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Overgeneralized autobiographical memory and future thinking in combat veterans with posttraumatic stress disorder

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ABSTRACT

Background: Studies show that individuals with Posttraumatic Stress Disorder (PTSD) tend to recall autobiographical memories with decreased episodic specificity. A growing body of research has demonstrated that the mechanisms involved in recalling autobiographical memories overlap considerably with those involved in imagining the future. Although shared autobiographical deficits in remembering the past and imagining the future have been observed in other clinical populations, this has yet to be examined in PTSD. This study examined whether, compared to combat trauma-exposed individuals without PTSD, those with combat-related PTSD would be more likely to generate overgeneralized autobiographical memories and imagined future events.

Method: Operation Enduring/Iraqi Freedom (OEF/OIF) veterans with and without PTSD were presented with neutral word cues and were instructed to generate memories or imagine future autobiographical events. Responses were digitally recorded and were coded for level of episodic specificity and content related to combat trauma.

Results: Individuals with PTSD were more likely to generate overgeneral autobiographical memories and future events than individuals without PTSD, and were more likely to incorporate content associated with combat when remembering the past or thinking about the future.

Limitation: Limitations of the study include a cross-sectional design, precluding causality; the lack of a non-trauma exposed group, relatively small sample, and almost all-male gender of participants, limiting the generalizability to other populations.

Conclusion: These findings suggest that individuals with PTSD show similar deficits when generating personal past and future events, which may represent a previously unexamined mechanism involved in the maintenance of PTSD symptoms.

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1. Introduction

Considerable progress has been made toward identifying cognitive (Conway & Pleydell-Pearce, 2000), neural (Rubin, 2005),

and functional (Bluck, 2009) properties of autobiographical memory across a wide range of populations. The study of autobiographical memory has become especially pertinent to psychopathology research, and in particular Posttraumatic Stress Disorder (PTSD), a psychiatric disorder characterized by unwanted distressing autobiographical memories (American Psychiatric Association [DSM-IV-TR], 2000). Some have even argued that PTSD is a response to a traumatic autobiographical memory rather than to a traumatic event *per se* (Rubin, Berntsen, & Bohni, 2008).

One consistent finding is that individuals with PTSD retrieve less specific autobiographical memories than those without PTSD, producing what is often referred to as “overgeneralized memories”

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(for a review see Moore & Zoellner, 2007). That is, when individuals with PTSD are provided with a word cue and are asked to recall a personal memory, they tend to retrieve categorical information (e.g. repeated time points, events that extend over more than one day) rather than unique moments within a distinct event. Overgeneralized autobiographical memory has been documented in Vietnam veterans with PTSD (McNally, Lasko, Macklin, & Pitman, 1995; McNally, Litz, Prassas, Shin, & Weathers, 1994), cancer survivors (Kangas, Henry, & Bryant, 2005) and injured individuals with acute stress disorder (Harvey, Bryant, & Dang, 1998). Significantly, it is not merely a consequence of trauma exposure (Moore & Zoellner, 2007), it appears to emerge independent of depression (McNally et al., 1995), and is not viewed as a marker of overall psychopathology, inasmuch as it is not related to other anxiety disorders (e.g. Wenzel, Jackson, & Holt, 2002; Wilhelm, McNally, Baer, & Florin, 1997). Overgeneralized autobiographical memory has been implicated as an important mechanism underlying the pathogenesis of PTSD as it appears to contribute to the onset and maintenance of the disorder (Bryant, Sutherland, & Guthrie, 2007; Harvey et al., 1998).

