

Prevalence and characteristics of driving difficulties in Operation Iraqi Freedom/Operation Enduring Freedom combat returnees

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Abstract—We studied the prevalence and characteristics of self-reported driving difficulties and examined their association with traumatic brain injury (TBI) and/or posttraumatic stress disorder (PTSD) in Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) veterans who were seen at a Department of Veterans Affairs outpatient polytrauma clinic. In this study, we used a brief driving questionnaire and chart reviews to assess the prevalence and characteristics of driving difficulties in the following four groups of patients: TBI only, PTSD only, TBI + PTSD, and Neither (neither TBI nor PTSD). Compared with before deployment, 93% of OIF/OEF veterans seen in the polytrauma clinic reported more difficulties with driving in at least one domain, with the most common areas of difficulty being (1) problems with anger or impatience (82%), (2) general driving difficulties (65%), and (3) experiences with near misses (57%). Patients with PTSD (with or without TBI) reported the most significant driving impairments, whereas respondents with a history of only TBI endorsed driving difficulties similar to veterans without either diagnosis. Qualitative analysis of veterans' comments also revealed similar patterns. Self-reported driving problems were common among OIF/OEF returnees. Respondents who had a diagnosis of PTSD (with or without TBI) reported the most severe driving difficulties since returning from deployment. The association between PTSD and driving problems warrants further investigation.

Key words: automobiles, combat, concussion, deployment, driving, OIF/OEF, posttraumatic stress disorder, road rage, traumatic brain injury, veterans.

INTRODUCTION

Injury due to motor vehicle crashes is one of the leading causes of preventable morbidity and mortality across all branches of the military [1]. Furthermore, motor vehicle crashes are the leading cause of death in veterans in the early years after returning from deployment [2]. This finding has been observed in both Gulf war and Vietnam veterans [3–6]. In 1991, deployed Gulf war veterans had an annual rate of 23.6 fatalities per 100,000 persons—a much higher rate than nondeployed veterans (15.9 per 100,000 persons) [4] or the general U.S. population around that time (16.3 per 100,000 persons) [7]. A recent study has shown that during the first 5 years following return from deployment, Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF)

Abbreviations: ANOVA = analysis of variance, CI = confidence interval, mTBI = mild traumatic brain injury, OIF/OEF = Operation Iraqi Freedom/Operation Enduring Freedom, OR = odds ratio, PCS = postconcussion syndrome, PNS = Polytrauma Network Site, PTSD = posttraumatic stress disorder, SD = standard deviation, TBI = traumatic brain injury, VA = Department of Veterans Affairs.

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veterans have a 75 percent greater risk of death from a motor vehicle accident than the general population [2]. Given these findings, the Department of Veterans Affairs (VA), Department of Transportation, and Department of Defense recently developed an initiative to reduce motor vehicle accidents among this cohort [2].

Several possible factors may contribute to increased driving problems in military personnel relative to the general population [8]. Veterans may engage in more risky driving behaviors; as one study observed that approximately 19 percent of U.K. armed forces personnel (active and reserve) reported speeding and/or not wearing seatbelts when driving in civilian settings [9]. One explanation for these driving issues is that demographic variables known to be risk factors for motor vehicle fatalities (i.e., being young, male, unmarried, and having a high school education or less) are characteristic of military personnel [10]. Additionally, deployment seems to convey unique and additive risk for driving difficulties. Lincoln et al. found that Gulf war era veterans who had been deployed had a significantly higher annual rate of motor vehicle fatalities (between 1991 and 1995) than those who served during the same period but were not deployed [4]. It has been proposed that exposure to and surviving traumatic events, such as those experienced during war, contribute to a personal sense of invulnerability, which may result in increased risk-taking behavior [11].

Other factors specific to OIF/OEF veterans may place them at even greater risk of postdeployment driving difficulties than veterans of previous wars. Before deployment, OIF/OEF servicemembers undergo "battlemind" training [12]. One component of this training involves learning aggressive or combat driving practices that are used during deployment. Examples of such skills include driving quickly and erratically, making rapid and unpredictable lane changes, straddling the middle line, and attempting to keep other vehicles at a distance to avoid explosives and ambushes [13]. These skills are contrary to the driving rules and behaviors that are required to drive safely in a civilian environment, and for some veterans, "unlearning" these maneuvers when they return home may be difficult [13].

