

Violent behaviour and post-traumatic stress disorder in US Iraq and Afghanistan veterans

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Background

Violence towards others in the community has been identified as a significant problem for a subset of Iraq and Afghanistan veterans.

Aims

To investigate the extent to which post-traumatic stress disorder (PTSD) and other risk factors predict future violent behaviour in military veterans.

Method

A national, multiwave survey enrolling a random sample of all US veterans who served in the military after 11 September 2001 was conducted. A total of 1090 veterans from 50 US states and all military branches completed two survey waves mailed 1 year apart (retention rate = 79%).

Results

Overall, 9% endorsed engaging in severe violence and 26% in other physical aggression in the previous year, as measured at Wave 2. Younger age, financial instability, history of violence before military service, higher combat exposure, PTSD, and alcohol misuse at Wave 1 were significantly associated with higher severe violence and other physical aggression in the past year at Wave 2. When combinations of these risk factors were present, predicted probability of violence in veterans rose sharply. Veterans with both PTSD and alcohol misuse had a substantially higher rate of

subsequent severe violence (35.9%) compared with veterans with alcohol misuse without PTSD (10.6%), PTSD without alcohol misuse (10.0%) or neither PTSD nor alcohol misuse (5.3%). Using multiple regression, we found that veterans with PTSD and without alcohol misuse were not at significantly higher risk of severe violence than veterans with neither PTSD nor alcohol misuse. There was a trend for other physical aggression to be higher in veterans with PTSD without alcohol misuse.

Conclusions

Co-occurring PTSD and alcohol misuse was associated with a marked increase in violence and aggression in veterans. Compared with veterans with neither PTSD nor alcohol misuse, veterans with PTSD and no alcohol misuse were not significantly more likely to be severely violent and were only marginally more likely to engage in other physical aggression. Attention to cumulative effects of multiple risk factors beyond diagnosis – including demographics, violence history, combat exposure, and veterans' having money to cover basic needs like food, shelter, transportation, and medical care – is crucial for optimising violence risk management.

Declaration of interest

E.B.E., C.T.T. and J.C.B. are US government employees.

Violence towards others after returning home from military service has been documented to be a significant problem among a subset of veterans in the US,^{1–3} UK,⁴ Australia⁵ and Canada.⁶ As more men and women re-enter civilian life, there is an increased need to assist clinicians with effective assessment and management of veterans who may be at higher risk of community violence. To date, there has been relatively little direction available to clinicians to help them gauge what level of risk a veteran may pose in the near future. Admission and discharge decisions as well as community treatment planning would be greatly enhanced by research that directly informs, and possibly improves, decision-making and resource allocation in these clinical contexts.⁷

Existing research that has examined violent behaviour towards others among veterans of Iraq and Afghanistan^{1,2,4,8} and previous eras of service^{9–12} provides a starting point, but many questions remain. Empirical studies have found that post-traumatic stress disorder (PTSD)^{1,3,7,13} and alcohol misuse^{1,8,10,11,13} are each associated with violence in veterans, but research in this field has predominantly been retrospective in design, with only a few exceptions,⁴ which to a large extent limits data interpretation.⁷ To illustrate, although multiple studies have shown that PTSD in veterans is correlated with aggression in the past, there has been relatively little empirical work examining whether current PTSD statistically predicts subsequent violent behaviour in veterans in the future, and if so, what the extent and nature of this relationship is.

Moreover, the links between PTSD, alcohol misuse and aggression warrant further clarification^{5,13} because although research has shown that PTSD and alcohol misuse each independently relate to aggression towards others in veterans, there has been virtually no attention given to examining violence risk among veterans with comorbid PTSD and alcohol misuse. As PTSD and alcohol misuse often co-occur in returning veterans,^{14–16} it is largely unknown whether veterans with dual disorders pose a higher risk of violence than veterans with PTSD only or with alcohol misuse only, similar to that reported in literature on mental illness and violence in civilian populations.^{17,18}

By what mechanism might risk be elevated? Current theory and science of self-dysregulation conceptualises violence and physical aggression as occurring when the strength of impelling forces (those pushing towards action) exceed the strength of the inhibiting forces (those preventing a move towards action).^{19,20} Within this model, if PTSD is viewed as an impelling force and alcohol misuse is considered a disinhibiting force, then the two in tandem could substantially elevate risk for aggression.^{19–21} What is it about PTSD that could impel a veteran towards violence? One answer appears to be hyperarousal symptoms.^{4,7,10,11,13} Anger and irritability, both measurable states, have been identified as empirically related among veterans to be associated with increased violence and aggression.^{4,7,13} In contrast, although alcohol is known to cause disinhibition, most people who drink are not aggressive. This begs the question of when drinking is likely to contribute to aggression.