In this paper, we explore whether the overgeneralization observed in the autobiographical memories of those with PTSD may extend to other autobiographical temporal time points, namely the construal and imagination of future episodes. Converging research from clinical, neuroscientific, and basic behavioral studies demonstrate that the underlying structures and processes involved in generating autobiographical memories overlap considerably with those involved in imagining one's autobiographical future. For example, recent brain imagining studies reveal that regions in the medial prefrontal cortex, posteromedial parietal cortex, and the medial temporal lobes (including regions in the parahippocampal cortex and hippocampus) are similarly engaged when individuals generate past and future personal events (e.g., Addis, Wong, & Schacter, 2007; Szpunar, Watson, & McDermott, 2007; for reviews see Schacter, Addis, & Buckner, 2008; Szpunar, 2010). Studies with amnesiac populations report that individuals with damage to the hippocampus have difficulty producing autobiographical memories and imagining future episodes (Klein, Loftus, & Kihlstrom, 2002; Tulving, 2002). Developmentally, the ability to recall past and imagine future events emerges and declines in parallel across the life-span (Addis, Wong, & Schacter, 2008; Atance & O'Neill, 2005).

In terms of overgeneralized autobiographical memories, studies with clinical populations have found that individuals who recall autobiographical memories with less episodic specificity show similar patterns when imagining the future. For example, Williams et al. (1996) found that compared to controls, suicidally depressed patients generate both personal memories and future events with less episodic specificity. Similar findings have also been observed among schizophrenic (D'Argembeau et al., 2008) and complicated grief patients (Maccullum & Bryant, 2011). Although overgeneralized autobiographical memory is well-documented in PTSD, studies have yet to examine whether they extend to imagined future events.

In addition to investigating overgenerality in PTSD, the present study examined the extent to which PTSD influenced the content of imagined future events. Schacter and Addis (2007) hypothesize that because autobiographical memories are reconstructed, they possess a flexibility that enables the construction and simulation of imagined future events (*constructive episodic simulation hypothesis*). Moreover, it has been demonstrated that predictions about the future are based on the ease with which past events are recalled (Tversky & Kahneman, 1973). Therefore episodic simulations are likely to draw on the contents of those memories most accessible at that time. In light of these findings, Schacter, Addis, and Buckner (2008) predict that because anxious individuals show increased memory accessibility for negative past events, they are likely to

construct negatively biased simulations for the future. Such biases in bidirectional 'time travel' indicate that people with PTSD are more likely to recall and imagine trauma-related events.

In sum, compared to combat veterans without PTSD, we predicted that (1) PTSD participants would retrieve autobiographical memories and imagine future events with less episodic specificity and (2) PTSD participants would include greater combat-related trauma content in their autobiographical memories and imagined future events.

2. Method

2.1. Participants

Participants were 28 Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) combat veterans between the ages of 19–50 years. Participants were recruited through the on-line classifieds website Craigslist (www.craigslist.com). Participants were pre-screened and excluded if they met criteria for Traumatic Brain Injury (TBI; Hoge et al., 2008) or had ever received behavioral or psychopharmacological treatment for PTSD. Proof of US military affiliation (e.g., DD-214) was required in order to participate in the study. The study was conducted at the New School for Social Research, and the study was approved from the New School for Social Research IRB Board.

Following informed consent, participants were assessed for PTSD with the Clinician-Administered PTSD Scale (CAPS, Blake et al., 1995). The CAPS is a semi-structured interview in which individuals are asked to rate on a 0–4 point scale the frequency and severity for the 17 symptoms that compose the DSM-IV-TR diagnosis of PTSD, with 4 being highest in frequency or severity. A symptom was considered endorsed if the frequency was rated '1' (once or twice in the past month) and the intensity was rated as '2' (2 = "moderate, distress clearly present but still manageable, some disturbance of activities"). Individuals were assigned to the PTSD group if they met DSM-IV-TR PTSD Criteria A1 (exposure to an event involving actual or perceived life threatening or serious injury) and A2 (a subjective response of fear, helplessness, or horror during or immediately after the event) and exhibited at least 1 re-experiencing symptom, at least 3 avoidance symptoms, and at least 2 hyperarousal symptoms (Blake et al., 1995). An advanced doctoral level student trained in the CAPS administered the interview. Twenty-five percent of the assessments were discussed with a clinical psychologist trained in the CAPS, blind to the hypothesis of the study, to confirm scoring accuracy. The CAPS possesses good sensitivity (.84), specificity (.95), and test–retest reliability (.90) relative to the SCID PTSD diagnosis (Blake et al., 1995). Participants also completed the Beck Depression Inventory-II, a reliable assessment to index symptoms of depression (BDI-II, Beck, Steer, & Brown, 1996), the Combat Exposure Scale to quantify the severity of combat exposure (Keane et al., 1989), and the Controlled Oral Word Association Task to measure executive functioning (COWAT, Benton & Hamsher, 1976). Demographic information regarding age, gender, highest military rank, level of education, duration of deployment, type of deployment (Iraq, Afghanistan, or both) and time since last exposure to combat was also collected (see Tables 1 and 2). The assessment was counterbalanced so that it was given either before or after the experimental phase of the study.

