

BLOCKED AND RECOVERED MEMORIES OF AFFECTIVE, DISTINCTIVE, AND
NEUTRAL PARAGRAPHS

A Thesis

by

BARBARA LYNN CORBISIER

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

May 2007

Major Subject: Psychology

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Approved by

Chair of Committee,	Steven M. Smith
Committee Members,	Lisa Geraci
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ABSTRACT

Blocked and Recovered Memories of Affective, Distinctive,
and Neutral Paragraphs. (May 2007)

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Highly affective memories have been thought to be longer lasting and more detailed than other memories, and many experimental results have supported this assertion. The apparent robustness of these memories, however, may result from their high distinctiveness, rather than their emotional content. Two experiments tested free and cued recall for negative affect, distinctive, and neutral paragraphs. Experiment 1 compared neutral and negative affect paragraphs using a blocked and recovered memory technique.

Affective paragraphs were remembered significantly better than neutral paragraphs in free recall of paragraph titles, regardless of condition. Details of neutral paragraphs were remembered significantly better than affective paragraphs, regardless of condition. No recovery effect was found.

Experiment 2 compared distinctive and neutral paragraphs using the same technique. Free recall of paragraph titles did not differ between paragraph types. Neutral paragraphs were remembered better than distinctive paragraphs in cued recall, regardless of condition. Participants remembered significantly more with cued recall, and

significantly more in the forget condition, and distinctive paragraphs were subject to a much greater forgetting effect than neutral paragraphs. It is unclear why a robust forgetting effect, using these stimuli, was not found. Consistent with previous literature, affective stimuli were remembered well, but inconsistently, distinctive stimuli were not. These results provide support for the claim that negative affect memories are more robust than other memories. This may result from their inherent emotional content as opposed to their being distinctive in some way.

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INTRODUCTION

Are materials that elicit strong negative emotional responses susceptible to forgetting and subsequent recall some time later? LeDoux (1992) pointed out that there are any number of harmful situations that need to be encoded firmly into memory so that the organism will avoid that situation in the future. A person who touched a glowing coal over and over would have a severely damaged hand, which might have made survival difficult in earlier times; similarly, an animal that got into potentially fatal situations willy-nilly would not survive long enough to reproduce. Therefore, it seems unlikely that negative emotional experiences would be susceptible to the same forgetting effects that are found with emotionally neutral stimuli.

While some experiences apparently need to be recalled accurately, most other experiences are forgotten. Having to distinguish where one left one's keys yesterday would be made much more difficult if every other instance of leaving the keys somewhere were still in memory, fully intact, and one had to sort through them all to find the correct memory. Forgetting serves a practical purpose of allowing the organism to not be overwhelmed by irrelevant and tangential information. Forgetting can be caused by new stimuli being processed that prevent rehearsal of old stimuli, a process called blocking. However, given the proper cue, the old stimuli can be recalled. This is known as recovery.

In the laboratory, consistent memory blocking and recovery effects have been found (Smith & Moynan, 2004; Smith et al., 2003). Memories can be blocked by

This thesis follows the style of *Psychological Science*.

presenting initial critical stimuli, but then presenting a number of interfering stimuli. Given a free recall test, participants typically do not remember the critical stimuli. However, this situation can be reversed simply by giving participants a retrieval cue that allows the previously blocked memory to be recovered. Accuracy for continuous and recovered memories is the same, as is the number of false memories (Gerken, 2004; Smith et al., 2003). Smith, Gleaves, and colleagues (2003) showed participants categorized lists including three critical lists and 18 filler lists. Participants in the blocking condition were given extra exposure to the filler lists. They were then asked to recall all of the lists that had been initially presented, which was followed by a cued recall task for the 3 critical lists. In the initial task, those in the blocking condition recalled significantly less lists than those in the control condition in several experiments. In two other experiments, if participants were given false cues for lists that had never been presented, a number of them falsely recalled the nonexistent lists. Accurate memories were associated with higher confidence ratings and were distinguishable via remember/know judgments.

The question of retrieval blocking and recovery of strong negative memories comes to the forefront in the so-called recovered memory debate. Several authors (McNally et al., 2004a; Kihlstrom, 2004; Reisberg & Heuer, in press) have argued that emotional memories are not liable to be forgotten and subsequently recovered with a minimum of encoding and retrieval errors. There is evidence that in laboratory studies, emotional materials are remembered better using pictures, word lists, and stories as stimuli (see Reisberg & Heuer, in press, for a review). Reisberg & Heuer (2004) found

that gist and central details of emotional events were remembered better than those of neutral events.

The effect of early traumatic experiences appears to affect how negative stimuli are recalled later in life. McNally and colleagues (2004b) recruited participants who had suffered childhood sexual abuse and a control group who had not. They had all participants rate 2 lists, one of trauma-related and one of positively valenced words. Participants were instructed to forget the first list after rating it. Both controls and sexual abuse survivors recalled more trauma-related words than positive words, and there were no differences in levels of recall between the groups. However, previous life experience and coping style may play a role in what types of stimuli are recalled.

Some have argued (e.g., Loftus, 1993) that all memory is malleable and reconstructive. Because memories for non-events can be created in a laboratory situation, specific, detailed, and accurate recall for real-life events that occurred years before would be nearly impossible, regardless of the emotional significance of the event.

Others (Smith & Gleaves, in press; DePrince & Freyd, 2004; Erdelyi, 2006) maintain that despite their high emotional content, negative memories can be forgotten just as any other event in memory can. There is evidence from a number of studies that show emotional stimuli are processed earlier and faster than other types of stimuli (see Kern et al., in press, for a review). This leads to better recognition of emotional stimuli in recognition tests, and superior memory for negatively valenced stimuli relative to neutral stimuli.

It may be possible to intentionally forget negative stimuli for free recall, but not for recognition. This might help explain why cues make previously inaccessible material available again in memory. Wessel & Merckelbach (2006) compared recall and recognition of two negative and two neutral word lists in a directed forgetting paradigm. They found a directed forgetting effect in free recall, but found no effect for recognition, regardless of list type.

Coping style may also have a significant effect on how negative stimuli are recalled. DePrince & Freyd (2001) classified study participants as high or low dissociators on the Dissociative Experiences Scale. Higher scores on this measure have been associated with PTSD and dissociative disorders. Participants' performance in a directed forgetting paradigm requiring selective or divided attention was measured as they viewed positive, neutral, or negatively valenced words. No differences in free recall of word type were found in the selective attention condition. However, in the divided attention condition, participants who were classified as high dissociators recalled more neutral and fewer trauma words compared to low dissociators, who showed the exact opposite pattern. It is important to note that forgetting negatively valenced words or not is not the same argument as whether individuals who are good at repressing traumatic episodic memories can forget trauma-related words more easily than non-repressors.