Applying this theory to the returning veteran population suggests that veterans with PTSD could feel impelled to act aggressively as a result of anger symptoms but still desist from acting if they are not disinhibited as a result of drinking alcohol. Similarly, veterans misusing alcohol may be disinhibited but be less impelled to act violently if not experiencing PTSD symptoms such as anger and irritability. This relationship may be especially complex for veterans because the military trains soldiers to aggress in a controlled way in the context of war but difficulties caused by PTSD and disinhibition from alcohol misuse could allow trained aggression meant for combat to become less well-controlled. The purpose of this paper is to employ a multiwave data-set of a random sample of US Iraq and Afghanistan veterans to analyse the association of risk factors with subsequent violence and aggression and to test the hypothesis that co-occurring PTSD and alcohol misuse leads to a higher odds of future violence and aggression than PTSD without alcohol misuse or alcohol misuse without PTSD. To our knowledge, this is the first national study of violence in US Iraq and Afghanistan veterans.

Method

Study design and participants

The study sample was taken from the National Post-Deployment Adjustment Survey (NPDAS),²² which was conducted as part of a US National Institute of Mental Health funded grant to develop risk assessment tools for veterans and was drawn by the US Department of Veterans Affairs (VA) Environmental Epidemiological Service in May 2009. The sample consisted of a random selection of 3000 veterans from a database of over 1 million US military service members who: (a) served after 11 September 2001 in Operation Iraqi Freedom (OIF) or Operation Enduring Freedom (OEF); and (b) either had separated from active duty service or were in the reserves/national guard. The sample was stratified by gender, and female veterans were oversampled to ensure adequate representation; specifically, 1000 female veterans were randomly selected from all female OEF/OIF veterans and 2000 male veterans were selected from all male OEF/OIF veterans.

After obtaining institutional review board approval, we surveyed veterans using Dillman survey methodology²³ using multiple and varied contacts to maximise response rate. We implemented two waves of data collection 1-year apart involving parallel procedures, and participants were reimbursed after finishing each wave. At Wave 1, participants were first sent an introductory letter regarding the upcoming survey. Four days later, potential participants were sent an invitation by mail, which contained commemorative postage stamps as an incentive and instructions on how to complete a 35-minute confidential internet-based survey. Sixteen days after invitations were mailed, potential participants were sent postcards thanking them for completing the survey or reminding them to do so. Two weeks after postcard mailings, those who had not taken the survey received a paper version with a postage-paid return envelope. Two months after the print survey a final letter was sent encouraging participation and explaining the survey would close the following week.

Wave 1 was conducted July 2009 to April 2010, yielding a 47% response rate and 56% cooperation rate. The 'response rate' refers to the number of surveys completed divided by the number of surveys sent out, whereas the 'cooperation rate' refers to the number of surveys completed divided by the number of surveys received by participants (i.e. not returned by mail).²³ These achieved rates are comparable to, or greater than, that achieved in other national surveys of veterans in the US^{15,24,25} and UK.²⁶ Details can be found elsewhere²² regarding generalisability of the

sample of $n = 1388$ veterans who completed Wave 1 of the NPDAS, describing the proportion of veterans receiving services at VA and non-VA facilities and indicating little difference on age, gender and geographic region between responders *v.* non-responders as well as little difference on available demographic, military and clinical variables between those who took the survey after the first invitation *v.* after subsequent reminders, and between paper *v.* internet survey completers.

At Wave 2, participants were queried exactly 1 year after completing the Wave 1 survey over the period July 2010–April 2011. At conclusion, $n = 1090$ veterans completed Wave 2, yielding a 79% retention rate. The median time lapse between completion of Wave 1 and Wave 2 was 12.8 months. Of the sample, 78% completed both waves between 12 and 14 months apart. Ninety per cent of the sample completed Waves 1 and 2 between 11 and 15 months apart. Very few were outside this range: less than 1% took the two surveys 10–11 months apart, 8% 15–19 months apart, and less than 1% 19–20 months apart.

In terms of retention, multivariate analyses revealed that younger age and lower income accounted for 4% of the attrition-related variance at Wave 2; other variables specified below – including PTSD and history of violence – were non-significant; presumably, residential stability of younger and less financially able participants as a subgroup affected re-survey efforts. Aside from the latter two measures, attrition analyses did not indicate any substantial bias associated with primary study outcomes. Regarding Wave 2 participation, we would emphasise that no other national studies of the OEF/OIF cohort have attained equivalent rates of retention.

