TECHNICAL COMMENTARY

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POST-TRAUMATIC STRESS DISORDER LIBRARY

Anger and aggression

Introduction

Excessive anger is often observed in people with posttraumatic stress disorder (PTSD) and other anxiety-related disorders. In PTSD, a propensity towards excessive anger may be apparent before exposure to a trauma, for example as a personality trait, or it could be a result of exposure to the trauma itself. The association between anger and PTSD has led to the suggestion that the disorder may be characterised by inefficient regulation of psychophysiological arousal and subsequent enhanced readiness to anger.

Elevated anger in PTSD has clinical implications as it may be a barrier to effective treatment outcomes. Therefore, anger and aggression are key targets for improvement early in the treatment process.

Method

We have included only systematic reviews (systematic literature search, detailed methodology with inclusion/exclusion criteria) published in full text, in English, from the year 2010 that report results separately for people with PTSD. Reviews were identified by searching the databases MEDLINE, EMBASE, and PsycINFO. When multiple copies of reviews were found, only the most recent version was included. We prioritised reviews with pooled data for inclusion.

Review reporting assessment was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist that describes a preferred way to present a meta-analysis[1]. Reviews with less than 50% of items checked have been excluded from the library. Note that early reviews may have been guided by less stringent reporting checklists than the PRISMA, and that some reviews may have been limited by journal guidelines.

Evidence was graded using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group approach where high quality evidence such as that gained from randomised controlled trials (RCTs) may be downgraded to moderate or low if review and study quality is limited, if there is inconsistency in results, indirect comparisons, imprecise or sparse data and high probability of reporting bias. It may also be downgraded if risks associated with the intervention or other matter under review are high. Conversely, low quality evidence such as that gained from observational studies may be upgraded if effect sizes are large or if there is a dose dependent response. We have also taken into account sample size and whether results are consistent, precise and direct with low associated risks (see end of table for an explanation of these terms)[2]. The resulting table represents an objective summary of the available evidence, although the conclusions are solely the opinion of staff of NeuRA (Neuroscience Research Australia).

Results

We found three systematic reviews that met our inclusion criteria[3-5].

- Moderate to high quality evidence finds a large effect size for increased difficulty with anger in people with PTSD.
- Moderate quality evidence suggests high levels of *premorbid* anger and hostility are risk factors for the development of PTSD in veterans, police, and firefighters subsequently exposed to trauma.
- Moderate quality evidence suggests the overall prevalence of any aggressive behaviour in veterans post-deployment is around 36%, which is significantly higher than in veterans with no combat exposure. Those deployed to combat situations who subsequently developed PTSD showed the highest levels of aggressive behaviour, particularly those with comorbid alcohol misuse.

Margarete Ainsworth Building, Barker Street, Randwick NSW 2031. Phone: 02 9399 1000. Email: info@neura.edu.au

Anger and aggression

DiGangi JA, Gomez D, Mendoza L, Jason LA, Keys CB, Koenen KC

Pretrauma risk factors for posttraumatic stress disorder: a systematic review of the literature

Clinical Psychology Review 2013; 33: 728-44

View review abstract online

Comparison	**Relationship between risk of PTSD and anger/hostility in veterans, police and firefighters.**
Summary of evidence	**Moderate quality evidence (mixed samples, appears consistent, unable to assess precision, direct) suggests high levels of premorbid anger and hostility are risk factors for the development of PTSD in veterans, police and firefighters subsequently exposed to trauma.**

Premorbid anger and hostility

1 study of 470 veterans assessed pre-deployment found none had a premorbid diagnosis of PTSD. At 6 months post-deployment, veterans were assessed using the Self-Rating Inventory for PTSD and found that high hostility and low self-directedness predicted PTSD, and also mediated the relationship between childhood trauma and age and PTSD.

1 study of 180 police officers were assessed prior to active duty and found the prevalence of alcohol dependence was 15.6%, depression was 10.6%, and PTSD was 0.6%. The police officers were assessed again at 12 months after the start of duty using the Mississippi Combat Scale-Civilian Version and the Critical Incident History Questionnaire and the study found that trait anger was a risk factor for PTSD symptoms.

1 study of 43 firefighters assessed prior to active duty found none had a premorbid diagnosis of PTSD. The firefighters were assessed again at 6 months, 9 months, 12 months, and 24 months using the PTSD Symptom Scale, and the study found that a combination of high levels of hostility and low levels of self-efficacy were risk factors for the development of PTSD symptoms.

