Augmenting trauma-focused cognitive behavior therapy for post-traumatic stress disorder with memory specificity training: a randomized controlled trial

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Although trauma-focused cognitive behavior therapy (TF-CBT) is the recommended treatment for post-traumatic stress disorder (PTSD), up to one-half of patients do not respond to this intervention. There is an urgent need to develop new strategies to improve treatment response. Training people to recall specific positive memories may augment treatment gains in TF-CBT. We conducted a controlled trial in Australia with current or former first responders (including police, firefighters and paramedics) with PTSD, who were randomized on a 1:1 basis to 12 weekly 90-min individual sessions of either TF-CBT combined with memory specificity training (TF-CBT/MT) or TF-CBT alone. The primary outcome was change in PTSD severity independently assessed at baseline, post-treatment, and six months after treatment (primary outcome timepoint). Secondary outcomes included measures of depression, trauma-related cognitions, alcohol use, and quality of life. Between October 2021 and May 2023, fifty participants were randomized to TF-CBT/MT, and fifty to TF-CBT alone. Most participants were males (71.0%) and the mean age was 46.8±9.9 years. At the 6-month assessment, participants receiving TF-CBT/MT showed a greater reduction of PTSD severity than those randomized to TF-CBT alone (mean difference: 9.2, 95% CI: 3.2-15.1, p=0.003), indicating a large effect size (0.9, 95% CI: 0.1-1.6). Participants receiving TF-CBT/MT also had greater reductions in alcohol use (mean difference: 5.3, 95% CI: 1.5-9.2, p=0.007; effect size: 0.8, 95% CI: 0.2-1.4) and self-blame cognitions (mean difference: 0.8, 95% CI: 0.2-1.4, p=0.008; effect size: 0.5, 95% CI: 0.1-0.9). These data suggest that memory specificity training adds significantly to the effect of standard TF-CBT in reducing PTSD severity. This approach can offer a simple and easy to implement strategy to augment treatment for PTSD patients.

Key words: Post-traumatic stress disorder, trauma-focused cognitive behavior therapy, memory specificity training, augmentation, treatment response, trauma-related cognitions

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Post-traumatic stress disorder (PTSD) is the most common psychiatric condition to arise after traumatic events, affecting approximately 5.6% of trauma-exposed people in their lifetime[1]. Trauma-focused cognitive behavior therapy (TF-CBT), which encompasses a range of treatments variably including exposure to one's trauma memory and cognitive reframing of excessively negative appraisals, is the frontline treatment for this disorder.

Despite the success of TF-CBT, between one-third and one-half of PTSD patients do not respond optimally to this treatment[2]. This situation, which has persisted for several decades, has led to much attention on new strategies to improve treatment response[3]. Most of these attempts have focused on modulating extinction processes, which are proposed to underpin core mechanisms of TF-CBT[4]. Despite the promise of these strategies, they have yielded only modest gains over standard TF-CBT[5].

An alternate approach to augmenting TF-CBT is enhancing a person's capacity to retrieve specific personal memories. There is considerable evidence that retrieval of autobiographical memories tends to be more overgeneral in people with PTSD[6]. This form of recall involves retrieval of abstract categories of events without being able to focus on highly specific instances of personal memories.

Overgeneral retrieval of autobiographical memories adversely affects people with a range of psychiatric disorders, because it promotes rumination, limits social functioning, can promote general beliefs that are maladaptive, and increases risk for suicidality[7,8]. This overgeneral retrieval has been shown to be a risk factor for ongoing PTSD, impeding problem-solving and planning for the future, and being associated with rumination about negative events[9,10].

For these reasons, strategies have been developed to train people with psychiatric disorders, particularly depression, to retrieve more specific memories. One initial variant involved training participants to systematically rehearse retrieving personal positive and negative memories with episodic detail, including temporal and contextual specificity[11]. This form of training focused primarily on people with depression, with early evidence showing effectiveness in reducing depressive symptoms[12].

