

Research Article

Forgetting Trauma Stimuli

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ABSTRACT—*Previous work reported in this journal suggested that the cognitive capacities of high dissociators are impaired under conditions of focused (selective) attention, but not under conditions of divided attention, compared with the cognitive capacities of low dissociators. Using a directed-forgetting paradigm, the current study demonstrated that under divided-attention demands, high dissociators have impaired memory for words associated with trauma (e.g., incest) but not for neutral words, as compared with low dissociators. In addition, high dissociators reported significantly more trauma history and significantly more betrayal trauma (abuse by a caregiver) than low dissociators. These results are consistent with the proposal that dissociation may aid individuals with histories of betrayal traumas to keep threatening information out of awareness.*

Traumatic exposure—particularly exposure to chronic and repeated trauma—has been associated with many deleterious consequences, such as posttraumatic stress disorder (PTSD), alterations in neuroendocrine function, and depression. Although there is little dispute that traumatic exposure is often associated with negative consequences, controversy has surrounded the extent to which traumatic exposure has an impact on basic cognitive processes of attention and memory. The controversy has been most intense regarding memory for trauma: Are some types of trauma associated with impaired memory for the event and avoidant encoding of trauma-related information?

At the same time that there has been controversy about memory for trauma, researchers have increasingly applied cognitive psychology to the study of various forms of posttraumatic distress, including acute stress disorder (e.g., Moulds & Bryant, 2002), PTSD (e.g., Brewin, Dalgleish, & Joseph, 1996), and dissociation (e.g., DePrince & Freyd, 1999). Dissociation—the breakdown of normally connected processes of consciousness and memory—is of particular interest to both trauma researchers and cognitive scientists. Dissociation has been associated with trauma exposure (see Putnam, 1997) and involves the alteration of fundamental cognitive functions. Betrayal-trauma theory predicts that dissociating information from awareness is mediated by the threat that the information poses to the individual's system of attachment (Freyd, 1994, 1996, 2001).

Theorists have proposed that memory impairment for trauma-related information involves avoidant processing (e.g., people may disengage attention from threatening information and thus fail to

encode the material), impaired retrieval processes (e.g., material is encoded, but cannot be retrieved; see McNally, Clancy, & Schacter, 2001), or both. Directed-forgetting paradigms have been used to investigate avoidant-processing hypotheses for negative stimuli (e.g., Cloitre, Cancienne, Brodsky, Dulit, & Perry, 1996) and trauma-related stimuli (e.g., McNally, Metzger, Lasko, Clancy, & Pitman, 1998; Moulds & Bryant, 2002).

In a directed-forgetting task, participants are presented with items and instructed after each item (or list of items) to remember or forget the material (MacLeod, 1999). Memory is tested for both to-be-forgotten and to-be-remembered items. The directed-forgetting task has been employed in two forms. In the *item* method, words appear one at a time with a memory instruction following each word. In the *list* method, participants receive the memory instruction at the end of a list of words. When the item method is used, participants likely selectively rehearse to-be-remembered words, whereas when the list method is used, participants likely inhibit to-be-forgotten words (e.g., Basden, Basden, & Gargano, 1993; MacLeod, 1999).

McNally et al. (1998) found that women diagnosed with PTSD who reported a history of childhood abuse did not demonstrate poorer recall for trauma-related stimuli compared with control groups, regardless of remember or forget instruction. Further, the women diagnosed with PTSD showed impaired recall for negative and positive words they were instructed to remember. The authors argued that these findings are inconsistent with an avoidant-encoding hypothesis.

In subsequent work, McNally et al. (2001) tested women who reported repressed or recovered memories of childhood sexual abuse and women who denied any history of childhood sexual abuse. Using the same methodology as in the previous study (McNally et al., 1998), the authors did not find evidence that the repressed- or recovered-memory groups were engaging in avoidant processing of trauma-related information.