Consistency in results‡	Appears consistent
Precision in results§	Unable to assess; no confidence intervals are reported.
Directness of results‖	Direct

MacManus D, Rona R, Dickson H, Somaini G, Fear N, Wessely S

Aggressive and violent behavior among military personnel deployed to Iraq and Afghanistan: prevalence and link with deployment and combat

exposure

Epidemiologic Reviews 2015; 37: 196-212

View review abstract online

Comparison	**Prevalence of aggressive behaviour in veterans post-deployment to Iraq or Afghanistan, and PTSD.**
Summary of evidence	**Moderate quality evidence (mixed samples, appears consistent, unable to assess precision, direct) suggests the overall prevalence of any aggressive behaviour in veterans post-deployment is around 36%, which is significantly higher than in veterans with no combat exposure. Those deployed to combat situations who subsequently developed PTSD showed the highest levels of aggressive behaviour, particularly in those with comorbid alcohol misuse.**

Aggressive behaviour

Overall prevalence of aggressive behaviours in veterans

5 studies, N = unclear, prevalence of any aggressive behaviour = 36%, 95%CI 25 to 48%, I^2 = 99%

A medium-sized increase in odds of aggressive or violent antisocial behaviour post-deployment (vs. no combat exposure);

3 studies, N = unclear, OR = 3.24. 95%CI 2.75 to 3.82, I^2 = 0%

Studies of PTSD

In a study of veterans (N = 117), 53% of veterans with PTSD, and 52% of veterans with subthreshold PTSD reported at least one act of violence in the past 4 months compared with a group without PTSD. They also found that the veterans who screened positive for PTSD or subthreshold PTSD reported more aggressive behaviour than those without PTSD.

Another study (N = 1,543) found that combat-exposed marines with PTSD were over six times more likely to engage in antisocial behaviour than those who did not have PTSD.

Another study (N = 13,846) found that PTSD, alcohol misuse, and symptoms of common mental disorders were strongly associated with self-reported post-deployment violence. Post-deployment violent offending was predicted by previously reported post-deployment mental health and behaviour problems (mostly PTSD and alcohol problems), which mediated some of the link between combat and traumatic exposures and violent offending.

Another study (N = 359) modelled how PTSD symptom clusters, alcohol misuse, and anger in veterans were related to aggression, and showed that those with reexperiencing symptoms and alcohol misuse were more likely to report aggression, while the those with numbing and hyperarousal symptoms reported aggression indirectly via personality-trait anger. Hyperarousal was most strongly associated with subsequent violent offending.

Another study (N = 1,388) found that 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

Margarete Ainsworth Building, Barker Street, Randwick NSW 2031. Phone: 02 9399 1000. Email: info@neura.edu.au

alcohol misuse (5.3%). PTSD anger symptoms predicted family aggression and violence but not stranger aggression and violence. PTSD flashbacks predicted stranger aggression and violence but not family aggression and violence.	
Consistency in results	Appears consistent
Precision in results	Unable to assess; no confidence intervals are reported.
Directness of results	Direct

Olatunji BO, Ciesielski BG, Tolin DF

Fear and loathing: a meta-analytic review of the specificity of anger in PTSD

Behaviour Therapy 2010; 41: 93-105

View review abstract online

Comparison	**Risk of difficulties with anger in people with PTSD vs. controls.**
Summary of evidence	**Moderate to high quality evidence (large sample, inconsistent, precise, direct) finds a large effect size for increased difficulty with anger in people with PTSD.**
Difficulties with anger	
28 studies, N = 2,169 *Large increased risk of difficulties with anger in people with PTSD;* 23 studies, d = 1.07, 95%CI 0.86 to 1.29, $p < 0.001$, Q = 126.78, $p < 0.001$ Subgroup analysis found large effect sizes for inability to control anger, anger feelings, and anger expression, and a medium-sized effect for verbally aggressive behaviour.	
Consistency in results	Inconsistent
Precision in results	Precise
Directness of results	Direct

Explanation of acronyms

CI = confidence interval, I^2 = the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance), N = number of participants, OR = odds ratio, p = statistical probability of obtaining that result, Q = test for heterogeneity, vs. = versus

Explanation of technical terms

* Bias has the potential to affect reviews of both RCT and observational studies. Forms of bias include; reporting bias – selective reporting of results; publication bias - trials that are not formally published tend to show less effect than published trials, further if there are statistically significant differences between groups in a trial, these trial results tend to get published before those of trials without significant differences; language bias – only including English language reports; funding bias - source of funding for the primary research with selective reporting of results within primary studies; outcome variable selection bias; database bias - including reports from some databases and not others; citation bias - preferential citation of authors. Trials can also be subject to bias when evaluators are not blind to treatment condition and selection bias of participants if trial samples are small[6].

