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Trauma Exposure and Risk Recognition in Young Adults: The Role of Attention Biases and Memory Biases

Elizabeth Reichert
University of Rhode Island

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TRAUMA EXPOSURE AND RISK RECOGNITION IN YOUNG ADULTS: THE
ROLE OF ATTENTION BIASES AND MEMORY BIASES

BY

ELIZABETH REICHERT

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
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Abstract

The vast literature on trauma and revictimization suggests that it is still relatively unknown as to why some people are more susceptible to re-experiencing trauma. Research suggests that women with previous histories of sexual victimization are at increased risk for revictimization. Increasingly, studies have demonstrated that women with histories of sexual assault took significantly longer to recognize risk as compared to non-victimized women. However, the research on risk recognition has focused almost exclusively on sexually victimized women. Extant studies however, have not examined risk recognition in a more diverse group of traumatized individuals nor the potential contributions of cognitive biases to risk recognition deficits. The current study examined the role of attention and memory biases in risk recognition in a sample of young adults with no, some, and multiple incident trauma histories. Participants were 312 college students at a large, northeastern university. They completed a packet of self-reported questionnaires, an attentional dot probe task, and a recall and recognition memory task. Participants received extra credit in their undergraduate psychology course for their participation. Participants were categorized into one of three conditions: individuals with no, some, and multiple trauma histories. Data were analyzed by MANOVAs and chi-square analyses. Results found no evidence to support the hypothesis that multiply traumatized individuals are more likely than individuals with some or no trauma histories to demonstrate risk recognition deficits. This finding emerged for both attention and memory tasks aimed at assessing biases to threat-related words as a way of evaluating risk recognition. Such results suggest that traumatized individuals are not characterized by memory and attention biases to threat, contributing to the growing body of literature

supporting that these effects do not exist. The limitations of this study, implications of these findings, and future directions for this line of research are discussed.

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Table of Contents

Abstract.....	ii
Acknowledgements.....	iv
Table of Contents.....	v
List of Tables.....	vi
Introduction.....	1
Method.....	14
Results.....	20
Discussion.....	24
Bibliography.....	40

List of Tables

Table 1: Percentage of Males and Females in Each Trauma Group.....	34
Table 2: Percentage of Males and Females Who Reported Trauma Related to a Sexual Experience and Loss of a Loved One	35
Mean Response Times (RTs) on the Dot Probe Attention Task.....	36
Table 3: Mean Response Times (RTs) of Males and Females on the Dot Probe Attention Task.....	37
Table 4: Percentage of Participants with Flawed Memories on the Memory Task.....	38
Table 5: Percentage of Males and Females with Flawed Memories on the Recognition Memory Task.....	39

Introduction

Incidents of trauma may severely impact an individual's life marked by great psychological distress and long-term mental health consequences. Research has found that women with previous histories of sexual trauma are at increased risk for revictimization. Studies have increasingly focused on deficiencies in risk recognition as explanations for revictimization, but have concentrated almost exclusively on sexually traumatized women. In such cases, studies have failed to examine risk recognition in a more diverse group of traumatized individuals. In addition, the potential contributions of attention and memory biases on risk recognition have not been addressed. The present study examines the role of attention and memory biases for threat in a sample of young adults with no, some, and multiple incident trauma histories.

Worldwide, sexual trauma toward women is regarded as a problem of great significance and is one of the most widely studied topics in the field of psychology. As a result, many studies examining the effects of trauma on later development have almost exclusively focused on sexual abuse (e.g., Krupnick, Green, Stockton, Goodman, Corcoran & Petty, 2004). There is compelling evidence to suggest that women with previous histories of sexual trauma are at a high risk for subsequent victimization. In a review of sexual revictimization studies, Arata (2002) found that women who experience sexual assault during childhood are 1.5 to 2.5 times more likely experience sexual revictimization in adolescence or adulthood than non-victimized women. In attempts to better understand such high rates of revictimization, studies have tried to identify risk factors and possible mediators of the relationship between sexual assault and revictimization.

Disentangling the mechanisms that increase such vulnerabilities is of interest to better understand why some individuals are prone to re-experiencing assault while others are not. For instance, some studies have found that socioeconomic status and living below poverty level may increase women's chances of repeated victimization (Byrne, Resnick, Kilpatrick, Best, & Saunders, 1999). Other possible mediators are symptoms of posttraumatic stress disorder (PTSD), substance use, certain sexual behaviors (e.g., having multiple sexual partners, initiating sex at an early age); age at the time of initial assault; number of perpetrators, and women's capacities for threat detection (e.g., Arata, 2000; Breitenbecher, 2001; Brown, Messman-Moore, Miller, & Stasser, 2005; Messman-Moore & Long, 2003).

Increasingly, studies have focused on deficiencies in risk recognition (i.e., ability to recognize danger cues) as explanations for revictimization. It has been hypothesized that poor risk recognition may mediate the relationship between initial trauma and subsequent victimization (Meadows, Jaycox, Stafford, Hambree, & Foa, 1995). To assess the impact of sexual assault on risk recognition, Meadows, Jaycox, Orsillo, and Foa (1997) exposed female participants to ambiguous written scenarios varying in the level of interpersonal threat. Participants were asked to indicate the point that they would leave the hypothetical situation. Women with a history of sexual assault indicated that they would exit the situation at a significantly later point than women without such histories. To more specifically evaluate revictimization, Wilson, Calhoun, and Bernat (1999) conducted a study examining risk recognition among single- and multiple-incident sexual assault victims as compared to non-victims. Participants were 300 undergraduate women enrolled in psychology class and recruited for a study of relationships and sexual attitudes.

Participants listened to an audiotaped portrayal of a man and women in a sexual encounter ending in date rape. They were asked to indicate (press a button) if and when they thought the man had “gone too far.” Women with histories of multiple victimizations took significantly longer to signal that the man had “gone too far” than both single-incident victims and non-victims. Wilson et al. concluded that women with histories of multiple sexual assaults displayed an impaired ability to recognize risk compared to non-victims. A decreased capacity to recognize potential danger cues may increase the risk of sexual revictimization.

