Understanding the Link Between Traumatic Brain Injury Accompanied by Loss of Consciousness and Well-Being: A Sample of UK Military Veterans

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Objective: To investigate the association between reported traumatic brain injury plus loss of consciousness (TBI + LOC) and a range of demographic, military, and physical and mental health factors among a sample of UK veterans seeking support for mental health difficulties. **Design:** The present study was a cross-sectional study. **Participants:** Clinical records were used to identify a sample of treatment-seeking UK veterans ($N = 3335$), of which a total of 403 took part. **Main Measures:** Information on demographic characteristics, military experiences, and a range of physical and mental health difficulties was collected. **Results:** Almost half of the sample (48%) reported a TBI + LOC, which was most strongly associated with drug use and childhood adversity. More modest associations also emerged with earlier service termination, likelihood of unemployment, as well as chronic pain and poor mobility. **Conclusion:** The findings suggested that TBI + LOC may not specifically be associated with symptoms of posttraumatic stress in a sample of treatment-seeking veterans. The demonstrated links between TBI + LOC and adverse childhood, drug use, physical health, and employment may be useful in improving the assessment and rehabilitation of veterans with TBI + LOC. **Key words:** *head trauma*, *loss of consciousness*, *treatment-seeking veterans*, *traumatic brain injury*

RESEARCH HAS IDENTIFIED traumatic brain injury (TBI) as a risk factor of psychiatric difficulties.[1] TBI has been defined as a "physiological disruption of brain function" resulting from an external force impacting the head and can be characterized as an impact to the head that is followed by a state of confusion or disorientation, loss of memory, or a period of unconsciousness.[2] Following TBI, individuals may experience various physical (eg, headaches, dizziness, sleep disturbances), cognitive (eg, poor memory), and behavioral/emotional symptoms (eg, irritability, depression, anxiety).[3] Although these symptoms often subside, many report a persistence of such difficulties in the months following a TBI.[4] This has previously been defined as "postconcussion syndrome" (PCS).[5] Despite initially conceptualizing PCS as result of TBI, more recent data provide compelling evidence that PCS may instead arise as a response to deployment-related psychological distress.[6,7] Other research has suggested that PCS may, in fact, be explained by the comorbid presentation of TBI and posttraumatic stress disorder (PTSD) rather than either one of the two.[8]

Clearly, there remains ambiguity regarding the long-term consequences of TBI. Developing a better understanding of the consequences of TBI is especially relevant in the military context as personnel are at risk of various physical and mental health difficulties, and due to military training and combat, it is not uncommon for veterans seeking support for such difficulties to report sustaining a TBI.[9–11] For example, about 45% of a sample of American veterans seeking support for their mental health difficulties (ie, treatment-seeking veterans) reported a history of lifetime TBI.[12]

Studies have consistently demonstrated an association between TBI and symptoms of PTSD, observed among US and UK military personnel alike.[4,13] Estimates suggest that up to 40% of military personnel reporting a TBI sustained during combat are likely to

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report comorbid PTSD.[14,15] However, the development of PTSD symptoms not only does follow deployment-related TBI[10,16] but also occurs within the civilian population.[17] Evidence suggests that, rather than the head injury itself, it is the loss of consciousness (LOC) following head impact that may predict the development of mental health difficulties such as PTSD and depression.[8] This is in line with findings of a dosage effect in terms of severity of TBI and severity of subsequent symptoms classified as PCS.[18] While this raises to question whether subsequent mental health difficulties may be partially due to alterations in brain physiology during TBI, such a dosage effect does not rule out that difficulties may arise as a response to the high stress associated with the situations in which TBI is sustained. Finally, research has demonstrated that TBI may be independently associated with comorbid medical disorders (although seemingly rare), while comorbid psychiatric diagnoses and functional outcomes are better predictors of PTSD irrespective of TBI.[19] Clearly, the seeming uncertainty of the correlates of TBI implies that caution should be taken to avoid an overstatement of its link with PTSD and other mental health difficulties,[20] and further clarity is necessary.