Recovered-memory advocates (e.g., Terr, 1995) have claimed that memories of intensely negative, threatening events, such as childhood sexual abuse, have a special status in memory, and as such, are not subject to the normal rehearsal and recovery errors that other memories. These memories are encoded differently than regular

memories. Once the threatening event is over, the memory is not accessible to regular, everyday conscious access. This could serve an evolutionary purpose. If an organism successfully escaped a life-threatening situation before, it would not be helpful for the episodic memory of that event to be subject to rehearsal errors. Keeping this memory protected by keeping it inaccessible in regular consciousness, but available in a similar threatening event could ensure that the means used to escape the first event would be accurately recalled so a similar strategy could be used in subsequent threatening situations. This could be accomplished via the different neuronal pathways active during threatening events when the sympathetic nervous system is active as opposed the reaction to a regular, non-threatening event. (see Kern et al., in press, for a review). Therefore, memories of high negative-affect events should be more accurate than emotionally neutral memories once they are finally accessed through some retrieval cue. If the memories were not accessible before the retrieval cue triggered them, they would not be subject to rehearsal and repeated retrieval errors like other episodic memories of prosaic events.

The vast majority of memory studies have used some form of word lists. While this paradigm has been useful in gathering basic information about how memory works, more ecologically valid stimuli would provide more information about emotional memory. Studies using emotionally-charged word lists (Paul & Whissell, 1992; Ferre, 2003; Smith & Moynan, 2004; Wessel & Merckelbach, 2006; McNally et al., 2004b; DePrince & Freyd, 2004) have been used with success, but this paradigm has limited ecological validity. Word lists, even those that use emotionally-charged words, do not

necessarily produce the deep elaborative processing that pictorial or paragraph-type stimuli typically do. Further, there are few examples in everyday life where people need to memorize lists of words, and even fewer where those lists have emotional significance for those that are memorizing them.

How do we know that participants are actually feeling the emotions that experimenters are trying to create in an experiment? Kenealy (1997) reviewed a number of techniques that have been proposed and used successfully, including hypnosis, music, and the Velten Procedure, in which participants read a number of self-referential positive or negative statements. Replication has not always been universal using these techniques, however.

Given the reliable memory errors from word list experiments, and the equivocal results from mood-induction experiments, how much can we extrapolate to episodic memory? Freyd & Gleaves (1996) cautioned about generalizing too much from laboratory results using word lists to false memories of events that never occurred. They pointed out that participants in Roediger & McDermott's (1995) experiment involving false memories and lists of related words never falsely remembered unrelated words that had been presented. They concluded that generalizing laboratory findings using related word lists to dissimilar events is inappropriate. They further cautioned that expectations of memory accuracy in a laboratory experiment are not necessarily higher than that found in therapy or of memories of childhood abuse. Pezdek & Roe (1997) tried to implant or change memories of being touched on the arm or shoulder in 4- and 10-year olds. They found that it was easier to change the children's memories than to implant a

memory for an event that did not occur. This corresponds to the Freyd & Gleaves (1996) argument that false memories of events that never occurred or words that were not presented in an experiment are less likely than falsely remembering a more plausible event. While everyday memory is certainly not infallible, details, rather than gist of an episodic memory tend to be misremembered more. This would lend weight to the idea that misremembering a word on a list is not equivalent to misremembering the list category, for example, just as misremembering being touched on the arm rather than the shoulder is not equivalent to misremembering being touched entirely.

In a laboratory situation, misremembering or forgetting is not guaranteed. However, a number of experimental paradigms have proved useful in causing experimental participants to forget studied items. The think/no-think method (Anderson & Greene, 2001) requires participants to suppress memories for studied items, for example, to recall semantic associates of a presented word that were not on a studied list. The directed forgetting technique (Kimball & Bjork, 2002, MacLeod, 1999) involves presenting initial critical and non-critical stimuli to a participant, then re-presenting the non-critical stimuli. Participants are tested for recall of critical stimuli that they only saw at the beginning of the experiment. Using cued recall, participants can overcome previously blocked memories of critical stimuli. This demonstrates that memory for a given even may exist in memory, but may not necessarily be accessible without the proper retrieval cue.

What makes a cue better or worse for retrieval? Tulving & Osler (1968) found that cues that were present at encoding facilitated recall of words better than those that

were not, and in fact, using cues that were not present at encoding interfered with recall. Light & Carter-Sobell (1970) used a recognition test to investigate the effects of semantic context. Participants studied word pairs, for example, *strawberry jam*, and at test, were presented with the studied pair or an unstudied pair, for example, *raspberry jam* or *traffic jam*, and participants had to decide if the noun was old or new. Over three different experiments, they found that presenting the noun with the studied adjective at test produced better recognition memory than non-studied adjectives. Light & Carter-Sobell hypothesized that the reason for this difference was that the non-studied adjectives interfered with a recency tag that had been encoded along with the noun during study. Another possibility they discussed is that the adjectives bias the category of the noun, so that if the participant had encoded *squash* as a vegetable at study, but the cue at test treats *squash* as a sport, the wrong category in memory will be searched and recognition will suffer.

More categories, rather than less, may aid in recall. Mandler & Pearlstone (1966) had participants sort high-frequency English words, randomly chosen English words, and simple patterns printed on note cards. Participants were divided into a *free* condition, where they could sort the cards in any way they desired, or a *constrained* condition, where participants were unknowingly yoked to a participant in the free condition. Participants in the constrained condition had to sort the cards in the same way as their counterpart in the free condition did, but were not given any information other than the total number of categories. When they sorted a card incorrectly, the experimenter took the card and placed it in the correct category pile. Those in the free condition had to

repeat the sorting process until they could complete a sorting procedure identically twice in a row, while those in the yoked condition had to repeat the procedure until they could do it without errors. Upon successful categorization, participants were given a free recall task where they wrote down as many of the words they had sorted as they could remember. For both conditions, participants remembered more high frequency words than random words, and there was a significant positive correlation between the number of categories and the number of words recalled. These results suggest that more categories actually help recall, in contrast to the possibility suggested by Light & Carter-Sobel (1970).

