Overgeneral autobiographical memory recollection in Iranian combat veterans with posttraumatic stress disorder

Ali Reza Moradi, Ahmad Abdi, Ali Fathi-Ashtiani, Tim Dalgleish, Laura Jobson

Abstract

This study examined the recollection of autobiographical material in memory among Iranian military veterans with and without posttraumatic stress disorder (PTSD), and healthy non-trauma-exposed control subjects. Participants completed the Autobiographical Memory Test, Autobiographical Memory Interview (counterbalanced), Impact of Event Scale-Revised, Beck Depression Inventory-II, Wechsler Memory Scale-III and Wechsler Adult Intelligence Scale-Revised. The PTSD group generated fewer specific episodic and semantic details of autobiographical memory compared to the non-PTSD and control groups. Working memory did not significantly moderate the relationship between PTSD diagnosis and reduced autobiographical memory specificity but did moderate the relationship between PTSD diagnosis and semantic recall; semantic memory recall was not significantly related to working memory ability for those with PTSD but was related to working memory ability for trauma survivors without PTSD. While the data provide some support for the expectation that higher working memory ability is associated with an increased ability to retrieve specific memories (i.e. semantic memory recall in those without PTSD), the findings are also consistent with the view that for those with PTSD the demands on working memory required for affect regulation cancel out this influence of working memory in augmenting access to specific memories.

Keywords:
Posttraumatic stress disorder
Autobiographical memory
Culture
Overgeneral memory

Overgeneral autobiographical memory recollection with posttraumatic stress disorder

Posttraumatic Stress Disorder (PTSD) is a debilitating anxiety disorder afflicting significant numbers of survivors of major psychological trauma (American Psychiatric Association, 2000). The hallmark symptom of PTSD is the intrusive recollection of memories of the traumatic experience. These intrusions often occur as vivid, highly emotive, sensory-laden flashbacks and reliving experiences (Brewin, Dalgleish, & Joseph, 1996; Ehlers & Clark, 2000), but also as nightmares, intrusive thoughts and images, and in the form of psychological and physiological distress when encountering trauma reminders (American Psychiatric Association, 2000). Profound attempts to prevent such involuntary access to the trauma memory manifest as the avoidance symptoms of PTSD, trauma memories themselves, has important implications for the functionality of everyday cognition. Firstly, reduced AMS in PTSD is associated with impaired daily problem-solving (Sutherland &...
Bryant, 2008) as a function of the fact that problem resolution almost always benefits from retrieval of specific past instances of similar situations and how they were addressed. Second, and related, reduced AMS about the past is strongly associated with a difficulty imagining specific events in the future (e.g. Williams et al., 1996) with a consequent impact on the ability to effectively plan daily life. Thirdly, difficulty accessing specific information about the past, including about the trauma, interferes with the ability to update and re-script the trauma memory – processes known to be integral to recovery from PTSD, especially within therapy (e.g. Wheatley, Hackmann, & Brewin, 2009). Given these relationships between reduced AMS and cognitive function, it is unsurprising that reduced AMS has been found to predict poorer posttraumatic stress symptom outcomes in longitudinal studies in trauma survivors, over and above current PTSD symptom levels. For example, Kleim and Ehlers (2008) found that reduced AMS in trauma survivors two weeks after an assault predicted PTSD six months later (see also Harvey, Bryant, & Dang, 1998). These various data strongly suggest that reduced AMS is more than an epiphenomena of PTSD.