2.2. Stimulus material, design and procedure

Based on previous work examining the specificity of autobiographical memory and episodic simulation (e.g., Addis et al., 2007), we employed a *Modified Autobiographical Memory Test*. Individuals were asked to generate autobiographical memories or future simulations in response to neutral word cues. Although previous

Table 1
Demographic characteristics for OEF/OIF veterans.

Variable	Veterans with PTSD (n = 12)		Veterans without PTSD (n = 16)	
	M	SD	M	SD
Demographic variables				
Age	30.25	6.03	31.38	8.69
Years of education	14.08	1.78	14.94	1.52
Months deployed	15.55	11.75	14.38	6.29
Months since combat	54.50	28.91	45.56	25.52
Military tour				
%OEF	3	(25%)	3	(18.8%)
%OIF	3	(25%)	7	(43.8%)
%OEF and OIF	6	(50%)	6	(37.5%)
Highest rank				
%E3	–	–	2	(12.5%)
%E4	4	(33.3%)	11	(68.8%)
%E5	7	(58.3%)	3	(18.8%)
%O3	1	(8.3%)	–	–

Note. OEF = Operation Enduring Freedom; OIF = Operation Iraqi Freedom; E3 = Private, E4 = Corporal; E5 = Sergeant; O3 = Captain.

studies examining autobiographical memory and future imagining in clinical populations tend to use positively and negatively valenced word cues, neutral words cues were selected for several reasons. First, this is the first effort to examine the phenomenon of future thinking in combat veterans with and without PTSD. To that end, as stated, the paradigm was closely modeled after the now well-replicated paradigm employed in behavioral and brain imaging studies by Addis, Schacter, and colleagues which employed neutral cue words (e.g. Addis et al., 2007). The primary aim of this study was to identify whether the phenomenon of overgeneralized episodic memory extends to future thinking in PTSD. Thus, before testing more specific questions related to valence, we felt that a prudent first step involved testing the hypothesis using neutral cues. Along those lines, given the clinical sensitivity of this population, we were reluctant to include words that would deliberately require participants to recall or imagine negative or trauma-related events.

The decision to use neutral words was also driven specifically to examine whether individuals with PTSD are more likely to incorporate combat-related information for past and future events in the absence of a negative or trauma-related words. That is, although it is commonly believed that PTSD is maintained, in part, by exaggerated fears and maladaptive appraisals about one's future, this is the first attempt to specifically examine the content of imagined future events in PTSD, and the use of neutral cues provides a novel method to observe whether individuals with PTSD are more likely to imagine their future involving traumatic events. Along these lines, a similar approach was adopted by Sutherland and Bryant (2008) in which individuals with PTSD, compared to trauma-exposed individuals without PTSD, were more likely to recall a traumatic event as their self-defining memory, even though the instructions were entirely absent of valence.

Table 2
Clinical summary for OEF/OIF veterans.