The most common OIF/OEF combat-related conditions, posttraumatic stress disorder (PTSD) and traumatic brain injury (TBI), likely place these veterans at an additional risk of postdeployment driving difficulties [14]. The prevalence of PTSD among Vietnam and Gulf war veterans has been estimated to be 19 and 10 percent,

respectively [15–16], and may be even more common among OIF/OEF veterans. Prevalence estimates of PTSD for this cohort have ranged between 11 and 18 percent [17–20], although some estimates have been upwards of 30 percent [21]. Given that the war is ongoing and many soldiers have multiple deployments [21–22], a factor shown to increase risk of developing PTSD [23], PTSD prevalence rates among OIF/OEF servicemembers could grow even higher.

PTSD could be associated with unsafe driving practices for multiple reasons. First, PTSD negatively affects cognitive functioning [24], especially in the domains of attention [25], executive functioning [26], and processing speed [27], all of which are essential to blocking out distractions, reacting to challenging situations, and using good judgment while driving. Second, a characteristic of the disorder is irritability and outbursts of anger, which could lead to aggressive driving and impulsive or risky driving behaviors [28]. Finally, increased startle response (e.g., becoming excessively alarmed at the sound of a backfiring car, screeching tires, etc.), another common feature of PTSD, also might create dangerous situations while driving. To date, no research that we are aware of has examined this issue.

In addition to increased rates of PTSD, TBI is believed to account for a greater proportion of injuries in OIF/OEF than in previous wars [29–30]. An estimated 11 to 20 percent of soldiers have sustained a TBI during their deployment [17,31], with nearly 80 percent of those injuries being mild in nature [32]. While most symptoms resulting from mild TBI (mTBI) typically resolve within a few weeks or months of the injury, a small percentage of people continue to experience symptoms for several months or even years. These symptoms, collectively known as post-concussion syndrome (PCS), typically include cognitive difficulties such as memory and concentration impairment, somatic complaints (i.e., headache, dizziness), and emotional disturbance including irritability, depression, and anxiety [32], all of which might interfere with driving. Research suggests a strong association exists between PCS and PTSD [33–34], and many potential symptoms that could affect driving are shared between disorders [8].

Before strategies to prevent and correct driving issues can be put into place, a better understanding is needed of the frequency and types of driving difficulties being experienced by OIF/OEF veterans and these veterans' characteristics. The following study of OIF/OEF veterans was an exploratory analysis that aimed to (1) document

and describe driving difficulties in a cohort of veterans seen within a VA Polytrauma Network Site (PNS) outpatient clinic and (2) determine how TBI and PTSD, two common clinical diagnoses among this cohort, are associated with self-reported driving difficulties.

METHODS

Sample and Procedure

Participants for this survey study were recruited from a VA PNS from September 2009 to November 2009. All veterans seen in the polytrauma outpatient clinic between October 2006 and May 2009 ($n = 450$) were identified as potential participants. Each veteran was mailed a letter that contained a description of the study, a brief questionnaire about driving difficulties, and a “participation declined” reply card. If no reply was received within 3 weeks, research staff attempted to call the veteran to administer the survey questions over the telephone. If contact could not be established with a veteran after three attempts over a 2-week time period, the potential subject was excluded from possible participation. Veterans who had not driven since returning from their deployment and those who served in a war other than OIF/OEF were also excluded (Figure 1).

Driving Questionnaire

The brief driving questionnaire is a seven-item measure that asks participants to indicate how their postdeployment

driving-related behavior compares with their predeployment driving behavior (see Appendix, available online only). The questions address (1) general driving difficulties, (2) receipt of a warning by the police for traffic violations, (3) receipt of a traffic citation (ticket or fine), (4) occurrence of driving accidents, (5) instances of near misses while driving, (6) problems with anger or impatience while driving, and (7) instances of becoming lost or disoriented while driving. The questionnaire asks respondents to report problems in terms of less than, the same, or more than before deployment. For the purposes of analysis, responses were reclassified into “more than before deployment” or “not more than before deployment.”

Demographic and Military Information

Participants were asked to answer several demographic questions regarding race/ethnicity, marital status, years of education, and branch of military. They were also asked to indicate how many tours of duty they had served in OIF/OEF, which year they returned from their most recent tour of duty, and how frequently they drove military vehicles during their tour of duty (frequently, occasionally, or rarely/never).

Respondent Comments

Veterans surveyed by telephone also had the opportunity to provide further comments on the driving questionnaire. Any information that was shared by the respondent was recorded by the research team member administering the questionnaire.