What is the relationship between enhanced involuntary access to trauma memories, impoverished voluntary access to coherent details of those same memories, and a more general impairment in retrieving specific personal memories in survivors of PTSD? An influential theoretical account has been put forward by Williams and colleagues (see Williams, 2006; Williams et al., 2007), a key component of which is the Affect Regulation Hypothesis—a proposal for which there is burgeoning empirical support (e.g. Hermans, Defranc, Raes, Williams, & Eelen, 2005; Hermans et al., 2008; Kuyken & Brewin, 1995; see Moore & Zoellner, 2007, and Sumner, 2012, for reviews). The Affect Regulation Hypothesis utilises mainstream cognitive models of autobiographical memory such as the Self Memory System Model (Conway, 2005; Conway & Pleydell-Pearce, 2000) as a framework to conceptualise the repeated attempts to preclude the involuntary intrusion of specific details of the traumatic experience in sufferers of PTSD. According to such models, the autobiographical memory database is represented hierarchically with general summaries of broad categories of life experience and/or lifetime periods at the top and increasingly specific details of individual events at the bottom. Voluntary retrieval of specific event details generally requires navigating down the hierarchy and is cognitively effortful requiring executive and working memory (WM) resources. Such voluntary specific memory recollection can be aborted or compromised by diverting retrieval towards general representations of the past that are stored higher in the hierarchy and are thus more readily accessible. Specific memory retrieval can also be compromised, according to such models, when executive and WM resources are low as there is insufficient capacity to maintain the hierarchical search. Williams et al. (2007) argue that, in sufferers of PTSD, attempts to avoid the recollection of specific details of the trauma involve diverting the hierarchical memory search in just this way towards these higher-level generic representations of personal experience. A consequence of this over time is that not only do coherent details of the trauma itself become difficult to access voluntarily, but all specific memory access becomes compromised as this emphasis on generic autobiographical retrieval becomes inflexible and habitual (Williams et al., 2007).

The key question of course is whether, for PTSD sufferers, this reconfiguration of the autobiographical memory system search process in favour of generic information succeeds in reducing the frequency of occurrence of intrusive trauma memories. This does not appear to be the case. Intrusive involuntary recollection of specific events appears to involve ‘direct access’ to specific event representations in the memory hierarchy thus bypassing the hierarchical search that underpins voluntary retrieval (Conway, 2005; Conway & Pleydell-Pearce, 2000). Consequently, avoidant cognitive strategies that divert hierarchical search towards generic representations appear to have little impact on involuntary intrusions and if anything such intrusions appear to be higher in those with reduced AMS (Williams et al., 2007).

The fact that reduced AMS seems to have no adaptive role in ameliorating symptoms, is associated with a range of other impairments in day-to-day mental functioning, and is diagnostic of poor clinical outcome across a number of clinical disorders, including PTSD (Williams et al., 2007), has motivated the development of low intensity clinical interventions targeted at enhancing AMS to counteract and potentially reverse these latter difficulties. The nature of reduced AMS is most clearly understood in relation to depression. Consequently, initial attempts at intervention development have focused on depressed patients with Raes and colleagues’ four session pilot programme of Memory Specificity Training (MEST) showing promising results (Raes, Williams, & Hermans, 2008). MEST also has considerable promise for populations with PTSD where we already know that AMS improves following successful treatment of PTSD using cognitive behaviour therapy (CBT) (Sutherland & Bryant, 2007). However, our understanding of the impact of AMS in PTSD lags behind that in depression, and so it is important to continue to elucidate the nature of the phenomenon to provide as strong a platform as possible to support these putative clinical developments.

In particular, there are two further important aspects of the Williams et al. (2007) model that are relatively unexplored in sufferers of PTSD and that are the focus of the present study. The first is the prediction that reduced AMS should be accompanied by reduced access to semantic information about the self as such access is mediated by common hierarchical mechanisms. There is some support for this in unselected samples of trauma survivors (Meesters, Merckelbach, Muris, & Wessel, 2000; Moradi, Herlihy, Yasseri, Turner, & Dalgleish, 2008) but none using a sample with PTSD and none looking at associations with reduced AMS.