Currently, the majority of the research aimed at understanding TBI and its relation to mental health outcomes comes from the United States.[8,21,22] This may relate to the high prevalence of TBI observed among US military personnel. As much as 12% to 23% of US military personnel may sustain TBI,[21,23] with substantially lower rates among Canadian (5.2%)[24] and UK military personnel (4.4%).[4] However, the noted differences in prevalence may relate to country-relevant differences in TBI awareness and criteria for diagnosis[25] or from biases associated with the time frames in which TBI is reported.[22,26] Nonetheless, it remains relevant to gain further insight into the difficulties associated with TBI among UK military personnel to ensure the application of appropriate assessment and treatment measures.

As such, the aim of the present study was to investigate the relationship between a reported lifetime TBI and a range of demographic factors, as well as physical and mental health difficulties, within a UK sample of treatment-seeking veterans. Following from literature demonstrating an increased risk of mental health difficulties after TBI involving time spent unconscious,[8] TBI was defined in the present study as reported impact to the head accompanied by LOC.

METHODS

Setting

Participants were recruited from Combat Stress (CS), the largest UK charity offering treatment to veterans seeking mental health support. Details of the clinical support provided at CS are described elsewhere.[27] The sample was recruited from CS because of its nationwide coverage (ie, not geographically restricted) and the high number of yearly referrals (about 2500),[28] thus representing a substantial number of treatment-seeking UK veterans.

Participants

The data used in this study were from a previous study that examined the needs of treatment-seeking veterans.[29] A random sample of participants was recruited from CS between January 31, 2015, and February 1, 2016. Participants were treatment-seeking veterans, defined as having attended a mental health treatment appointment subsequent to the initial assessment. This was to ensure that the sample would be representative of treatment-seeking veterans across the United Kingdom. Previous reports demonstrated that those who took part in the study did not differ from those who did not.[29] It is worth noting that treatment-seeking UK and Australian veterans have previously been shown to have similar demographic and mental health profiles,[30] suggesting that the current sample may be representative of the wider treatment-seeking veteran population. However, previous research suggests that the profile of the present sample may differ from the wider UK veteran population.[31] It is perhaps not surprising that demographic differences exist between the treatment-seeking and wider veteran populations as the demographics of treatment-seeking veterans (eg, male, deployment experience, lower ranks, combat roles) are similar to those identified as risk factors for PTSD in a study representative of the wider military population.[32]

Of 3335 veterans who attended at least one CS treatment appointment, 667 (20%) were randomly selected for the present study. Four participants passed away prior to the start of data collection and another 63 were later removed because of insufficient address information. Of the remaining 600 treatment-seeking veterans, 403 completed and returned the questionnaires (response rate = 60.4%). Eight participants were excluded because of missing data on the presence of TBI item, one due to reporting no TBI but LOC and another 11 for reporting TBI but missing data on item assessing LOC.

The final sample consisted of 383 treatment-seeking veterans (M_{age} = 50.86 years, SD_{age} = 12.59).

Measures

Participants completed a questionnaire booklet and provided information of sociodemographics, military history, childhood adversity, and physical and mental health outcomes.

Demographics

Participants provided information regarding age, sex, relationship status, and current employment status. They also provided details of their military history including service enlistment before leaving the military, length of service, and years since leaving the service.

Childhood adversity

Participants provided information on experienced childhood adversity by responding to 16 true-or-false items relating to difficult early life events.[33] Childhood adversity was categorized into low (0-5 adverse childhood experiences) and high (≥6 adverse childhood experiences). Factors of childhood adversity (family-related adversity and externalizing childhood behaviors) were also computed.[33] Items were counted to create 3 categories (ie, low, medium, and high) for each factor separately, before being dichotomized as low and medium counts versus high count.

Physical health

Using an NHS screening tool commonly used by a general district hospital,[29] participants indicated the current presence of 14 physical health complaints. They also reported on body mass index.