Categories of emotional stimuli appear to be processed differently than categories of neutral stimuli. Studies in both animals and humans have shown that emotional stimuli are remembered better than neutral ones. Specifically, long-term memories for negative-affect stimuli appear to be stronger than are neutral or positively valenced memories (Cahill & McGaugh, 1998). A mechanism to encode negative, threatening situations into memory after one or two repetitions is needed in order for the survival of a species. Fear conditioning seems to be the result of this evolutionary need. To study this process, animals are classically conditioned to a novel stimulus that is followed by a negative experience, for example, a foot shock. Often only one exposure to the conditioned stimulus/unconditioned stimulus (CS/US) is needed in order for the animal to show fear signs when subsequently exposed to the CS. Further, this association is not necessarily subject to the typical extinction seen in less aversive CS/US combinations (LeDoux, 1992).

The limbic system, and in particular the amygdala, appears to play a major role in memory for negative affect. Sullivan et al. (2000) conditioned very young rat pups (9 and 10 days old) to an odor paired with shock. Four hours after the conditioning, the 9-day-old pups actually approached the odor that was paired with shock, unlike the 10-day-old pups, which showed typical avoidance behavior. Sullivan and colleagues concluded that pups were able to learn an odor-aversion as the developing amygdala showed more neural activity.

Human neuroimaging studies have also found a connection between increased emotional response, memory, and limbic system activation. Hamann, Ely, Grafton, & Kilts (1999) did a PET study involving appealing pictures (sexually arousing, appealing animals, or appetizing food), aversive pictures (i.e., mutilated bodies, frightening animals), and a neutral condition consisting of nonemotional pictures (i.e., chess players) or distinctive but emotionally unarousing pictures (i.e., a chrome rhinoceros, an exotic parade). Participants' arousal levels were measured via skin conductance and heart-rate measures. PET scans showed significantly higher amygdala activation during the emotional pictures than during the neutral pictures, regardless of whether the pictures were positively or negatively valenced. A surprise memory test for the pictures was given 10 minutes after the PET scan was completed, and another surprise test was given four weeks later. The appealing, aversive, and distinctive pictures were remembered significantly better than the neutral unemotional pictures.

To test whether the amygdala was more sensitive to emotionally intensive material, and whether those stimuli would be better-remembered, Canli and colleagues

(2000) used event-related fMRI. They showed participants neutral and negative scenes during an fMRI scan. A separate scan was used for each scene. The participant rated the scenes for emotional intensity as she saw them. Participants were tested for their memories of the scenes three weeks later. Amygdala activation was significantly correlated with participants' higher ratings of emotional intensity. Further, participants remembered highly-emotionally intense scenes better than lower-rated scenes. For these highly emotional stimuli, left-amygdala activation levels were a predictor of how well the stimuli would be remembered. More amygdala activation was associated with better recall. Canli et al. (2000) showed that less amygdala activation in a highly emotional stimulus was a predictor that the stimulus would not be remembered as well. For emotionally neutral stimuli, there was no significant amygdala activation as shown in an fMRI scan.

Taken as a whole, these neuroimaging and animal studies provide evidence that emotional stimuli are encoded and recalled differently than neutral stimuli. But how exactly is this accomplished? Are negative stimuli immune to forgetting caused by interference? If negative memories are special, can interference impede their retrieval, as occurs with other memories, or are these experiences preserved due to their special memory status? Furthermore, if forgotten, can such distinctive and negatively emotional material be recovered? These are the major questions posed by the present experiments.

The present study used paragraphs to garner an emotional response in the participants, as well as provide an easy means to check what participants remember compared to what they were shown. Paragraphs are intuitively more ecologically valid

than word lists, and should trigger greater affective responses than word lists because participants should be able to picture the scenario described, thus leading to deeper processing. While it is certainly possible to have a mental image of a given word, word lists are not necessarily as emotionally compelling as a descriptive paragraph. This deeper processing should also help with encoding the material with appropriate category information. Specifically, are these highly-affective negative paragraphs so distinctive as to be better-remembered than the neutral paragraphs, or are they so unpleasant that participants will block out the details, either in the encoding or the recall phase? Using this information, we can help answer the questions of whether emotional experiences in the form of narratives are forgotten, and whether distinctive experiences in the form of narratives are forgotten. Further, we can test whether forgotten emotional and distinctive experiences are recoverable.

Using the blocked and recovered memory technique, free recall and cued recall of memories for emotional and distinctive paragraphs were tested. Specifically, the present study sought to answer the following questions:

1. Are negative paragraphs susceptible to interference/forgetting effects?
2. Are distinctive but nonemotional paragraphs susceptible to interference effects?
3. Are negative and distinctive paragraphs recalled better (or worse) than neutral ones?

PILOT EXPERIMENT: NORMING STUDY

Because the paragraphs chosen for the present experiments had not been used as experimental stimuli before, norming data were needed to ensure that the affective, distinctive, and neutral paragraphs were sufficiently different from each other to warrant their use. Ratings of the paragraphs' emotionality and distinctiveness were needed to make sure the stimuli were appropriate for the memory tasks in Experiments 1 and 2.

Participants

All paragraphs were rated by participants who were undergraduate students in introductory psychology classes at Texas A&M University. They received course credit in exchange for participation in the experiment. 37 potential participants were screened, of these, 19 passed the screening procedure and completed the experiment (see Appendix B for the screening questionnaire).

Materials

Two highly-charged emotional paragraphs and 17 neutral paragraphs were used. Neutral paragraphs were taken from a Test of English as a Foreign Language (TOEFL) practice test. This source was chosen because the paragraphs are all written in a similar style and difficulty level, and concern neutral topics. Additionally, as most study participants will be native English speakers, the chance that they may have been previously exposed to the paragraphs will be minimized. Paragraphs were edited for length so as to be comparable (mean word count=126.53; mean Fleisch-Kincaid Grade level=10.33; mean Fleisch-Kincaid Reading Ease Score=55.67; see Appendix A).

Emotional paragraphs concerned topics associated with high negative affect: a childhood sexual abuse incident and a description of war atrocities (see Appendix A). These were taken from web pages written by individuals who had suffered the experiences first-hand. The paragraphs were edited for length to be comparable to the neutral paragraphs (mean word count=128).

Distinctive paragraphs were taken from quirky human-interest type news stories obtained from The Coffee News, a weekly publication distributed in doughnut shops. Again, the paragraphs were edited for length (mean word count=129.50) (see Appendix A for examples).

Design and Procedure

Participants were given handouts with the paragraphs printed in 12-point type. Each was given a numerical title (Paragraph 1, Paragraph 2, etc.). Participants read each paragraph and rated the paragraphs for emotionality and distinctiveness using a 7-point Likert scale on a separate rating sheet. The task was self-paced. Some participants failed to follow instructions and did not rate all paragraphs, so some paragraphs only had 16 ratings.