Variable	Veterans with PTSD		Veterans without PTSD		t
	M	SD	M	SD	
CAPS	70.17	25.15	14.06	9.52	8.22***
Combat exposure	17.25	3.84	10.13	3.69	4.94***
BDI-II	13.58	7.08	9.47	6.87	1.71
COWAT	37.25	9.38	39.94	10.14	0.72

Note. CAPS = Clinician-Administered PTSD Scale; Combat exposure = Combat Exposure Scale; BDI – II = Beck Depression Inventory – Second Edition; COWAT = Controlled Oral Word Association Task. ** $p < .001$. *** $p < .0001$.

Thus, the neutral cues were 20 words selected from the Clark and Paivio's extended norms (Clark & Paivio, 2004). The cues were high in imageability ($M = 6.42$, $SD = .28$), Thorndike-Lorge frequency ($M = 1.75$, $SD = .25$), and concreteness ($M = 6.75$, $SD = .28$). The 20 words were randomly divided into four lists of five nouns, with each list of five nouns presented in a block. Analysis of variance (ANOVA) demonstrated that the lists did not differ significantly in imageability, $F(3, 19) = 1.02$, $p = .41$, $\eta^2 = .16$; frequency, $F(3, 19) = 1.55$, $p = .24$, $\eta^2 = .23$; or concreteness, $F(3, 19) = 1.02$, $p = .15$, $\eta^2 = .28$. Depending on the condition, for a particular block of nouns, participants were asked to either describe a recent memory (past month), a remote memory (past 5–20 years), a recent anticipated event (next month) or a remote anticipated event (next 5–20 years) that the cue word evoked. Time frame (recent/remote) was manipulated because previous work shows that past and future event phenomenology, such as personal significance and level of event detail, varies with temporal distance (Addis et al., 2007; D'Argembeau & van der Linden, 2004). Moreover, time frame was manipulated to address the possibility that remote memories overlapping with military deployment may be characteristically different than recent memories and future events. The pairing of list with time period was counterbalanced, and the order of the words within a list was randomly determined. An additional four words were selected from Clark and Paivio (2004) to serve as practice items.

At the beginning of the experimental task, participants read instructions in which they were told that they would be asked to either recall or imagine recent or remote events in as much detail as possible. Participants were instructed that they could "freely associate" to the word cue. That is, the response could be any personal past or imagined future event elicited by the cue, and did not have to be directly related to the word. Events had to be personally relevant and took place (or could take place when imagining a future event) within a 24-h time period. Moreover, participants were informed that future events had to be realistic and not previously experienced by the participants. Four practice trials were completed before beginning each task.

Consistent with previous work (Addis et al., 2007), participants viewed a computer screen in which each cue word was presented in the center of the monitor, with the task (recall past event or imagine future event) and time period (month or 5–20 years) displayed underneath the cue, as well as a reminder to supply as much detail as possible. After the presentation of each cue participants pressed a computer key indicating when an event had been recalled or imagined. Participants then described the event into a digital audio recorder. There were no time constraints on the verbal description. Responses were later transcribed. At the beginning of each condition, after the instructions were repeated, participants confirmed that they understood them before the first cue word appeared. If participants did not begin to recall an event after 3 min, the experiment moved on to the next trial; this occurred an average of .38 times per participant.

2.3. Scoring

We refer to reported events in the memory or simulation tasks as a memory/simulation, respectively. Following previous work (Williams et al., 1996), a score of '3' (specific) was given if the event took place, or could take place, within a 24-h time period, included people, and a specific location. A response was coded as '2' (intermediate) if the response was a repeated event or a past or future event that took place or could take place over a period of more than one day. A response was coded as '1' (general) if it did not contain specific details or was something other than a memory. A response was coded as a '0' if the individual did not generate a response. For

example, for the cue “‘Library’ (‘imagine future event, ‘month,’”), “Asking the librarian where I can find *The Adventures of Huckleberry Finn*” would receive a score of 3, “working as a summer intern at the library” would receive a score of 2, “I haven’t read a book in a while” would be coded as a 1, and an omission would receive a score of 0. The score for each trial was summed to create a total score for each of the four conditions (Recent Memory, Remote Memory, Recent Simulation, and Remote Simulation). Two individuals blind to the hypothesis of the study demonstrated high inter-rater reliability ($K = .87$) for coding each response for levels of specificity.