The second issue concerns the relationship between individual differences in the capacity of WM and the extent of reduced AMS in sufferers of PTSD. In depression there is now clear evidence that WM moderates levels of AMS with lower WM being associated with reduced specificity (Dalgleish et al., 2007), presumably as a function of the proposed key role WM plays in instigating and controlling hierarchical memory searches (Conway, 2005). Although there is good evidence that WM is compromised in PTSD (e.g. Koso & Hansen, 2006; Samuelson et al., 2009), the predictions about how this will influence AMS are less clear. It is possible that the relationship will mimic that in depression with lower WM being associated with reduced AMS. However, as reduced AMS is believed to function in the service of affect regulation in PTSD, as Demaree, 2008), one could also argue that reduced AMS may be associated with greater levels of WM in those with PTSD. Finally, these two opposing demands on WM, driven by the task instructions and the desire to regulate affect, could cancel each other out resulting in a null relationship between WM and AMS. The exact nature of this relationship is important to resolve because there is gathering evidence that WM ability can be ameliorated in the clinic through systematic cognitive training and that such training gains can transfer to improvements in the processing of emotional material (Swiss, Hampshire, & Dalgleish, 2011). Understanding how WM relates to reduced AMS in PTSD will clarify whether WM training is likely to help as an adjunctive component of therapeutic efforts to augment AMS in this population.
Iranian norms and norming procedures for the WMS-III and WAIS-R. Study was to expand the purview of research on memory specific to posttraumatic stress disorder; IES-R — Impact of Event Scale-Revised; BDI — Beck Depression Inventory; AMT — Autobiographical Memory Test; AMI — Autobiographical Memory Interview. Based on these unresolved issues in the literature, the present study therefore addressed two research questions: 1) whether PTSD was associated with reduced access to specific autobiographical information as well as to specific episodic autobiographical memories; and 2) whether the relationship between PTSD and degree of reduced semantic and episodic autobiographical access was moderated by individual differences in WM capacity in survivors of trauma, and if so, how? An additional aim of the study was to expand the purview of research on memory specificity to a non-western population. Reduced AMS has to date only been investigated in western trauma survivor samples. Investigating AMS in non-western trauma survivor samples is of relevance because of the accumulating research demonstrating that those from non-western, collectivistic cultures are less likely to provide specific autobiographical memories than those from western, individualistic cultures (e.g., Han, Leichtman, & Wang, 1998; Jobson, 2009a; Wang & Conway, 2004). These findings have been accounted for by the notion that culturally differing emphasis on either independence or interdependence influences the self and in turn, autobiographical remembering style (see Conway & Jobson, in press; Jobson, 2009b; Ross & Wang, 2010; Wang & Conway, 2004). Therefore, an additional important unanswered question is whether the relationship between reduced AMS and psychopathology, such as posttraumatic stress, still holds in non-western, collectivistic cultures.

**Method**

### Participants

The participants were male Iranian military personnel who had participated in the Iran—Iraq war and who were diagnosed with (n = 25) or without (n = 25) PTSD, and a sample of healthy male controls (n = 25) who had not been exposed to combat stress. Baghiyatallah Hospital and the Medical Department of Bonyad Shahid in Arak, Iran, have special units established to offer medical and psychological services to Iranian military personnel involved in this eight-year conflict (September 1980—August 1988) between Iraq and Iran. To recruit participants for the PTSD and non-PTSD groups the Departments of Psychology and Psychiatry at Baghiyatallah Hospital and the Medical Department of Bonyad arranged a programme of visits of the with patients who had been involved in the war and invited them to participate in the study. Patients who decided to participate contacted the researcher and a time was set up for the study. Participants were allocated to the PTSD or non-PTSD groups based on whether they met (or did not meet) the diagnostic criteria for PTSD as determined by the Iranian version of the Structured Clinical Interview for DSM-IV (First, Spitzer, Gibbon, & Williams, 1996). The validity and reliability of the Iranian version has been assessed and found to be adequate by the Institute of Psychiatry, Medical Tehran University. The structured clinical interviews were conducted in Farsi by clinical psychologists who had received training on the Iranian SCID prior to conducting the diagnostic evaluations. Participants were also excluded if they had any brain injury (such as closed head injury, head injury, stroke, etc.), history or current symptoms of psychosis, acute suicide risk or current substance abuse or dependence.

The healthy control participants were recruited from the same geographical regions by local advertisements that called for people who had not experienced any trauma or been exposed to combat. The absence of psychiatric history in controls was also determined by the Iranian SCID. Trauma history was also assessed in the interview. All attempts were made to recruit participants (including controls) from similar backgrounds (i.e., socioeconomic, cultural, education and similar urban regions — Tehran and Arak city). Table 1 shows the means and standard deviations for age and IQ. The groups did not differ in terms of age or IQ, Fs < 1. All participants were Muslim.