Victims’ interpretation of an initial sexual assault may also have implications for the likelihood of future revictimization. Marx and Soler-Baillo (2005) examined risk recognition among “acknowledged” sexual assault victims (i.e., those who acknowledged experiencing sexual assault either by a stranger or acquaintance), “unacknowledged” sexual assault victims (i.e., those who indicated having an unwanted sexual experience but did not consider it a sexual assault of any kind), and non-victims (i.e., those that did not indicate any unwanted sexual experiences or sexual assault). The study examined whether or not perceiving an unwanted sexual experience (e.g., unwanted sexual play, attempted intercourse) as a “sexual assault” impacts one’s ability to recognize potential threat cues. Each group was instructed to listen to an audio-taped sexual encounter and indicate when they thought the man had “gone too far” (see Marx & Soler-Baillo, 2005; Wilson, Calhoun, & Bernat, 1999 for procedure). Unacknowledged victims took significantly longer to indicate when the man had “gone too far” compared to both acknowledged victims and non-victims of sexual assault. This suggests that victims, who are unable or unwilling to classify an experience as assault, may tend to ignore important

threatening cues or have difficulty processing threatening information. This may impact their ability to adequately assess risk and their ability to respond to threat (Soler-Baillo, Marx, & Sloan, 2005).

Furthermore, repeated sexual victimization may significantly increase the risk of psychological distress and long-term mental health consequences. Research has found that revictimized women are more likely to have a greater number of negative psychological health outcomes and report more symptoms of depression, anxiety, and PTSD as compared to non-victims (Casey & Nurius, 2005; Kimerling et al., 2007). It is possible that such symptoms may also help to understand rates and effects of revictimization. In a study examining experiential and long-term psychological and health outcomes of women with different sexual assault histories (i.e., victims of a single assault, ongoing abuse by single perpetrators, or multiple assaults by different perpetrators), multiply victimized women were found to experience significantly more nonsexual trauma in their lifetime. In addition, they experienced significantly more PTSD symptoms and poorer self-rated health than both the singly victimized group and the ongoing abuse group. PTSD-related symptoms, for instance, such as intrusive thoughts and the associated emotional distress may exacerbate women's vulnerability to repeated sexual trauma. These symptoms may interfere with their ability to perceive potential risk, especially if the situation contains cues reminding them of earlier abuse, and thus possibly negate their ability to protect themselves (Messman-Moore & Long, 2003). Conversely, higher levels of PTSD among victimized women may serve to increase hypervigilance toward threat and thus act as a "buffer" against subsequent victimization (Wilson, Calhoun & Bernat, 1999).

Both physical and sexual revictimizations are related to the development of PTSD, depression and anxiety disorders (Kimerling, Alvarez, Pavao, Kaminski, & Baumrind, 2007). Cognitive biases associated with these disorders may also help to explain deficits in risk recognition as explanations for repeated trauma. A considerable amount of empirical evidence exists to support cognitive biases among anxious individuals. Attention and memory biases, in particular, are thought to be important in the development and maintenance of various emotional disorders, such as anxiety and PTSD (MacLeod et al., 2002). Attention and memory biases to threat may play a critical role in understanding revictimization. The present study will assess attention and memory biases to attempt to clarify their relationship to risk recognition.

Attentional Biases. Studies have used facilitation or interference paradigms in order to assess attentional biases among anxious individuals. Facilitation paradigms help to elucidate how focusing on emotionally relevant stimuli may help to facilitate one's performance on various tasks. Interference paradigms show how attending to emotionally relevant stimuli can impede performance by disrupting the processing of information. Many studies of attentional biases have utilized trauma-relevant words or pictures as representative of threatening stimuli. Two of the most widely used paradigms to study attentional biases in anxiety disorders and PTSD are the emotional Stroop task (see Gotlib & McCann, 1984 for details) and the dot probe task (MacLeod, Mathews, & Tata, 1986). This review will be limited to the dot probe task.

The dot probe task has been instrumental in assessing attentional biases for threat. Modified versions of the dot probe task have been utilized such as visual-probe tasks using faces and word-probe tasks using threat-relevant words. The dot probe paradigm

presents a threat and neutral word simultaneously in two different areas on a computer screen. Subjects are required to identify a neutral probe placed in the location of either the threat or neutral word. Participants are told to respond as quickly as they can to the probe and response times (RTs) are calculated to determine an index of attentional biases.

Some studies using the dot probe task have found that traumatized individuals tend to yield faster RTs, meaning that these individuals are faster to detect threatening cues. Bryant and Harvey (1997), for example, conducted a study of motor vehicle accident (MVA) victims comparing victims with PTSD, victims with sub-clinical PTSD and non-PTSD victims and their response times to strong threat words, mild threat words, positive words, and neutral words. To assess response latencies, the dot probe program used word pairs consisting of threat stimuli and neutral filler words presented simultaneously in different locations. PTSD victims were found to respond significantly faster to target probes when located adjacent to the mild threat words as compared to sub-clinical PTSD victims and controls. These findings supported an attentional bias to mild threat among PTSD victims, suggesting a hypervigilance to threat and response facilitation. Strong threat words, however, were associated with slower response times among PTSD victims. Bryant and Harvey suggested that individuals with PTSD may be have been distracted by the strong threat words impairing their reaction times thus, reflecting response inhibition. It is possible that victims were unable to disengage from the strong threat stimuli interfering with their ability to attend to threatening cues quickly and efficiently. Response inhibition is considered a characteristic of an attentional bias to threat.

Studies of anxious individuals have found support for attentional biases related to both attentional interference and facilitation for threat-related stimuli (e.g., Pineles, Shipherd, Welch, & Yovel, 2007). Such studies used various visual search paradigms to assess anxious subjects' ability to detect and/or respond to threat stimuli. The most consistent results supported an effect of attentional interference. Findings suggest that individuals with high anxiety tend to have greater difficulty disengaging from threatening stimuli than those with low levels of anxiety (e.g., Byrne & Eysenck, 1995; Fox et al., 2001, 2002; Gilboa-Schechtman, Foa, & Amir, 1999). Another study found that anxious individuals tend to be faster to detect probes replacing threat cues than those replacing neutral cues, suggesting a facilitation effect and an attentional bias to threat (Mogg, Holmes, Garner, Bradley, 2008). Overall however, studies suggesting a facilitation effect were less reliable (Fox et al., 2000; Rinck & Becker, 2005; Rinck et al., 2003).

Whether or not traumatized individuals are characterized by an attentional facilitation or interference of threat relevant stimuli remains unclear. Pineles, Shipherd, Welch, and Yovel (2007) attempted to differentiate between attentional interference and facilitation in a study of Vietnam-era veterans with varying degrees of PTSD (high or low, see Pineles et al., 2007 for details). Participants completed a visual search task using threat-relevant words and neutral words in two conditions: interference and facilitation. Those with high-PTSD showed slower response times in the presence of threat (versus neutral distracters) as compared to the low-PTSD veterans. This supported the role of an attentional interference to threat stimuli. Furthermore, the study found no evidence for attentional facilitation in detecting threatening stimuli among PTSD veterans. Such findings are somewhat consistent with studies of anxious individuals.