Directed forgetting, in its standard form, implicitly requires focused attention. However, recent research suggests that attentional context may play a critical role in the conditions under which recall of trauma-related information is impaired. Freyd, Martorello, Alvarado, Hayes, and Christman (1998) found that high dissociators showed more Stroop interference than low dissociators under selective-attention demands, suggesting that high dissociators have disruptions in consciously controlled attentional abilities. We (DePrince & Freyd, 1999) found that although high dissociators performed worse (more Stroop interference) than low dissociators under selective-attention conditions, they performed better (less Stroop interference) than low dissociators under divided-attention conditions. A free-recall task revealed that high dissociators recalled more neutral and fewer trauma-related words than low dissociators, supporting the argument

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that dissociation may help to keep threatening information from awareness.¹

These studies suggest that high dissociators might be at a cognitive advantage in tasks that require divided attention. We predicted, therefore, that divided-attention contexts would help high dissociators to keep threatening information from awareness. In a previous study (DePrince & Freyd, 2001), we tested high and low dissociators using an item-method directed-forgetting task under selective- and divided-attention conditions. Like McNally et al. (1998), we found no difference in free recall of trauma-related items presented under selective-attention conditions; however, under divided-attention conditions, high dissociators recalled fewer trauma-related and more neutral to-be-remembered words than did low dissociators.

The item method of the directed-forgetting task likely drives participants to selectively rehearse words; this presumably enhances encoding and does not invoke inhibition. Recent research points to inhibition as a possible mechanism in memory impairment for trauma-related information (e.g., Anderson, 2001; Anderson & Green, 2001). We were therefore interested in how high and low dissociators would perform in a directed-forgetting task using the list method, which is believed to invoke inhibitory processes. We predicted results consistent with those of our previous studies (DePrince & Freyd, 1999, 2001). Specifically, we expected that under divided-attention conditions, high dissociators would demonstrate impaired recall for trauma-related but not neutral stimuli, relative to low dissociators. We also predicted that high dissociators would report significantly more trauma (including betrayal traumas for which the reported perpetrator was described as very close) than low dissociators.

METHOD

Participants

Participants were 24 low dissociators (mean age = 19.0; 16 female) and 21 high dissociators (mean age = 19.0; 14 female) enrolled in an introductory psychology course at the University of Oregon; they received partial credit toward a research requirement for participating. Using the same methodology as in our previous studies (e.g., DePrince & Freyd, 1999, 2001), we recruited participants who scored above 20 and below 10 on the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986) for the high- and low-dissociator groups, respectively. Mean DES score was 28.9 ($SD = 13.4$) for the high-DES group and 5.8 ($SD = 2.5$) for the low-DES group. Recognition data for 1 high-DES and 1 low-DES participant were deleted because of computer error.

Materials

Stimuli presented during the directed-forgetting task were neutral (e.g., *stairs*, *curtain*) and trauma-related (e.g., *rape*, *assault*, *incest*) words taken from McNally et al. (1998). Words matched for neutral (e.g., *chair*, *light*) and trauma-related (e.g., *attack*, *violate*) meaning were added to the lists for use in the recognition task.

¹Alternatively, high dissociators may be more familiar with trauma words than low dissociators are, making the words less memorable. We addressed this issue in the current research. In a sample of 286 undergraduate participants, dissociation level was not related to familiarity ratings for the trauma and neutral words used in the current study, suggesting that differences in recall cannot be explained by simple differences in familiarity with trauma stimuli between groups.

The DES is a self-report measure of dissociation (Bernstein & Putnam, 1986). Participants indicate the percentage of time that they experience each of 28 items (e.g., “Some people have the experience of feeling that other people, objects, and the world around them are not real”). DES score was calculated by averaging responses across the 28 items.

