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## Completion of a Veteran-Focused Civic Service Program Improves Health and Psychosocial Outcomes in Iraq and Afghanistan Veterans With a History of Traumatic Brain Injury

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### Abstract

**Introduction**—Volunteering as a health promotion intervention is positively related to improved health and well-being in civilians and older adults. Yet, the impacts of participating in a community-based volunteering program on returning military veterans have not been studied, nor have the outcomes for veterans who have experienced a traumatic brain injury (TBI).

**Materials and Methods**—This observational, pre–post survey examines health, psychological, and social outcomes from a cohort of post-9/11/01 veterans with ( $N = 67$ ) and without a reported TBI history ( $N = 273$ ) who completed a 6-month, 20-hour per week veteran-focused civic service program. This study was approved by the Saint Louis University Institutional Review Board.

**Results**—Veterans with a TBI history who completed the 6-month civic service program conducted by a veteran-focused national nonprofit organization showed significant pre–post improvement ( $p < 0.05$ ) in overall health, decreased post-traumatic stress disorder (PTSD) symptoms, increased perceived self-efficacy, decreased feelings of isolation and loneliness, and increased perceived availability of social support. These significant findings were not due to participants seeking external help for emotional problems. Out of four aspects of PTSD symptomatology assessed, “feeling numb or detached from others, activities, or surroundings” most accounted for the decrease in PTSD scores. Given this and taken together with the significant decrease in social isolation and loneliness and the social nature of the program, we posit that decreased social isolation and loneliness is the primary driver of the improved psychological and social outcomes documented here. Finally, pre–post change scores did not differ significantly between veterans with and without a TBI, indicating that TBI history did not hinder the ability to benefit from this program.

**Conclusion**—Completion of this civic service program positively impacted veterans with TBI, especially on psychological and social outcomes important to recovery and life satisfaction after TBI. Civic service may provide an innovative approach to promoting wellness in returning veterans with a TBI. Results of this study provide preliminary evidence that civic service decreases social isolation and loneliness in veterans with a reported TBI history. Given our

findings, volunteering may prevent against social isolation and be promotional of perceived social support in veterans with TBI.

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## INTRODUCTION

Traumatic brain injury (TBI), the “signature injury” of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) has been diagnosed in 19 to 23% of military service members in the U.S. Armed Forces.<sup>1–3</sup> Of those, an estimated 7% experience co-occurring posttraumatic stress disorder (PTSD) and/or depression.<sup>1</sup> TBI history is also associated with a 1.5-fold increase in the likelihood of death by suicide among current OEF/OIF veterans who engage in health care service at the Veterans Health Administration.<sup>4</sup> Symptoms that may result from a TBI include cognitive changes, headaches, and sleep difficulties, as well as changes in behavior and mood including impulsivity, anxiety, and depression.<sup>3</sup> These TBI symptoms have been associated with productivity loss<sup>5</sup> and difficulties performing daily and work-related activities.<sup>6,7</sup> Given the impact of TBI symptoms on veterans, psychosocial recovery during postdeployment reintegration may be compounded for this population.

Reintegration into civilian life can be a challenging time for veterans returning from deployment. Some adversities experienced may include professional, financial, and personal complications such as difficulties with employment, complex renegotiations of partner/family roles, and reestablishment of social support networks.<sup>8–10</sup> Given these hurdles, resources that can ameliorate or support the reintegration process, especially for subgroups facing additional challenges such as those with a history of TBI, are of great importance. Several psychosocial constructs have been identified as important to recovery following a TBI. Perceived self-efficacy was found to be predictive of life satisfaction.<sup>11</sup> The construct of social isolation and loneliness is known as being problematic for veterans with TBI,<sup>12</sup> putting them at increased risk for depression<sup>13</sup> and suicide.<sup>14</sup> Perceived availability of social support has been shown to be lower in TBI patients relative to non-TBI counterparts<sup>15,16</sup>; thus, it is of marked importance that this social construct plays a role in psychosocial health and quality of life in persons recovering from a TBI.<sup>17–20</sup>