In summary, there is evidence to support that anxious individuals and those with PTSD are characterized by attentional biases to threat. It has been found that such individuals may detect threat-relevant stimuli more quickly than non-anxious individuals but that they also may be distracted by threatening stimuli and have trouble disengaging, resulting in slower response times in the presence of threat (Bryant & Harvey, 1997; Byrne & Eysenck, 1995; Fox et al., 2001, 2002; Gilboa-Schechtman, Foa, & Amir, 1999; see Williams, Watts, MacLeod, & Mathews, 1997, for review). It still remains unclear as to whether or not traumatized individuals attend to threatening stimuli more quickly or experience difficulty detecting or disengaging from threatening information. Further investigation of attentional bias among trauma victims may help to reconcile the seemingly discrepant findings. It is possible that attentional biases may contribute to risk recognition deficits associated with repeated trauma; however, such possibilities remain uninvestigated. Investigation of attentional biases among individuals with multiple trauma histories may be helpful in disentangling such issues.

Memory Biases. Memory biases are cognitive biases that either impair or enhance the recall and recognition of information or alter the content of recalled information. A review of the literature found mixed support for memory biases to threat associated with anxiety disorders (Coles & Heimburg, 2002). Researchers have varied their approach to studying memory by examining different types of memory including explicit memory, implicit memory, and autobiographical memory. In addition, study designs have varied from verbal stimuli (e.g., word lists) to visual stimuli (e.g., faces). Discrepant results relating to memory biases may be attributed to the wide range of study designs and lack of consistency among researchers.

Coles and Heimberg (2002) found that the amount of support for explicit memory biases varied greatly by disorder, while support for implicit memory biases was moderate across disorders. The few studies on explicit memory provided only some support for a bias to threat-relevant information, while studies on implicit memory were even less conclusive. In fact, studies of individuals with obsessive-compulsive disorder (OCD) (e.g., Wilhelm, McNally, Baer, & Florin, 1996; Foa, Amir, Gershuny, Molner, & Kozak, 1997) and PTSD (e.g., McNally, Metzger, Lasko, Clancy, & Pitman, 1998; Vrana, Roodman, & Beckham, 1995) were found to be supportive of an explicit memory bias for threat, but these studies were limited in number and thus lacking sufficient evidence. Studies of GAD and social phobia however, did not support an explicit memory bias to threat (Mogg, Mathew, & Weinman, 1987; Rapee, McCallum, Melville, Ravenscroft, & Rodney, 1994), whereas, evidence for explicit memory biases in individuals with panic disorder (PD) was consistently found in the majority of studies. These discrepant results may be due to inadequate testing with poor stimuli or suggest a lack of memory biases for threat among anxious individuals (Coles Turk, & Heimburg, 2007).

Memory paradigms are frequently used methodologies for studying memory biases associated with anxiety and fear. Initially described by Deese (1959), the “false memory” paradigm was later elaborated on by Roediger and McDermott (1995) and is known as the Deese-Roediger-McDermott (DRM) paradigm in the literature. According to Roediger and McDermott (1995) “false memories” refer to remembering information (e.g., words) that was never presented or remembering information differently from what it was originally. To study memories, Roediger and McDermott recruited 30 undergraduate participants for a “memory experiment.” Participants were presented with

15-item lists of words associated with unrepresented target words. The primary variable of interest was the rate at which participants recalled and recognized the unrepresented target words, not the words actually presented in the lists. In addition, the study attempted to identify whether or not the recall task would affect later recognition. The study found that participants recalled 55% of unrepresented target words and depending on completion of the free recall task, they recognized between 65% and 79% the unrepresented targets. Such findings support the DRM paradigm to study false memories, referring to the false alarm rate to the unrepresented target words. The term “false memory” however, has incurred criticism as some researchers have over generalized it to include memory errors of whole events, such as recovered memories of abuse (DePrince, Allard, Oh, & Freyd, 2004). The DRM paradigm however, is not testing whether or not participants remember reading the word lists (an event) but instead, their memory of the specific, never presented words they think they heard. To precisely and accurately represent what the memory paradigm is studying, the term “flawed memory” will be used to refer to errors in recall or recognition for details of an event (e.g., words from a list) (Pezdek & Lam, 2007).

The DRM memory paradigm has been instrumental in studying memory among anxious individuals. Zoellner, Foa, Brigidi, and Przewski (2000) for instance, utilized a similar protocol to that of Roediger and McDermott’s (1995) study to evaluate flawed memories among traumatized women with PTSD, traumatized women without PTSD, and non-traumatized control women. The study used a series of 24 15-item word lists associated with unrepresented target words. They found that traumatized women with PTSD exhibited higher rates of recall of unrepresented target words as compared to the other two groups. Traumatized women without PTSD had higher rates of recall of

unpresented target words than controls. Recognition data produced a similar pattern but this effect was not found to be statistically significant. Interestingly, both PTSD severity and trait anxiety was positively correlated to the immediate recall of unpresented target words. A critical limitation to the study was that participants were not asked about other (not previously recalled) unpresented words on the recognition task thus providing a possible overestimation of false recognition in PTSD group. Consequently, their findings provide more general information as to how individuals with PTSD process information suggesting that the findings may be due to a deficit in source-monitoring (i.e., distinguishing between imagined or experienced events and determining the reliability of learned information). A similar study of abused women with PTSD, abused women without PTSD, and men and women without abuse or PTSD, found nearly identical results on memory tasks with neutral stimuli (Bremner, Shobe, & Kihlstrom, 2000). Thus, individuals with PTSD and those exposed to trauma exhibited higher rates of flawed memories (i.e., errors in recall and recognition) on memory tasks involving neutral stimuli and not necessarily threat-relevant stimuli (Zoellner et al. 2000; Bremner, Shobe, & Kihlstrom, 2000).