Results

Generic paragraphs were rated neutral on distinctiveness (mean=3.67, SEM = .19) and low in emotionality (mean=2.20, SEM = .19). Emotional paragraphs were rated higher on distinctiveness (mean=5.36, SEM = .30) and emotionality (mean=5.78, SEM = .19). Distinctive paragraphs were rated above neutral in distinctiveness (mean=4.33, SEM = .28) and lower in emotionality (mean=3.22, SEM = .36) (See Table 1).

A repeated-measures analysis of variance (ANOVA) was computed for each set of ratings. A significance level of .05 was used for all tests.

TABLE 1

Means and Standard Errors of Paragraph Ratings

Means and Standard Errors of Ratings		
Paragraph Type	Emotionality	Distinctiveness
Neutral	<i>M</i> = 2.20; <i>SEM</i> = .19	<i>M</i> = 3.67; <i>SEM</i> = .19
Emotional	<i>M</i> = 5.78; <i>SEM</i> = .19	<i>M</i> = 5.36; <i>SEM</i> = .30
Distinctive	<i>M</i> = 3.22; <i>SEM</i> = .36	<i>M</i> = 4.33; <i>SEM</i> = .28

Note. Paragraphs were rated on a 7-point Likert scale (1=low, 3=neutral, 7=high) for emotionality and distinctiveness.

Emotional paragraphs were rated significantly higher in distinctiveness [$F(1, 15) = 27.26$, $MSE = 19.99$, $p < .001$] and in emotionality [$F(1, 15) = 174.82$, $MSE = 100.90$, $p < .001$] compared to neutral paragraphs. Distinctive paragraphs were rated significantly more distinctive [$F(1, 15) = 5.83$, $MSE = 3.00$, $p = .029$] and more emotional [$F(1, 15) = 16.57$, $MSE = 11.67$, $p = .001$] than the neutral paragraphs as well.

Comparing emotional and distinctive paragraphs, emotional paragraphs were rated significantly higher in distinctiveness [$F(1, 17) = 17.25$, $MSE = 9.51$, $p = .001$] and in emotionality [$F(1, 17) = 37.75$, $MSE = 58.78$, $p < .001$].

Discussion

The fact that a stimulus is distinctive may give it more emotional weight than a neutral paragraph. Conversely, the fact that a stimulus is emotional may make it more distinctive than a neutral paragraph. Although the ratings show that the affective and distinctive paragraphs are not only high in one area and low in the other, they are different enough from each other and from the neutral paragraphs to justify their use in these experiments.

PRESENT EXPERIMENTS

There are several predictions for the present experiments. These are:

1. Emotional paragraphs will be remembered better than neutral paragraphs, regardless of extra exposure to neutral paragraphs.
2. Emotional paragraphs will be forgotten just as any other type of stimuli.
3. Distinctive paragraphs will be remembered better than neutral paragraphs.
4. Distinctive paragraphs will be forgotten just as any other type of stimuli.

If participants have similar or worse free recall of the negatively valenced paragraphs compared to the neutral paragraphs, this would provide evidence for the forgetting effect. If cues help participants to recall the critical stimuli better than in free recall, this would lend credence to the idea that memories of threatening, negative events can, indeed, be blocked from memory and later recalled. Conversely, if the affective paragraphs are recalled better than the neutral paragraphs, this would strengthen the argument that high negative-affect material does not have a special memory status that allows it to be encoded and recalled differently than neutral material. In this case, cues should have no significant effect on participants' recall of the neutral vs. emotional paragraphs.

Because of the confound with emotionality and distinctiveness, Experiment 2 should help distinguish between the two. If recall of distinctive paragraphs is worse or similar to neutral paragraphs, and if cues help recall, we have evidence that it is distinctiveness, and not negative emotion, that may contribute to blocking and recovery. On the other hand, if distinctive paragraphs are recalled better than the neutral ones and

we have obtained a forgetting effect in Experiment 1, then we can conclude that negative emotion rather than distinctiveness, helps determine whether a negative-affect event is encoded differently.

If no forgetting effect is found in Experiment 1, but a forgetting effect is found in Experiment 2, we have evidence to support the claim that high negative emotion that will help ensure a memory is easily accessible in memory more than distinctiveness. If no forgetting effects are found in either experiment, we have evidence that both factors contribute to make these types of memories accessible, and that forgetting of either type of event is unlikely.

EXPERIMENT 1

Are affective paragraphs remembered differently than neutral stimuli?

Experiment 1 tested this by comparing both free and cued recall for details of affective and neutral paragraphs using a forgetting and recovery paradigm.

Experiment 1 compared neutral paragraphs and negative emotional paragraphs. Participants read two emotional and 17 neutral paragraphs. Participants in the experimental group received extra exposure to 15 of the neutral paragraphs, with the critical emotional and 2 neutral paragraphs dropped out. The control group performed filler tasks instead of receiving extra exposure. They were then tested for free recall of the critical paragraphs, and then tested on cued recall of the critical paragraphs. Repeated-measures ANOVAs were performed to determine whether recall of the negative affect paragraphs differs from that of the neutral paragraphs, and what effect, if any, cues have on recall of both paragraph types.

Participants

Ninety-four undergraduate students in introductory psychology classes at Texas A&M University received course credit in exchange for participation in the experiment. All participants filled out a screening questionnaire to eliminate those who might have had similar experiences to those described in the affective paragraphs and those who might be upset or offended by the affective material. These participants were debriefed and dismissed from the experiment with credit. In total, 43 students passed this screening and completed the experiment (See Appendix B for questionnaire). Of these, three

participants failed to follow instructions for the free recall portion of the experiment; the free-recall data of these participants are not included.

Materials

Short paragraphs of approximately 125 words were used as stimuli (mean=126.68 words). There were 2 affective paragraphs and 17 neutral paragraphs. Sample paragraphs can be seen in Appendix A.

Design and Procedure

The experiment consisted of a 2(control or experimental; between-subjects) x 2 (neutral vs. affective paragraphs; within-subjects) x 2(free vs. cued recall; within-subjects) mixed design.

Participants viewed a PowerPoint presentation containing 19 short paragraphs. This presentation included two strongly negative-affect paragraphs and 17 neutral paragraphs. The strongly-affective paragraphs were vignettes of combat or sexual abuse. The remaining 17 were neutral paragraphs taken from the test of English as a second language (TOEFL). The TOEFL paragraphs were chosen because they are on neutral topics, are written at the same difficulty level, and, since the majority of our participants are native-English speakers, they would probably not have seen them before.