The military branch breakdown of the final sample (55.21% army, 19.92% air force, 14.88% navy, 9.64% marines, and 0.35% coast guard) approximated the composition of the armed forces (48% army, 22% air force, 17% navy, 11% marines, and 2% coast guard) at the time of the survey.²⁷ Of the veterans sampled, 73% were White and 48% in the sample were national guard/reserves, similar to 70% who were White and 37% who were national guard/reserves in the military at the time.²⁷ The majority of respondents (82%) had been deployed to Iraq or Afghanistan with a range in time from last deployment of 1–8 years, with a median time of 4 years. The remainder of the sample was comprised of OIF/OEF veterans that were not stationed in either of the two combat theatres. Geographically, the final sample corresponded to known military demographics with the 50 US states, Washington DC, and 4 territories representing in a close approximation to reported military statistics.²⁷ To our knowledge, the NPDAS has enrolled one of the most representative samples of US Iraq and Afghanistan veterans to date.

Assessment protocol

At Wave 1, current PTSD was measured by the Davidson Trauma Scale²⁸ using a cut-off score of 48; this cut-off point has been shown to provide 0.82 sensitivity and 0.94 specificity with the Structured Clinical Interview for DSM-IV Disorders (SCID) in Iraq and Afghanistan veterans.²⁹ Current alcohol misuse was defined positive for veterans attaining a score of 8 or greater on the Alcohol Use Disorder Identification Test (AUDIT).³⁰

We selected covariates at Wave 1 based on a review of risk factors in veterans populations,⁷ which included: age, financial stability (defined as having money to cover basic needs such as food, clothes, shelter, medical care, transportation, and social activities per the Quality of Life Interview³¹), history of violence (defined by self-report of arrest for a violent crime or engagement in an act of violence towards others prior to military service), and combat exposure (as measured by the Deployment Risk and

Resilience Inventory³²). We also included gender as it has been shown consistently to have one of the strongest associations with violence in civilian populations and thus would also be relevant to include in analysis.³³

At Wave 2, community-based violence towards others during the 1 year study period was measured at two levels of severity. Severe violence in the past year was measured by endorsement of specific items on the Conflict Tactics Scale³⁴ (i.e. ‘Used a knife or gun’, ‘Beat up the other person’ or ‘Threatened the other person with a knife or gun’) or on the MacArthur Community Violence Scale³⁵ (i.e. ‘Did you threaten anyone with a gun or knife or other lethal weapon in your hand?’, ‘Did you use a knife or fire a gun at anyone?’ or ‘Did you try to physically force anyone to have sex against his or her will?’). Other physical aggression in the past year was assessed using additional items from these two scales addressing less lethal/serious physically aggressive acts (i.e. kicking, slapping, using fists, getting into fights).

Definitions are consistent with operationalisation of severe violence and other physical aggression in the MacArthur Violence Risk Assessment Study.³³ Research has shown that veterans’ self-reports of violence are related to arrest records for violent crimes^{4,36} and that veterans’ self-report of violence substantially agrees with collateral informants.³⁷ This is consistent with civilian studies of violent behaviour supporting the validity of self-report for measuring violent behaviour as used in the current study.^{17,18}

Statistical analyses

SAS 9.2 for Windows was used for statistical analyses. Women were oversampled to comprise 33% of the survey sample but constituted 15.6% of the military at the time of data collection.²⁷ Data were weighted to reflect the latter proportion, rendering a weight-adjusted *n* = 866. Chi-squared analyses were used to analyse associations between risk factors at Wave 1 and severe violence and other physical aggression at Wave 2.

Multiple logistic regression was used to analyse associations between risk factors at Wave 1 and severe violence and other physical aggression at Wave 2. Model validity was assessed using bootstrapped bias estimates (1000 replications) to derive

comparisons between model-based coefficients and corresponding bootstrap estimates. Models were also re-estimated: (a) using the subset of the 82% of veterans actually deployed in Iraq and/or Afghanistan to investigate for putative effects of theatre and time since last deployment; and (b) adding ‘time between waves 1 and 2’ as an additional variable to modelling.

We explored factors associated with alcohol misuse in a subset of veterans meeting criteria for PTSD, focusing on the association between violence and PTSD symptoms. Predicted probabilities for subsequent severe violence measured at Wave 2 were estimated using a measure of multiple risk factors measured at Wave 1 in order to ascertain whether there were cumulative effects of factors on outcomes.