Wenzel, Jostad, Brendle, Ferraro, and Lystad (2004) completed a study replicating the protocols used by Roediger and McDermott (1995) and Zollener et al. (2000). In contrast, their study aimed to evaluate memory biases to threat-relevant stimuli among anxious individuals. They used two types of word lists: those associated with neutral unpresented target words and those associated with threat-relevant unpresented target words. Wenzel et al. hypothesized that anxious and fearful participants would demonstrate higher rates of flawed memories (i.e., recall and recognize more unpresented

threat-relevant target words) than non-anxious and non-fearful participants. No difference between groups, however, was found in the rate of misremembering unrepresented target threat words. Fearful individuals, however, were found to remember more neutral unrepresented target words than non-fearful individuals. This study did not support a memory bias to threat among anxious participants. Wenzel et al. suggested that the threat-relevant words might have distracted participants making it difficult to fully engage in the task. They also suggested that anxious individuals might be better characterized by memory deficits as opposed to memory biases (Zoellner et al. 2000; Bremner, Shobe, & Kihlstrom, 2000). Such findings however, may indicate that anxious individuals are not characterized by a memory bias toward threat, but instead, a bias away from threat, in that they are less likely to attend to, recognize, and remember threat-relevant information.

Examining deficits in memory and attention processes among anxious individuals may help to disentangle the emotional and behavioral implications of trauma. The vast literature on trauma and revictimization suggests that it is still relatively unknown as to why some people are more susceptible to re-experiencing trauma. It has been established that experiencing a traumatic event is associated with the development of anxious and PTSD-related symptomatology. Extant studies however, have not examined risk recognition in a more diverse group of traumatized individuals nor the potential contributions of cognitive biases to risk recognition deficits. The current study aimed to extend the literature by studying adults with no, some, and multiple trauma histories. The purpose of the present study was to assess whether or not the ability to recognize risk is influenced by the number of traumatic events one experiences. It is thought that

individuals with multiple trauma histories will demonstrate greater risk recognition deficits than those with some or no trauma histories. To assess differences in risk recognition deficits, trauma groups will be defined based on participant's reported trauma histories on the Traumatic Events Scale (TES, Flannery-Schroeder, 2005). In order for an event to be considered a trauma, participants had to endorse a severity score of four (i.e., "somewhat traumatic") or greater, on a 7-point Likert scale, for each event. Based on responses, participants were placed into one of three conditions: individuals without a history of trauma (no trauma group, NT), individuals with a history of one or two traumas (some trauma group, ST), and individuals with a history of three or more traumas (multiple trauma group, MT). The current study investigated the following hypotheses in a non-clinical sample of 312 college students:

1. Individuals with multiple trauma histories will demonstrate greater risk recognition deficits by demonstrating slower response latencies on the dot probe task when the probe is preceded by words related to emotional and/or physical threat, and no difference when the probe is preceded by neutral words, as compared to individuals with some or no trauma histories.
2. Individuals with multiple trauma histories will recall fewer unrepresented threat target words and the same number of unrepresented neutral target words on the memory task, than individuals with some or no trauma histories.
3. Individuals with multiple trauma histories will recognize fewer unrepresented threat target words (indicated by "old" judgments for each word) and recognize the same number of neutral unrepresented target words, than individuals with some or no trauma histories.

Method

Research Design

The current study consisted of a secondary data analysis performed on a sample of a larger study that assessed physical, emotional, and behavioral health implications of anxiety (Flannery-Schroeder, Robbins, Sieberg, Lamb, 2005). The study design, recruitment methods, inclusion and exclusion criteria were determined by investigators for the primary data collection. Eligible participants were undergraduates, at least 18 years of age.

Participants

Participants (N=312) were undergraduate students enrolled in either of two introductory-level psychology classes at the University of Rhode Island. Participants were offered credit (i.e., extra credit or fulfillment of a required course assignment) for their participation in the study. The dataset was collected during the 2006-2007 academic year.

Participants ranged in age from 18-29 years ($M = 19.01$, $SD = 0.49$). The sample included 183 women (58.7%) and 126 men (40.4%); three participants (1.0%) did not report their gender. The majority of the participants were White (90.4%), 3.8% were Black/African American, 1.6% were Asian, 0.6% were American Indian/Alaskan Native, and 1.9% were from other ethnic groups. Five participants (1.6%) did not report their race. Seven participants (2.2% of the entire sample) were Hispanic.

The demographics of the current study sample are fairly consistent with the URI undergraduate population. The current sample is slightly higher in percentage of female participants (sample: 58.5% female and 40.6% male; URI undergraduate population: 48%

female and 39% male), which is most likely a result of the tendency for more females to enroll in psychology courses at URI. With regards to other demographics (e.g., race and ethnicity), the difference between the current sample and URI undergraduate population is within, on average, 3-4 percentage points. However, the study sample is slightly higher in percentage of White participants than other racial/ethnic groups compared to the overall URI undergraduate population (sample: 90% White and URI undergraduate population: 73% White).

Based on an extensive literature review, it appears as if studies of deficits in risk recognition have not directly focused on gender differences. Due to this, the current study will conduct exploratory analyses of gender differences in risk recognition. In addition, the literature does not appear to evaluate racial and ethnic differences in risk recognition. Thus, due to limited ethnic diversity in the current study's sample and the lack of prior literature, ethnic differences will not be directly examined in this study.

Measures

Demographics Questionnaire. Participants first completed a demographics questionnaire. Standard descriptive demographic information was requested from participants, including sex, age, race/ethnicity, and information about income, occupation, and education.

Traumatic Events Scale. Traumatic Events Scale – College Version (TES) (Flannery-Schroeder, 2005) is a 45-item retrospective self-report measure developed for the current project. This measure assesses the type, impact and frequency of nine potentially traumatic events (e.g. death of a close friend/family member; major upheaval between parents; traumatic sexual experience; physical abuse; non-sexual violence;

extremely ill or badly injured; deadly accident or fire; natural disasters; major life change). Participants are initially asked whether or not they have experienced a particular occurrence. If yes, participants are asked to provide information regarding their age at the time of trauma, frequency of the trauma, severity of the trauma (7-point Likert scale), and the extent to which they confided in others about the experience (7-point Likert scale). Currently the TES is an unpublished measure of trauma history and therefore, psychometric data are not available.

Trauma Symptom Inventory. The Trauma Symptom Inventory (TSI) (Briere, 1995) is a measure used to assess symptoms of PTSD. TSI is a 100-item self-report measure assessing posttraumatic stress and other psychological sequelae of traumatic events. This measure has three validity scales and 10 clinical scales yielding sex- and age- normed T scores. There are 12 critical items. The 10 scales assess the following symptoms: anxious arousal, depression, anger/irritability, intrusive experiences, defensive avoidance, dissociation, sexual concerns, dysfunctional sexual behavior, impaired self-reference, and tension reduction behavior. The validity scales are: 1) Response Level which measures a tendency toward defensiveness, a general under-endorsement response set, or a need to appear unusually symptom-free; 2) Atypical Response which measures psychosis or extreme distress, a general over endorsement response set, or an attempt to appear especially disturbed or dysfunctional; and 3) Inconsistent Response which measures inconsistent responses to items, potentially due to random item endorsement, attention or concentration problems, or reading/language difficulties.