The Brief Betrayal Trauma Survey (BBTS; Goldberg & Freyd, 2003) is a 12-item, behaviorally defined, self-report measure. Items assess noninterpersonal (e.g., natural disasters) and interpersonal (e.g., assault) traumas before and after age 18. Interpersonal traumatic events distinguish between those perpetrated by someone relationally close to the victim and those perpetrated by someone not close to the victim. Freyd and Goldberg (2003) categorized the items as reflecting three levels of betrayal depending on whether the event endorsed was perpetrated by someone relationally close to the victim. An example of a high-betrayal item is “made to have some form of sexual contact, such as touching or penetration, by someone with whom you were very close (such as a parent or lover).” An example of a medium-betrayal item is “witnessed someone with whom you were very close deliberately attack another family member so severely as to result in marks, bruises, blood, broken bones, or broken teeth.” And an example of a low-betrayal item is “been in a major earthquake, fire, flood, hurricane, or tornado that resulted in significant loss of personal property, serious injury to yourself or a significant other, the death of a significant other, or the fear of your own death.” Construct validity has been demonstrated based on agreement between traumatic events endorsed on the BBTS and an existing trauma inventory (DePrince, 2001).

Procedure

Participants were tested individually with an experimenter present. They saw words appear one at a time on the computer screen in four blocks (two selective- and two divided-attention blocks); each word was presented for 6 s. In each attention condition, one block was followed by remember instructions and the other by forget instructions. Each block comprised six neutral and six trauma-related words. During the selective-attention blocks, words appeared in black on a white background. During divided-attention conditions, the stimuli changed in color from red to blue at random intervals. Participants were instructed to press a key every time the color changed (as in DePrince & Freyd, 2001). Block order (divided vs. selective attention and forget vs. remember instructions) was randomized for each participant. A block of country names was presented at the beginning and end of the experiment.

Recall was assessed by giving participants 5 min to write down all of the words they could remember from the lists presented, regardless of the remember or forget instruction. For the recognition test, participants saw items presented one at a time and pressed one key to indicate they recognized the word from the lists viewed previously and another key to indicate they did not recognize the word from the lists. Test items included words from the experimental lists previously presented and 24 words not previously viewed. Finally, participants completed the BBTS.

RESULTS

Reported Trauma History

The total number of traumatic events reported on the BBTS was computed for each participant (possible scores ranged from 0 to 24).

TABLE 1
Mean Number of Traumas by Dissociation Group

| Trauma category | Dissociation group | | Difference between groups | |
|-----------------|-----------------------------|------------------------------|---------------------------|----------|
| | Low DES (<i>n</i> = 24) | High DES (<i>n</i> = 21) | <i>t</i> | <i>p</i> |
| | Total | 2.6 (2.5) | 6.2 (3.9) | -3.7 |
| High betrayal | 0.5 (0.7) | 1.5 (1.6) | -2.7 | <.01 |
| Medium betrayal | 1.2 (1.5) | 2.9 (1.9) | -3.2 | <.01 |
| Low betrayal | 0.9 (0.9) | 1.9 (1.4) | -2.8 | <.01 |

Note. Standard deviations are in parentheses. For each participant, sums were calculated for the total number of traumas reported (range: 0–24), as well as the number of low-betrayal events (range: 0–6 events), medium-betrayal events (range: 0–12 events), and high-betrayal events (range: 0–6). The *t* tests were two-tailed. DES = Dissociative Experiences Scale.

To more closely examine the type of traumas reported, we also calculated totals for the number of high-, medium-, and low-betrayal events. High dissociators reported significantly more traumatic events overall and more high-betrayal events than low dissociators (see Table 1).

Memory Findings

The total number of items correctly recalled and recognized was tallied (see Table 2). A significant DES Group × Word Category interaction for to-be-remembered stimuli in the divided-attention condition, $F(1, 43) = 15.313, p < .001, \eta_p^2 = .26$, indicated that as in previous studies, high dissociators recalled more neutral and fewer trauma words than low dissociators (see Fig. 1). Main effects for DES group and word category were not significant in this analysis. In a follow-up analysis, those participants who reported at least one betrayal trauma were di-