One pilot trial has also shown that memory specificity training may have benefit in reducing PTSD symptoms[13]. This initial finding accords with accumulating evidence that accessing positive memories is linked to reduced avoidance and more adaptive post-traumatic appraisals[14,15]. Subsequent variants of this intervention which have trained people to be flexible in specific and general retrieval have also shown to be effective in reducing PTSD symptoms[16].

The goal of this trial was to evaluate the extent to which a form of memory specificity training focused on promoting retrieval of positive autobiographical memories could augment the clinical benefit of TF-CBT in people with PTSD. The training aimed to produce a shift towards retrieving memories that can: a) promote more adaptive views of the self, which can be compromised in PTSD[3,17], and b) facilitate positive affect, which has additional benefits in reducing anxiety[18].

The trial focused on first responders – including police, firefighters and paramedics – because these personnel have particularly high rates of PTSD[19], and tend to ruminate on negative personal memories[20]. We hypothesized that combined TF-CBT and

memory training treatment (TF-CBT/MT) would achieve greater PTSD severity reduction than TF-CBT alone.

METHODS

Study design and participants

In this randomized, parallel, controlled trial, first responders who met DSM-5 diagnostic criteria for PTSD were randomly assigned to either TF-CBT/MT or TF-CBT alone on a 1:1 basis. Assessments were conducted by independent psychologists who were blinded to the treatment condition of participants. The primary outcome was PTSD severity, and the primary outcome timepoint was the 6-month assessment.

Participants were recruited in Sydney (Australia) by referral, online advertising, and notices in first responder publications. Potential participants were initially screened during a telephone intake by a psychologist to determine eligibility, and suitable participants subsequently received a baseline assessment by a clinical psychologist.

Inclusion criteria were: a) aged at least 18 years, b) meeting DSM-5 diagnostic criteria for PTSD, c) being a current or former first responder, and d) being proficient in English. Exclusion criteria were: a) severe suicidal risk (reporting suicidal plan and intent), b) presence of psychosis, and c) substance dependence. At baseline assessment, major depressive disorder, anxiety disorders and substance use disorders were assessed using the Mini-International Neuropsychiatric Interview (MINI, version 5.5)[21].

The trial was approved by the University of New South Wales Human Research Ethics Committee (HC210804), and prospectively registered on Australian and New Zealand Clinical Trials Registry (ACTRN12621001442897). No changes were made to the protocol during the trial.

Randomization and masking

Participants were assigned to either TF-CBT/MT or TF-CBT alone by randomization on a 1:1 ratio, in blocks of four, by personnel who were independent of the trial using a computerized software that generated random number sequences. Randomization was not stratified. Assignment to one of the treatment conditions was e-mailed to a trial coordinator, and the relevant therapist was informed of the participant's treatment condition. All assessors were masked to treatment condition. To index the success of blinding, the assessors were asked to guess the participants' treatment condition at each assessment.

Interventions

Following explanation of the rationale of the study and written informed consent, participants completed the Credibility/Expectancy Questionnaire[22], a 6-item measure that asks respondents to rate on 10-point scales their confidence in the treatment they will receive and the perceived logic of the treatment.

Therapy comprised 12 weekly 90-min individual sessions, and was modelled on previous TF-CBT programs for first responders[23]. It was conducted by master's or doctoral level clinical psychologists, who were trained to use treatment manuals and received weekly supervision from the principal investigator. Both treatment manuals are available in the supplementary information.