Jenkinson et al<sup>21</sup> systematically reviewed multiple large cohort studies with over 1,000 participants, predominantly in elder populations, and found that volunteering in a formal program, also known as civic service, was associated with positive impacts on a variety of health, mental health, and psychosocial factors including mortality, self-rated health, depression, life satisfaction, and quality of life. The possibility of self-selection bias is a noted potential confounder in some of these studies on volunteering, hindering the ability to elucidate mechanisms driving positive mental health and health benefits.<sup>21</sup> Yet, while there are methodological issues in the existing volunteer literature such as the amount and duration of volunteering among diverse groups of participants and small sample sizes in efficacy trials likely resulting in underpowered studies,<sup>21</sup> the evidence from cohort studies is compelling, suggesting a need to test the potential of volunteering, as a health promotion intervention, to benefit veterans. Previously, we found that volunteering had positive health and psychosocial effects on a large cohort of 346 returned post-9/11/01 veterans.<sup>22</sup> Given the additional challenges that veterans with TBI may experience, here we extend our previous research with a specific focus on the potential effects of volunteering on a subgroup of

veterans with a self-reported history of TBI. To our knowledge, the health, psychological, and social impacts of civic service on veterans with a history of TBI, and the differential outcomes for veterans with and without a TBI history have not been previously studied.

## METHODS

### Study Design and Participants

We describe outcomes from an innovative health promotion intervention for returning veterans. This evaluation consisted of post-9/11/01 veterans who volunteered in community-based organizations across the United States. Using pre–post survey data from a national nonprofit organization, The Mission Continues, and its flagship program known as the Fellowship Program, we evaluated this formal, 6-month, stipend-supported, civic service program. The intervention involved 26 weeks of volunteering for 20 hours per week at a nonprofit of the veterans' choosing within the context of a veteran-focused volunteer and leadership program.

Adults, aged 18 and over, who had served in the U.S. military in the post-9/11/01 era, who competitively applied for and were approved by the agency staff, were enrolled in the program. A minimum of 2 years of service in the U.S. military after September 11, 2001, was required for program eligibility with an exception made for veterans who were medically discharged before the 2-year minimum. An additional expectation was that veterans would have been honorably discharged with a clean criminal record. However, considerations were made on a case-by-case basis for veterans who had experienced substance use problems, involvement with the criminal justice system, and/or other discharge status, as the agency was sensitive to challenges that may accompany the transition from military to civilian life.

The Mission Continues is an excellent organization in which to conduct this type of project because it has been in existence since 2007, long enough to permit a rigorous assessment of its impact. Also, we collaboratively developed the longitudinal evaluation plan, use of standardized measures, and then designed, implemented, and tested the program on an initial cohort. The implementation plan dictated that collected data were deidentified to the researchers and that the surveys were administered before and after the program and tied to initial stipend distribution. Therefore, data tend to be of high quality. The study sample here is a subsample from a larger, parent study which included ( $N = 346$ ) completers of the Fellowship Program who provided both pre- and postsurveys and completed the program between February 2011 and March 2014. From 2011 through 2014, the average completion rate of the Fellowship Program was 78%. Of completers, 60% responded to both pre- and postsurveys (346/580). Here, we report on the health, psychological, and social outcomes for a subsample of veterans with a TBI history who completed the program ( $n = 67$ ). This study was approved by the Saint Louis University Institutional Review Board.

### Measures

Dependent variables included measures of health, psychological, and social health, and Cronbach's alpha calculations were included for each outcome measure with a composite

scale. All measures, excluding the TBI question, were administered at both pre- and postcompletion of the civic service program.

**TBI Status**—TBI group status was ascertained through a single question on the presurvey where participants responded (yes or no) to the question: “Have you ever been diagnosed with/treated for a Traumatic Brain Injury (TBI)?” Although TBI severity was not directly assessed, it was assumed that the majority of veterans would have a mild or moderate TBI based on program eligibility that required the ability to work in a nonprofit organization. Other veterans with polytrauma injuries and severe TBI who previously underwent extensive rehabilitation and therapy also participated in the program.

**Health Domain**—Overall health was rated based on the response to the following question obtained from a standard military service personnel screening tool, the Post Deployment Health Re-Assessment<sup>23</sup>: “Overall, how would you rate your health during the past month?” Responses were indicated on a 5-point Likert scale: 1 = Excellent, 2 = Very Good, 3 = Good, 4 = Fair, and 5 = Poor.