Traumatic brain injury

Participants reported on a lifetime TBI by indicating whether they "ever had a serious blow to the head" (yes/no [*Y/N*]). If yes, they were then asked to indicate whether they experienced (i) an alteration in mental state (*Y/N*), (ii) a memory gap lasting over an hour (*Y/N*), and (iii) LOC (*Y/N*), as well as how long it lasted. The present study defines TBI as reporting a serious blow to the head accompanied by LOC.

Mental health

Participants also reported on their mental health using various validated health questionnaires. The 20-item *PTSD Checklist for DSM-5* (PCL-5) was used to assess the presence and severity of PTSD symptoms over the past month,[34] with a cutoff score of 34 indicating a provisional PTSD diagnosis within UK military populations.[35] The 12-item *General Health Questionnaire* (GHQ-12) was used to assess general well-being over the past month, with a cutoff score of 4 or more indicating case criteria of general psychological distress.[36]

The 5-item *Dimension of Anger Reactions* (DAR-5) was used to assess difficulties with controlling anger, with a cutoff score of 12 or higher indicating probable anger difficulties.[37] The 4-item *Walter Reed Four* (WR-4), developed by the Walter Reed Army Institute of Research was used to measure overt aggression over the past month.[38] Scores were summed, and caseness was defined as scores in the highest tertile.

The *Work and Social Adjustment Scale* (WSAS) was used to assess functioning across various life domains, with a cutoff score of 20 indicating severe functioning impairment.[39] The 10-item *Alcohol Use Disorders Identification Test* (AUDIT) was used to assess problems with alcohol use over the past month.[40] Scores were categorized into no harmful consumption (0-7), hazardous drinking (8-15), and harmful drinking/mild dependence (16+). Finally, participants indicated how often they used nonprescription drugs over the past month on a scale ranging from 0 (*never*) to 4 (*four or more times a week*), with a score of 1 or higher indicating drug use.

Procedure

Participants were mailed the questionnaire booklet via a 3-try mailing strategy. They were made aware that participation was independent of CS clinical services and that participation was voluntary and that they had the right to withdraw at any time. A research assistant made 3 phone attempts to establish contact with those who did not respond and to inquire about their interest in the study. Data were collected between April and August 2016.

Statistical analyses

The analyses were conducted in a stepped manner. First, multiple χ^2 tests were conducted to determine whether, as compared with no TBI, TBI accompanied by LOC (TBI + LOC) was associated with a range of demographic, childhood adversity, physical health, and psychological health variables. Next, separate logistic regressions were conducted with TBI + LOC as the dependent variable for each variable identified as a significant predictor. An additional logistic regression was conducted with all significant predictors to account for explained variance.

Exploratory analyses

Additional logistic regressions were conducted with TBI + LOC as the dependent variable and all mental health outcomes as predictors, while controlling for the significant demographic predictors.

RESULTS

Of a sample of 383 participants, 184 (48.0%) reported having sustained a TBI + LOC. Additional descriptive information of the sample is outlined in Tables 1 and 2.

Tables 1 and 2 examine the association between TBI + LOC with demographic information, childhood adversity, and physical and mental health outcomes. Data

TABLE 1 *Associations between demographic information and childhood adversity with presence of TBI + LOC*

		Association with TBI +LOC vs no TBI	
Participant characteristics (*N* = 383),	***n*/*N* (%)**	**χ^2**	***P***
Age, y			
<35	46/383 (12.0)		
35-44	91/383 (23.8)	0.77	.856
45-54	104/383 (27.2)		
55+	142/383 (37.0)		
Sex			
Male	367/383 (95.8)	0.16	.694
Female	16/383 (4.2)		
Relationship status			
In a relationship	259/383 (67.6)	0.68	.409
Single/divorced/separated/widowed	124/383 (32.4)		
Service			
Naval services	29/383 (7.6)	3.83	.148
British Army	327/383 (85.4)		
Royal Air Force	27/383 (7.0)		
Service length, y			
<4	43/383 (11.2)	7.98	.019[a]
4-14	193/383 (50.4)		
15+	147/383 (38.4)		
Time since leaving forces, y			
<5	49/383 (12.8)	3.51	.173
5-15	120/383 (31.3)		
15+	214/383 (55.9)		
Employment status			
Working	121/383 (31.6)	7.22	.027[a]
Not working	92/383 (24.0)		
Not working due to ill health	170/383 (44.4)		
Childhood adversity			
Low (0-5)	213/383 (55.6)	11.45	.001[a]
High (6+)	170/383 (44.4)		
Family adversity	102/383 (26.6)	2.24	.135
Externalizing behaviors adversity	107/383 (27.9)	6.32	.012[a]