TABLE 2
Mean Number of Words Correctly Recalled and Recognized

| Test and condition | Trauma words | | Neutral words | |
|---------------------|----------------------|--------------------|----------------------|--------------------|
| | Remember instruction | Forget instruction | Remember instruction | Forget instruction |
| Low-DES group | | | | |
| Recall | | | | |
| Selective attention | 3.1 (1.1) | 1.5 (1.1) | 2.0 (1.6) | 2.3 (1.6) |
| Divided attention | 1.7 (1.4) | 1.5 (1.2) | 1.1 (0.9) | 0.7 (1.0) |
| Recognition | | | | |
| Selective attention | 5.1 (1.1) | 5.0 (1.1) | 4.7 (1.4) | 4.9 (1.2) |
| Divided attention | 4.8 (1.3) | 4.6 (1.4) | 4.3 (1.1) | 2.9 (1.5) |
| High-DES group | | | | |
| Recall | | | | |
| Selective attention | 3.6 (1.1) | 1.4 (1.2) | 2.3 (1.2) | 2.5 (1.1) |
| Divided attention | 1.0 (1.0) | 1.5 (1.3) | 2.0 (1.2) | 0.8 (0.8) |
| Recognition | | | | |
| Selective attention | 5.3 (0.9) | 5.1 (0.9) | 5.1 (0.8) | 5.3 (0.9) |
| Divided attention | 4.3 (1.2) | 4.3 (1.4) | 4.4 (1.2) | 3.8 (1.7) |

Note. Standard deviations are in parentheses. DES = Dissociative Experiences Scale.

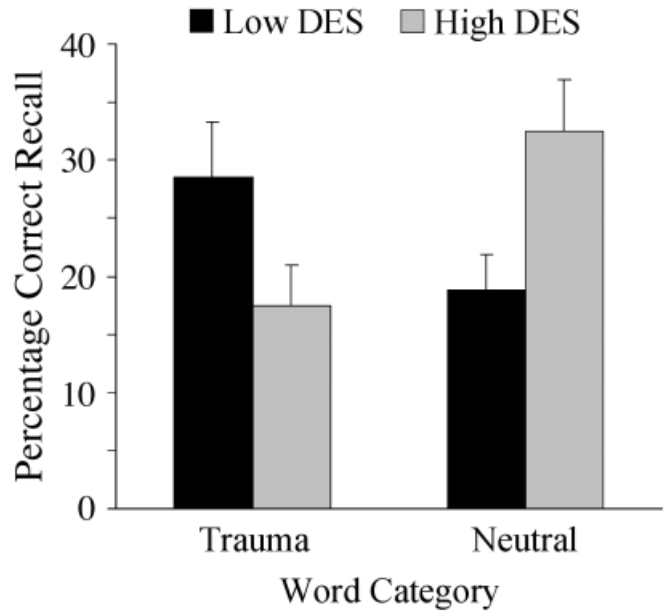


Fig. 1. Percentage correct recall of to-be-remembered neutral and trauma-related words presented under divided-attention conditions. Results are shown separately for participants with high (above 20) and low (below 10) scores on the Dissociative Experiences Scale (DES).

vided into high-DES (*n* = 13) and low-DES (*n* = 10) groups; the same significant interaction of DES group and word category for to-be-remembered words under divided-attention conditions was present, $F(1, 21) = 8.704, p < .01, \eta_p^2 = .29$. There was no significant interaction of DES group by word category or main effect of dissociation for to-be-forgotten words presented under divided-attention conditions, nor for to-be-remembered or to-be-forgotten words presented under selective-attention conditions.

Analyses of the recognition data revealed a trend for the interaction of DES group and word category for the to-be-remembered items presented under divided-attention conditions, $F(1, 41) = 2.939, p = .09, \eta_p^2 = .07$. No other effects for these items were significant under divided attention. The DES-group-by-word-category interaction was significant for the to-be-forgotten items under divided-attention conditions, $F(1, 41) = 4.447, p < .05, \eta_p^2 = .10$, such that the high-DES group recognized more neutral and fewer trauma-related items than the low-DES group. The main effect for word category was significant, $F(1, 41) = 14.521, p < .001, \eta_p^2 = .26$; participants recognized more trauma than neutral words. There was no main effect of DES group. The interaction between DES group and word category was not significant under selective-attention demands.