### Measures

**Impact of event scale-revised (IES-R; Weiss & Marmar, 1997)**

The IES-R is a 22-item self-report questionnaire measuring severity of symptoms of posttraumatic intrusion, avoidance and hyperarousal in the previous week. Internal consistency is high and test-retest reliability is good (Weiss & Marmar, 1997). The Farsi version of the IES-R was used in the present study (Moradi et al., 2008).

### Autobiographical memory test

The gold-standard laboratory measure of AMS is the Autobiographical Memory Test (AMT) which presents participants with lists of cue words and asks them to retrieve a specific memory to each word (Williams & Broadbent, 1986). There are promising psychometric properties for this test (Griffith, Klein, Sumner, & Ehlers, in press). The AMT was administered in Farsi. In terms of word selection, in a pilot study the researchers gave a list of 100 words which were selected from a pool of Farsi words, including negative war trauma related and positive words, to more than 60 individuals to rate their emotionality. After rating the words, the 20 words (10 positive and 10 negative war trauma-related words) with the highest emotionality ratings were presented to five psychologists to select the most appropriate five positive and five negative trauma-related words based on frequency, length and emotionality. The five positive cues were: spring, laugh, love, and fly (Farsi translations: bahar, khunde, esgh, gol and parvaz). The five negative cues were: bust, sleeping bag, bomb, torture and chemical (Farsi translations: enfejar, kise khab, shekanje, bomb and shimiaei). Participants were instructed that they would read ten words and that the researcher was interested in specific memories. They were told that, for the purposes of this task, a specific memory is a memory of an event that lasted less than a day and with a distinct

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Note. Standard deviations appear in parentheses. PTSD — Posttraumatic stress disorder; IES-R — Impact of Event Scale-Revised; BDI — Beck Depression Inventory; AMT — Autobiographical Memory Test; AMI — Autobiographical Memory Interview.

### Table 1

Mean participant characteristics and responses on the AMT and AML

<table>
<thead>
<tr>
<th></th>
<th>PTSD</th>
<th>Non-PTSD</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>42.00 (4.66)</td>
<td>42.28 (4.61)</td>
<td>43.00 (4.44)</td>
</tr>
<tr>
<td>IQ</td>
<td>102.76 (5.09)</td>
<td>102.88 (4.25)</td>
<td>103.72 (4.61)</td>
</tr>
<tr>
<td>Working Memory</td>
<td>9.44 (3.23)</td>
<td>19.36 (2.94)</td>
<td>25.24 (4.17)</td>
</tr>
<tr>
<td>IES-R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>72.88 (6.30)</td>
<td>5.16 (1.49)</td>
<td>—</td>
</tr>
<tr>
<td>Intrusions</td>
<td>24.04 (2.05)</td>
<td>1.80 (1.15)</td>
<td>—</td>
</tr>
<tr>
<td>Avoidance</td>
<td>26.16 (2.82)</td>
<td>1.92 (1.22)</td>
<td>—</td>
</tr>
<tr>
<td>Hyperarousal</td>
<td>23.08 (1.08)</td>
<td>1.48 (1.05)</td>
<td>—</td>
</tr>
<tr>
<td>Depression (BDI)</td>
<td>40.72 (6.17)</td>
<td>12.92 (5.24)</td>
<td>7.28 (2.35)</td>
</tr>
<tr>
<td>AMT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specificity</td>
<td>1.64 (.99)</td>
<td>6.20 (1.00)</td>
<td>8.24 (1.20)</td>
</tr>
<tr>
<td>Extended</td>
<td>1.68 (1.07)</td>
<td>.64 (.95)</td>
<td>.80 (.76)</td>
</tr>
<tr>
<td>Categoric</td>
<td>6.32 (1.35)</td>
<td>2.96 (1.21)</td>
<td>.80 (.82)</td>
</tr>
<tr>
<td>Omissions</td>
<td>.36 (.57)</td>
<td>.20 (.41)</td>
<td>.16 (.37)</td>
</tr>
<tr>
<td>AMI — Child</td>
<td>15.66 (2.76)</td>
<td>17.34 (2.50)</td>
<td>20.12 (1.25)</td>
</tr>
<tr>
<td>AMI — Early Adult</td>
<td>16.20 (1.57)</td>
<td>17.86 (2.39)</td>
<td>19.84 (1.77)</td>
</tr>
<tr>
<td>AMI — Recent</td>
<td>18.62 (1.65)</td>
<td>19.46 (1.34)</td>
<td>20.68 (1.00)</td>
</tr>
</tbody>
</table>