To assess physical and emotional health problems, the following questions from the Post Deployment Health Re-Assessment<sup>23</sup> were used: “During the past month, how difficult have physical health problems (illness and injury) made it for you to do your work or other regular daily activities?” and “During the past month, how difficult have emotional problems (such as feeling depressed or anxious) made it for you to do your work, take care of things at home, or get along with other people?” Responses to these questions were scored on a 4-point Likert scale: 1 = Not difficult at all, 2 = Somewhat difficult, 3 = Very difficult, and 4 = Extremely difficult.

**Psychological Health Domain**—The Primary Care PTSD Screen<sup>24</sup> is a 4-item measure assessing the presence of the following PTSD symptoms in the past month: re-experiencing, avoidance, numbness, and arousal. Respondents indicate “yes” or “no” to each item and scores range from 0 to 4. A cutoff score of 2 designates PTSD symptoms of clinical significance ( $\alpha = 0.88$ ).

Depressive symptoms were measured using the Patient Health Questionnaire-2,<sup>25</sup> a 2-item screener based on the frequency of anhedonia and depressed mood. Each item was rated on a 4-point Likert scale assessing symptom frequency: 0 = Not at all, 1 = Few or several days, 2 = More than half the days, and 3 = Nearly every day, with a score range of 0 to 6. A cutoff score of 3 is considered clinically significant for screening purposes ( $\alpha = 0.89$ ).

An additional categorical item was included to assess mental health treatment exposure: “Are you currently seeking professional help for emotional problems (such as feeling depressed or anxious)?” (yes/no).

**Social Health Domain**—The Purpose in Life scale, a 14-item subscale of the Scales of Psychological Well-Being,<sup>26</sup> assesses direction and purpose in life. Responses are on a 6-point Likert scale from 1 = “strongly disagree” to 6 = “strongly agree” and summed scores

range from 14 to 84. Higher scores indicate goal-setting, a sense of direction, and a notion that life holds purpose and meaning with lower scores indicating a lack thereof ( $\alpha = 0.86$ ).

The General Self-Efficacy Scale,<sup>27</sup> a 10-item scale, was used to assess the perception of self-efficacy associated with both daily minor stressors and major stressful life events. Responses are on a 4-point Likert scale: 1 = Not at all true, 2 = Hardly true, 3 = Moderately true, and 4 = Exactly true, with summed scores ranging from 10 to 40 so that higher scores indicate higher perceived self-efficacy and coping abilities ( $\alpha = 0.93$ ).

Social isolation and loneliness were measured with the UCLA Loneliness Scale (Version 3),<sup>28</sup> a 20-item questionnaire for which responses are on a 4-point Likert scale: 1 = Never, 2 = Rarely, 3 = Sometimes, and 4 = Always. Summed scores can range from 20 to 80 and indicate frequency of feelings conveyed by the item, with high scores indicating a higher degree of loneliness ( $\alpha = 0.94$ ).

Perceived availability of social support was measured with the Interpersonal Support Evaluation List short form,<sup>29</sup> a 12-item scale comprising three subscales: appraisal, belonging, and tangible aid. Responses are on a 4-point Likert scale: 1 = Definitely false, 2 = Probably false, 3 = Probably true, and 4 = Definitely true, with summed scores totaling 12 to 48 and higher scores indicating a higher degree of perceived social support ( $\alpha = 0.93$ ).

## Analysis

Because of the data being non-normally distributed, nonparametric tests were used for all statistical analyses and all were conducted at an alpha level of 0.05. Mann–Whitney *U* tests were conducted to test for differences between TBI and non-TBI groups on demographic characteristics. Wilcoxon signed-rank tests, two-tailed, were used to determine whether significant changes occurred from pre to post within the TBI group on outcome measures in the health, psychological and social domains. Pre and post scores used in these analyses consisted of summed composite scores from the multi-item survey instruments. Pre–post effect sizes (Cohen’s *d*) were estimated using means and pooled standard deviations. A McNemar’s test was used to assess pre–post changes on the single-item survey question on seeking professional help for emotional problems, which has a dichotomous response option. McNemar’s tests were also used to discern, at the item level, which of the four PTSD symptoms had statistically significant decreases in the proportion of participants reporting those symptoms from pre to post. McNemar’s test *p* values were calculated exactly using the binomial distribution. Mann–Whitney *U* tests were used to test for between-group significant differences in item level depression symptoms by comparing pre–post change scores (continuous data) between veterans with ( $n = 67$ ) and without a TBI history ( $n = 273$ ).

