & Colantonio, A. (1997). Outcomes after head injury: Level of agreement between subjects and their informants. *Occupational Therapy International, 4*(3), 163-179. https://doi.org/10.1002/oti.54

O'Neil, M. E., Carlson, K., Storzbach, D., Brenner, L., Freeman, M., Quinones, A., … Kansagara, D. (2013). *Complications of mild traumatic brain injury in veterans and military personnel: A systematic review.* Washington DC: Department of Veterans Affairs. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK189785/

Pais, C., Ponsford, J. L., Gould, K. R., & Wong, D. (2019). Role of valued living and associations with functional outcome following traumatic brain injury. *Neuropsychological Rehabilitation, 29*(4), 625-637. doi:10.1080/09602011.2017.1313745

Pavot, W., & Diener, E. (1993). Review of the satisfaction with life scale. *Psychological Assessment, 5*(2), 164-172. doi:10.1037/1040-3590.5.2.164

Pavot, W., Diener, E. D., Colvin, C. R., & Sandvik, E. (1991). Further validation of the Satisfaction with Life Scale: Evidence for the cross-method convergence of well-being

measures. *Journal of Personality Assessment*, *57*(1), 149-161. https://doi.org/10.1207/s15327752jpa5701_17

Plach, H. L., & Sells, C. H. (2013). Occupational performance needs of young veterans. *The American Journal of Occupational Therapy*, *67*(1), 73–81. http://dx.doi.org/10.5014/ajot.2013.003871

Pogoda, T. K., Levy, C. E., Helmick, K., & Pugh, M. J. (2017). Health services and rehabilitation for active duty service members and veterans with mild TBI. *Brain Injury 31*(9), 1220-1234. https://doi.org/10.1080/02699052.2016.1274777

Ponsford, J. L., Downing, M. G., Olver, J., Ponsford, M., Acher, R., Carty, M., & Spitz, G. (2014). Longitudinal follow-up of patients with traumatic brain injury: Outcome at two, five, and ten years post-injury. *Journal of Neurotrauma*, *31*(1), 64-77. https://doi.org/10.1089/neu.2013.2997

Radomski, M. V., Davidson, L., Voydetich, D., & Erickson, M. W. (2009). Occupational therapy for service members with mild traumatic brain injury. *The American Journal of Occupational Therapy*, *63*(5), 646-655. doi:10.5014/ajot.63.5.646

Reistetter, T. A., & Abreu, B. C. (2005). Appraising evidence on community integration following brain injury: A systematic review. *Occupational Therapy International*, *12*(4), 196-217. https://doi.org/10.1002/oti.8

Schneiderman, A. I., Braver, E. R., & Kang, H. K. (2008). Understanding sequelae of injury mechanisms and mild traumatic brain injury incurred during the conflicts in Iraq and Afghanistan: persistent post-concussive symptoms and posttraumatic stress disorder. *American Journal of Epidemiology*, *167*(12), 1446-1452. https://doi.org/10.1093/aje/kwn068

Schober, P., Boer, C., & Schwarte, L. A. (2018). Correlation coefficients: Appropriate use and interpretation. *Anesthesia & Analgesia*, *126*(5), 1763-1768. https://doi.org/10.1213/ANE.0000000000002864

Scott, P. J., McKinney, K. G., Perron, J. M., Ruff, E. G., & Smiley, J. L. (2019). The Revised Role Checklist: Improved utility, feasibility, and reliability. *OTJR: Occupation, Participation and Health*, *39*(1), 56-63. https://doi.org/10.1177/1539449218780618

Sollinger, J. M., Fisher, G., & Metscher, K. N. (2008). The wars in Afghanistan and Iraq: An overview. In T. Tanielian & L. Jaycox (Eds.), *Invisible wounds of war: Psychological and cognitive injuries, their consequences, and services to assist recovery* (pp. 19–31). Santa Monica, CA: RAND

Speicher, S. M., Walter, K. H., & Chard, K. M. (2014). Interdisciplinary residential treatment of posttraumatic stress disorder and traumatic brain injury: Effects on symptom severity and occupational performance and satisfaction. *American Journal of Occupational Therapy*, *68*(4), 412-421. https://doi.org/10.5014/ajot.2014.011304

Stiers, W., Carlozzi, N., Cernich, A., Velozo, C., Pape, T., Hart, T., ...Gordon, W. (2012). Measurement of social participation outcomes in rehabilitation of veterans with traumatic brain injury. *Journal of Rehabilitation Research Development, 1(*49*),* 139-154. https://dx.doi.org/10.1682/JRRD.2010.07.0131

Tanev, K. S., Pentel, K. Z., Kredlow, M. A., & Charney, M. E. (2014). PTSD and TBI co-morbidity: Scope, clinical presentation and treatment options. *Brain Injury*, *28*(3), 261-270. https://doi.org/10.3109/02699052.2013.873821

Taylor, B., Hagel, E., Carlson, K., Cifu, D., Cutting, A., Bidelspach, D., & Sayer, N. (2012). Prevalence and costs of co-occurring traumatic brain injury with and without psychiatric

disturbance and pain among Afghanistan and Iraq war veteran VA users. *Medical Care, 50*(4), 342-346. Retrieved April 11, 2020, from www.jstor.org/stable/23216628