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1. Please contact first author for further details about these measures, including Iranian norms and norming procedures for the WMS-III and WAIS-R.
time and place, and that the memories could be recent or distant, interesting or trivial. The need for specificity was repeated and an example given. The test did not proceed until the participant had given a specific memory for at least two practice items. Participants were given 30 s for each word to retrieve a specific memory. If the first memory was not specific, a standard prompt was given — such as “can you remember a specific event?”. The first retrieved memories were coded as to whether or not they were specific (i.e. if the memory was of an event that lasted less than a day and with a distinct time and place). If participants failed to generate a memory in the allotted time, their responses were coded as omissions. In line with prior studies (e.g. Dalglish et al., 2003), nonspecific or ‘overgeneral’ memories were also coded as either categoric (a memory of conflating over numerous related events e.g. ‘I have never enjoyed holidays’) or extended (a single episodic event that nevertheless lasts longer than a day; e.g. my week’s vacation last summer). Although complete data are presented here, only specific memory scores were the focus of our analyses. However, the pattern of results was the same if numbers of overgeneral memories were substituted into the analyses. Two assessors rated the memories for all participants. These raters were blind to the study’s aims and to the group allocation of participants. Inter-rater reliability for specificity/nonspecificity was good, Kappa = .84. Discrepancies between raters for the coding of specificity/nonspecificity were resolved through discussion.

Autobiographical memory interview (AMI, Kopelman Wilson, & Baddeley, 1990)

The AMI provides an assessment of the participant’s personal remote (retrograde) memory. The semantic portion of the AMI was used in the present study. The AMI assesses semantic autobiographical memory through a structured interview concerning autobiographical facts from the participant’s own past life (e.g. where one lived during childhood or adolescence). The semantic component of the AMI examines three time periods: childhood (e.g. names of schools or teachers or friends), early adult life (e.g. name of first employer), and more recent facts (e.g. holidays). For each of these lifetime period sub-sections the range of scores is 0–21. The AMI has good reliability and validity (Kopelman et al., 1990). The Farsi version of AMI was used (Moradi et al., 2008).

Working memory

WM was assessed using the working memory subtests (Letter-Number Sequencing and Spatial Span) of the Wechsler Memory Scale–III (WMS-III; Wechsler, 1997). The Iranian standardized version of the WMS-III, which has been normed for Iranian populations (as developed by Shiraz University and available from Sherkat Hoshazemay Novin, Tehran, Iran) was used.

Beck depression inventory-II (BDI-II; Beck, Steer, & Brown, 1996)

The BDI-II was used to measure depressive severity over the previous 2 weeks. The BDI-II is a 21-item self-report questionnaire that rates each question on a scale of 0–3 with total scores ranging from 0 to 63. It has shown high internal consistency (Beck et al., 1996; Dozois, Dobson, & Ahnberg, 1998) and good convergent and discriminant validity (Beck et al., 1996). The Farsi version of BDI-II was used (Moradi et al., 2008).

Procedure

All participants were informed about the aims of the research and were told that all information would be confidentially protected. Participants were tested individually in a quiet room by researchers. Following written informed consent and administration of the SCID, participants completed the AMT and AMI. The AMT and AMI were counterbalanced. This was followed by the IES-R (the Control group did not complete the IES-R as it requires an index trauma), BDI-II, working memory components of the WMS-III and the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1981), which was used as a measure of IQ. The Iranian standardized version of the WAIS-R which has been normed for Iranian populations (as developed by Shiraz University and available from Sherkat Hoshazemay Novin, Tehran, Iran) was used. All measures were administered in Farsi. Participants received the equivalent of $10 for being taking part in the study.