A binomial logistic regression was performed to ascertain the effects of the pre to post change in the four psychological and social variables that had medium size effects: PTSD screening score, social isolation and loneliness, availability of social support, and self-efficacy on the likelihood that participants were seeking external professional experience for emotional problems. Linearity of the continuous variables with respect to the logit of the dependent variable was assessed via the Box–Tidwell (1962) procedure. Based on this assessment, all continuous independent variables were found to be linearly related to the

logit of the dependent variable. There were two studentized residuals with values between 2 and 2.5 standard deviations, which were kept in the analysis.

## RESULTS

Participants in the Fellowship Program between February 2011 and March 2014 who responded to the TBI history question totaled 340 veterans. We examined a subsample of 67 (67/340; 19.7%) veterans who reported a TBI history as lifetime TBI diagnosis or treatment. Within-group, pre–post changes in veterans with a TBI history were assessed, and 273 veterans who reported no history of TBI (non-TBI group) were used as a control group for between-group comparisons.

Veterans who completed the program were predominantly white (66%), male (89%), and no more than 40 years old (91%). Most had more than a high school education (70%) and less than half were married (43%). With gender being the only exception, wherein the TBI (11%; 7/66) group contained a lower proportion of females than the non-TBI group (36%; 98/271), the TBI and non-TBI groups were demographically similar (Table I).

Positive screening scores on PTSD and depression were based on the clinically designated cutoff value using the pre and post mean scores calculated using individual participants' summed scale scores. Descriptively, among veterans with a history of TBI, 82% (54/66) screened positive (with 2 out of 4 symptoms) for PTSD at preintervention which dropped to 69% (44/64) at program completion. In contrast, these same veterans showed negligible pre–post differences in depression screening rates, with 30% (20/66) screening positive at pre and 30% (19/63) at post. Finally, the rate of veterans screening positive for both PTSD and depression decreased from a rate of 30% (20/66) before entering the program to 25% (16/63) after completion (Table I).

Wilcoxon signed-rank tests were used to detect significant pre to post changes within the TBI group on three health-related, two psychological, and four social outcomes. Significant changes and medium effect sizes were noted in decreased PTSD scores ( $d = 0.4$ ), increased self-efficacy ( $d = 0.4$ ), decreased social isolation and loneliness ( $d = 0.4$ ), and increased perceived availability of social support ( $d = 0.4$ ). In addition, perceived overall health changed significantly for a small effect (Table II).

To further elucidate the nature of the decreases in self-reported PTSD symptoms in the TBI group, we determined whether any particular aspect(s) of PTSD symptomatology accounted for the significant decrease from pre to post. McNemar's tests were conducted at the item-level for each of the four symptoms included in the 4-item measure (re-experiencing, avoidance, numbness, and arousal) to determine the proportion of individuals who went from yes at pre to no at post for each of the four symptoms. While the proportion of individuals reporting "yes" to experiencing a symptom at pre had decreased at post for all four symptoms, numbness stood out showing a statistically significant decrease ( $p = 0.031$ ,  $\alpha = 0.05$ ). Before beginning the volunteer program, 75.41% (46/61) of participants reported feeling numb or detached from others, activities, or surroundings; however, this decreased to 59.02% (36/61) of participants at program completion.