Chart Review

A neuropsychologist (MMA or MK) reviewed the electronic medical records of all veterans who completed the driving questionnaire. The purpose of the chart review was to document a history of TBI or PTSD. Based on the presence or absence of these diagnoses, participants were classified into one of four clinical groups: TBI only, PTSD only, TBI + PTSD, or Neither (no TBI or PTSD).^{*} Historically, mTBI is the most common TBI diagnosis among patients seen at a VA polytrauma outpatient clinic.

^{*}Mental health conditions that were documented in the patient electronic medical record were examined for the Neither group: 43.5 percent had no mental health condition, 21.7 percent had an adjustment disorder, 13.0 percent depression, 13.0 percent anxiety, 4.3 percent mood disorder, and 4.3 percent a combination of any of the above.

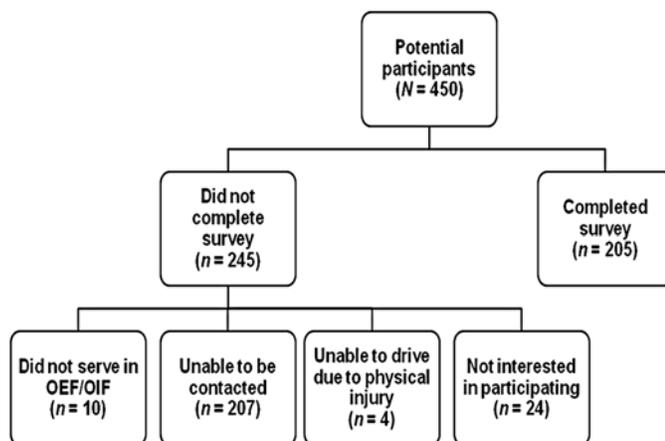


Figure 1. Population and study respondents to survey of postdeployment driving difficulties. OEF/OIF = Operation Enduring Freedom/Operation Iraqi Freedom.

TBI Diagnosis

Before their recruitment to the study, all study participants had completed a comprehensive TBI evaluation as part of their polytrauma clinic visit. The comprehensive TBI evaluation involved a medical examination by a physician, and a standardized VA protocol was used to assess the veteran's injury-related history and deployment-related experiences associated with injuries, exposure to blast, and immediate postblast/injury experiences. Participants were classified as having a history of TBI, as defined by the American Congress of Rehabilitation Medicine [35], if they reported having experienced at least one of the following: alteration of consciousness, posttraumatic amnesia, or loss of consciousness. For this study, the comprehensive TBI evaluation note entered into the patient's electronic medical record was the primary source used to document history of TBI. For each study participant with a history of TBI, the severity (mild, moderate, or severe) was also documented according to the currently accepted VA and Department of Defense criteria based on the durations of alteration of consciousness, posttraumatic amnesia, or loss of consciousness [35–36].

PTSD Diagnosis

Each participant's electronic medical record was reviewed by a neuropsychologist to determine whether the participant had a previous diagnosis of PTSD. Participants were classified as having a history of PTSD if a VA mental health provider (i.e., psychologist or psychiatrist) had assessed and subsequently diagnosed the participant with PTSD.

Data Analysis

Group characteristics were examined with the use of chi-square for categorical variables (e.g., sex, marital status, education level) and analysis of variance (ANOVA) for continuous variables (e.g., age, time back since most recent deployment). When appropriate, the Tukey Honestly Significant Difference test was used for ANOVA post hoc comparisons. Logistic regression was used to test for the effects of PTSD (yes, no), TBI (yes, no), and any significant covariates on the seven driving survey questions with dichotomous outcomes (problems with driving-related issues: more than before deployment, not more than before deployment). Due to the exploratory nature of this analysis, the alpha significance level was set at 0.05.

Qualitative Analysis of Driving Questionnaire

In addition to responding to the driving questionnaire, 60 telephone respondents also offered comments regarding driving-related changes they had experienced since returning from deployment. These comments ranged from sharing stories about specific experiences to thoughts about why they believed such changes had occurred. Some comments described problems that were initially experienced but had since resolved, while others described ongoing driving difficulties. One research team member de-identified comments offered by driving questionnaire telephone respondents, and three other research team members reviewed all de-identified questionnaire responses independently and developed a coding scheme for categorizing them. The team members then met to discuss common themes and reached consensus on a final coding list of 10 categories. Responses were also coded according to the persistence or resolved state of the complaint. Each reviewer then recoded all the responses based on this list and met again for a final coding comparison. All coders reached consensus for each response.