The TF-CBT/MT condition commenced with a session of psychoeducation about PTSD and the rationale for TF-CBT, and a slow breathing exercise. In this first session, training retrieval of specific memories was started by coaching participants into recalling a neutral memory in response to a cue word (e.g., "bicycle") in highly specific detail, including where and when it occurred, all perceptual experiences attached to the event, and any other contextual details. This was then repeated for positive memories

Table 1 Baseline characteristics of participants in the trial

	TF-CBT/MT (N=50)	TF-CBT (N=50)
Age, years (mean±SD)	45.7±9.1	45.8±10.8
Male, N (%)	37 (74.0)	34 (68.0)
Education, years (mean±SD)	14.4±3.2	14.6±2.6
Time working as first responder, years (mean±SD)	20.1±9.8	18.9±10.7
Time since trauma, months (mean±SD)	103.2±99.8	76.4±75.0
Relationship status, N (%)		
Married/de facto	35 (70.0)	35 (70.0)
Divorced/separated	10 (20.0)	9 (18.0)
Widowed	0	1 (2.0)
Single	5 (10.0)	5 (10.0)
Ethnicity, N (%)		
White	43 (86.0)	40 (80.0)
Asian	1 (2.0)	3 (6.0)
Indigenous	3 (6.0)	7 (14.0)
Other	3 (6.0)	0
Profession, N (%)		
Police	30 (60.0)	29 (58.0)
Firefighter	13 (26.0)	13 (26.0)
Paramedic	7 (14.0)	8 (16.0)
Major depressive disorder, N (%)	32 (64.0)	28 (56.0)
Anxiety disorder, N (%)	12 (24.0)	12 (24.0)
Substance use disorder, N (%)	11 (22.0)	6 (12.0)
On antidepressant, N (%)	18 (36.0)	20 (40.0)
Credibility/Expectancy Questionnaire total score (mean±SD)	37.0±9.4	39.5±7.2

TF-CBT/MT – trauma-focused cognitive behavior therapy combined with memory specificity training, TF-CBT – trauma-focused cognitive behavior therapy alone

to cue words (e.g., "happy"). When participants delivered general memories, they were given corrective suggestions to deliver more specific detail. This was followed by providing participants with a workbook to practice retrieval of positive memories between sessions.

Memory training was continued in sessions 2-11. Session 2 also introduced labelling of emotions and cognitive reframing, and commenced monitoring of daily thoughts. Session 3 introduced challenging of maladaptive trauma-related thoughts, which continued in sessions 4-9. Session 3 also introduced skills training to assist participants with specific problems they may be experiencing (e.g., anger, panic, depression, sleep difficulties), and this continued in sessions 4-9. These skills were taught because previous trials with emergency service personnel indicated that they benefit from treatment addressing comorbidity issues common in this population[23]. Session 4 also introduced *in vivo* exposure to avoided situations.

Session 5 introduced imaginal exposure to the trauma memory, comprising 30 min of reliving of the traumatic event. This was continued in sessions 6-10. Sessions 10-11 reviewed all previously taught strategies. Session 12 focused on relapse prevention, including how strategies learnt in treatment would be applied to future stressors or exacerbation of symptoms.

The TF-CBT condition was identical to TF-CBT/MT, except that there was no memory specificity training. In this condition, the time allocated to memory training in TF-CBT/MT was assigned to