Furthermore, descriptions were dichotomously coded for the presence or absence of combat trauma-related content. Consistent with Sutherland and Bryant (2008), an event was coded as combat trauma-related if the participant described a combat trauma in their memory or imagined future. Events describing military life with no trauma were coded as not combat trauma-related. The number of responses containing combat trauma were tallied for a summed score. Again, two individuals blind to the hypothesis of the study demonstrated high inter-rater reliability ($K = .93$) for coding each response for levels of specificity and the presence of combat-related content.

3. Results

3.1. Demographic and clinical characteristics

A multivariate analysis of variance (MANOVA) revealed no significant differences for age, education, duration of deployment, time since combat exposure, depression, or verbal fluency. However, compared to non-PTSD participants, individuals with PTSD reported greater exposure to combat stressors during deployment.

3.2. Specificity of autobiographical memories and future simulations

Table 3 illustrates the mean total specificity scores for the four conditions. A 2 (Task: Memory, Simulation) \times 2 (Distance: Recent, Remote) \times 2 (Group: PTSD, No PTSD) mixed design ANOVA indicated a main effect for Group, $F(1, 26) = 39.00$, $\eta_p^2 = .60$, $p < .001$. No other main effects or interactions were found. PTSD participants reported less specific recent and remote autobiographical memories and episodic simulations than non-PTSD participants. We combined the temporal variables (Recent and Remote) for all participants and found a significant correlation between specificity for autobiographical memories and episodic simulations ($r = .83$, $p < .001$).

We then conducted a secondary analysis employing a dichotomous (specific, overgeneral) coding technique often used in overgeneralized autobiographical memory studies in clinical populations (Raes, Hermans, de Decker, Eelen, & Williams, 2003). Therefore, memories and imagined future events were categorized as either specific or overgeneral, in which responses were coded as overgeneral if they were categoric, extended, a non-memory or

future event, or an omission (Raes et al., 2003). The dependent variable was the total number of specific memories or imagined future events. The same pattern emerged. A 2 (Task: Memory, Simulation) \times 2 (Distance: Recent, Remote) \times 2 (Group: PTSD, No PTSD) mixed design ANOVA yielded a significant main effect for Group, $F(1, 26) = 61.24$, $\eta_p^2 = .70$, $p < .001$. No other main effects or interactions were observed. Across all four conditions (memory/future, recent/remote) individuals with PTSD, compared to those without PTSD, generated fewer specific memories and future events (Recent Memory: $t(26) = 6.22$, $p < .001$, $d = 2.26$; Remote Memory: $t(26) = 4.75$, $p < .001$, $d = 1.79$; Recent Simulation: $t(26) = 6.07$, $p < .001$, $d = 2.25$; Remote Simulation: $t(26) = 4.98$, $p < .001$, $d = 1.89$).

3.2.1. Combat trauma content

A 2 (Task) \times 2 (Distance) \times 2 (Group) repeated measures ANOVA revealed main effects for Distance, $F(1, 26) = 10.32$, $\eta_p^2 = .35$, $p < .01$, Task, $F(1, 26) = 15.79$, $\eta_p^2 = .38$, $p < .01$, and Group, $F(1, 26) = 8.75$, $\eta_p^2 = .25$, $p < .01$, and interactions between Distance and Task, $F(1, 26) = 5.03$, $\eta_p^2 = .17$, $p < .05$, and Task and Group, $F(1, 26) = 1.40$, $\eta_p^2 = .02$, $p < .01$. Participants were more likely to mention combat trauma for memories than simulations, $t(26) = 3.58$, $p < .001$, $d = .61$. PTSD participants mentioned combat trauma significantly more frequently than those without PTSD, $t(26) = 2.11$, $p < .05$, $d = .94$. The Task by Group interaction arose because individuals with PTSD generated more combat trauma content for memories than for simulations, $t(11) = 3.92$, $p < .001$, $d = .89$, whereas non-PTSD participants did not. Individuals generated more combat-related content for remote than recent events, but this appears to be due to a floor effect among individuals without PTSD. Importantly, individuals with PTSD generated more combat-related content for future simulations than individuals without PTSD, $t(26) = 2.11$, $p < .05$, $d = .89$.