Abbreviations: LOC, loss of consciousness; TBI, traumatic brain injury.
[a] $P \leq .05$.

revealed that the presence of TBI + LOC was significantly associated with service length ($P = .019$), current employment status ($P = .027$), number of reported adverse childhood experiences ($P = .001$), childhood externalizing behaviors ($P = .012$), chronic pain ($P = .014$), poor mobility ($P = .025$), and drug use ($P = .005$). In terms of mental health difficulties, no significant interactions were found between the presence of TBI + LOC and symptoms of PTSD (PCL-5), general psychological distress (GHQ-12), anger difficulties (DAR-5 and WR-4), functional impairment (WSAS), or alcohol use (AUDIT).

Tables 3 and 4 explore the relationship between TBI + LOC and the significant predictors as outlined earlier. Data showed that participants with TBI + LOC were less likely to report serving for 15 years or more as compared with less than 4 years. More specifically, 31% of participants with TBI + LOC served for 15+ years compared with 45.2% of those without TBI. However, this association disappeared when controlling for other predictors. Participants with TBI + LOC were also more likely to report not working due to ill health than to report being employed. However, after controlling for other predictors, participants with TBI + LOC were more likely to indicate not working due to reasons not attributed to ill health than to report being employed.

Participants with TBI + LOC were also more likely to indicate experiencing a greater number of adverse childhood events, an association that remained after controlling for other predictors. More than half (53.8%) of participants with TBI + LOC reported experiencing 6 or more childhood adverse events, whereas only 35.7%

TABLE 2 *Association between presence of TBI + LOC and physical and mental health outcomes*[a]

Participant characteristics ($N = 383$)	n/N (%)	Association with TBI + LOC vs no TBI	
		χ^2	P
BMI			
Normal	88/366 (23.0)	0.42	.810
Overweight	141/366 (36.8)		
Obese	137/366 (35.8)		
Physical health outcomes			
Chronic pain	159/383 (41.5)	5.98	.014[b]
Poor mobility	133/383 (34.7)	5.00	.025[b]
Hearing impairment	115/383 (30.0)	0.00	.973
High/low blood pressure	95/383 (24.8)	0.20	.659
Gastro/digestive problems	84/383 (21.9)	0.63	.428
Heart problems	57/383 (14.9)	2.66	.103
Respiratory problems	58/383 (15.1)	2.77	.096
Diabetes	57/383 (14.9)	1.81	.179
Other physical health difficulties	57/380 (15.0)	0.03	.874
Communication problems	53/383 (13.8)	3.44	.064
Sight impairment	45/383 (11.7)	0.00	.963
Neurological problems	28/383 (7.3)	2.99	.084
Liver or kidney problems	27/383 (7.0)	0.00	.964
Limb amputation	7/383 (1.8)	1.49	.222
Mental health outcomes			
Provisional PTSD diagnosis	328/383 (85.6)	1.17	.279
General psychological distress	273/383 (71.3)	0.60	.440
Anger difficulties	280/381 (73.5)	0.50	.480
Overt aggression	107/375 (28.5)	0.00	.993
Severe functional impairment	255/383 (66.6)	0.06	.801
Drinking behavior			
Drinking-related harm (4+)	223/383 (58.2)	4.32	.116
Hazardous drinking (8+)	80/383 (20.9)		
Heavy drinking (16+)	83/383 (21.3)		
Drug use	42/380 (11.1)	7.84	.005[b]