DISCUSSION

Among the to-be-remembered words presented under divided-attention conditions, high dissociators recalled fewer trauma-related and more neutral words compared with low dissociators. Among the to-be-forgotten words presented under divided-attention conditions, high dissociators recognized more neutral and fewer trauma-related words compared with low dissociators. Taken together with previous findings (DePrince & Freyd, 1999, 2001; Freyd et al., 1998), these findings point to the importance of attentional context in identifying

the conditions under which high dissociators forget trauma-related information.

The high-dissociator group reported significantly more trauma, including high-betrayal events, than low dissociators. Further, the dissociation-group-by-word-category interaction was present when we looked at only those participants who reported a history of betrayal trauma. This pattern is consistent with betrayal-trauma theory's prediction that individuals who experience events high in betrayal will use dissociation to keep threatening information from awareness.

We did not find interactions between dissociation group and remember-forget instruction, suggesting that inhibitory mechanisms did not play a role in the high dissociators' memory impairment for trauma-related versus neutral information. Presumably, the effect of semantic content occurred at initial encoding, resulting in the interaction of dissociation group and word category for to-be-remembered items; an effect at encoding is consistent with the prediction that high dissociators will engage in avoidant processing of threatening information under certain attention conditions. This does not mean that inhibitory mechanisms are not a viable route to memory impairment for trauma-related information (to the contrary, Anderson and colleagues, e.g., Anderson, 2001, and Anderson & Green, 2001, have presented models of inhibitory mechanisms that might account for some memory impairment of trauma-related information); rather, the participants in this study appear to have failed to encode the trauma-related information under divided-attention conditions.

Research with preschool-age children suggests a similar effect. Children in a community sample saw neutral and emotionally charged pictures under selective- and divided-attention conditions (Becker-Blease, Freyd, & Pears, 2004). Children who had trauma histories and who were highly dissociative recognized fewer charged pictures relative to nontraumatized children under divided-attention conditions; no group differences were found under selective-attention conditions.

The current study is an important addition to correlational research examining the relation between exposure to trauma and memory impairment. For example, previously we found that reports of abuse perpetrated by caregivers were related to higher degrees of reported memory impairment than was abuse by noncaregivers (Freyd, DePrince, & Zurbriggen, 2001). Such self-report research is inherently limited by its correlational nature and the potential confounds associated with self-report of memory persistence (e.g., Schooler, 2001). The current study demonstrated differences in experimental measures of memory for trauma-related stimuli without relying solely on self-reports of memory persistence.

There are several limitations to the current work. This study used an undergraduate sample, which likely does not reflect the more severe distress observed in clinical groups. The self-reported trauma histories are limited in that they were not corroborated, though there is evidence that retrospective reports of early childhood events are reasonably reliable (Brewin, Andrews, & Gotlib, 1993). However, empirical reports indicate that abuse rates based on a single report are likely to significantly underestimate true prevalence (Femina, Yeager, & Lewis, 1990; Fergusson, Horwood, & Woodward, 2000; Martin, Anderson, Romans, & Mullen, 1993; Sjöberg & Lindblad, 2002). Such false negatives would likely decrease the strength of the observed correlation between dissociation and trauma.

The current study adds to understanding of impaired memory for trauma stimuli by examining memory for trauma-related information under experimental conditions. The research reported here specifi-

cally identifies attentional context as a critical aspect of the conditions under which individuals may experience memory impairment for trauma-related information. Future investigation is needed to evaluate the proposition that the divided-attention condition more closely reflects task demands in complex social situations than does the typical laboratory situation. If this is indeed the case, researchers may discover that keeping betrayal-trauma stimuli out of awareness and memory is fairly common for individuals with dissociative tendencies.

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