4. Discussion

Although these data are based on a small and predominantly male sample, they are the first to show that consistently observed PTSD-related deficits in autobiographical memory are also found in future thinking. Compared to combat veterans without PTSD, combat veterans with PTSD were less likely to remember or imagine distinct episodic events. Although we cannot entirely rule out the possibility that these findings reflect differences in combat exposure, rather than PTSD per se (the PTSD group reported greater exposure than the non-PTSD group), we believe that the decreased specificity for past and future events observed while controlling for combat severity, as well as reviews showing that PTSD, not trauma exposure, is more consistently associated with overgeneralized memory (see Moore & Zoellner, 2007), suggests that the mechanism underlying the between-group differences was PTSD, not exposure to combat trauma. These findings converge with studies in other clinical populations showing reduced specificity for personal past and future events (D’Argembeau, Raffard, & Van der Linden, 2008; Maccallum & Bryant, 2011; Williams et al., 1996), and further extend evidence for a shared underlying cognitive system in autobiographical memory and future simulation.

While we cannot determine the exact mechanisms influencing the reduced specificity in generating past and future events in PTSD from this study, Williams’ (2006) comprehensive CARFAX model suggests that functional avoidance, executive dysfunction, and ruminative thinking may independently or interdependently lead to overgeneralized memories. In addition, neuroimaging studies show that the shared neuro-anatomical structures involved in recalling the past and imagining the future (e.g. Schacter et al., 2008) depend, in part, on a network of structures that have been

Table 3

Degree of specificity for autobiographical memories and future simulations (0–15).

Variable	Veterans with PTSD		Veterans without PTSD		<i>t</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Recent memory	5.81	3.17	9.13	.95	6.41***
Remote memory	5.26	3.17	8.83	1.09	4.55***
Recent future	4.34	2.93	9.00	1.03	4.54***
Remote future	5.34	2.63	9.25	1.65	4.73***

Note. Recent = month; Remote = 5–20 years. *** $p < .001$.

shown to be altered in PTSD (e.g. Lanius, Bluhm, Lanius, & Pain, 2006). Thus, future studies would benefit from employing approaches that can tease apart the potential cognitive and neurobiological mechanisms underlying these shared deficits.

In addition, and consistent with the *flexible recombination hypothesis* (Schacter & Addis, 2007), we also found overlapping patterns of content in past and future events. That is, in response to neutral cue words, individuals with combat-related PTSD, compared to those without PTSD, were more likely to generate combat-related content when recalling the past and imagining the future. For example, several PTSD participants imagined engaging in disaster relief and rescue efforts in New York City as a result of imagined terrorist attacks. Other participants imagined volunteering for redeployment and constructed imagined combat scenarios. These data are also consistent with complicated grief patients whom were also more likely to generate grief-related content in future simulations and hold grief-related future goals (Maccallum & Bryant, 2011).

Although preliminary, these data may reflect an important mechanism underlying the maintenance of PTSD symptoms. For example, considering the wealth of evidence of attentional bias to threat in PTSD (Bryant & Harvey, 1995; Thrasher, Dalgleish, & Yule, 1994), it is possible that reconstruction of memories in ways that emphasize threat may contribute to the increased perception of future harm, and in turn may be reflected in hypervigilance or avoidance to potential threats. That is, based on these findings, individuals with PTSD appear to be more concerned about the possibility of future trauma exposure, and as a result, these maladaptive beliefs are likely to perpetuate ongoing feelings of current threat and distress.