Due to the nature of the stimuli, a screening questionnaire was given to all participants before the study began. This questionnaire contained 18 short yes/no questions, 4 of which were used for screening purposes. Participants who indicated that they found sexual words or expletives in printed materials offensive, who were bothered by material with explicitly violent or sexual content, who had experienced something

they perceived as violent that affected them currently, or who had a threatening sexual experience were taken to another room, debriefed, and dismissed with credit for the experiment. Not only did this allow these participants to leave discreetly, it should not have affected the behavior of the remaining study participants. Remaining participants were assigned randomly to the control ($N=21$) or the experimental ($N=22$) groups.

Participants viewed a PowerPoint presentation where they were presented with a “Ready” slide for 3 seconds, followed by the paragraph title presented for 2 seconds, the paragraph for 50 seconds, and then two multiple-choice questions about the paragraph presented for 15 seconds each. This pattern repeated until all paragraphs had been presented. Participants wrote down their answers to the multiple choice questions as they were presented.

Critical affective paragraphs were presented in positions 2 and 4. Critical neutral paragraphs were presented in positions 7 and 10. Order presentation was the same for both conditions. Critical paragraphs were presented only once.

Once all paragraphs had been presented once, participants in the experimental condition were given extra exposure to the non-critical paragraphs via a “word recognition” task. They were shown a “Ready” screen for 3 seconds, followed by the paragraph for 50 seconds, and then shown a list of words, some of which appeared in the previous paragraph. Participants had one minute to write down which words they had seen in the paragraph. This pattern was repeated for all non-critical paragraphs.

They were then given a summarization task. Here, the 3-second “ready” screen was followed by the non-critical paragraph titles presented for 1 minute 3 seconds.

Participants wrote down as much as they could remember about the paragraph given the title.

Participants in the control condition completed filler tasks consisting of mazes, visual search, and mental rotation for 45 minutes.

Participants in both conditions then were given 4 minutes for free recall of all paragraph titles presented at the beginning of the experiment. They were instructed that if they could not remember the title, they should write down a brief summary of the paragraph. They were given 4 minutes for this task.

The free recall task was followed by a cued recall task in which participants were presented with the titles of each of the four critical paragraphs and told to write as much as they could remember about the paragraphs. They were given 2 minutes per title. Participants were then thanked and debriefed.

Results

Participant responses were scored for free recall of paragraph titles using a liberal criterion, i.e., either the exact title or the gist was counted as correct¹. Interrater reliability for scoring of gist titles was calculated using two raters, (the second rater only looked at a portion) and was found to be .89. Reliability for free recall was calculated by computing the mean of titles scored as correct by both raters. Cued recall for critical paragraphs was scored using idea units. Interrater reliability for idea unit scoring was

¹ Responses were also scored with strict criteria, but this method did not yield enough data, so liberal criteria were used. Using strict criteria, responses had to be exact to the title of the paragraph. Using liberal criteria, responses could be either exact or could be the gist of the title, i.e., the exact title *Rape* or the gist title *Sexual Abuse* were both counted as correct. See Table 3 on page 27 for means, and Appendix C for totals of strict and lenient scoring.

calculated using four raters, and was found to be .82. Reliability for cued recall was calculated by computing the mean of the number of idea units scored by all four raters.

TABLE 2

Means and Standard Errors for Free Recall of Paragraph Titles as a Function of Condition and Paragraph Type in Experiment 1

Control		Forget	
Affective	Neutral	Affective	Neutral
$M=1.43$	$M=.95$	$M=1.36$	$M=.82$
$SEM=.15$	$SEM=.16$	$SEM=.10$	$SEM=.14$

Note. A score of 2 would indicate perfect recall of titles.

A 2 (condition, forget vs. control, between Ss) x 2 (paragraph type, affective vs. neutral, within Ss) mixed ANOVA using the number of titles recalled as the dependent measure was computed to test the effect of paragraph type (affective vs. neutral) for recall of paragraph titles in the initial free-recall task. Affective paragraphs were remembered significantly better than neutral paragraphs [$F(1, 41) = 17.23$, $MSE = .33$; $p < .001$; see Figure 1]. There was no significant interaction of paragraph type with condition [$F(1,41) = .08$, $MSE = .25$; $p = .78$]. Independent t -tests comparing control vs. forget conditions showed no significant differences in recall of affective paragraph titles [$t(41) = .36$, $p = .72$, $d = .06$] or neutral paragraph titles [$t(41) = .63$, $p = .54$, $d = .53$], although mean recall was lower for both paragraph types in the forget condition (see Table 2).

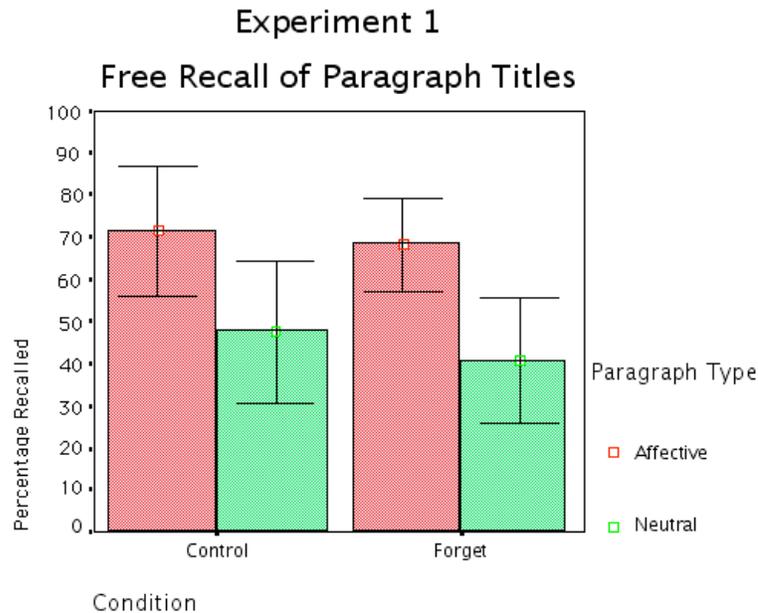


Fig. 1. Free recall of critical paragraph titles as a function of condition and paragraph type in experiment 1. Participants were instructed to recall as many titles as they could from all paragraphs shown in the experiment. Shown is the percentage of critical paragraph titles recalled. Error bars represent 95% confidence intervals.