Abbreviations: BMI, body mass index; LOC, loss of consciousness; PTSD, posttraumatic stress disorder; TBI, traumatic brain injury.
[a]Provisional PTSD diagnosis, general psychological distress, anger difficulties, overt aggression, severe functional impairment, and drinking behavior were assessed with the PTSD Checklist for DSM-5, 12-item General Health Questionnaire, 5-item Dimension of Anger Reactions, 4-item Walter Reed Four, Work and Social Adjustment Scale, and Alcohol Use Disorders Identification Test, respectively. Caseness of each mental health outcome is outlined in the description of the measures.
[b]$P \leq .05$.

of participants without TBI reported such a history of childhood adversity. Participants with TBI + LOC were also almost twice as likely to report externalizing behaviors during childhood. A total of 33.7% of participants with TBI + LOC and 22.6% of participants without TBI reported externalizing behaviors during childhood.

In terms of physical health, data showed that participants with TBI + LOC reported a significantly higher rate of chronic pain (48.4%) and poor mobility (40.8%). Finally, participants with TBI + LOC were more likely to report using drugs, with 15.8% of participants with TBI + LOC and only 6.5% of participants with no TBI. The association between TBI + LOC and drug use remained significant when controlling for additional predictors.

Exploratory analyses

To specifically explore the association between mental health outcomes and TBI, additional logistic regressions, controlling for significant demographic predictors, were conducted with all mental health predictors. Posttrauma symptoms (PCL-5), general psychological distress (GHQ-4), anger (as reported on both DAR-5 and WR-4), and functional impairment (WSAS) remained nonsignificant predictors of TBI + LOC (all Ps > .168). However, there was a significant association between alcohol use and TBI + LOC. Participants with TBI + LOC were more likely to report hazardous drinking, as indicated by a score of 16+ on the AUDIT measure (OR = 1.11; 95% CI, 0.64-1.91).

TABLE 3 *Logistic regression of significant demographic and childhood adversity predictors*[a]

Variable	No TBI, *n* (%)	TBI + LOC, *n* (%)	No TBI vs TBI + LOC			
			Unadjusted OR (95% CI)	*P*	Adjusted OR (95% CI)[b]	*P*
Frequency	199 (52.0)	184 (48.0)	. . .		. . .	
Service length, y						
<4	19 (9.5)	24 (13.0)	1		1	
4-14	90 (45.2)	103 (56.0)	0.91 (0.47-1.76)	.771	1.15 (0.56-2.33)	.707
15+	90 (45.2)	57 (31.0)	0.50 (0.25-0.997)	.049[c]	0.66 (0.32-1.37)	.263
Employment						
Working	76 (38.2)	45 (24.5)	1		1	
Not working	46 (23.1)	46 (25.0)	1.69 (0.97-2.93)	.062	1.94 (1.07-3.53)	.029[c]
Not working due to ill health	77 (38.7)	93 (50.5)	2.04 (1.27-3.29)	.003[c]	1.60 (0.94-2.74)	.085
Childhood adversity						
Low (0-5)	128 (64.3)	85 (46.2)	1		1	
High (6+)	71 (35.7)	99 (53.8)	2.10 (1.39-3.16)	.000[c]	1.92 (1.17-3.13)	.009[c]
Externalizing childhood behaviors						
No	154 (77.4)	122 (66.3)	1		1	
Yes	45 (22.6)	62 (33.7)	1.74 (1.11-2.73)	.016[c]	1.32 (0.78-2.26)	.305

Abbreviations: CI, confidence interval; LOC, loss of consciousness; OR, odds ratio; TBI, traumatic brain injury.
[a]The first category of each variable serves as the reference group for each logistic regression.
[b]Adjusted for service length, employment, childhood adversity, externalizing childhood behaviors, chronic pain, poor mobility, and drug use.
[c]$P \leq .05$.