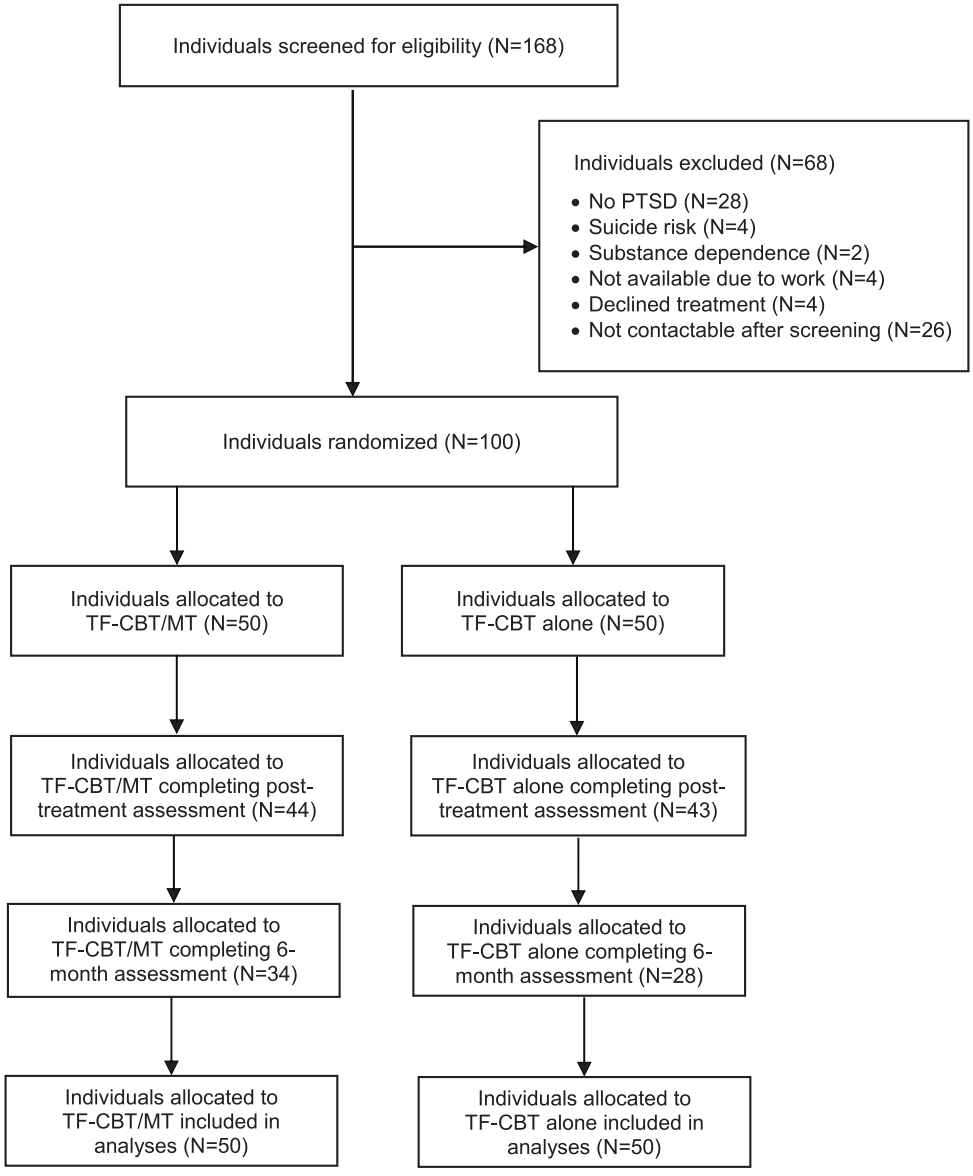

Figure 1 CONSORT flow diagram. TF-CBT – trauma-focused cognitive behavior therapy, TF-CBT/MT – TF-CBT combined with memory specificity training.

non-directive counseling.

To assess treatment fidelity, audio recordings of 10% of sessions were randomly selected and rated by an independent clinical psychologist who was blinded to treatment condition. This rater assessed the presence or absence of each of 61 treatment components across sessions, and evaluated quality of the therapy on a 7-point scale (0 = unacceptable, 6 = extremely good). The mean quality ratings were 5.2±0.8 for TF-CBT/MT and 5.1±1.1 for TF-CBT. No participants in the TF-CBT condition received memory specificity training.

An independent data monitoring committee reviewed adverse events occurring during the trial. No interim analyses were conducted.

Outcomes

The primary outcome was change in PTSD severity, as measured by the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5)[24]. This is a structured clinical interview that indexes

Table 2 Results from linear mixed model analyses of primary and secondary outcomes