The TSI has been standardized on a random sample of men and women from the general population (N=828), age 18 or older, and includes separate norms for male and female Navy recruits (N=3,659). Separate norms are available for different combinations of sex and age (18-54, 55 or older), which makes it appropriate for all adult sex by age combinations. The ten clinical scales of the TSI are internally consistent with mean alphas of 0.86, 0.87, 0.84, and 0.84 in standardization, clinical, university, and military samples, respectively. They exhibit reasonable convergent, predictive and incremental validity. Validity scales covary as expected with similar scales from other measures.

Attentional Task. An attentional dot probe computer task, which pairs words related to emotional and physical threat with neutral words, was used to assess attentional biases. A modified version of the dot probe software from the Cognition and Emotion Laboratory, Department of Psychology at the University of Western Australia (2003) was used. The stimulus materials for the tasks are 96 word pairs were drawn from an initial pool of 140 word pairs (MacLeod, C., Rutherford, E., Campbell, L., Ebsworthy, G., & Holker, L., 2002). Each word pair contained one emotionally-negative word and one emotionally-neutral word (e.g., Unpopular/Shoreline; Sad/Pat; Panicky/Clarets). Words within each pair were matched for length and frequency of usage. The position of the threat word was randomized, such that it appeared either in the upper or lower screen location with equal probability. For this study, the probe location was also randomized such that it appears in the location vacated by the threat word or non-threat word with equal probability. The order of trials and probe type were randomized. Latency to respond to the directionality of the probe (is it pointing to the right or to the left?) was the variable of interest.

Memory Task. Stimuli for the assessment of memory biases consisted of threat and non-threat words which were presented in a false memory paradigm (Deese, 1959; Roediger & McDermott, 1995). Four word lists of 15 words each were comprised of threat (e.g., thread, pin, steal, robber) or neutral words (e.g., sour, candy, door, glass). Specifically, each list was composed of 15 primary associates of an unrepresented (target) word. There were a total of four unrepresented target words: two threat (needle, thief) and two neutral (sweet, window). Recall and recognition of unrepresented target words were of primary interest.

Procedure

The original study was approved by the Institutional Review Board (IRB) of the University of Rhode Island. During a class period designated by the course instructor, the researcher distributed packets of self-report questionnaires and the informed consent document. The researcher then described the study and answered questions regarding participation in the study. Students who wished to participate in the study implied their consent to participate by completing the packet of questionnaires. Signatures on the consent forms were not obtained to ensure anonymity. Students who did not wish to participate in the study were dismissed from class. A unique code was created to link study materials for purposes of analyses. Participants were asked to provide a code – the same code – for each task. This code was never linked to participants' names.

Upon completion of the questionnaires, participants completed the memory task. Participants heard four word lists (two threat, two neutral) of 15 words played from an audiotape. Following each list, participants were given two minutes to freely recall the words for each list and write them down on paper provided by the researcher.

Subsequently, participants were provided with an additional list of words, some of which they had just heard, and asked to judge items as old (previously presented) or new (not presented) and if old, to indicate if they specifically remembered hearing the word or rather just knew that it had occurred. Participants were told that a remember judgment was to be made for items in which they had a vivid memory of the actual presentation of the item; know judgments were to be made for items that they were sure had been presented but that they lacked the feeling of remembering the actual occurrence of the words. Upon completion of the memory task, participants were asked to indicate a day and time that was convenient to come to the Child Anxiety Lab to complete the final part of the study.

Students completed the attentional dot probe computer task at a later date and time selected by the student. A laptop computer was used to run the task. Participants were instructed to read the directions on the computer screen that indicated they would be performing a dot probe detection task. The task included three practice trials followed by 96 test trials. Each trial began with a fixation cue ‘+++’ presented at the center of the screen. Subsequently, a word pair (one threat word, one neutral word) was presented. One word appeared directly above the location of the preceding fixation cue and the other word appeared directly below this location. One of the stimulus words was then replaced by one of two probes, a symbol pointing to the left or right (i.e., < or >); directionality of the symbol occurred randomly. Participants were instructed to indicate the direction of the probe following each word pair by pressing the arrow key on the keyboard that corresponded with the direction of the probe as quickly and accurately as possible. When a response was detected, the screen was cleared for the next trial to begin.

Results

Descriptive Statistics

An analysis of variance and multivariate analysis of variance assumes that data are linear, normal, and homoscedastic. Descriptive statistics were conducted in order to assess these assumptions prior to conducting analyses. Results of evaluation of assumptions of normality, homogeneity of variance-covariance matrices, linearity, and multicollinearity were satisfactory across all tests based on criteria specified by Tabachnick & Fidell (2007).

A one-way analysis of variance (ANOVA) was conducted to determine if self-reported PTSD-related symptoms on the TSI differed among trauma groups (Briere, 1995). Results indicated that TSI total scores significantly differed by trauma group $F(2, 280) = 6.643, p = .002, \eta^2 = .05$. Follow-up Tukey tests revealed that multiply traumatized participants ($M = 56.48, SD = 34.61$) reported significantly more PTSD-related symptoms than the some trauma group ($M = 43.60, SD = 27.47$) and the no trauma group ($M = 41.50, SD = 30.27$). In general, these results lend validity to the differentiation among trauma groups, as individuals in the multiply traumatized groups reported significantly higher levels of posttraumatic stress symptomatology than the single and no trauma groups.

To explore potential gender differences for the TSI total scores, an independent samples t-test was conducted. Interestingly, results indicated that females ($M = 51.75, SD = 32.61$) reported significantly more PTSD-related symptoms on the TSI than males ($M = 40.10, SD = 29.40$), $t(279) = -3.043, p = .003$. To further investigate this finding, a chi square analysis was conducted to assess whether the percentages of males and

females differed across trauma groups (NT, ST, MT). Results yielded marginally significant findings, $\chi^2(2) = 5.79, p = .06, \eta^2 = .14$. Table 1 displays the percentages of males and females within each trauma group. More specifically, chi square analyses were completed to determine if the percentages of males and females differed significantly across different types of reported trauma (i.e., death of a loved one; major upheaval between parents; sexual trauma; physical trauma; illness, injury or accident; natural disaster). Females were found to report significantly more incidents of sexual trauma than males, $\chi^2(2) = 6.10, p = .01, \eta^2 = .14$. Females also reported significantly more incidents of trauma from losing a loved one than males, $\chi^2(2) = 19.55, p < .005, \eta^2 = .25$. Table 2 displays the percentages of males and females who reported a trauma from a sexual experience and the percentages of males and females who reported trauma from loss of a loved one. No significant gender differences were found across reports of trauma resulting from a major upheaval between parents, physical abuse, illness, injury or an accident, or natural disaster.