DISCUSSION

Current findings

The present study revealed a high rate of mental health difficulties among a sample of treatment-seeking UK veterans, including general psychological distress, symptoms of PTSD, anger difficulties, alcohol use, and functional impairment. Furthermore, the results indicated that a substantial number of veterans (48.0%) reported a lifetime TBI. While the study demonstrated

TABLE 4 *Logistic regression of significant physical and mental health predictors*[a]

Variable	No TBI, *n* (%)[b]	TBI + LOC, *n* (%)	No TBI vs TBI + LOC			
			Unadjusted OR (95% CI)	*P*	Adjusted OR (95% CI)[c]	*P*
Frequency	199 (52.0)	184 (48.0)	. . .		. . .	
Chronic pain						
No	129 (64.8)	95 (51.6)	1		1	
Yes	70 (35.2)	89 (48.4)	1.73 (1.15-2.60)	.009[d]	1.52 (0.93-2.50)	.098
Poor mobility						
No	141 (70.9)	109 (59.2)	1		1	
Yes	58 (29.1)	75 (40.8)	1.67 (1.09-2.56)	.017[d]	1.18 (0.70-1.99)	.529
Drug use						
No	184 (92.5)	154 (83.7)	1		1	
Yes	13 (6.5)	29 (15.8)	2.67 (1.34-5.31)	.005[d]	2.37 (1.15-4.90)	.020[d]

Abbreviations: CI, confidence interval; LOC, loss of consciousness; OR, odds ratio; TBI, traumatic brain injury.
[a]The first category of each variable serves as the reference group for each logistic regression.
[b]Drug use: No TBI, $N = 197$; TBI + LOC, $N = 183$.
[c]Adjusted for service length, employment, childhood adversity, childhood externalizing behaviors, chronic pain, poor mobility, and drug use.
[d]$P \leq .05$.

important associations of TBI with demographic factors and physical health, there appeared to be a scarce association with mental health difficulties.

More specifically, the results demonstrated that veterans who reported TBI + LOC, compared with no TBI, were more likely to report having served for less than 4 years in the military and were more likely to report being unemployed because of poor health. They were also more likely to have experienced a greater number of adverse events during childhood and to have engaged in more externalizing behaviors during their childhood. Finally, they were also more likely to indicate difficulties with chronic pain and poor mobility, as well as to engage in drug use. The results further revealed that when controlling for predictors of TBI, TBI + LOC was only significantly associated with employment status, number of adverse childhood experiences, and drug use. More specifically, veterans with TBI + LOC were more likely to report being unemployed (irrespective of ill health) than employed. They were also more likely to report more adverse childhood events and using drugs.

Interpretation

The prevalence observed in the present study was substantially higher than estimates of community samples of Canadian, US, and UK veterans,[4,21,23,25] as well as the general population (~12%).[41] This may be due to the focus on the prevalence of a lifetime TBI, rather than being restricted to incidence rates during, for example, typical 12-month deployments. Alternatively, as the estimate was similar among other samples of treatment-seeking UK veterans,[42] this likely suggests a higher incidence of TBI among military personnel who are seeking support.

As the study examined lifetime TBI prevalence, it could be assumed that chances of sustaining a TBI may increase with time spent in military services. However, the findings suggested that veterans reporting TBI are more likely to fall in the category of "early service leavers" (ESLs), defined in the United Kingdom as leaving the military within the first 3 to 4 years.[43] Research has suggested that ESLs are at an increased risk of probable PTSD and other mental and physical health difficulties[43] and that they may in fact leave services early due to preexisting mental health difficulties.[44] There are also trends suggesting that ESLs may report more childhood adversity,[43] which may partially explain the increased incidence of TBI in this group. Importantly, the present study indicates that the association between ESLs and TBI may be accounted for by a higher frequency of adverse childhood events as well as drug use.

The findings further highlighted an important link between TBI and employment status, irrespective of other predictors. Previous research demonstrated that military personnel with moderate-to-severe TBI history were more likely to be unemployed but that those with mild TBI were no more likely to be unemployed than those with no TBI history.[45] Although the present study did not examine the association based on TBI severity due to power concerns, it is important to note that 78.5% of the participants reported LOC under 30 minutes, which has previously been used to define mild TBI.[46] Contrary to findings that unemployment increases with the presence of multiple psychiatric conditions across levels of TBI,[45] the presence of mental or physical health conditions did not fully account for the association between TBI and unemployment in this study.