A 2 (condition, forget vs. control, between Ss) x 2 (recall type, free vs. cued, within Ss) mixed ANOVA using the number of paragraphs recalled as the dependent measure was computed to see if there was a recovery effect for recall of critical stimuli. For free recall, answers were scored as having recall if participants wrote down at least one correct idea unit. This yielded scores of 0, 1, or 2, comparable to scoring for free recall of paragraph titles. Participants remembered significantly more in free recall of affective paragraph titles than in cued recall [$F(1, 41) = 13.51, MSE = .22.96; p = .001$; see Figure 2]. The interaction was not significant [$F(1, 41) = .14$]. There was no

significant difference between free and cued recall for neutral stimuli [$F(1, 41) = 1.77$, $MSE = .41$; ns], or for the interaction [$F(1, 41) = .17$] (see Figure 3).

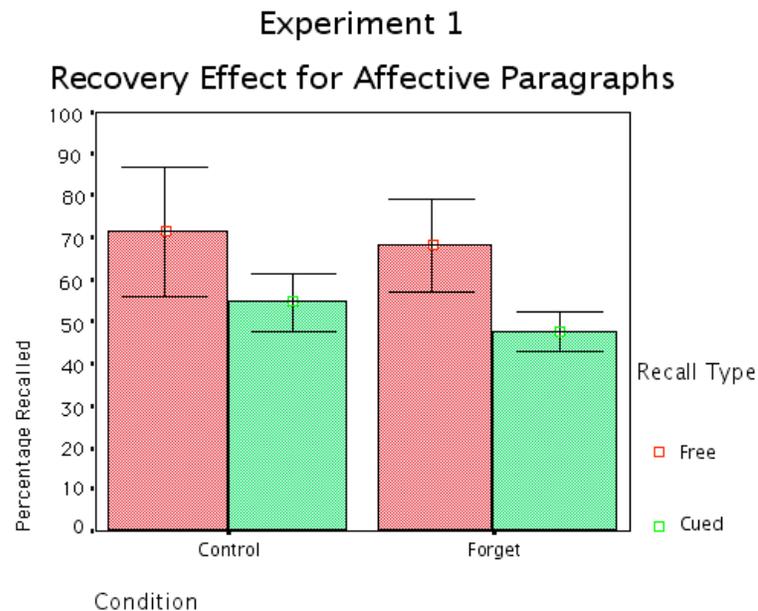


Fig. 2. Recovery effect comparing free recall of affective paragraph titles and cued recall as a function of condition. Means are out of a maximum of 2, one for each stimulus. Error bars represent 95% confidence intervals.

For cued recall, raw scores were converted into percent recalled of total data units. A 2 (condition, forget vs. control, between Ss) x 2 (paragraph type, affective vs. neutral, within Ss) mixed ANOVA was computed to test the effect of paragraph type (affective vs. neutral) for cued recall of paragraph content. There was no main effect for condition. There was a significant difference in number of recalled data units [$F(1, 40) =$

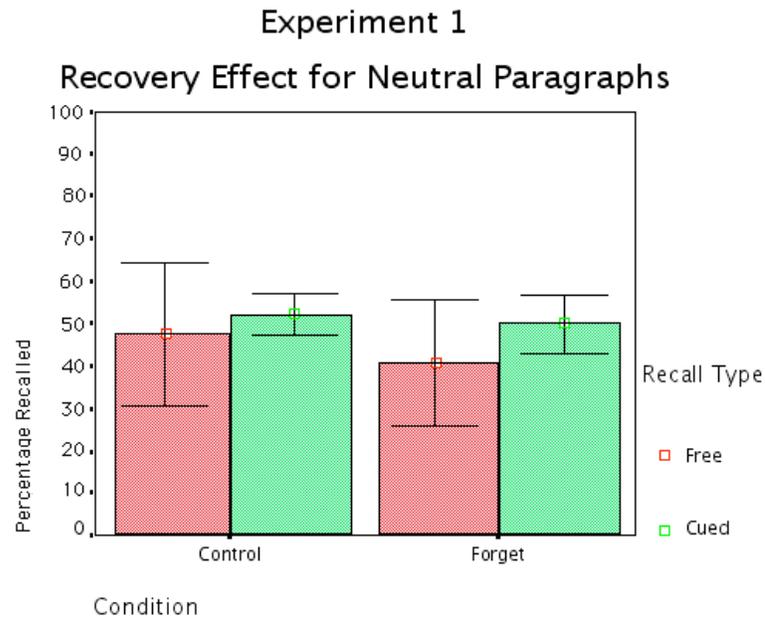


Fig. 3. Recovery effect for free and cued recall of neutral paragraph content as a function of condition in experiment 1. While the results are not significant, cued recall is greater than free recall, as would be expected. Error bars represent 95% confidence intervals.

8.308; $MSE = .01$; $p = .006$]; that is, data units of neutral paragraphs were recalled significantly better than affective paragraphs (see Figure 4). Data units were determined using sentence subjects, verbs, and key adjectives (range 13-20; mean=16.5, see Table 3 for percentage means and standard errors.)². There was no significant difference for the interaction of paragraph and condition [$F(1, 40) = 1.14$; $MSE = .01$, $p = .29$].

An independent-samples t -test comparing the percentage of data units in the critical paragraphs confirmed that there were no significant differences in cued recall between the two conditions for the affective [$t(40) = .26$, $p = .80$, $d = .06$] or neutral conditions [$t(40) = -.51$, $p = .8$, $d = .15$].

² Data units were scored for accuracy only; intrusions were not scored.

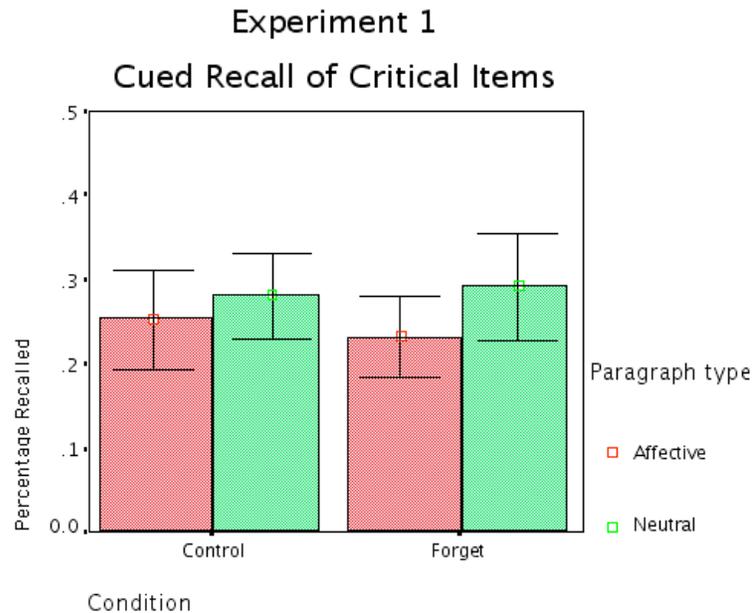


Fig. 4. Cued recall of critical paragraphs as a function of condition and paragraph type in experiment 1. Total data units recalled in critical paragraphs. Participants were given the paragraph title as a cue and wrote down as much as they could remember about that paragraph. Data are shown here as a percentage of the total possible data units. Error bars represent 95% confidence intervals.