		Estimated marginal mean (95% CI)		Mixed model analysis		
Outcome measure		TF-CBT/MT (N=50)	TF-CBT (N=50)	Difference in estimated means (95%CI)	p	Effect size (95% CI)
PTSD severity (CAPS)	Baseline	39.5 (36.8-42.1)	36.6 (33.9-39.3)			
	Post-treatment	15.2 (11.7-18.8)	18.6 (15.0-22.2)	6.3 (1.6-11.0)	0.01	0.6 (0.1-1.0)
	6-month	17.9 (13.7-22.2)	21.8 (17.3-26.4)	9.2 (3.2-15.1)	0.003	0.9 (0.1-1.6)
Depression (BDI-2)	Baseline	29.9 (27.3-32.6)	29.3 (26.5-32.1)			
	Post-treatment	14.5 (11.2-17.9)	18.1 (14.5-21.7)	4.2 (−6.8 to 9.1)	0.09	0.4 (−0.6 to 0.9)
	6-month	19.4 (15.2-23.7)	21.5 (16.7-26.3)	2.7 (−3.7 to 9.0)	0.40	0.2 (−0.3 to 0.8)
Alcohol use (AUDIT)	Baseline	8.5 (6.6-10.4)	7.4 (5.5-9.5)			
	Post-treatment	7.4 (5.8-9.1)	6.2 (4.5-7.9)	−0.2 (−2.0 to 1.7)	0.87	0.0 (−0.3 to 0.3)
	6-month	4.7 (2.5-7.0)	9.0 (6.9-11.0)	5.3 (1.5-9.2)	0.007	0.8 (0.2-1.4)
Trauma-related cognitions (PTCI), Self	Baseline	4.1 (6.3-7.4)	4.0 (3.7-4.3)			
	Post-treatment	3.0 (2.5-3.4)	3.2 (2.7-3.6)	0.3 (−0.2 to 0.8)	0.26	0.2 (−0.2 to 0.7)
	6-month	3.3 (2.8-3.7)	3.3 (2.8-3.8)	0.1 (−0.4 to 0.6)	0.74	0.1 (−0.3 to 0.5)
Trauma-related cognitions (PTCI), World	Baseline	5.2 (4.8-5.5)	4.8 (4.4-5.2)			
	Post-treatment	4.2 (3.7-4.7)	4.1 (3.7-4.6)	0.3 (−0.2 to 0.8)	0.20	0.2 (−0.2 to 0.5)
	6-month	4.2 (3.7-4.7)	4.1 (3.6-4.6)	0.3 (−0.3 to 0.9)	0.31	0.2 (−0.2 to 0.6)
Trauma-related cognitions (PTCI), Self-blame	Baseline	3.1 (2.7-3.5)	2.4 (2.0-2.9)			
	Post-treatment	2.3 (1.9-2.7)	2.4 (2.0-2.8)	0.8 (0.2-1.4)	0.01	0.5 (0.1-1.0)
	6-month	2.3 (1.9-2.7)	2.4 (1.9-2.7)	0.8 (0.2-1.4)	0.008	0.5 (0.1-0.9)
Quality of life (WHOQOL-BREF), Physical	Baseline	3.1 (2.9-3.2)	2.9 (2.8-3.1)			
	Post-treatment	3.6 (3.4-3.8)	3.2 (3.0-3.5)	−0.2 (−0.4 to 0.1)	0.16	−0.3 (−0.6 to 0.1)
	6-month	3.5 (3.3-3.7)	3.1 (2.9-3.4)	−0.2 (−0.5 to 0.1)	0.22	−0.3 (−0.7 to 0.1)
Quality of life (WHOQOL-BREF), Psychological	Baseline	2.7 (2.6-2.8)	2.7 (2.6-2.9)			
	Post-treatment	2.9 (2.7-3.1)	2.9 (2.7-3.2)	−0.2 (−0.4 to 0.1)	0.25	−0.3 (−0.7 to 0.2)
	6-month	3.5 (3.3-3.7)	2.8 (2.6-3.0)	−0.1 (−0.4 to 0.1)	0.22	−0.2 (−0.8 to 0.2)
Quality of life (WHOQOL-BREF), Social relationships	Baseline	2.8 (2.6-3.0)	2.9 (2.6-3.1)			
	Post-treatment	3.2 (3.0-3.5)	3.2 (3.0-3.4)	−0.1 (−0.4 to 0.2)	0.47	−0.1 (−0.5 to 0.3)
	6-month	3.0 (2.7-3.3)	3.2 (2.8-3.5)	0.1 (−0.3 to 0.5)	0.50	0.2 (−0.4 to 0.6)
Quality of life (WHOQOL-BREF), Environment	Baseline	3.5 (3.4-3.7)	3.5 (3.4-3.7)			
	Post-treatment	3.8 (3.7-4.0)	3.7 (3.5-3.8)	−0.2 (−0.4 to 0.0)	0.06	−0.3 (−0.7 to 0.0)
	6-month	3.7 (3.5-3.9)	3.7 (3.4-3.9)	0.0 (−0.3 to 0.2)	0.80	0.0 (−0.5 to 0.3)