Results

Sample characteristics

At Wave 1, 18% of respondents met criteria for probable PTSD and 24% met criteria for alcohol misuse. Of these, 11% met criteria for PTSD without alcohol misuse, 18% met criteria for alcohol use only, and 7% met criteria for both PTSD and alcohol misuse. The median age was 34 years (mean = 37, s.d. = 9.5). The age range was 21–92 years, noting that in our random sample of all veterans who served after 9/11, there were 8 participants older than 65. In the sample, 38% reported difficulties meeting their basic needs financially, and 8% reported history of violence prior to enlisting in the military. At Wave 2, the overall prevalence of self-reported severe violence in the past year was 9% and other physical aggression in the past year was 26%.

Associations between risk factors and violent behaviour

Table 1 presents the analyses between Wave 1 PTSD and alcohol misuse and Wave 2 severe violence and other physical aggression. Unadjusted chi-squared statistics showed that PTSD was associated with higher rates of severe violence (20% v. 6%) and other physical aggression (48% v. 21%) compared with veterans without PTSD. Correspondingly, unadjusted chi-squared

Factor at Wave 1	Severe violence					Other physical aggression			
	Total <i>n</i>	Severe violence at Wave 2, <i>n</i>	%	χ^2	<i>P</i>	Other physical aggression at Wave 2, <i>n</i>	%	χ^2	<i>P</i>
Meets criteria for PTSD									
No	711	46	6.41	27.34	<0.0001	150	21.05	48.41	<0.0001
Yes	155	30	19.52			75	48.06		
Meets criteria for alcohol misuse									
No	656	39	5.97	26.21	<0.0001	141	21.50	27.07	<0.0001
Yes	211	36	17.43			83	39.54		
PTSD without alcohol misuse									
Yes	98	10	9.96	3.27	0.0705	39	40.23	23.94	<0.0001
No PTSD or alcohol misuse	558	29	5.27			102	18.21		
Alcohol misuse without PTSD									
Yes	154	16	10.57	5.64	0.0175	48	31.38	12.59	0.0004
No PTSD or alcohol misuse	558	29	5.27			102	18.21		
PTSD + alcohol misuse									
Yes	57	21	35.88	65.15	<0.0001	35	61.49	56.16	<0.0001
No PTSD or alcohol misuse	558	29	5.27			102	18.21		
None	558	29	5.27	61.91	<0.0001	102	18.21	67.81	<0.0001
PSTD without alcohol misuse	98	10	9.96			39	40.23		
Alcohol misuse without PTSD	154	16	10.57			48	31.38		
PTSD + alcohol misuse	57	21	35.88			35	61.49		

PTSD, post-traumatic stress disorder.

statistics showed that alcohol misuse was associated with higher rates of severe violence (17% *v.* 6%) and other physical aggression (40% *v.* 22%) compared with veterans without alcohol misuse.

However, veterans with PTSD and no alcohol misuse were not statistically more likely to be severely violent compared with veterans with neither PTSD nor alcohol misuse (10% *v.* 5%), although they were more likely to engage in other physical aggression (40% *v.* 18%). Alcohol misusers with no PTSD were more likely to be severely violent (11% *v.* 5%) and engage in other physical aggression (31% *v.* 18%) than were veterans with neither PTSD nor alcohol misuse. The latter group was significantly less likely to engage in severe violence (5% *v.* 36%) and other physical aggression (18% *v.* 61%) compared with veterans with co-occurring PTSD and alcohol misuse, who had the highest rates of both outcomes, as shown at the end of Table 1.

Given this, we ran a formal test of the interactions between PTSD and alcohol misuse on severe violence and other physical aggression. As could be anticipated from the data on the bottom of Table 1, we found a statistically significant PTSD \times alcohol misuse interaction with respect to severe violence ($F=19.94$, $d.f.=1$, mean square = 1.18, $P<0.0001$) but not with respect to other physical aggression ($F=1.28$, $d.f.=1$, mean square = 0.181, $P=0.2573$). Put differently, the combination of PTSD and alcohol misuse had a unique contribution to predicting severe violence at year 2 above their main effects.

Table 2 presents chi-squared analyses of covariates at Wave 1, showing that history of violence before the military, financial instability, younger age and higher combat exposure were

significantly related to severe violence and other physical aggression in the next year as measured in Wave 2.

Multivariate models of violent behaviour

Multivariate logistic regression analyses presented in Table 3 show that severe violence at Wave 2 was associated significantly with lower age, financial instability, history of violence prior to the military, combat exposure and a comorbid diagnosis of PTSD and alcohol use. Non-significant factors were gender, PTSD without alcohol misuse, and alcohol misuse without PTSD. Other physical aggression at Wave 2 was predicted by Wave 1 history of violence before military, combat exposure, financial instability, alcohol misuse without PTSD, and co-occurring PTSD and alcohol misuse. Gender and age were non-significant. There was a trend for PTSD without alcohol misuse to be positively related to other physical aggression at Wave 2.