Given the curious finding that PTSD screening scores decreased significantly for both TBI and non-TBI groups while depression screening scores decreased only for the non-TBI group but remained unchanged for the TBI group, we examined whether one of the two items in the depression screener was particularly responsible for this between-group difference. A Mann–Whitney *U* analysis was conducted to determine whether there were differences in change scores for the anhedonia item, “little interest or pleasure in doing things,” between TBI and non-TBI groups. Distributions of the change scores for TBI and non-TBI groups were not similar, as assessed by visual inspection. Symptom change scores for the TBI group (mean rank = 158.30) and non-TBI group (mean rank = 161.03) were not statistically significantly different,  $U = 7,861.5$ ,  $z = -0.234$ ,  $p = 0.815$ . Interestingly, however, the same between-group analysis of change scores for the depression item (“feeling down, depressed, or hopeless”) revealed that symptom change scores for the TBI group (mean rank = 140.93) were statistically significantly lower than for the non-TBI group (mean rank = 165.20),  $U = 6,784.5$ ,  $z = -2.045$ ,  $p = 0.041$  indicating that a lack of improvement in “feeling down, depressed, or hopeless” particularly accounted for the difference in depression change scores between the TBI and non-TBI groups.

Whether or not participants were seeking external help for emotional problems (binary variable) could affect pre to post changes on psychological and social outcomes. Therefore, a binomial logistic regression was performed to ascertain the effects of the pre to post change in the four psychological and social variables that had medium size effects: PTSD screening score, social isolation and loneliness, availability of social support, and self-efficacy, on the likelihood that participants were seeking external professional experience for emotional problems. The logistic regression model was not statistically significant ( $\chi^2(4) = 3.263$ ,  $p = 0.515$ , Nagelkerke  $R^2 = 0.074$ ); however, it also was not a poor fit (Hosmer–Lemeshow  $\chi^2(8) = 7.866$ ,  $p = 0.447$ ). The model correctly classified 71% of cases, which was less than the 72.6% classified correctly with no predictor variables in the model. Sensitivity was 97.8%, specificity was 0%, positive predictive value was 44.72%, and negative predictive value was 0%. A Wald test showed that none of the four predictor variables were statistically significant ( $p > 0.05$ ). These results indicate that the significant pre to post changes (difference scores) for PTSD screening score, social isolation and loneliness, availability of social support, and self-efficacy are not significantly associated with whether participants were externally seeking professional help for emotional problems.

Consistent with the finding that external help seeking was not associated with pre to post changes in psychosocial outcomes in veterans who completed the civic service program, McNemar’s tests comparing the proportion of veterans with a TBI who reported seeking professional assistance for emotional problems at pre and post revealed that this proportion remained virtually unchanged from pre (73.0%; 46/63) to post (71.4%; 45/63). Further, comparison of those who reported seeking assistance with those who reported not seeking assistance (at preintervention) revealed similar distributions of pre–post change scores, and median scores did not significantly differ on all nine outcome measures.

Finally, in order to determine whether demands of the program would compromise the ability of veterans with a TBI to benefit, Mann–Whitney *U* tests were used to assess whether pre–post change scores differed significantly between veterans with ( $n = 67$ ) and without ( $n$

= 273) a TBI history. Results revealed that veterans in the TBI and non-TBI groups had similar distributions of change scores on all nine outcome measures with median scores that did not significantly differ.

## DISCUSSION

Volunteering as a health promotion intervention for returning veterans from Iraq and Afghanistan with a TBI is important because reintegration is associated with a myriad of rehabilitation challenges in domains such as physical and mental health, social functioning, productivity, community involvement, and self-care.<sup>9,30</sup> Rehabilitation after a TBI, even outside the challenge of reintegration, is likewise associated with the same hurdles in addition to an increased likelihood of PTSD and major depression diagnoses,<sup>31</sup> thus likely compounding difficulties during reintegration and rehabilitation from TBI for this subgroup. Furthermore, studies have shown that prevalence rates of mental health problems and reported cases of TBI increase with increasing time home from deployment,<sup>32–34</sup> calling for a need for effective health and wellness promotion interventions to be available to service members returning from deployment. Comparison of pre–post changes between TBI and non-TBI groups, on nine health, psychological, and social outcomes, revealed that TBI history did not hinder veterans' ability to benefit from a nonprofit administered civic service program.

Among veterans with a history of TBI, we found significant changes of small effect size for perceived overall health and medium effect sizes with regard to decreased PTSD symptoms, increased perceived self-efficacy, decreased feelings of isolation and loneliness, and increased availability of social support. These significant findings were not due to participants seeking external help for emotional problems.