Attention Task

To determine response latencies on the dot probe attention task in the presence of threat-related words versus neutral words, response time mean scores were calculated for threat-related word trials and neutral word trials for each participant. A 2 (word type: threat, neutral) X 3 (trauma groups: NT, ST, MT) mixed factorial MANOVA was conducted with trauma groups as between-subject factors and word type as the within-subjects factor to determine if response latencies on the dot probe attention task differed in the presence of threat-related words or neutral words across each trauma group.

Neither main effects nor the interaction effect was found to be significant, all p -values $> .05$. The sample means are displayed in Table 3.

A 2 (word type: threat, neutral) X 2 (gender: male, female) mixed factorial MANOVA was conducted with gender as between-subject factors and word type as the within-subjects factor to determine if response latencies on the dot probe attention task differed in the presence of threat-related words or neutral words based on gender. Results indicated a trend toward a main effect for gender, $F(1,103) = 3.29, p = .07, \eta^2 = .03$, suggesting a tendency for females to respond slower on the attention task than males, see Table 4. No main effect for word type or gender X word type interaction effect were found, meaning that there were no differences in males' and females' response times for neutral or threat-related words.

Memory Task

Two chi square analyses were conducted to compare rates of recall of unrepresented target words among trauma groups and rates of recognition of unrepresented target words among trauma groups. Chi square analyses comparing recall of unrepresented threat and neutral target words yielded non-significant results across trauma groups, $\chi^2(2) = 4.53, p > .05, \eta^2 = .14$ and $\chi^2(2) = 0.90, p > .05, \eta^2 = .06$, respectively. Chi square analyses comparing recognition of unrepresented threat and neutral target words also yielded non-significant results across trauma groups, $\chi^2(2) = 1.02, p > .05, \eta^2 = .06$ and $\chi^2(2) = 1.29, p > .05, \eta^2 = .06$, respectively. Table 5 displays the percentages of participants within each trauma group that recalled or recognized the unrepresented target words.

Chi square analyses were conducted to assess the relationship between gender and rates of recall and recognition of unrepresented target words. Results yielded non-significant findings for the recall of unrepresented threat and neutral target words. Results however, indicated that recognition of threat and neutral target words differed significantly by gender, $\chi^2(2) = 3.79, p = .05, \eta^2 = .11$ and $\chi^2(2) = 8.50, p < .005, \eta^2 = .17$, respectively, indicating a relationship between gender and recognition of threat and neutral unrepresented target words. Table 6 displays the percentages of males and females that recognized the unrepresented target words.

Discussion

The present study examined attention and memory biases among individuals with a history of multiple traumas, one or two traumas, and no trauma, to assess whether increased trauma is associated with a decreased ability to recognize risk among a sample of young adults with a diverse set of trauma histories. Results found no evidence to support the hypothesis that multiply traumatized individuals are more likely than individuals with some or no trauma histories to demonstrate risk recognition deficits. This finding emerged for both attention and memory tasks aimed at assessing biases to threat-related words as a way of evaluating risk recognition. Although previous studies of sexual trauma lend support for deficits in risk recognition as an explanation for revictimization, such findings appear limited to studies of sexual victimization (Meadows, Jaycox, Stafford, Hambree, & Foa, 1995; Wilson, Calhoun, & Bernat, 1999; Meadows, Jaycox, Orsillo, & Foa 1997; Marx & Soler-Baillo, 2005; Soler-Baillo, Marx, Sloan, 2005). The results of the present study suggest that traumatized individuals are not characterized by memory and attention biases to threat, contributing to the growing body of literature supporting that these effects as an explanation for revictimization do not exist (see Williams, Watts, MacLeod, & Mathews, 1997, for review; Zoellner et al. 2000; Bremner, Shobe, & Kihlstrom, 2000; Wenzel, Jostad, Brendle, Ferraro, & Lystad, 2004).

Attention Biases

Attention biases were measured by mean response times for each condition on the dot probe attention task: threat condition (probe preceded by threat-related words) and neutral condition (probe preceded by neutral words). Analyses comparing mean response

times among trauma groups failed to support the study's hypothesis. Multiply traumatized participants did not demonstrate significantly slower response times in the presence of threat-related words, as compared to individuals with some and no trauma histories. Furthermore, no significant difference was found among group mean response times for the neutral condition. Null results for the attention task suggest that multiply traumatized individuals are not characterized by an attentional bias away from threat when compared to individuals with some or no trauma.

Whether or not a person experienced some or multiple traumas may not be the variable of interest when studying attention biases. Studies of individuals with PTSD and those studying PTSD-severity are suggestive of an attentional bias to threat-related stimuli (Pineles, Shipherd, Welch, and Yovel, 2007; Bryant & Harvey, 1997). It remains unclear however, whether or not individuals with PTSD are characterized by attentional facilitation or inhibition towards threat, making it difficult to determine if risk recognition deficits are playing a role or, if individuals with PTSD are better characterized as hypervigilant. When assessing traumatized individuals' ability to attend to threatening stimuli, some studies find support for a facilitation effect (Mogg, Holmes, Garner, Bradley, 2008; Fox et al., 2000), which may suggest hypervigilance, while other studies provide support for an inhibitory effect (Pineles, Shipherd, Welch, & Yovel, 2007; Byrne & Eysenck, 1995; Fox et al., 2001), which could suggest hypovigilance. Nonetheless, the current study was not directly studying facilitation or inhibition, and instead, focused on individuals' response rate to threat-related words. While it is possible that the dot probe task utilized in the present study may be an adequate way to measure attentional facilitation/inhibition, visual search paradigms may be more sensitive to studying such

effects (Pineles, Shipherd, Welch, & Yovel, 2007; Mogg, Holmes, Garner, Bradley, 2008). In addition, the current study was aimed at identifying whether multiple traumatic experiences could explain increased risk recognition deficits and it did not directly assess PTSD-severity.