TABLE 3

Means and Standard Errors for Cued Recall in Experiment 1 as a Function of Condition and Paragraph Type

Control		Forget	
Affective	Neutral	Affective	Neutral
M=.25	M=.28	M=.22	M=.31
SEM=.03	SEM=.02	SEM=.02	SEM=.03

Discussion

There was no recovery effect found between free and cued recall. Participants remembered the titles of the affective paragraphs quite well, so the cued recall of paragraph content did not produce any boost to memory. This unexpected result is contrary to previous findings where cues usually aid or at least do not hinder recall.

For free recall, no forgetting effect was found for neutral paragraph titles, or for affective paragraph titles. While the overall mean for both paragraph types was lower in the forget condition, this was not a significant difference. For the neutral paragraphs, this differs from the predictions, and from previous word list findings. Deeper processing is known to contribute to better memory. It is possible that the deeper processing involved in remembering a paragraph compared to a word list could have contributed to this difference.

Affective paragraph titles were remembered significantly better than neutral paragraph titles, regardless of condition. This is consistent with the predictions and previous research showing that strongly affective stimuli are remembered better than neutral stimuli.

The opposite was found in the cued recall of the paragraph content. The content of neutral paragraphs was remembered significantly better than affective paragraph content, with condition having no effect. Why?

Schemas for abuse situations and war atrocities may have been more firmly entrenched in participant's minds, as these are frequently encountered in media and news outlets. This would not hold true for the neutral paragraphs, which spanned a wide

variety of topics of that would be less frequently seen by freshmen undergraduates such as those who participated in the experiment. This could contribute to superior recall for titles of the affective paragraphs. However, this does not explain why neutral paragraphs were better recalled in the cued task.

One possibility is that the affective paragraph titles were easy to recall due to their high distinctiveness compared to the neutral paragraphs, but that their high affective content caused them to be blocked from accessibility during the cued recall task. If the content was so unpleasant that the participants did not want to think about them, it is possible that participants did not encode the content of the affective paragraphs to the same extent as they did the neutral paragraphs, so a cue would not have aided in recall. The affective paragraphs did vary in style from the neutral paragraphs, as they were modified from survivor accounts on support group websites, while the others were very similar in style and reading level and had a much more didactic tone.

The emotional paragraphs were rated not only as more emotional than the neutral ones, but as more distinctive as well. It is possible that this distinctiveness, rather than the emotionality, contributed to the differences in recall between the two paragraph types. How do distinctiveness and emotionality separately contribute to recall, and how do we distinguish between the two? Because an event can be distinctive but unemotional, for example taking a different route to work, or emotional but nondistinctive, as in the case of ongoing abuse, it becomes necessary to try to define the differences between them. A fundamental problem in discussing distinctiveness is

deciding what exactly constitutes a distinctive stimulus. If it is lack of shared features, then we must decide what features we are using, and whether or not those features will be emphasized in the experiment through differences in color, font, background, etc. Are those display characteristics enough to determine distinctiveness, or is it the concept that is important? Schmidt (1991) discusses the many problems inherent in simply trying to define distinctiveness. A number of potential definitions have been proposed, but the inherent difficulty of addressing individual differences in these theories have made defining distinctiveness in terms of mental models nearly impossible.

Physiological measures have been proposed as a reliable means to measure distinctiveness, as have similarity ratings (see Schmidt, 1991, for a review). This latter method is comparatively simple, and was used to rate the paragraphs used as stimuli in the current experiments. These ratings showed that the emotional paragraphs were significantly more emotional and distinctive than the neutral paragraphs. Distinctive but less emotional paragraphs were also rated, and these were shown to be significantly more distinctive than the neutral paragraphs, but significantly less emotional than the affective paragraphs.

To test whether distinctiveness or emotion played a greater role in paragraph recall, Experiment 2 replaced the affective paragraphs used in Experiment 1 with ones that were rated as significantly more distinctive than the neutral paragraphs, but significantly less emotional than the affective paragraphs. The neutral paragraphs were identical. All other procedures in Experiment 2 were identical to Experiment 1.

EXPERIMENT 2

Participants

48 undergraduate students in introductory psychology classes at Texas A&M University received course credit in exchange for participation in the experiment.

Materials, Design, and Procedure

Two paragraphs that were rated as less emotional than the affective paragraphs used in Experiment 1 were substituted for the affective paragraphs. The rest of the materials, design, and procedure were identical to Experiment 1. Participants were randomly assigned to the control ($N=26$) or experimental ($N=22$) conditions.

Results

Participants were scored in the same manner as Experiment 1. One rater scored all cued recall data, so interrater reliability measures were not calculated.

A 2 (condition, forget vs. control, between Ss) x 2 (paragraph type, distinctive vs. neutral, within Ss) mixed ANOVA using the number of titles recalled as the dependent measure was computed to test the effect of paragraph type in the initial free-recall task.³ No difference was found for recall of titles of distinctive vs. neutral titles [$F(1, 46)=.65$, $MSE=.56$; ns, see Figure 5]. The interaction between paragraph type and condition approached significance, [$F(1,46)=2.43$, $MSE=.56$; $p=.13$].

³ As with Experiment 1, strict scoring criteria did not yield enough data, so liberal criteria were used. See Table 4 on page 35 for means.