The constructs of perceived self-efficacy, social isolation and loneliness, and perceived availability of social support have been previously studied in patients with TBI. Perceived self-efficacy has been shown to predict life satisfaction in community-dwelling adults with a TBI.<sup>11</sup> Social isolation has been identified as a problem for veterans with TBI<sup>12</sup> and is a risk factor for depression in this group.<sup>13</sup> Research suggests that feelings of social isolation and loneliness, left untreated, are associated with cognitive deficits, decreased emotional well-being, adverse social behavior outcomes, and increased mortality rates.<sup>35</sup> Importantly, social isolation and loneliness are risk factors for suicide<sup>14</sup> as well as for Alzheimer's disease and dementia.<sup>35</sup> Given that TBI is also a risk factor for Alzheimer's disease/dementia<sup>36</sup> and that veterans with a TBI are at an increased risk of suicide relative to counterparts without a TBI history,<sup>4</sup> identification of interventions that can ameliorate these risk factors are needed. Results of this study provide preliminary evidence that civic service decreases social isolation and loneliness in veterans with a reported TBI history.

Although perceived availability of social support is known to be important to psychosocial health and quality of life following a TBI,<sup>17–20</sup> it is often lower in persons with TBI relative to those without such injury.<sup>15,16</sup> Given our findings, volunteering may protect against social isolation and be promotional of perceived social support in veterans with TBI. Although we did not see a significant decrease in mean depression scores of veterans with a TBI, the fact



that depressive symptoms did not worsen is notable as a previous peer-mentoring intervention in which social outcomes improved saw an unexpected concomitant increase in depressive symptoms<sup>19</sup>; however, that was not the case here. At the same time, it should be noted that the peer-mentoring study was a controlled study with participants who ranged in severity from mild to severe, therefore, a direct comparison cannot be made. Given that isolation was significantly reduced in our sample and that volunteering was associated with decreased rates of depression in civilians and elders, further investigation with a larger sample size and controlled study design is needed to determine whether volunteering can improve depression symptom scores in veterans with a TBI.

With regard to the analysis of the depression screening items, of the two items in the depression screener, “feeling down, depressed, or hopeless” as opposed to the anhedonia item, accounted for the greatest difference in the pre to post depression change scores between the TBI and non-TBI groups. This is an important finding given that hopelessness is strongly predictive of suicide.<sup>37,38</sup> Specifically in individuals with TBI, higher levels of hopelessness are strongly associated with suicidal ideation and high levels of ideation are strongly associated with suicide attempts.<sup>39</sup> Further investigation of the particular symptom(s) beaoned by this item is needed to allow augmentation of the civic service intervention for more tailored support of individuals with TBI, even within the context of improvement on a host of other psychosocial outcomes.

We found that completion of the civic service intervention resulted in a significant decrease in PTSD screening scores from pre- to post-program and that the decrease was independent of whether a participant was seeking external support for emotional problems. Interestingly, of four aspects of PTSD symptomatology assessed, “feeling numb or detached from others, activities, or surroundings” most accounted for the decrease in PTSD screening scores. Given this and taken together with the significant decrease in social isolation and loneliness and the social nature of the program, we posit that decreased social isolation and loneliness is the primary driver of the improved psychological and social outcomes documented here. At the same time, tests of the specific effects of volunteering on PTSD would require the addition of a nonvolunteering control group, which was beyond the scope of the present study. A future study that could address this hypothesized mechanism would be a dose–response study, including a nonvolunteering control group, to assess the impact of the dose of volunteering on levels of loneliness and social isolation as well as a sample size sufficient to allow for a moderator analysis of whether a decrease in loneliness moderates the relationship between volunteering and improved psychological/health symptoms.