Memory Biases

To examine memory biases that may impair recall and recognition of information, participants in each group (NT, ST, MT) completed tasks assessing their memory of unrepresented neutral and threat target words. As expected, multiply traumatized participants did not exhibit a difference in the number of flawed memories for unrepresented neutral targets as compared to the ST and NT groups, but contrary to expectation, they also did not demonstrate significantly lower rates of flawed memories for unrepresented threat-relevant target words on the memory task than participants in the ST and NT groups. Consistent with findings on the attention task, such findings suggest that multiply traumatized individuals do not exhibit memory biases for recall and recognition of threat-related words.

Memory task findings are consistent with some studies of fearful and anxious individuals, which did not find evidence to support that fearful and anxious participants are characterized by a memory bias to threat (Wenzel, Jostad, Brendle, Ferraro, & Lystad, 2004; Wenzel et al., 2005). These studies hypothesized that anxious and fearful participants would exhibit higher rates of flawed memories for unrepresented threat-relevant target words however, their results failed to confirm this hypothesis. As an explanation for such findings, researchers suggested that the presence of threat-relevant words might act as a distracter by not allowing fearful or anxious participants to fully

engage in the memory task (Wenzel, Jostad, Brendle, Ferraro, & Lystad, 2004).

Therefore, it is possible that in the current study, the presentation of threat-relevant words may have distracted the multiply traumatized group from completely engaging in the memory task and obscuring the purpose of the task. This would suggest that the Deese-Roediger-McDermott (DRM) memory paradigm is not an adequate assessment of risk recognition deficits and also provide a possible rationale for the lack of differences among trauma groups on the task. It remains unclear however, why performance on the memory task would not have differed between groups in rates of flawed memories of threat-relevant target words (Wenzel, Jostad, Brendle, Ferraro, & Lystad, 2004).

Gender Differences

Exploratory analyses assessing gender differences produced interesting findings. While the MT group reported significantly more PTSD-related symptoms, across all trauma groups, females were found to report significantly more symptoms than males. In addition, findings indicated that more females than males tended to report instances of sexual trauma and trauma from losing a loved one. Due to these findings, gender differences in biases on the memory and attention tasks were also considered. On the memory recognition task, a relationship between gender and flawed memories was found, as females recognized more threat and neutral unrepresented target words than males. Since women reported more PTSD symptoms, increased symptomatology may be a contributing factor related to this finding. Some studies of sexually victimized women suggest that higher levels of PTSD may serve to increase hypervigilance toward threat and thus, may provide an explanation for why females recognized significantly more threat and neutral unrepresented target words (Wilson, Calhoun, & Bernat, 1999). This

however, would not suggest risk recognition deficits and instead, hypervigilance.

Alternatively, the difference in the number of men and women in the study sample ($N = 126$ and $N = 183$, respectively) may help to explain gender differences in the recognition results. This finding however, is further complicated by the fact that females tended to respond slower in the presence of both threat and neutral words on the attention task. This trend would suggest possible risk recognition deficits among females but cannot be further explained by study findings.

Limitations of the Present Study

Some methodological variables may have accounted for this pattern of null results and therefore, limitations of the present study must be acknowledged. First, the TES was used to assess for a diverse set of possible traumatic experiences (e.g., “experiencing the death of a very close friend or family member or witnessing anyone die”, a traumatic sexual experience, physical abuse, victim of violence, etc.). Since the trauma literature is fairly limited to sexual trauma, it seemed advantageous to assess trauma from a wider scope. However, the type of traumatic event may be indicative of particular mental health consequences. Focusing on a particular type of trauma may provide a better understanding of the role of risk recognition. Perhaps more importantly, the TES was developed for the purposes of this study, and its psychometric properties have not yet been determined. Although extremely useful in collecting information relevant to diverse set of traumas, an assessment of the reliability and validity of the measure is necessary.

Second, the present study assessed traumatic experiences retrospectively, relying on participants’ memories for information that may have occurred during childhood and/or adolescence. These recollections may not be accurate and could in fact, be

remembered as more or less severe than actually experienced at the time. To reduce error in self-report measures, reports could have been corroborated by reports from family members or friends. Furthermore, since the TES is a self-report measure, it is unclear whether or not a reported traumatic event would actually qualify as a traumatic event without conducting a life events interview and drawing a connection between reported trauma and subsequent symptomatology. Additionally, while the TES is a measure of lifetime traumatic experiences, the TSI is a measure of current symptoms (“in the last six months”) making it difficult to adequately assess participants posttraumatic stress symptomatology.

Finally, the generalizability of this study is limited by the homogeneity of the sample and the attention and memory tasks used to assess biases. The majority of the sample was White, upper-middle class, undergraduate students which prohibited testing for potential demographic effects. Due to this, it should be noted that the results might not generalize to other groups. In addition, assessing flawed memories and response times to threat-relevant words on the attention task may suggest deficits in memory and attention but these only pertain to words presented or not presented. Memory and attention for traumatic events may be different from words from lists, bearing the question of the generalizability of the study outside of the laboratory setting (Zoellner, Foa, Brigidi, Przeworski, 2000). In addition, it is important to clarify that these results are referring to memory and attention for threat and neutral words and not traumatic events.

Summary

Studies focusing on deficits in risk recognition among trauma victims as explanations for high rates of revictimization have focused almost exclusively on

sexually traumatized women and failed to examine such deficits with other types of trauma. There is strong evidence to suggest that women with histories of multiple sexual traumas demonstrate deficits in risk recognition (Wilson Calhoun & Bernat; 1999; Meadows, Jaycox, Orsillo, & Foa, 1997). Since physical and sexual revictimizations are associated with the development of PTSD and anxiety disorders, evaluating cognitive biases associated with the development and maintenance of these disorders was considered to help better understand deficits in risk recognition as a rationale for repeated trauma. Nonetheless, studies including the current study, aiming to elucidate the role that attention and memory biases may play in risk recognition remain inconclusive. The current study was an effort to clarify why some people are more susceptible to re-experiencing trauma and others are not. Since the current study did not find evidence for attention and memory biases among traumatized individuals, findings suggest that multiply traumatized individuals do not present with greater risk recognition deficits as compared to those with some or no trauma histories, when considering various types of trauma. As a result, whether or not trauma exposure and more specifically, multiple traumatic exposures, increases risk recognition deficits still remains unclear.