Models in Table 3 were validated with bootstrap methodologies and showed little evidence of shrinkage in the original estimates, indicating bias estimates for most coefficients less than 2%. Bootstrapping of severe violence showed good model fit, with a mean concordance = 0.86 (s.d. = 0.001, 95% CI 0.83–0.90). Likewise, bootstrapping of other physical aggression also showed good model fit, with a mean concordance = 0.85 (s.d. = 0.001, 95% CI 0.82–0.87).

The two models were also re-estimated on a subset restricted to the 82% of deployed veterans. Results closely approximated those presented in Table 3 except for age which was no longer significant for severe violence. We also re-ran models to include a

Table 2 Correlates of violent behaviour in Iraq and Afghanistan veterans

Factor at Wave 1	Total <i>n</i>	Severe violence				Other physical aggression			
		Severe violence at Wave 2 <i>n</i>	%	χ^2	<i>P</i>	Other physical aggression at Wave 2, <i>n</i>	%	χ^2	<i>P</i>
Young age									
Above median ≥ 34	444	21	4.76	18.15	<0.0001	89	20.04	16.20	<0.0001
Below median <34	423	55	12.95			135	32.02		
Gender									
Female	134	11	8.10	0.09	0.7689	35	26.26	0.01	0.9153
Male	732	65	8.88			189	25.82		
History of violence pre-military									
No	799	55	6.92	43.67	<0.0001	189	23.60	28.12	<0.0001
Yes	67	21	30.61			36	53.06		
High combat exposure									
Below median	441	20	4.62	19.23	<0.0001	74	16.73	39.26	<0.0001
Above median	425	56	13.05			151	35.38		
Money to cover basic needs									
No	325	47	14.35	20.34	<0.0001	125	38.36	42.16	<0.0001
Yes	541	29	5.40			100	18.40		

Table 3 Multivariate models of severe violence and other physical aggression in Iraq and Afghanistan veterans

Factor at Wave 1	Severe violence at Wave 2			Other physical aggression at Wave 2		
	Odds ratio	95 % CI	<i>P</i>	Odds ratio	95 % CI	<i>P</i>
Covariates						
Age	0.96	0.93–0.99	0.0184	0.99	0.97–1.00	0.0847
Gender	0.88	0.42–1.86	0.7412	0.80	0.50–1.27	0.3347
History of violence pre-military	3.95	2.05–7.62	<0.0001	2.51	1.44–4.37	0.0011
Combat exposure	1.03	1.01–1.05	0.0066	1.04	1.02–1.05	<0.0001
Money to cover basic needs	0.81	0.71–0.92	0.0009	0.82	0.75–0.90	<0.0001
PTSD and/or alcohol misuse						
PTSD only	0.91	0.39–2.16	0.8249	1.63	0.98–2.70	0.0583
Alcohol misuse only	1.32	0.67–2.62	0.4197	1.55	1.00–2.39	0.0484
PTSD + alcohol misuse	4.09	1.91–8.77	0.0003	3.45	1.83–6.50	0.0001
Reference group: neither PTSD nor alcohol misuse	$R^2=0.22$, $\chi^2=94.91$, $d.f.=8$, $P<0.0001$			$R^2=0.18$, $\chi^2=126.89$, $d.f.=8$, $P<0.0001$		

PTSD, post-traumatic stress disorder.