RESULTS

Participant Characteristics

A total of 205 (45.6%) OIF/OEF veterans completed the driving questionnaire (telephone, $n = 153$; mail, $n = 52$). Rates of PTSD and TBI were not significantly associated with sex, race/ethnicity, education level, marital status, branch of military, frequency of driving while deployed (for all χ^2 , $p > 0.05$), age (mean \pm standard deviation [SD] = 33.5 ± 10.0 years; all $F(1, 203) < 1.15$, $p > 0.25$), or number of tours (mean \pm SD = 1.48 ± 0.73 ; all $F(1, 203) < 1.50$, $p > 0.20$). Response rates by mail or survey also did not differ as a function of clinical group, all $\chi^2(1) < 1.00$, $p > 0.05$. Participants reported that they had returned from their most recent deployment between 2003 and 2009. Each response was converted to a numeric value based on the midpoint of the year that was indicated (e.g., 2009 = 0.5 years; 2008 = 1.5 years). On average, respondents had been back for 3.73 ± 1.39 years, but groups varied in their time since return from deployment, $F(3, 201) = 4.55$, $p = 0.004$. Participants with PTSD (mean \pm SD = 3.85 ± 1.40) had been back significantly longer than participants without PTSD (mean \pm SD = 3.45 ± 1.33), $F(1, 201) = 6.04$, $p < 0.02$. There was no significant difference in time since return for patients with TBI, $F(1, 201) = 2.56$, $p > 0.05$, but

there was a marginally significant PTSD \times TBI interaction, $F(1, 201) = 3.47, p < 0.07$. Among patients with PTSD, those without TBI (PTSD only group) had been back from deployment significantly longer (mean \pm SD = 4.35 ± 1.42) than those without TBI (Neither group, mean \pm SD = 3.60 ± 1.33), $t(146) = 3.16, p = 0.002$. Additional participant characteristics are summarized in **Table 1**.

Driving Questionnaire

Approximately 93 percent of respondents reported having more difficulties with driving in at least one domain compared with before deployment. Of the seven domains addressed in the questionnaire, the three most frequently endorsed driving-related problem areas were (1) problems with anger or impatience (82%), (2) general driving difficulties (65%), and (3) experiences with near misses (57%). While the specific prevalence rates differed, this pattern held true for all four clinical groups (**Figure 2**).

Relationship of TBI and PTSD with Driving Problems

Because there was a significant group difference in time back since deployment, this variable was included as a covariate for the logistic regression analyses. Responses to questions related to postdeployment general driving issues, traffic warnings, tickets, accidents, and near misses did not vary as a function of a TBI or PTSD diagnosis. There was a significant model related to postdeployment driving-related anger or impatience, $\chi^2(4) = 10.59, p < 0.04$. Participants who had a diagnosis of PTSD were more than three times more likely to report increased anger or impatience while driving relative to participants without a PTSD diagnosis (odds ratio [OR] = 3.65, 95% confidence interval [CI] = 1.08–12.31, $p < 0.04$). Clinical groups also differed in self-reported problems with becoming lost or disoriented while driving, $\chi^2(4) = 11.31, p < 0.03$. Participants with PTSD were significantly more likely to report becoming lost or disoriented while driving than participants without PTSD (OR = 6.06, 95% CI = 1.88–19.46, $p < 0.003$). There was also a marginal effect of TBI (OR = 2.84, 95% CI = 0.86–9.44, $p < 0.09$). However, these main effects were moderated by a significant PTSD \times TBI interaction (OR = 0.22, 95% CI = 0.05–0.89, $p < 0.04$). Follow-up analyses found that among participants without TBI, a significantly higher percentage of participants with PTSD only (62.5%) reported having more postdeployment driving problems with disorientation or getting lost than the percentage of participants in the Neither group (21.7%), $\chi^2(1) = 10.34, p = 0.001$. No significant effect was observed in participants with TBI.

Table 1.