Several limitations to this study should be acknowledged. The findings are based on a relatively small and almost all male sample. Future studies need to examine whether these findings extend to other PTSD populations. Furthermore, the study was limited by its cross-sectional design without a non-trauma control group. Although prior PTSD studies show decreased specificity independent of depressive symptoms (Moore & Zoellner, 2007), reduced specificity for future simulations is found in depressed, dysphoric, and bereaved populations (Maccallum & Bryant, 2011; Williams et al., 1996). Therefore, research needs to clarify the relation between deficits and alterations in episodic simulations and comorbid disorders, and whether these observations result from shared or distinct mechanisms. Moreover, during the autobiographical memory and future imagining task, individuals were not probed for additional details. Hence, these results may reflect an “overgeneralized style” as opposed to an inability to remember or imagine detailed episodic events. In addition, although we believed that all participants clearly understood and followed instructions to imagine novel future events, we were not able to corroborate the uniqueness of these events with each participant. Therefore, it may be, that some of the future events overlapped with personal memories. This is particularly important for future studies to examine more closely, as individuals with PTSD whom were more likely to mention combat-related trauma were also exposed to more combat. Therefore, it is possible, that the imagined combat-related future events were actual memories re-framed as future episodes. However, the authors of the study feel that this is unlikely as all participants appeared to clearly understand the instructions to generate novel future events. We do, however, and consistent with the flexible recombination hypothesis, believe that some details or themes from the past were incorporated into combat-related future events. Future studies would benefit from a more refined metric that quantifies the amount of detail from memory that is being used in an imagined future event.

The observed deficits in PTSD may have important implications for treatment. Increased memory specificity for positive memories is linked with PTSD symptom reduction following cognitive behavior therapy (Sutherland & Bryant, 2007). Therefore, strategies that promote the retrieval of episodically-rich memories, and in particular positive memories, may help patients contextualize and integrate traumatic events in a manner that is conducive to recovery. Increased specificity of autobiographical memories may also promote future-oriented problem solving abilities, which may also contribute to the reduction of PTSD symptoms. Along those lines, recent experimental work (Brown, Dorfman, Marmar, & Bryant, *in press*) suggests that changes in how individuals view their capacity to manage stressful events in the past had an impact on their specificity and content of their imagined future events. College students who were falsely led to believe that they were in the top 1% of “copers” (high self-efficacy condition) were more likely to generate autobiographical memories and imagined future events with greater specificity and greater content reflecting positive and self-efficacy statements, compared to those who were falsely led to believe they were in the bottom 30% of copers (low self-efficacy condition). Additionally, those in high self-efficacy condition performed better on a social problem solving task, which was predicted by specificity scores on the future imagining task. Thus, although preliminary, therapeutic interventions aimed at increasing self-efficacy may beneficially alter not only how individuals once viewed their capacity to handle adverse events, but how they imagine their ability to negotiate them in the future.

In addition, interventions for PTSD may also benefit from placing greater emphasis on how individuals imagine the future, such as imagery re-scripting or future-oriented imaginal exposure techniques that aim to increase the specificity and decrease the maladaptive biases toward the future. Therefore, techniques that involve re-scripting imagined future events with themes of perceived mastery and controllability may be particularly useful for PTSD interventions. An inability to simulate such novel events in specific detail may hinder efforts to benefit from this technique. In general, the capacity to simulate future events appears to underlie a number of factors related to psychological well-being. The simulation of future events has been associated with a number of functional benefits, including coping and affect regulation (Taylor & Schneider, 1989), problem solving (Oettingen, 1996; Taylor & Pham, 1996), implementing self-care behaviors (Orbell, Hodgkins, & Sheeran, 1997), and achieving goals (Taylor, Pham, Rivkin & Armor, 1998). Accordingly, future research could usefully examine the extent to which the simulation of future events, and its relationship to autobiographical memories, impacts on recovery from trauma and on treatment of PTSD.

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