Results

Mood and symptom measures

Table 1 shows the means and standard deviations for the groups on the IES-R and BDI-II. As expected, the PTSD and Non-PTSD groups differed significantly on the IES-R, t(73) = 52.30, p < .001, d = 14.79, and its subscales: IES-R Intrusion, t(48) = 47.24, p < .001, d = 13.38; IES-R Avoidance, t(48) = 39.39, p < .001, d = 11.16; and IES-R Hyperarousal, t(48) = 33.19, p < .001, d = 9.39. The three groups differed significantly on the BDI-II, F(2, 72) = 338.16, p < .001, ηp2 = .90. Pairwise comparisons revealed that the PTSD group scored significantly higher than the Non-PTSD group, t(48) = 17.17, p < .001, d = 4.86, who in turn scored significantly higher than the Control group, t(48) = 4.91, p < .001, d = 1.39.

Working memory (WM)

The groups differed significantly in terms of WM as one would expect, F(2, 72) = 131.26, p < .001, ηp2 = .76 (see Table 1). The PTSD group scored significantly lower than the Non-PTSD group, t(48) = 11.36, p < .001, d = 3.21, who in turn scored significantly lower than the Control group, t(48) = 5.76, p < .001, d = 1.63.

Research question 1: recollection of autobiographical (semantic and episodic) material

Descriptive statistics for the three groups on the AMS and AMI are presented in Table 1. Consistent with previous studies, none of the types of memory on the AMT yielded a significant valence effect (positive vs. negative cue word), so the data are shown collapsed across the positive and negative cues (Griffith et al., in press). Testifying to the strong relationship between episodic and semantic aspects of specificity of autobiographical recollection, correlation analyses across all participants revealed that specificity on the AMT and on the three AMI semantic subtests were significantly associated with large effect sizes: AMI childhood, r(73) = .59, p < .001; AMI early adulthood, r(73) = .55, p < .001; AMI recent, r(73) = .49, p < .001.

Episodic specificity on the AMT

An ANOVA with specificity on the AMT as the dependent variable revealed a significant difference across the three groups, F(2, 72) = 249.69, p < .001, ηp2 = .87. Follow-up tests revealed that the PTSD group provided significantly fewer specific memories.
There was a significant multivariate effect of Group, Wilks’ Lambda = .48, F(2, 72) = 10.33, p < .001, η²p = .31. Univariate tests revealed that the groups differed significantly on the childhood, F(2, 72) = 24.69, p < .001, η²p = .41, adult, F(2, 72) = 22.01, p < .001, η²p = .38, and recent, F(2, 72) = 14.63, p < .001, η²p = .29, subtests. Follow-up tests revealed that the PTSD group scored significantly lower than the Non-PTSD group on the childhood, t(48) = 2.26, p = .03, d = .64, adult, t(48) = 2.90, p < .01, d = .82, and recent, t(48) = 1.98, p = .05, d = .56, subtests. Additionally, the Non-PTSD group scored significantly lower than the Control group on the childhood, t(48) = 4.97, p < .01, d = 1.41, adult, t(48) = 3.33, p < .01, d = .94, and recent, t(48) = 3.65, p < .01, d = 1.03, subtests.

Research question 2: moderating effects of working memory

The moderation analyses involving WM focused only on the two trauma survivor groups. Two hierarchical multiple regression analyses were used. Each explored the role of WM as a predictor (Step 1) of autobiographical memory (either on the AMS or the AMI) and as a moderator of the relationship between PTSD status (i.e. PTSD vs. no PTSD; included as an interaction term: WM × PTSD) and autobiographical memory (Step 2) (Baron & Kenny, 1986; Holmbeck, 1997). To examine the influence of depression symptoms on these relationships, depression severity on the BDI-II was included as a predictor variable on Step 1 and as an interaction term with WM on Step 2, for each regression. WM and depression scores were mean-centred prior to the construction of the interaction terms in order to minimise any problems of multicollinearity and to aid the interpretation of the results (Aiken & West, 1991; Holmbeck, 2002).

The outputs for the two regressions are presented in Table 2. In the case of AMS, a significant amount of variance was accounted for by PTSD diagnosis, depression severity and WM on Step 1. As expected based on our prior case-control analyses (reported above), PTSD diagnosis significantly predicted AMS. However, there was no support for a predictive relationship between WM and AMS. Furthermore, the interaction terms (WM × PTSD and WM × Depression) did not emerge as significant predictors of AMS (see Table 2).