Respondent demographics and characteristics. $N = 205$

Participant Characteristic	Frequency (%)
Sex	
Male	191 (93.2)
Female	14 (6.8)
Race/Ethnicity	
White, not Hispanic	150 (73.2)
Hispanic	23 (11.2)
Black or African American	19 (9.3)
Other (Asian, American Indian, Alaska Native, other)	13 (6.3)
Education	
College Graduate or More	46 (22.4)
Some College or Technical Training	118 (57.6)
High School Graduate, GED, or Less than High School	41 (20.0)
Marital Status	
Single	98 (47.8)
Married	81 (39.5)
Other (Widowed, Divorced, or Separated)	21 (12.7)
Branch of Military	
Army	136 (66.3)
Marines	57 (27.8)
Navy, Air Force, Coast Guard	12 (5.9)
Frequency of Combat Driving	
Frequently	137 (66.8)
Occasionally	39 (19.0)
Rarely/Never	29 (14.1)
Total No. of Combat Tours	
1	131 (63.9)
2	54 (26.3)
3	16 (7.8)
4	4 (2.0)
Clinical Diagnosis	
TBI + PTSD	100 (48.8)
PTSD Only	48 (23.4)
TBI Only	34 (16.6)
Neither PTSD nor TBI	23 (11.2)

GED = general equivalency degree, PTSD = posttraumatic stress disorder, TBI = traumatic brain injury.

Whether participants with TBI had a diagnosis of PTSD (51.0%) or not (44.1%), participants were statistically equally likely to report problems with disorientation or getting lost, $\chi^2(1) = 0.48, p = 0.49$.

Respondent Comments

The categorization of telephone participant responses may be seen in **Table 2**. Some veterans offered multipart responses that fell into more than one category. In these

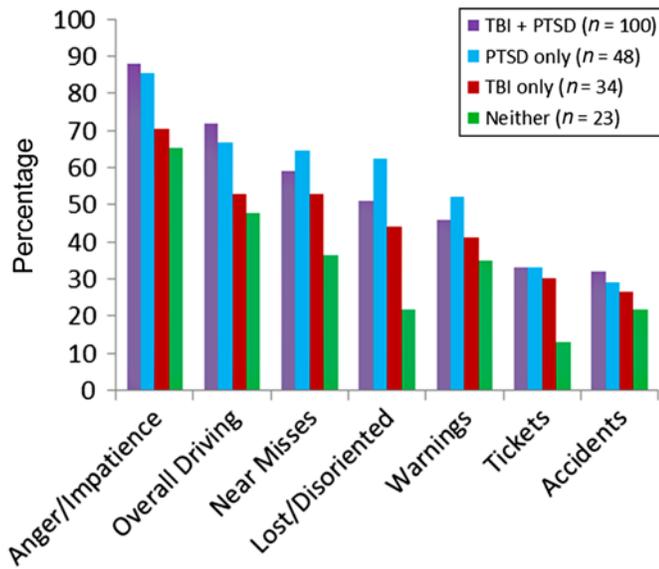


Figure 2.

Prevalence of veterans' self-reported postdeployment driving difficulties by clinical group: posttraumatic stress disorder (PTSD) only, traumatic brain injury (TBI) only, TBI and PTSD (TBI + PTSD), and neither condition (Neither).

cases, the comments were coded for multiple categories; however, responses for a single veteran were only counted once per category. Comments were offered by 60 participants, and this resulted in a total of 99 responses that were reported and coded. Review of the responses revealed that four was the maximum number of categories coded from a single participant's multipart comment. **Table 3** represents the breakdown of the persisting versus improved/resolved classification for each of the four clinical groups.

Frequently Reported Driving Problems

Consistent with the pattern of response to the driving questionnaire, the most common theme that emerged from the qualitative data was a self-perceived increase in postdeployment anger, aggression, or impatience while driving. Approximately one-fifth of the responses indicated that the veterans drove (and continue to drive) more aggressively. Specifically, driving behaviors such as speeding and tailgating were described, in addition to general aggressive driving maneuvers. Several veterans noted that they had sought treatment for their aggression.

The second most common driving-related problem that veterans commented on was lapses in attention. Many described this phenomenon as "zoning out" while driving. The consequences of this issue ranged from relatively benign experiences, such as frustration over being unable to

stay focused on where they were going, getting lost, and missing a turn or exit, to more concerning problems such as getting distracted and having more near misses or getting into accidents. Some veterans stated that when they zoned out, they were actually thinking about deployment-related experiences. Approximately 15 percent of the comments fell into this category, and among these, only one participant indicated that the problem had resolved.