Finally, in the case of co-occurring PTSD and TBI, PTSD symptom severity and not the presence of a TBI, has been shown to confound treatment outcomes<sup>33,40–42</sup> and account for greater functional limitations such as difficulties at work and with other daily activities.<sup>43</sup> Therefore, a focus on the treatment of PTSD symptoms is recommended for improvement of the more severe level of PTSD symptom intensity documented in individuals with co-occurring TBI and PTSD, in order to ameliorate these high intensity symptoms as well as the associated functional impairments experienced by this group.<sup>43</sup> Although the intervention tested here was not designed as a PTSD treatment, the aforementioned findings provide guidance for choosing the most appropriate outcomes when the goal is to promote

and support overall health in this particular subpopulation. The findings of a slight, nonsignificant improvement in perceived physical health interference and a significant increase in perceived overall health ratings parallel findings in other studies. Our findings in veterans without TBI<sup>22</sup> as well as those of previous studies on volunteering in elder populations both similarly found no physical health impact<sup>21</sup> while volunteering did significantly impact self-rated health.<sup>21,22</sup> This improvement in self-rated health in the TBI group, despite no significant change in physical health interference, is noteworthy given the additional functional impairment experienced by individuals living with a TBI. For example, an epidemiological study of combat-related disability in soldiers and marines revealed that soldiers with combat-related TBI were found to have 1.6-fold more disabilities or “unfitting conditions” relative to those with other non-TBI, combat-related disabilities.<sup>44</sup> Further, symptoms of TBI have been shown to impact both productivity<sup>5</sup> and performance of daily and work activities.<sup>6,7</sup> Thus, the experience of volunteering may result in improved perceived health status despite the ongoing presence of physical challenges that older age and a TBI may confer.

Limitations to this study include the small, select sample and an uncontrolled design. Because the administration of the preintervention survey was tied to initial stipend distribution, participants could potentially have responded based on social desirability. In future studies, we plan to examine the effect of the stipend, by first analyzing qualitative data from these participants on their reason for joining the program to determine how much of a driver the stipend was, and second, in a randomized trial design where the stipend is provided as study compensation for participation in the volunteer program and not tied to the assessment intervals. While effects of seeking external help for emotional problems on significant psychological and social outcomes were assessed, the survey did not include a question addressing whether participants were currently undergoing physical rehabilitation for TBI, therefore, potential effects of a rehabilitation program on significant psychological and social outcomes were not assessed. Using a single item to assess TBI may have resulted in recall bias; however, as previously noted, the proportion of veterans reporting a TBI history in the present study is congruent with that of other published studies on TBI in veteran populations. PTSD and depression screener scores are not synonymous with psychiatric diagnoses and only serve to indicate a higher probability that an individual would meet diagnostic criteria from reporting current symptoms.

Finally, we do not know if the program would be more or less impactful if tested in other service sectors such as the federal government or in other less veteran-focused civic service programs such as AmeriCorps or ExperienceCorps. Because of the lack of long-term follow-up data, future research is needed to determine whether veterans continue to volunteer after participating in this program and if greater or continued improvement occurs in self-reported psychological and physical health, or if the positive effects of this program remain even if volunteering ceases. Veterans with TBI could also have opted not to apply to the program assuming the intensity of performing volunteer tasks in the community may not support their current rehabilitation goals. Thus, definitive conclusions regarding the efficacy of a formal veteran-focused civic service program to improve health and psychosocial outcomes requires a more rigorous trial design. Despite these limitations, findings from this study suggest that participation in a formal civic service program can have a significant positive impact on the

health outcomes of veterans with a TBI. Volunteering as an innovative health promotion intervention for veterans could be integrated into other health, rehabilitation, and social service settings.

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TABLE I

Demographic Characteristics of Iraq and Afghanistan Veterans With and Without a History of Traumatic Brain Injury, Who Completed “The Mission Continues” Fellowship Program, a Veteran-Focused Civic Service Program ( $N= 340$ )