While the literature on sexual trauma supports deficits in risk recognition, such deficits may not be able to explain revictimization with a more diverse group of trauma histories. Deficits in the ability to recognize risk may be limited to sexual trauma and revictimization and therefore, the type of trauma a person experiences may play a role in understanding risk recognition. Potential confounding factors associated with other types of trauma (e.g., grief from loss of a loved one) may impact cognitive biases differently than those associated with sexual trauma, suggesting that a different theory may be

needed to better explain repeated victimization. For instance, revictimized individuals who experience multiple traumas of varying types (e.g., physical abuse, loss of a loved one, natural disaster) may be better perceived as a product of coincidence as opposed to deficits in the ability to recognize risk. Moreover, multiple traumatic experiences associated with one type of event (e.g., natural disasters) may also be better understood in terms of external factors and not related to cognitive biases. The current study did not consider the different types of reported traumas (e.g., abuse versus loss of a loved one) and how these influenced risk recognition, but instead, grouped all types of traumas together. The study however, did evaluate gender differences across each type of reported trauma. Since gender differences were found across different types of trauma, this lends support for further examination of the impact different types of trauma may have on cognitive biases and may help to clarify rates of revictimization.

The literature on attention and memory biases in anxious and traumatized individuals remains fairly unsettled. Some studies of anxious individuals using attentional dot probe tasks have indicated that anxious individuals demonstrate faster response times to detect probes replacing threat-relevant words than neutral words (Macleod et al., 1986; Bradley, Mogg, Falla, & Hamilton, 1998; Mogg & Bradley, 1998, 2004). Other studies have found that individuals with PTSD may have trouble disengaging from threatening stimuli and thus, demonstrate slower response times in the presence of threat-relevant words (Pinnels, Shipherd, Welch, & Yovel, 2007; Bryant & Harvey, 1997). Studies of memory biases are similarly divided; some providing evidence that such biases may exist and others suggesting that the effect is nonexistent (see Coles

& Heimburg, 2002 for review; Zoellner et al., 2000; Bremner, Shobe & Kihlstrom, 2000).

Wenzel, Jostad, Brendle, Ferraro, & Lystad (2004) suggest that experiencing distress at the time of the study may be important to more clearly evaluate effects of anxiety on cognitive biases. In the current study, it is possible that participants were not experiencing enough distress to adequately evaluate the impact of trauma on memory and attention biases. This may also be representative of a limitation in the self-report measures utilized to assess trauma and PTSD symptomatology. While the TES is used to assess lifetime trauma history, the TSI assesses current PTSD-related symptoms. Thus, it is unclear whether or not those who had experienced multiple traumas still experienced effects from the trauma and how this may have contributed to their performance on the various study tasks. Again, it may be important to consider both the number of traumas and PTSD-severity to better clarify these issues.

It is also possible that memory and attention biases may not be the most adequate measure of risk recognition deficits. A distinction between hypervigilant and hypovigilant individuals may better characterize differences between the some and multiple trauma groups. It is possible that multiply traumatized individuals are not characterized by deficits in risk recognition, but instead are more hypervigilant to threatening information in their environment. Higher levels of PTSD among victims may serve to increase hypervigilance toward threat and thus act as a “buffer” against subsequent victimization, suggesting that risk recognition deficits among traumatized individuals are not a viable explanation (Wilson, Calhoun & Bernat, 1999).

In conclusion, the current study's findings suggest that traumatized individuals do not demonstrate attention and memory biases to threatening information in their environment. Thus, support for risk recognition deficits among multiply traumatized participants was not found. The results are comparable to previous research; yet continue to highlight a major discrepancy among the literature and whether or not attention and memory biases for threat exist among anxious and traumatized individuals.

Future research in this area should seek to clarify these findings, especially taking into account PTSD-severity. Furthermore, it will be important to better assess whether the DRM memory paradigm and dot probe attention tasks are measuring cognitive biases generalizable to trauma and revictimization. Evaluating the impact of different types of trauma on cognitive biases may also help to clarify the role of risk recognition as an explanation for subsequent victimization. Finally, future research should consider whether or not cognitive biases are the most appropriate measure of deficits in risk recognition.

Table 1

Percentage of Males and Females in Each Trauma Group

	Males	Females
No Trauma (N=126)	48.4	51.6
Some Trauma (N=77)	39.0	61.0
Multiple Trauma (N=106)	33.0	67.0

Note. Percentage of males and females in each trauma group.

Table 2

Percentage of Males and Females Who Reported Trauma Related to a Sexual Experience and Loss of a Loved One

	Males (N=2)	Females (N=15)
Sexual Experience	88.2	11.8
	Males (N=44)	Females (N=114)
Loss of a Loved One	27.8	72.2

Note. Percentage of males and females who reported trauma related to a sexual experience, $p < .05$.
 Percentage of males and females who reported trauma related to loss of a loved one, $p < .005$.

Table 3

Mean Response Times (RTs) on the Dot Probe Attention Task

	Mean RTs	
	Threat	Neutral
No Trauma	540.85 (140.44)	541.60 (145.35)
Some Trauma	481.83 (74.89)	478.04 (68.77)
Multiple Trauma	548.72 (170.62)	551.78 (158.97)

Note. Values in parentheses are standard deviations. Differences were not significant.

Table 4

Mean Response Times (RTs) of Males and Females on the Dot Probe Attention Task

	Mean RTs	
	Threat	Neutral
Males	500.09 (100.37)	501.09 (103.96)
Females	549.46 (161.44)	549.32 (155.64)

Note. Values in parentheses are standard deviations. Differences between groups were marginally significant, $p = .07$.

Table 5

Percentage of Participants with Flawed Memories on the Memory Task

	No Trauma (N=106)	Some Trauma (N=59)	Multiple Trauma (N=81)
Targets recalled			
Threat	69.8	84.7	75.3
Neutral	74.5	72.9	79.3
	No Trauma (N=129)	Some Trauma (N=77)	Multiple Trauma (N=106)
Targets recognized			
Threat	79.1	75.3	73.6
Neutral	80.6	76.6	74.5

Note. Percentage of participants in each trauma group who recalled and recognized unrepresented targets (threat and neutral) on the memory task. Relationships among trauma groups and the number of words recalled and recognized did not reach statistical significance.

Table 6

Percentage of Males and Females with Flawed Memories on the Recognition Memory Task

	Male (N=126)	Female (N=183)
Targets recognized		
Threat	43.8	56.2
Neutral	45.2	54.8

Note. Percentage of males and females who recognized unrepresented targets (threat and neutral) on the memory task, $p < .05$.

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