Respondents also described difficulty in adjusting from driving in a combat zone to driving in a civilian environment. The comments that fell under this category were varied but generally indicated that many participants had (and continue to have) difficulty adjusting to driving in an environment that is relatively free of danger or threat. For example, several veterans reported that after returning home they continued to use battlemind driving skills that they had been taught to use to avoid being attacked during deployment (e.g., ignoring stop signs, not yielding to pedestrians). They also noted that they became anxious in driving situations that were not anxiety-provoking before deployment (e.g., driving over bridges, through tunnels, or in heavy traffic). Veterans stated that they also tended to confuse objects on the road (e.g., potholes, trash) for improvised explosive devices and tended to overreact to such stimuli by driving in the middle of the road or quickly swerving into other lanes to avoid contact with these objects. Some veterans also reported increased startle response since returning from deployment, such as experiencing intense anxiety or taking cover (while still driving) when hearing screeching tires. Although many legitimate potential driving threats existed in Iraq or Afghanistan, many veterans continued to perceive threats in similar driving situations even though they were no longer in a dangerous or threatening environment. Of all the reported driving difficulties, this category of problems was reported to have improved or resolved over time more than any other category.

DISCUSSION

The goals of this study were to document the prevalence and types of driving difficulties in a sample of OIF/OEF veterans seen at a VA polytrauma outpatient clinic. To our knowledge, no studies have investigated the prevalence or types of driving problems in this cohort to date.

The driving questionnaire indicated that driving problems were common in our sample, with 93 percent of participants self-reporting a negative change in at least one

Table 2.
Qualitative driving problems reported by survey respondents.

Driving Problem	Sample Participant Response	% Symptoms Reported as Persisting (out of 79 reported symptoms)	% Symptoms Reported as Improved or Resolved (out of 20 reported symptoms)
1. Anger/Aggression/Impatience	Has more of a temper than before deployment. Frustrated more easily; would ram into other vehicles if he would not get in trouble.	23 (<i>n</i> = 18)	20 (<i>n</i> = 4)
2. Lapses in Attention/Zoning Out	Sometimes zones out while driving, thinking about Iraq, and will drive by where he is going. Not sure how he reaches destinations because mind wanders.	18 (<i>n</i> = 14)	5 (<i>n</i> = 1)
3. Battlemind Training/Misperceived Threat/Reaction to Benign Stimuli	Tells wife to run through toll booths because he is afraid to stop. Gets anxious driving under bridges. Has had many near misses because he is afraid of pedestrians and does not always stop for crosswalks.	15 (<i>n</i> = 12)	30 (<i>n</i> = 6)
4. Hypervigilance/Heightened Attention	Thinks he is a better driver now because he pays more attention and is always looking for things on the side of the road.	10 (<i>n</i> = 8)	5 (<i>n</i> = 1)
5. Disorientation/Navigation Problems	Has lots of problems with directions, had to get GPS.	8 (<i>n</i> = 6)	5 (<i>n</i> = 1)
6. Anxiety	Has noticed heart racing when driving at night.	6 (<i>n</i> = 5)	0 (<i>n</i> = 0)
7. Flashbacks	Still has flashbacks, which cause him to have near misses.	6 (<i>n</i> = 5)	0 (<i>n</i> = 0)
8. Avoidance of Driving	Doesn't drive at all because of PTSD—it's hard to be in a vehicle at all.	5 (<i>n</i> = 4)	15 (<i>n</i> = 3)
9. Physical/Sensory Problems	Has most trouble driving at night because of vision issues.	3 (<i>n</i> = 2)	0 (<i>n</i> = 0)
10. Miscellaneous	Thinks a driving course would be helpful if it were available, because it would help a lot if everyone got retrained in driving.	6 (<i>n</i> = 5)	20 (<i>n</i> = 4)

GPS = global positioning system, PTSD = posttraumatic stress disorder.

Table 3.
Persistence or improvement of driving problems reported by clinical groups.

Group	Persisting (%)	Improved or Resolved (%)
TBI Only (total responses = 12)	50	50
PTSD Only (total responses = 19)	79	21
TBI + PTSD (total responses = 59)	88	12
Neither (total responses = 9)	67	33

PTSD = posttraumatic stress disorder, TBI = traumatic brain injury.

domain of driving ability since returning from deployment. The three most common driving-related problems endorsed by veterans in our sample were increased anger or impatience, general driving difficulties, and near misses, respectively. This pattern held true not only for the sample as a whole, but also when the sample was broken down into the four diagnostic groups (TBI only, PTSD only, TBI + PTSD,

and Neither). A similar pattern emerged in the qualitative data. The most frequent driving-related comments were related to increased anger, aggression, and impatience; frequent lapses in attention; and difficulties adjusting to driving in a noncombat (nonthreatening) environment, respectively. As described by some respondents, lapses in attention could be related to the previously described increase in near misses.