Theeler, B. J., Flynn, F. G., & Erickson, J. C. (2010). Headaches after concussion in US soldiers returning from Iraq or Afghanistan. *Headache: The Journal of Head and Face Pain*, *50*(8), 1262-1272. https://doi.org/10.1111/j.1526-4610.2010.01700.x

van Baalen, B., Odding, E., van Woensel, M. P., van Kessel, M. A., Roebroeck, M. E., & Stam, H. J. (2006). Reliability and sensitivity to change of measurement instruments used in a traumatic brain injury population. *Clinical Rehabilitation*, *20*(8), 686-700. https://doi.org/10.1191/0269215506cre982oa

Wheeler, S., Acord-Vira, A., Arbesman, M., & Lieberman, D. (2017). Occupational therapy interventions for adults with traumatic brain injury. *American Journal of Occupational Therapy*, *71*(3), 7103395010p1-7103395010p3. doi:10.5014/ajot.2017.713005

Wheeler, S., Acord-Vira, A., & Davis, D. (2016). Effectiveness of interventions to improve occupational performance for people with psychosocial, behavioral, and emotional impairments after brain injury: A systematic review. *American Journal of Occupational Therapy*, *70*(3), 1-9. https:// doi.org/10.5014/ajot.2017.713005

Wheeler, S. D., Lane, S. J., & McMahon, B. T. (2007). Community participation and life satisfaction following intensive, community-based rehabilitation using a life skills training approach. *OTJR: Occupation, Participation and Health*, *27*(1), 13-22. https://doi.org/10.1177/153944920702700103

Willer, B., Ottenbacher, K., & Coad, M. (1994). The community integration questionnaire: A comparative examination. *American Journal of Physical Medicine and*

Rehabilitation, *73*(2), 103-103. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/8148099

Zhang, L., Abreu, B. C., Gonzales, V., Seale, G., Masel, B., & Ottenbacher, K. J. (2002). Comparison of the Community Integration Questionnaire, the Craig Handicap Assessment and Reporting Technique, and the Disability Rating Scale in traumatic brain injury. *The Journal of Head Trauma Rehabilitation*, *17*(6), 497-509.

Table 1

Descriptive Statistics for Demographics and Participant Characteristics (N = 21)

	M	SD	Min	Max
Age	49.38	10.93	33	70
	N	%		
Gender				
Female	1	4.8		
Male	20	95.2		
Employment Status				
Employed	10	47.62		
Unemployed	11	52.38		
TBI Severity				
Mild	19	90.48		
Moderate	1	4.76		
Severe	1	4.76		
Mechanism of Injury				
Fall	3	14.29		
Blast	6	28.57		
Other	12	57.14		
Service-Connected				
Yes	14	66.67%		
No	7	33.33%		

Education Level		
High School/GED	10	47.62
Some College or Greater	11	52.38

Notes. TBI = Traumatic brain injury; Min = Minimum; Max = Maximum

Table 2

Correlations Between Participant Characteristics and Occupational Performance

	MPAI Ability	MPAI Adjustment	MPAI Participation	MPAI Total
	r	*r*	*r*	*r*
Age (*n* = 21)	.45	.02	-.02	.33
	η	*η*	*η*	*η*
Education Level (*n* = 16)	.04	.44	.08	.44
Mechanism of Injury (*n* = 16)	.14	.39	.15	.19
Service-Related (*N* = 16)	.05	.03	.10	.22

Note. MPAI = Mayo Portland Adaptability Inventory

Table 3

Correlations Between Community Integration and Occupational Performance

	MPAI Ability	MPAI Adjustment	MPAI Participation	MPAI Total
	r_s	r_s	r_s	r_s
CIQ Home Integration (n = 12)	-.18	-.49	-.38	-.43
CIQ Social Integration (n = 12)	.04	.03	-.51	0 [a]
CIQ Productive Activities (n = 12)	.22	.18	-.26	.11
CIQ Total (n = 12)	-.05	-.25	-.38	-.24

Note. MPAI = Mayo Portland Adaptability Inventory; CIQ = Community Integration Questionnaire

[a] r_s = .004

Table 4

Correlations Between Role Participation and Occupational Performance

	MPAI Ability	MPAI Adjustment	MPAI Participation	MPAI Total
	r_s	r_s	r_s	r_s
Past Roles (n = 12)	.25	.13	.23	.13
Present Roles (n = 11)	.08	-.30	-.13	-.26
Anticipated Roles (n = 12)	-.59	-.72	-.56	-.76

Note. MPAI = Mayo Portland Adaptability Inventory

Table 5

Correlations Between Satisfaction with Life and Occupational Performance

	MPAI Ability	MPAI Adjustment	MPAI Participation	MPAI Total
	r_s	r_s	r_s	r_s
SWLS (n = 7)	-.57	-.60	-.79	-.61

Note. MPAI = Mayo Portland Adaptability Inventory; SWLS = Satisfaction with Life Scale

Appendix

Criteria for Traumatic Brain Injury Severity

Criteria	Mild	Moderate	Severe
Structural Imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of Consciousness	0 – 30 minutes	> 30 minutes and < 24 hours	> 24 hours
Alteration of Consciousness or Mental State	A moment up to 24 hours	> 24 hours	
Post-traumatic amnesia (PTA)	0 – 1 day	> 1 and < 7 days	> 7 days
Glasgow Coma Scale (best available score in first 24 hours)	13 – 15	9 – 12	< 9

O'Neil et al. (2013)