Second, for semantic knowledge assessed on the AMI, while PTSD diagnosis, depression and WM accounted for a significant amount of the variance, only PTSD diagnosis was near-significant (p = .05). The interaction term, WM × PTSD, did emerge as a significant predictor of semantic knowledge recall (see Table 2) and remained significant in a reduced model that included only the two main effects and the interaction (Holmbeck, 2002). The nature of the interaction was explored in greater detail using the method of simple slopes (Holmbeck, 2002) (see Fig. 1). The simple slope was significant for participants without PTSD (B = .56, p = .04), with

3 Given the relationship between age and cognitive ability, the results were also analysed with age as a covariate and the three groups still differed significantly, F(2, 71) = 10.14, p < .001, η²p = .31.

Table 2 Summary of regression analyses testing moderating effects of the working memory variable.

<table>
<thead>
<tr>
<th>Step and variable</th>
<th>AMS</th>
<th>AMI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE B</td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>.05</td>
<td>.03</td>
</tr>
<tr>
<td>PTSD Diagnosis</td>
<td>−6.21</td>
<td>.87</td>
</tr>
<tr>
<td>WM</td>
<td>−.01</td>
<td>.05</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTSD diagnosis × WM</td>
<td>−.26</td>
<td>.18</td>
</tr>
<tr>
<td>Depression × WM</td>
<td>.01</td>
<td>.01</td>
</tr>
</tbody>
</table>

Note. PTSD = Posttraumatic stress disorder; WM = Working memory; AMS = Autobiographical Memory Specificity; AMI = Autobiographical Memory Interview. For AMS – R² = .85*** for Step 1; ΔR² = .01 for Step 2. For AMI – R² = .28** for Step 1; ΔR² = .13* for Step 2.

Discussion

The present study found that trauma survivors, and in particular trauma survivors with PTSD, show reduced specificity in their recall of both autobiographical episodic memories and personal semantic information. Moreover, there was a strong inter-relationship between these episodic and semantic aspects of specificity of autobiographical recollection. These findings accord with the notion that reduced AMS is accompanied by reduced access to semantic information about the self and that such access may be mediated by common hierarchical mechanisms (Williams et al., 2007). The results also demonstrate reduced AMS in a non-western trauma survivor sample which suggests that findings that are typically obtained from studies with Western samples in this domain can be generalized to non-western cultures; trauma exposure and PTSD appear to exert a similar influence on AMS transculturally.

![Fig. 1. Simple slopes for semantic recall of trauma survivors with and without post-traumatic stress disorder (PTSD) at 1 SD below the mean, the mean and 1 SD above the mean of working memory capacity.](image-url)
The current results found no support for a moderating role for WM in AMS, either as a main effect or as an interaction, in trauma survivors, with trivial effect sizes. These findings potentially provide support for the proposition that reduced AMS is associated with WM-demanding affect regulation that cancels out the influence of WM in augmenting access to specific memories through enhanced hierarchical search. Similarly, the data provided no support for WM playing a role in predicting semantic autobiographical memory in those with PTSD, and indeed numerically the suggestion was that higher WM was associated with reduced semantic specificity. In contrast, however, WM did appear to moderate the specificity of semantic autobiographical recall in trauma survivors without PTSD as one might expect with higher WM associated with greater specificity.

The current findings have a number of potential clinical implications. At the broadest level, our understanding of reduced AMS in PTSD has hitherto lagged behind that in depression and thus research in this area is of importance in continuing to develop a platform to support clinical developments in this area — especially as reduced AMS has detrimental effects on processes known to be integral to recovery from PTSD that are thus, targeted in therapy. Additionally, most of our understanding regarding the development, maintenance and treatment of PTSD symptoms is based on research conducted in Western societies, thus research improving our understanding of the processes involved in PTSD for those from different cultural groups is imperative for improving the generalizability of current interventions (Foa, Keane, Friedman, & Cohen, 2009).