Characteristics	TBI	Non-TBI
	<i>n</i> (%)	<i>n</i> (%)
Age (years)		
22–40	61 (91.0)	220 (80.6)
41–55	6 (9.0)	53 (19.4)
Gender <sup>a</sup>		
Male	59 (89.4)	173 (63.8)
Female	7 (10.6)	98 (36.2)
Education <sup>b</sup>		
= High School or GED	20 (29.9)	54 (19.9)
> High School or GED	47 (70.1)	218 (80.1)
Race/ethnicity <sup>c</sup>		
White/Caucasian	44 (65.7)	147 (54.6)
Black/African American	10 (14.9)	77 (28.6)
Asian/Pacific Islander	1 (1.5)	12 (4.5)
Native American/Alaskan Native	2 (3.0)	1 (0.4)
Multiracial/Biracial	3 (4.5)	20 (7.4)
Other race	7 (10.4)	12 (4.5)
Hispanic/Latino	12 (17.9)	37 (13.8)
Marital Status		
Married	29 (43.3)	120 (44.0)
Divorced, Never Married	18 (26.9)	55 (20.1)
Single	20 (29.9)	96 (35.2)
Widowed	0 (0.0)	2 (0.7)
Mental Health Treatment History <sup>d</sup>	46 (73.0)	99 (36.4)
Positive PC-PTSD Screen <sup>e</sup>	54 (81.8)	117 (43.0)
Positive PHQ-2 Depression Screen <sup>f</sup>	20 (30.3)	59 (21.6)

All demographic and mental health characteristics are those reported at preintervention.

<sup>a</sup>  $n = 66$  for TBI and  $n = 271$  for non-TBI, missing data.

<sup>b</sup>  $n = 272$  for non-TBI, missing data.

<sup>c</sup>  $n = 269$  for non-TBI, missing data.

<sup>d</sup>  $n = 63$  for TBI and  $n = 272$  for non-TBI.

<sup>e</sup>  $n = 66$  for TBI and  $n = 272$  for non-TBI, missing data.

<sup>f</sup>  $n = 66$  for TBI.

Health, Psychological, and Social Outcomes of Iraq and Afghanistan Veterans with a History of Traumatic Brain Injury Who Completed “The Mission Continues” Fellowship Program, a Veteran-Focused Civic Service Program ( $N = 67$ )

TABLE II

Health, Psychological, and Social Outcomes	<i>n</i>	M1 (SD)	M2 (SD)	Scale Range and Directionality	Difference Score (Post-Minus Pre)	Z (2-Tailed)	<i>d</i>
Perceived Overall Health <sup>a</sup>	64	3.06 (0.91)	2.73 (1.16)	1 (+) to 5 (-)	-0.33	-2.7*	0.32
Perceived Physical Health Interference <sup>a</sup>	64	2.00 (0.69)	1.86 (.79)	1 (+) to 4 (-)	-0.14	-1.4	0.19
Perceived Emotional Health Interference <sup>a</sup>	62	2.15 (0.88)	2.06 (.85)	1 (+) to 4 (-)	-0.09	-0.66	0.10
PTSD Screen <sup>a</sup>	63	3.0 (1.3)	2.4 (1.6)	0 (+) to 4 (-)	-0.6	-2.5*	0.4
Depression Screen <sup>a</sup>	62	2.3 (1.6)	2.2 (1.8)	0 (+) to 6 (-)	-0.1	-0.5	0.1
Belief that Life Holds Purpose and Meaning <sup>b</sup>	64	59.8 (12.8)	61.8 (12.0)	14 (-) to 84 (+)	2.0	-1.7	0.2
General Self-Efficacy <sup>b</sup>	64	32.4 (5.6)	34.3 (4.6)	10 (-) to 40 (+)	1.9	-2.5*	0.4
Social Isolation and Loneliness <sup>a</sup>	62	48.6 (11.9)	44.3 (12.5)	20 (+) to 80 (-)	-4.3	-3.4*	0.4
Availability of Social Support <sup>b</sup>	64	32.7 (8.6)	36.3 (8.1)	12 (-) to 48 (+)	3.6	-3.7*	0.4

Clinically designated cutoff for positive PTSD screen is 2 and for depression is 3; for scale range and directionality column, the possible score range is shown and (-) or (+) denotes whether the low or high score is associated with negative or positive outcomes, respectively. Z statistic is from Wilcoxon-signed rank test (2-tailed,  $\alpha = 0.05$ ).

\* Significant at 0.05 alpha level. Cohen's *d* effect sizes = small (0.2), medium (0.5), and large (0.8).

<sup>a</sup> Z statistic was based on positive ranks.

<sup>b</sup> Z statistic was based on negative ranks.