TF-CBT/MT – trauma-focused cognitive behavior therapy combined with memory specificity training, TF-CBT – trauma-focused cognitive behavior therapy alone, CAPS-5 – Clinician-Administered PTSD Scale for DSM-5, BDI-2 – Beck Depression Inventory-2, AUDIT – Alcohol Use Disorders Identification Test, PTCI – Posttraumatic Cognitions Inventory, WHOQOL-BREF – World Health Organization Quality of Life - Brief Version

the 20 symptoms described by the DSM-5 criteria for PTSD, with each symptom rated for severity and frequency in the past month on 5-point (0-4) scales (score range: 0-80; higher scores indicate greater PTSD severity). The CAPS-5 has strong inter-rater reliability (.91), test-retest reliability (.78), and internal consistency (.88)[24].

Among secondary outcomes, depression was assessed by the Beck Depression Inventory-2 (BDI-2)[25], which is a 21-item self-report measure of depression in the past two weeks (score range: 0-63; higher scores indicate more severe depression). Trauma-related cognitions were assessed by the Posttraumatic Cognitions Inventory (PTCI)[26], which is a 36-item self-report scale that measures maladaptive appraisals commonly associated with PTSD (negative cognitions about self, negative cognitions about the world, and self-blame; score ranges: 21-147, 7-49 and 5-35, respectively; higher scores indicate more maladaptive appraisals). Participants are asked to respond on how they currently think, without reference to a timeframe.

Quality of life was assessed using the World Health Organization Quality of Life – Brief Version (WHOQOL-BREF)[27], which assesses quality of life across four domains of functioning in the past two weeks, with higher scores indicating better functioning (physical health: score range 7-35; psychological: score range 6-30; social relationships: score range 3-15; environment: score range 0-40). Alcohol use was assessed by the Alcohol Use Disorders Identification Test (AUDIT)[28], which is a 10-item self-report scale providing an overall severity score of alcohol use in the past month (score range: 0-40; higher scores indicate greater alcohol use).

Statistical analyses

We determined that, in order to have 90% power (with alpha = 0.05, two-sided) to detect a between-treatment effect at 6-month follow-up equivalent to a large effect size of 0.8, 35 participants per group would be needed. This effect size was based on a previous pilot trial of a variant of memory specificity training in PTSD, which found a large effect size[13]. On the expectation that 30% of participants would not be retained for the follow-up assessment, it was estimated that 100 participants (50 per group) would be required.

We focused on intent-to-treat analyses. Using SPSS (Version 28.0), hierarchical linear models were applied to assess differential changes in PTSD severity between treatment arms, because this allows the number of observations to vary between participants and handles missing data by using maximum likelihood estimation methods. All missing data were assumed to be random, because the participants who were and were not retained at 6 months did not differ in terms of baseline characteristics (see supplementary information). Models included time-of-assessment point, treatment condition, and their interaction.

Fixed (intervention, time of assessment) effects and their interactions were entered in unstructured models to determine the relative effects of the treatments assessed at baseline, post-treatment, and 6-month follow-up. This approach uses maximum likelihood estimation to derive estimated means, and calculate the differences between conditions in the estimated means relative to baseline levels. Fixed effects parameters were tested using the Wald test (t-test, $p<0.05$, two-sided) and 95% confidence intervals (CIs). Cohen's d effect sizes were calculated by dividing the difference in change between treatment arms relative to baseline by the pooled standard deviations.