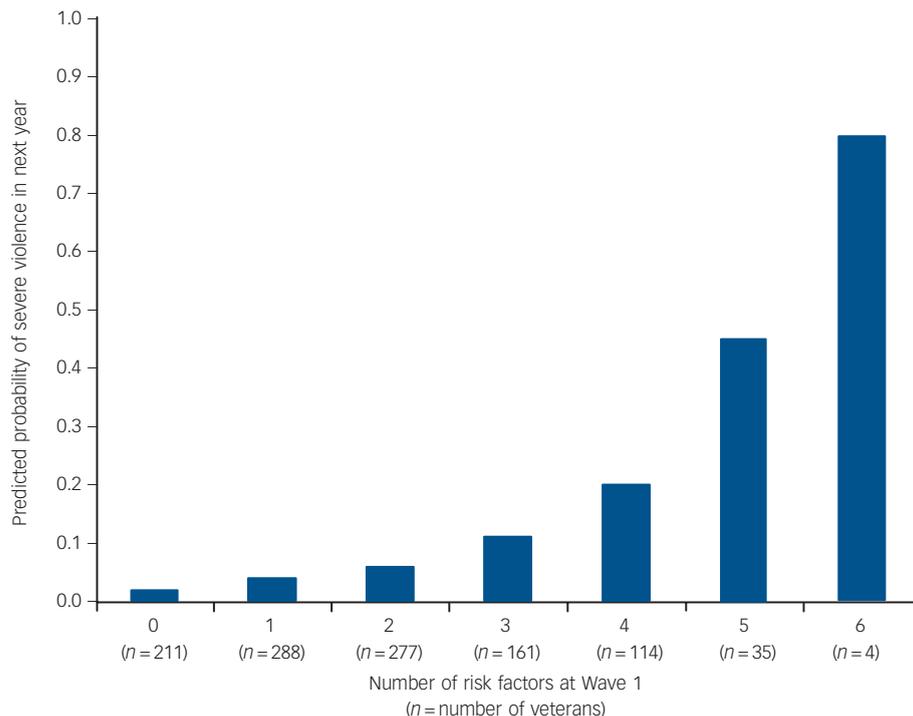


Fig. 1 Predicted probability of violence in the next year as a function of cumulative risk factors at Wave 1.

Risk factors included: young age (below median of 34 years), not meeting basic needs, history of violence before military service, higher combat exposure (above median), post-traumatic stress disorder, and alcohol misuse.

variable connoting number of days between Wave 1 and Wave 2. We found that the overall fit of both multivariate models were not significantly altered by the addition of this variable and that risk factors associated with future violence and other physical aggression in Table 3 retained the same magnitude of statistical significance when time between waves was added into regression analyses.

Another model was estimated that attempted to identify factors that might differentiate between veterans with co-occurring PTSD and alcohol misuse *v.* those with PTSD only. Results showed that alcohol misuse among veterans with PTSD was significantly associated with specific PTSD symptoms: feeling numb/being unable to have sad or loving feelings (odds ratio (OR) = 1.510, $P = 0.0054$) and anger/irritability (OR = 1.358, $P = 0.0470$). No other PTSD symptoms or general risk factors were associated with increased alcohol misuse.

The increase in violence risk associated with co-occurring diagnoses of PTSD and alcohol misuse suggests that the effect of risk factors may be cumulative. To test this possibility, risk factors identified above were combined and modelled using logistic regression procedures. Results are presented in Fig. 1 showing the predicted probability of severe violence at Wave 2 as a function of cumulative risk factors at Wave 1. As shown in the graph, the predicted probability of severe violence increases with cumulative risk. Thus, veterans with no risk factors at Wave 1 had a very low probability of severe violence in the following year (0.02); this probability increases with the cumulative increase in risk to a dramatically high maximum risk of 0.80 among veterans endorsing all six risk factors.

violence and physical aggression. To our knowledge, this is the first national multiwave study examining empirically the association between PTSD and subsequent violence in US Iraq and Afghanistan veterans. Although previous studies have shown a relationship,^{1,3,4,7,13} and PTSD is often touted as a key contributor to violence in veterans, our current findings reveal a more nuanced relationship.

Associations between PTSD, aggression and violent behaviour

On the one hand, the data provide some evidence that PTSD is associated with elevated risk of violence and aggression in veterans. Unadjusted chi-squared analyses show that veterans with PTSD were more likely to commit severe violence in the next year compared with veterans without PTSD (20% *v.* 6%) and were more likely to be involved in other physical aggression (48% *v.* 21%). Post-traumatic stress disorder without alcohol misuse came close to showing a significant relationship to elevated risk of other physical aggression in multiple regression analyses. Because veterans with PTSD and alcohol misuse had higher rates of violence than veterans with only alcohol misuse, PTSD remains an important factor in the study of violence and aggression in veterans.

On the other hand, the data suggest that PTSD may play a less direct and somewhat weaker role in violence by veterans than is commonly perceived. Veterans with PTSD who did not misuse alcohol reported both less anger and irritability and were not significantly more likely to engage in severe violence compared with veterans with neither PTSD nor alcohol misuse, and were 72% less likely to report severe violence in the next year than their counterparts with PTSD who misused alcohol. In this national random sample, most veterans with PTSD did not report severe violence. The current results thus highlight that better understanding of the relationship between PTSD and violence

Discussion

Using a random sample of US Iraq and Afghanistan veterans, the current study enhances understanding of how PTSD is related to

requires consideration of co-occurring conditions, specific PTSD symptoms and severity of violence.