At a more specific level, the current data, in tandem with the other accumulating evidence demonstrating reduced AMS in PTSD, suggest that it would be timely to explore the feasibility, acceptability and likely efficacy a low intensity clinical intervention that targets enhancing AMS in this population, building on the promising early results from similar interventions in depression (Raes et al., 2009). To that end we have just completed a pilot study of Memory Specificity Training (MEST) in trauma-exposed adolescent refugees suffering paternal bereavement (Neshat Doost et al., submitted for publication). The preliminary results suggest that MEST not only enhances AMS but that improvements in AMS drive treatment-related improvements in self-reported negative mood states. The current results also suggest that these memory interventions may be further improved by targeting semantic recall, but that is yet to be explored clinically.

As well as their potential as stand-alone interventions, low-intensity protocols such as MEST, if offered adjunctively may enhance existing gold-standard interventions for PTSD such as CBT. For example, enhanced AMS following MEST could aid trauma-focused therapeutic components such as editing and re-scripting of the trauma memory, engagement with the trauma memory in exposure therapy, and accessing of other episodic memories that support safe and successful experiences (and thus provide counter evidence to that provided by the trauma memory and associated appraisal) (Ehlers & Clark, 2000; Kleim & Ehlers, 2008; Sutherland & Bryant, 2007).

A final clinical implication of the present data is the suggestion that efforts to augment executive control (e.g. Schweizer et al., 2011) in the service of reducing AMS in those with PTSD may well be misplaced. We found no support for the notion that better WM was associated with greater specificity and there are theoretical reasons why one might speculate that the reverse may be true. That said, enhancing executive control in affective contexts in tandem with intervention elements designed to independently enhance specificity (such as MEST) may well reap benefits.

A number of potential study limitations merit discussion. The first is the study’s cross-sectional design which precludes causal inferences about the relationship between psychiatric status and specificity. Second, while our findings suggest cultural similarities in AMS, further research would benefit from directly investigating cultural differences in using a cross-cultural design and a richer set of measures; for example, an assessment of collectivist vs. individualist attitudes. Third, while we did assess trauma history in our clinical interview, the study may have been improved by the inclusion of a standardised trauma history questionnaire to facilitate comparison with the wider literature. Additionally, we did not derive formal diagnoses of DSM-IV-TR Axis I conditions other than PTSD in the trauma groups. This is a limitation of the study, despite the presence of a self-report depression measure. Fourth, future studies would benefit from using a more thorough and robust assessment of WM that might be more sensitive. To that end we have now devised WM measures that specifically assess executive control in trauma-related contexts (Schweizer & Dalgleish, 2011) and it would be interesting to elucidate the relationship between this construct and AMS. A further issue is that the AMI is scored based on number and details of information provided rather than the accuracy of that information. However, it is worth highlighting that the AMI authors report that in studies investigating the accuracy of general AMI responses, the overall tendency for accurate responses is very high (Kopelman et al., 1990). Sixth, we acknowledge that the correlations between reduced specificity in the episodic and semantic domains reported here were conducted by collapsing across groups. However, this procedure has been used in previous studies using the AMT (e.g. Schönfeld & Ehlers, 2006) and it should also be noted that the correlations were still significant when using just the trauma survivor groups. Furthermore, while researchers attempted to match groups in terms of education, city, socioeconomic status etc., the study would be improved by including formal measures of these variables to ensure the groups were similar. Additionally, recruitment involved a programme of visiting patients who had been involved in the war and inviting them to participate in the study. Participants were then self-selected to take part. This potentially biases findings and limits generalisability as it remains unknown whether the characteristics of those who did not participate were similar to those who did choose to take part in the study. Finally, we should that there were significant group differences in depression scores. However, depression was not found to predict AMS or interact with WM significantly in the regression analyses and so it is unlikely that it can account for our key study findings.

In summary, the current study found that non-western trauma survivors of the Iran—Iraq war retrieved less specific autobiographical episodic memories and fewer personal semantic memories than healthy controls. Furthermore, among these trauma survivors, those with PTSD showed relatively reduced AMS and less personal semantic knowledge recall compared to the survivors without PTSD. There was no support for a role for WM in moderating specificity of recall in those with PTSD. The data have interesting clinical implications regarding therapeutic enhancement of AMS in those with PTSD using memory training programmes (e.g. Neshat Doost et al., submitted for publication).

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References