Veterans who had returned to a civilian setting sooner would be expected to have quicker diminishment or resolution of postdeployment readjustment problems. Yet, we observed the opposite in our sample. Patients who were diagnosed with PTSD had been back from deployment for significantly longer than patients without PTSD, but more patients with PTSD reported problems with anger and disorientation while driving. Moreover, although the small sample size comprising **Table 3** precludes making generalizations, participants in this sample with a diagnosis of

PTSD (PTSD only or PTSD + TBI) appear to have more persistent driving problems than participants without PTSD. The discrepancy in the resolution of driving difficulties might be due to the chronic nature of PTSD symptoms (given the low rate of recovery in untreated patients) [37], unlike the symptoms of mTBI, which are generally expected to resolve without treatment within a month of injury [24]. Our findings are consistent with other studies reporting that PTSD symptoms and deployment-related mTBI are associated with self-perceived impairments in emotional, physical, and social functioning [38–39]. Similarly, Sayer et al. found that OIF/OEF veterans with probable PTSD experience anger (though not necessarily while driving), engage in dangerous driving upon returning home, and generally struggle more with reintegration than veterans without PTSD [40]. Irrespective of the significant group differences, we highlight that self-reported anger/impatience ranged from 65.2 percent (Neither group) to 88.0 percent (TBI + PTSD group) and becoming lost/disoriented ranged from 21.7 percent (Neither group) to 62.5 percent (PTSD only group), indicating that these emotional and cognitive/perceptual driving-related problems were prevalent in this OIF/OEF veteran sample. We caution that we do not know what types of therapies or treatments these veterans may have received since their return from deployment, which might also account for this difference in the remission of driving difficulties between groups.

Overlap of mTBI and PTSD symptoms has been documented [14], and in the current study, we observed a general trend that proportionally more individuals diagnosed with PTSD and coexisting TBI and PTSD tended to endorse the driving-related problems itemized in the driving questionnaire. These preliminary results suggest that while all patients undergoing an mTBI evaluation should be queried on driving-related issues, increased attention should be paid to those with a PTSD diagnosis. Indeed, the qualitative responses offered by veterans indicated that PTSD-related symptoms (i.e., exaggerated startle response, hypervigilance, anxiety, anger, difficulties with attention/concentration, flashbacks, and avoidance of driving) were problematic, and even though some symptoms resolved over time, many still persisted years beyond return from deployment. An extensive literature exists regarding an association between motor vehicle accidents and the development of PTSD [41–45], yet no studies (to our knowledge) have specifically examined how PTSD affects driving. With an estimated range of 75,000 to 225,000

OIF/OEF servicemembers who will be diagnosed with PTSD and given the types of driving-related problem areas described in the current sample, PTSD's association with driving problems warrants further study, because driving is an important activity of daily living.

Several factors could be contributing to the driving difficulties that veterans described. All soldiers undergo battlemind training that teaches them aggressive driving skills that are meant to be life-preserving in a combat situation. Numerous veterans reported having difficulty unlearning these behaviors once returned to a civilian setting. While this category was noted to be the most likely to improve or resolve following return from deployment, the small sample size precludes identifying specific factors regarding who will get better.

Role of Sleep Disturbance and Substance Abuse in PTSD and Driving Issues

As described, cognitive dysfunction (particularly in the areas of attention/concentration and executive functioning), emotional dysregulation, and increased startle response are symptoms of PTSD that may negatively affect driving performance. Although not assessed in the current study, additional contributors to decreased driving performance could be sleep disruption and substance abuse, which are commonly comorbid with PTSD. A growing body of research suggests that PTSD negatively affects sleep [46–48]. In one study of OIF/OEF veterans who had various combinations of the “Polytrauma Clinical Triad” of pain, PTSD, and TBI, nearly 94 percent of the sample reported trouble falling or staying asleep [49]. Similarly, problematic substance use is endorsed by a greater number of OIF/OEF veterans with PTSD compared with those without PTSD [40,50]. Given that insufficient sleep is known to impair driving ability [51–54] and problematic drinking has been linked to even greater risk for collisions [55], it seems likely that both problems could also be contributing to the driving difficulties noted in our sample. Although patients in the present study were not systematically evaluated for any type of sleep problems or substance abuse, future studies are needed to examine the impact of these conditions on driving safety in individuals with PTSD.