Understanding violence in veterans with co-occurring PTSD and alcohol misuse

These data signal that a subset of veterans, specifically those with co-occurring PTSD and alcohol misuse, is at substantially higher risk of violence when compared with other veterans. Of all veterans meeting criteria for current PTSD in this sample, 37% also met criteria for current alcohol misuse. As shown in Table 1, a higher risk of severe violence does not result merely from the added effects of PTSD and alcohol misuse. This is consistent with the previously discussed conceptual model of violence which identifies the critical importance of understanding the possible relevance of impelling and inhibiting forces.^{20,21}

Several potential pathways exist in which PTSD and alcohol misuse could increase risk of violence. Use of alcohol could exacerbate PTSD hyperarousal symptoms such as anger/irritability. This was suggested by previous research,^{10,13} and is consistent with current findings that anger and irritability were greater among veterans with PTSD and alcohol misuse. Conversely, higher PTSD symptoms could lead to increasing use of alcohol as a form of self-medication which in turn may increase disinhibition and impulsivity. Both pathways could occur simultaneously and reinforce one another, creating a cycle of increased risk. The current findings underscore the possible benefit of future research focusing on better understanding of the interrelationships between PTSD symptoms, alcohol misuse and violence in veterans.^{10,13,38}

Treating violence in veterans with co-occurring PTSD and alcohol misuse

There are challenges for clinicians addressing violence in this at-risk group of veterans. At the individual level, studies have identified the presence of barriers to care among veterans with mental health problems^{15,16} and in particular have shown that veterans with co-occurring PTSD and alcohol misuse are among those with the highest level of perceived barriers to care and least likely to recognise that mental health treatment will be helpful to them.²² Additional studies show that veterans with alcohol use disorders show relatively low rates of treatment utilisation.^{14,22} As such, policy makers should be alerted that alcohol misuse needs to be considered and targeted in campaigns to promote mental healthcare use in veterans. Likewise, clinicians should be aware that insight into the relationship between one's mental health condition and alcohol misuse needs to be addressed in a subset of veterans at high risk of violence.

On a systems level, there are also challenges for integrating mental health and alcohol misuse treatment for veterans. In the USA, although VA medical centres provide assessment and treatment for PTSD and alcohol misuse, integrating services for veterans with co-occurring disorders can be difficult. Recent VA policies are aimed at better coordination of treatment, but training clinicians to competently and consistently assess for and treat both PTSD and alcohol misuse is likely to take time. Currently, there exist no violence risk assessment tools designed specifically for military populations but clinicians can use risk assessment tools developed for civilians with the caveat of limited research at this time.⁷ Questions also remain as to how to best address risk management in the context of integrated treatment.

Recent research supports that veterans with aggression do utilise treatment; unfortunately, reduction in aggressive behaviour among Iraq and Afghanistan veterans has not been shown to be

related to the number of out-patient mental health visits or to first-line recommended psychotropic medications. These studies underscore the need for more investigation into *how much* and *what type* of treatment may be most effective in reducing violence and for more research targeting the study of integrated interventions aimed at establishing optimal treatment outcomes. Better coordination of care between PTSD and alcohol misuse clinics could help veterans at highest risk get the services they need to function more safely in the community. Standardised and repeated assessment of PTSD symptom status and alcohol misuse patterns and severity could encourage ongoing attention to documentation of these pertinent violence risk factors.

Association of other risk factors and reduction of violent behaviour in veterans

The findings also support that risk factors beyond PTSD and alcohol misuse are important in understanding violence and physical aggression in veterans. Other risk factors affecting levels of violence included younger age, combat exposure, financial instability and history of violence before military service, and are consistent with those found in previous research.^{1,3,4,13,36} The complexity of interactions of these factors is shown in Fig. 1. For example, meeting criteria for PTSD or having higher combat exposure substantially elevated probability of violence when other risk factors (e.g. history of violence prior to military) were present.

Moreover, PTSD, alcohol misuse and meeting basic needs (e.g. having enough money to cover food, shelter, clothes, medical care, transportation, social activities) are dynamic risk factors and can be changed. If treatment providers help veterans address these factors clinically, there is a good likelihood of reducing the odds of violence. Specifically, the current data suggest that the various methods that armed forces use to attempt to proactively address the potential psychological impact of combat experiences or traumatic exposure, such as BattleMind³⁹ or Master Resiliency Training⁴⁰ in the USA, the Decompression Programme and CAN OSIS in Canada,⁴¹ BattleSMART in Australia⁴² and the TRiM programme in the UK,⁴³ may help reduce violence risk if they are successful in decreasing PTSD symptoms and alcohol misuse. Figure 1 illustrates that the cumulative effect of risk factors is more important for clinicians to consider than any individual risk factor when determining risk of violence.