† Different effect measures are reported by different reviews.

Prevalence refers to how many existing cases there are at a particular point in time. Incidence refers to how many new cases there are per population in a specified time period. Incidence is usually reported as the number of new cases per 100,000 people per year. Alternatively some studies present the number of new cases that have accumulated over several years against a person-years denominator. This denominator is the sum of individual units of time that the persons in the population are at risk of becoming a case. It takes into account the size of the underlying population sample and its age structure over the duration of observation.

Reliability and validity refers to how accurate the instrument is. Sensitivity is the proportion of actual positives that are correctly identified (100% sensitivity = correct identification of all actual positives) and specificity is the proportion of negatives that are correctly identified (100% specificity = not identifying anyone as positive if they are truly not).

Weighted mean difference scores refer to mean differences between treatment and comparison groups after treatment (or occasionally pre to post treatment) and in a randomised trial there is an assumption that both groups are comparable on this measure prior to treatment. Standardised mean differences are divided by the pooled standard deviation (or the standard deviation of one group when groups are homogenous) that allows results from different scales to be combined and compared. Each study's mean difference is then given a weighting depending on the size of the sample and the variability in the data. Less than 0.4 represents a small effect, around 0.5 a medium effect, and over 0.8 represents a large effect[6].

Odds ratio (OR) or relative risk (RR) refers to the probability of a reduction (< 1) or an increase (> 1) in a particular outcome in a treatment group, or a group exposed to a risk factor, relative to the comparison group. For example, a RR of 0.75 translates to a reduction in risk of an outcome of 25% relative to those not receiving the treatment or not exposed to the risk factor. Conversely, a RR of 1.25 translates to an increased risk of 25% relative to those not receiving treatment or not having been exposed to a risk factor. A RR or OR of 1.00 means there is no difference between groups. A medium effect is considered if RR > 2 or < 0.5 and a large effect if RR > 5 or < 0.2[7]. lnOR stands for logarithmic OR where a lnOR of 0 shows no difference between groups. Hazard ratios measure the effect of an explanatory variable on the hazard or risk of an event.

Correlation coefficients (eg, r) indicate the strength of association or relationship

Margarete Ainsworth Building, Barker Street, Randwick NSW 2031. Phone: 02 9399 1000. Email: info@neura.edu.au

between variables. They can provide an indirect indication of prediction, but do not confirm causality due to possible and often unforseen confounding variables. An r of 0.10 represents a weak association, 0.25 a medium association and 0.40 and over represents a strong association. Unstandardised (*b*) regression coefficients indicate the average change in the dependent variable associated with a 1 unit change in the independent variable, statistically controlling for the other independent variables. Standardised regression coefficients represent the change being in units of standard deviations to allow comparison across different scales.

‡ Inconsistency refers to differing estimates of effect across studies (i.e. heterogeneity or variability in results) that is not explained by subgroup analyses and therefore reduces confidence in the effect estimate. I^2 is the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance) - 0% to 40%: heterogeneity might not be important, 30% to 60%: may represent moderate heterogeneity, 50% to 90%: may represent considerable heterogeneity and over this is considerable heterogeneity. I^2 can be calculated from Q (chi-square) for the test of heterogeneity with the following formula[6];

$$I^2 = \left(\frac{Q - df}{Q}\right) \times 100\%$$

§ Imprecision refers to wide confidence intervals indicating a lack of confidence in the effect estimate. Based on GRADE recommendations, a result for continuous data (standardised mean differences, not weighted mean differences) is considered imprecise if the upper or lower confidence limit crosses an effect size of 0.5 in either direction, and for binary and correlation data, an effect size of 0.25. GRADE also recommends downgrading the evidence when sample size is smaller than 300 (for binary data) and 400 (for continuous data), although for some topics, these criteria should be relaxed[8].

‖ Indirectness of comparison occurs when a comparison of intervention A versus B is not available but A was compared with C and B was compared with C that allows indirect comparisons of the magnitude of effect of A versus B. Indirectness of population, comparator and/or outcome can also occur when the available evidence regarding a particular population, intervention, comparator, or outcome is not available and is therefore inferred from available evidence. These inferred treatment effect sizes are of lower quality than those gained from head-to-head comparisons of A and B.

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