To assess the robustness of this approach, secondary analyses were conducted which focused only on participants who completed the 6-month assessment. Noting the possible effects of time working as a first responder, analyses were repeated using this variable as a covariate.

RESULTS

Participants

Between October 2021 and May 2023 (with final follow-up assessments completed in November 2023), 100 participants were enrolled into the trial. Participants in the two arms did not differ at baseline on any sociodemographic characteristic or psychopathology measure (see Table 1). The mean number of intervention sessions attended did not differ between participants in the TF-CBT/MT (10.2±3.4) vs. TF-CBT alone (10.6±2.7) conditions ($t_{98}=0.7$, $p=0.48$).

Figure 1 summarizes the participant flow. There were 100 participants randomized to either TF-CBT/MT (N=50) or TF-CBT alone (N=50). Most participants completed the post-treatment (87, 87.0%), and 6-month assessment (62, 62.0%). The other participants were not contactable for these assessments. Participants who were and were not retained at 6-month assessment did not differ on any pre-treatment variable (see supplementary information).

Blinding efficacy

Assessors correctly guessed the treatment condition within chance levels, for participants in TF-CBT/MT and TF-CBT arms, at both post-treatment (51.6% and 50.0%, respectively) and 6-month follow-up (51.6% and 54.2%, respectively). This pattern indicates that assessors were actually blind to treatment condition at each assessment.

Primary outcome

Both treatments displayed a marked reduction in PTSD symptoms at the 6-month assessment (mean difference: 18.0, 95% CI: 15.1-21.0, $p<0.001$), with a large effect size (1.9, 95% CI: 1.6-2.2).

Participants receiving TF-CBT/MT showed a greater reduction in PTSD severity on the CAPS-5 than those randomized to TF-CBT alone, at both post-treatment (mean difference: 6.3, 95% CI: 1.6-11.0, $p=0.01$) and 6-month follow-up (mean difference: 9.2,

95% CI: 3.2-15.1, p=0.003) (see Table 2). The difference at 6-month assessment indicated a large effect size (0.9, 95% CI: 0.1-1.6).

Analysis of participants who completed the post-treatment assessment indicated no difference in rates of meeting PTSD diagnostic criteria between the TF-CBT/MT (6, 13.6%) and the TF-CBT (10, 23.2%) arms. Although there was a trend for fewer participants in TF-CBT/MT (6, 17.6%) than in TF-CBT (10, 35.7%) condition to meet PTSD criteria at the 6-month follow-up, this difference was not significant (χ^2=2.6, p=0.11). The number needed to treat at follow-up was 5.4.

Secondary outcomes

TF-CBT/MT resulted in a greater reduction of alcohol use at the 6-month assessment (mean difference: 5.3, 95% CI: 1.5-9.2, p=0.007) than TF-CBT alone, with a large effect size (0.8, 95% CI: 0.2-1.4). There was also a greater reduction in self-blame cognitions in the former group (mean difference: 0.8, 95% CI: 0.2-1.4, p=0.008), with a moderate effect size (0.5, 95% CI: 0.1- 0.9). There were no significant differences in terms of depression, other forms of post-traumatic appraisals, or quality of life between the two groups (see Table 2).

Secondary analyses

Secondary analyses focusing only on participants who completed the 6-month follow-up replicated the intent-to-treat findings that TF-CBT/MT led to greater reductions in PTSD severity and self-blame relative to TF-CBT. The intent-to-treat finding that TF-CBT/MT led to less alcohol use than TF-CBT was not observed in this analysis (see supplementary information). Consistent with the primary analyses, there were no significant differences on other secondary outcomes.