Limitations

Violence and physical aggression are serious problems for a subset of veterans. The benefits from this research appear to outweigh any limitations. Nonetheless, self-report leaves the possibility of underreporting behaviours relevant to factors (e.g. PTSD) and outcomes (e.g. violence). To address this, standardised definitions and standardized measures to increase internal validity of findings were used. Study rates of PTSD comport with national prevalence in US Iraq and Afghanistan veterans, although are higher than rates in the UK,¹⁴⁻¹⁶ which speaks against underreporting. Rates of violence found also were generally consistent with extant literature on veterans and violence.^{3,7}

Not every possible candidate risk factor or covariate was examined in this study. Other possible pathways to violence in veterans with PTSD in addition to alcohol misuse, such as use of illegal drugs, negative affect, lower socioeconomic status, and state *v.* trait anger, all warrant further investigation, particularly given the need to identify effective treatment interventions in at-risk veterans. It is possible that some veterans were in treatment for anger and aggression but this was not measured or factored

into analyses in this study; future research is needed to examine effects of treatment on violence in veterans. Study of classes of victims of violence was not addressed. Future research should be directed as examining correlates of family *v.* stranger violence, with the goal of helping to develop best practise interventions to prevent violence in veterans. This study did not identify an association of gender with violence in veterans, and is in line with past research⁷ but further investigation remains pertinent given the increasing numbers of women veterans over the past two decades.

Although it is difficult to ensure perfect sample representativeness, a number of steps were taken to increase generalisability and external validity. These included a strategy of random sampling of all US veterans who served post 9/11, designing to achieve relatively high response and retention rates, and assessing for similarity between survey sample and actual military on ethnicity, branch and geography. Previous research on violence in veterans has primarily enrolled samples from VA facilities only or from an individual branch of the US military.^{3,7} This national study including VA and non-VA veterans who served across all the different US military branches was designed to help increase the external validity of knowledge gained regarding violent and aggressive behaviour in veterans.^{4,12}

Implications

The current findings provide a context for understanding violent behaviour in US veterans, a subset of whom appeared to be at higher violence risk, consistent with recent findings in the UK.⁴ The data demonstrated that PTSD had some association with violence but it was co-occurrence of PTSD and alcohol misuse that was particularly associated with dramatically increased odds of violent behaviour perpetrated by veterans. It is hoped that results from this study not only contribute to continued international research on this subject, but also inform clinical efforts to more accurately assess veterans' risks for violence and assist in the development of safety and risk reduction plans to ensure better and safer veterans' adjustment into their communities.

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First received 2 Jul 2013, final revision 30 Oct 2013, accepted 7 Nov 2013

Funding

The US National Institute of Mental Health (NIMH) funded this project. The US Department of Veterans Affairs provided infrastructure to conduct the project. The authors' work on this manuscript was independent of the US NIMH and US Department of Veterans Affairs, which had no role in the analysis, interpretation or decision to submit this research report. Preparation of this manuscript was supported by the NIMH (R01MH080988), the Office for Research and Development Clinical Science and Health Services, Department of Veterans Affairs, and the Mid-Atlantic Mental Illness Research, Education and Clinical Center.

Acknowledgements

The authors extend their sincere thanks to the participants who volunteered for this study. We also thank Dr Charles Hoge and Dr Matt Huss for comments on an earlier draft of this manuscript. The views expressed in this article are those of the authors and do not necessarily represent the views of the US Department of Veterans Affairs or the National Institutes of Health.

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words

Macbeth, by William Shakespeare (c.1606)

Trevor Turner

The 1605 Gunpowder Plot, much-quoted sayings, betrayals and killings infest Shakespeare's shortest tragedy, best played without an interval. Macbeth and his Lady who are throneward-bound murder King Duncan, Banquo (whose ghost returns), Macduff's wife and children. Witches and prophecies enthral Macbeth, Lady M goes mad with hand washing: 'canst thou not minister to a mind diseased?', he asks a physician. There are hallucinations – 'is this a dagger?', stones that 'prate' – delusions of invincibility and haunting lines on life's meaninglessness that reflect contemporary witchcraft angst and doubts. A demonic blood fest about regime change, in post-Fawkesian Britain, *Macbeth* is theatrical fireworks.

The British Journal of Psychiatry (2014)
204, 375. doi: 10.1192/bjp.bp.112.123141