Limitations

A number of limitations to the study should be addressed. Participants were recruited from a single VA polytrauma outpatient clinic that, by its nature, evaluates

and treats veterans who have sustained physical, cognitive, or emotional injuries. Therefore, the rates of TBI and PTSD in our sample are likely higher than in the general OIF/OEF veteran population. Also important to note is that only 205 out of 450 people were able to be reached and agreed to participate in the study. Contacting those who were not working or were prone to staying at home may have been easier, and therefore, this may represent a biased sample with higher rates of TBI and/or PTSD, diagnoses that may limit function and participation in the workforce. Although slightly less than half responded to the survey, we note that the study's 45.6 percent participation rate is in the response rate range (28.5% to 59.0%) [31,56–57] of other published OIF/OEF servicemember survey responses.

Cognitive deficits associated with TBI may lead to memory difficulty and inability to accurately identify problems one may have experienced. In this study, respondents recalled driving behaviors, on average, 3.5 to 4.0 years after return from deployment and the driving questionnaire also did not define a circumscribed period upon return (e.g., 3 months) to consider driving difficulties. Together this may have led to an underreporting of symptoms, recall bias, or other memory inaccuracies. Future studies should be designed to prospectively follow veterans longitudinally and assess driving problems veterans encounter immediately upon return from deployment as well as over time. These studies may also want to include observations from significant others to corroborate self-reported findings. This systematic approach would allow for targeted assessment and rehabilitation strategies for safe driving.

The primary instrument used to gather the data collected in this study also has some limitations. The driving questionnaire was created specifically for this study and its psychometric properties have yet to be evaluated. Although the wording of the questions may also have elicited a response bias toward reporting an increase in driving difficulties, all questions were worded the same way and therefore had an equal likelihood of eliciting an "increased" report of driving problems. While the data may represent an overendorsement of driving difficulties, the pattern of responses among the questions may reflect a pattern that is representative of the specific problems that OIF/OEF veterans with PTSD and TBI are experiencing. We also note that the driving-related problems sampled in the questionnaire may not be independent from one another and that some may be manifestations of

others (e.g., near misses resulting from lapses in attention), as suggested by respondent comments. However, we believe that this study provides a snapshot of driving-related problems that some veterans are currently experiencing and provides a good foundation for further exploration of OIF/OEF veteran driving issues.

Another limitation of the study is that the qualitative data were not gathered in a structured manner, because those who mailed back their surveys were not given an explicit opportunity to offer comment. By contrast, comments from telephone respondents were elicited and recorded by the interviewers when respondents offered thoughts beyond their responses to the driving questionnaire. The qualitative data reported here may not fully capture in detail the extent to which all veterans from our sample were having driving-related issues.

Considering the existing literature documenting the negative impacts of moderate to severe TBI on driving skills [58], we emphasize that the findings in this present study should not be generalized to other TBI populations, which include a spectrum of mild, moderate, and severe TBIs. Instead, the current findings are likely specific to patients seen in a VA PNS outpatient clinic.

Implications

While definitive conclusions cannot be drawn from the data collected in this study, the data suggest that post-deployment driving difficulties are a real problem that many veterans in our sample experienced. Furthermore, a relationship between driving difficulties and PTSD appears to exist. Given the large number of veterans who have, or will have, served in the current war, the consequences of unsafe driving have the potential to be significant and widespread. It is critical that appropriate prevention, assessment, and treatment programs be established to address driving-related issues. For example, many participants in our sample anecdotally noted that their driving difficulties were most noticeable during the first several months after returning home. Just as soldiers are taught combat driving skills before deployment, they may need to be retaught civilian driving skills and safe driving practices upon their return. Increased anger and impatience while driving were significant concerns for the majority of the participants in our sample, even those without a history of PTSD or TBI. Instruction in anger-management strategies to be used when driving may be beneficial to returning OIF/OEF servicemembers. This is an issue that must continue to be addressed and studied in

order to provide veterans with the skills they need to ensure a smooth and safe transition when returning home from deployment.

CONCLUSIONS

In this study, 205 OIF/OEF veterans completed a survey comparing their current civilian driving ability to predeployment driving skills and 93 percent reported experiencing some degree of increased driving difficulty. Comments offered by respondents suggested that difficulties with anger, unlearning battlemind driving behaviors, and sustaining attention while driving were the most common types of problems experienced in this sample of OIF/OEF veterans. While the limited sample precludes large-scale generalizability, these findings suggest a significant and serious problem that has potentially fatal consequences for both veterans and other drivers on the road. Given the large number of people potentially affected by this issue, additional research to develop ways of addressing the driving-related difficulties experienced by OIF/OEF veterans is imperative.

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