When controlling for number of years served as a first responder, the same pattern of findings was observed as in the primary analyses, with TF-CBT/MT resulting in greater reductions in PTSD severity, alcohol use, and self-blame than TF-CBT (see supplementary information).

There was one adverse event reported. A participant in the TF-CBT arm asked to not continue treatment because of an increase in nightmares.

DISCUSSION

In this trial, both TF-CBT conditions were associated with significant reductions in PTSD severity, which is consistent with previous reports of a positive impact of TF-CBT in first responders[23]. The major finding, however, was that augmenting TF-CBT with memory specificity training for positive memories significantly enhanced reduction of PTSD symptoms relative to standard TF-CBT. This is in line with previous reports of the efficacy of memory specificity training in mitigating anxiety and mood symptoms[29], as well as with pilot evidence of an amelioration of PTSD symptoms[13]. However, this is the first trial to show that this strategy can increase the treatment gains of TF-CBT in individuals with PTSD.

The utility of memory specificity training which focuses on positive memories for enhancing the effects of TF-CBT can be understood in the context of evidence that PTSD is characterized by overgeneral retrieval of memories[6]. It has been proposed that promoting more specific retrieval of autobiographical memories can reduce rumination, improve social functioning, reduce maladaptive appraisals, and boost self-esteem[15]. It is noteworthy that TF-CBT/MT resulted in greater reductions of self-blame appraisals than TF-CBT, which supports the proposal that memory specificity training can alleviate negative cognitions about oneself[17].

We observed that TF-CBT/MT resulted in a greater reduction of alcohol use. This finding appears to be a function of TF-CBT participants' alcohol use increasing over the 6-month follow-up, whilst alcohol use decreased in the TF-CBT/MT arm. It is possible that, as PTSD symptoms decreased over the six months after treatment, participants had a weaker motivation to self-medicate with alcohol. There is indeed abundant evidence that changes in PTSD severity influence alcohol use[30]. Although TF-CBT alone also resulted in a reduction in PTSD severity, it is possible that this level of symptom reduction was not sufficient to trigger a decrease in alcohol use. We note that this finding was not replicated in the secondary analysis including only those who completed the 6-month assessment. Thus, we regard the finding as tentative.

TF-CBT/MT did not reduce depressive symptoms more than TF-CBT alone, which may appear not to be in line with previous reports that memory specificity training can alleviate depressive symptoms[12]. However, it should be considered that the training implemented in this trial was not as comprehensive as the programs that have been shown to reduce depression. It is also known that reductions in depression can often occur as a result of TF-CBT alone[31], and it is worth noting that depression decreased significantly in both TF-CBT/MT and TF-CBT arms in this trial. It is possible that the gains produced by memory specificity training were not sufficient to augment the benefits of reduced PTSD symptoms achieved by patients in both treatment arms.

In terms of trial limitations, we note that three-quarters of the sample were male, so that generalizability to females requires further evaluation. Second, we cannot definitively conclude that TF-CBT led to PTSD reduction, because the design lacked a no-treatment or placebo condition. Third, whereas 87% of the sample was retained at the post-treatment assessment, only 62% was assessed at the 6-month follow-up. However, there were no baseline differences between those who were and were not retained at follow-up, and the number of retained participants was larger than in most previous PTSD trials[32]. It is possible that attrition did not occur at random, and this raises questions concerning the symptom trajectories of those lost to attrition. Fourth, we acknowledge that it was not possible to blind therapists and participants concerning their assigned treatment condition, and accordingly we cannot rule out expectancy effects impacting the outcomes. Fifth, this trial focused on first responders, and results need to be replicated in other PTSD populations.

In conclusion, this study represents the first demonstration that integrating memory specificity training for positive personal memories with TF-CBT can augment the effects of this frontline treatment. In the context of up to one-half of PTSD patients not responding to TF-CBT[2], it is important for clinicians to consider auxiliary strategies that can promote better treatment response. Training patients to retrieve positive autobiographical memories is a relatively simple strategy, and this promising technique can be readily implemented into clinical practice.

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