Previous research demonstrated that pain was associated with comorbid TBI and PTSD but not specifically associated with TBI and that pain reported among military personnel with TBI presented most frequently as headaches.[19] However, other research suggests that the vast majority of veterans reporting TBI also report difficulties with pain.[47] The present study also demonstrated an association between TBI and poor mobility, which is in line with previous reports suggesting that a substantial proportion of individuals report movement difficulties following a TBI.[48] A recent study further demonstrated that, among a sample of veterans, dual-tasking significantly increased mobility issues.[49] Although this may be attributed to the cognitive strain introduced by the dual-task, the present study corroborates that there is an experiential awareness of mobility issues among military personnel with TBI history. This could be important to consider as it may significantly impact their daily activities and quality of life.

There are plenty studies demonstrating a link between TBI and mental health difficulties such as PTSD, anxiety, and depression.[9,11,50] Contrary to such evidence, the present study found no association between TBI and various psychological problems. Furthermore, in contrast to evidence suggesting that TBI may be a risk factor for PTSD,[16] there was no association observed specifically between TBI and PTSD. However, this may be explained by the use of a clinical sample in the present study. As treatment-seeking UK veterans present with high rates of psychological difficulties,[51] the present study may have lacked sufficient power to detect differences in mental health correlates of TBI. Alternatively, the association may be dependent on TBI being sustained in a deployment or combat setting,[10,16] which may have been missed in an assessment of lifetime TBI prevalence. However, as previously stated, similar associations between TBI and PTSD have been observed among civilian populations.[17] Contrary to previous research demonstrating a significant association between TBI and functional impairment, even when controlling

for psychological well-being,[52] functional impairment did not appear to be associated with TBI. The findings did, however, suggest that military personnel with TBI may be at an increased risk of engaging in drug use.

Limitations

The present study had limitations. First, the study included many variables, which may have increased the chance of significant findings. This was controlled for by conducting the analyses in a stepped manner to first identify predictors that were significant before further conducting logistic regressions and outlining the additional regressions of mental health predictors as exploratory. Second, the study offers limited insight into the effects of TBI sustained during service as TBI was assessed in terms of lifetime prevalence. Alongside this, the present study was limited in the ability to draw inferences regarding the association between TBI and childhood adversity, as no data were collected regarding the manner or age that TBI was acquired.

Third, the study did not account for severity of brain injury (eg, mild TBI vs more severe TBI). Although severity could be argued on the basis of duration of LOC,[8] the present study did not investigate this due to power concerns. Finally, the data were cross-sectional and were reported postdeployment. Postdeployment assessment of probable TBI symptoms may be inflated compared with if assessed during deployment.[22] Although the present study aimed to examine the association of a lifetime TBI to symptoms not directly linked to TBI (in terms of veterans' awareness), such an effect is worth consideration.

CONCLUSION

The present study demonstrated that among a sample of treatment-seeking UK veterans, reporting of TBI + LOC was not associated with PTSD and other mental health difficulties. It has, however, provided evidence of a link between TBI and reporting a greater number of adverse childhood events. In addition, the data revealed that treatment-seeking veterans with TBI + LOC were more likely to report leaving the military early, being currently unemployed, and experiencing difficulties with pain and mobility. Finally, the data suggest that, albeit infrequent, military personnel who sustain a TBI may be at risk of engaging in drug use.

The findings of the present study provide insight into the difficulties of a sample of treatment-seeking UK veterans who reported TBI + LOC. Such insight is essential to inform the appropriate treatment of veterans with TBI, which may involve a fine-tuning of assessment methods, modifying care plans to more long-term treatment to address complexities that may be introduced by adverse childhood experiences, and consideration of risk of injuries and impairments that may be unrelated to military experiences.

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