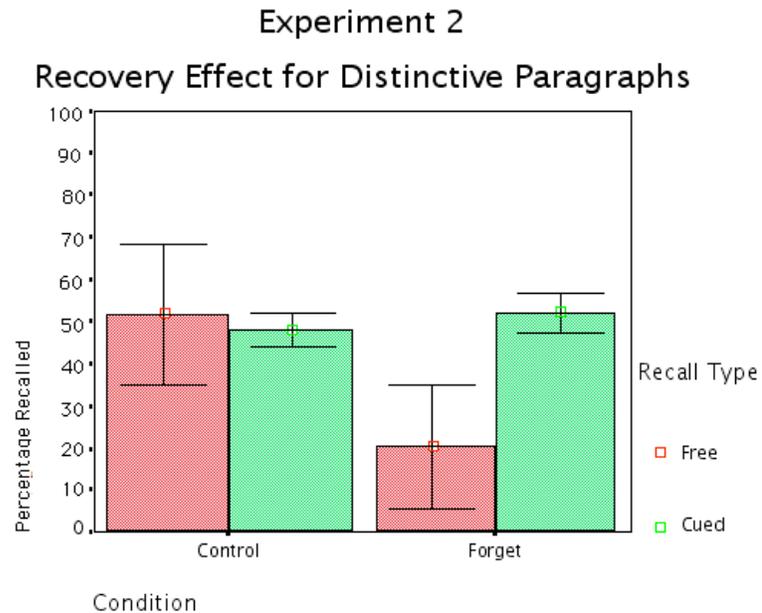


Fig. 5. Free recall of critical paragraph titles as a function of condition and paragraph type in experiment 2. Participants were instructed to recall as many paragraph titles as they could from all paragraphs shown in the experiment. Shown is the percentage of critical paragraph titles recalled. Error bars represent 95% confidence intervals.

An independent samples *t*-test using number of paragraph titles recalled as the dependent measure showed a significant difference in forgetting in free recall for distinctive paragraphs between the control and forget conditions, [$t(46) = 2.874, p = .006, d = .98$], but no difference in free recall between the two conditions for the neutral paragraphs, [$t(46) = .793, ns, d = .20$].

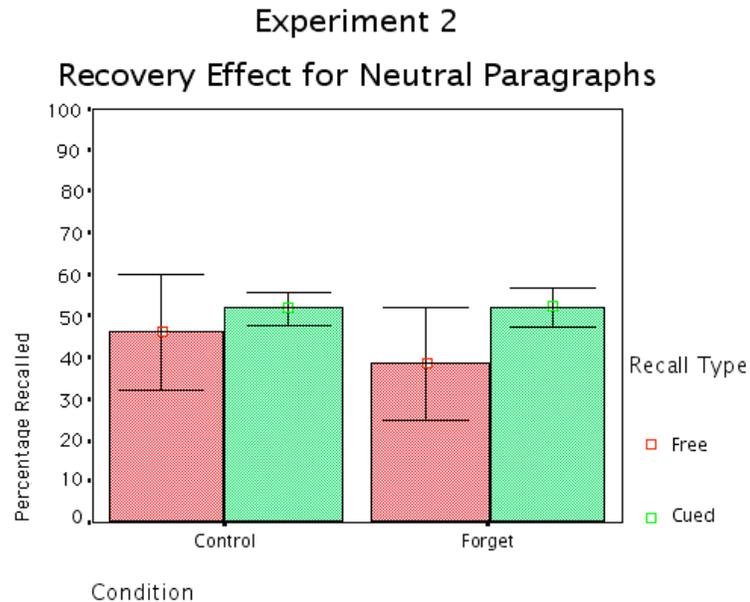


Fig. 6. Recovery effect comparing free recall of distinctive paragraph titles and cued recall as a function of condition in experiment 2. There was significantly greater recall with cued recall, and significantly more in the forget condition. Error bars represent 95% confidence intervals.

To test for a recovery effect, a 2 (condition, forget vs. control, between Ss) x 2 (recall type, free vs. cued, within Ss) mixed ANOVA comparing free and cued recall of distinctive paragraphs was computed. Scoring of cued recall was done in the same way as Experiment 1. A significant main effect was found for recall type, [$F(1,46)=7.48$, $MSE=1.87$; $p=.009$] and an interaction between recall type and condition, [$F(1,46)=12.16$ $MSE=3.03$; $p=.001$, see Figure 6 and Table 5]. Participants remembered significantly more with cued recall, and in the forget condition. Giving participants cues allowed them remember significantly more than free recall.

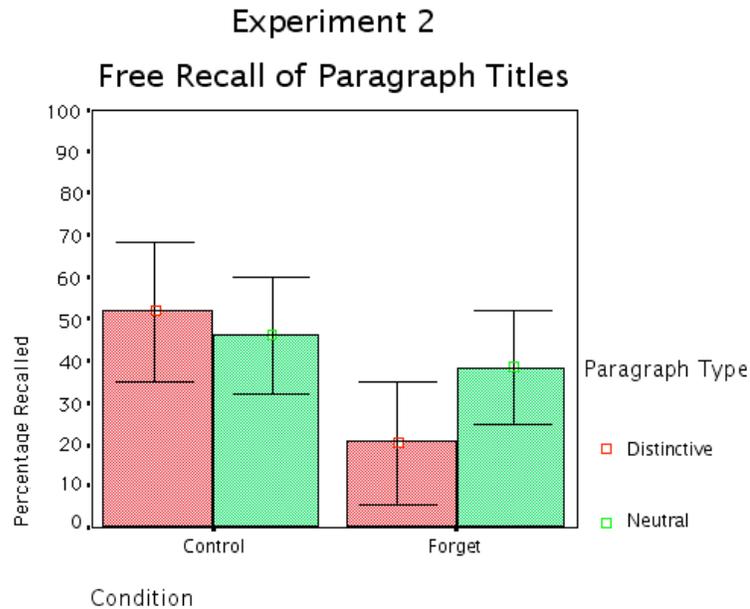


Fig. 7. Recovery effect for free and cued recall of neutral paragraph content as a function of condition in experiment 2. The main effect for recall type approached significance. Error bars represent 95% confidence intervals.

To test for a recovery effect with neutral paragraphs, a 2 (condition, forget vs. control, between Ss) x 2 (recall type, free vs. cued, within Ss) mixed ANOVA comparing free and cued recall of these stimuli was computed. Scoring of cued recall was done in the same way as Experiment 1. A near-significant main effect was found for recall type, [$F(1,46)=3.59$, $MSE=.90$; $p=.065$, see Figure 7]. The interaction between recall type and condition was not significant, [$F(1,46)=.59$, ns]. Participants remembered more with cued recall.

TABLE 4

Means and Standard Errors for Cued Recall in Experiment 2 as a Function of Condition and Paragraph Type

Control		Forget	
Distinctive	Neutral	Distinctive	Neutral
$M=.31$	$M=.34$	$M=.27$	$M=.29$
$SEM=.02$	$SEM=.02$	$SEM=.02$	$SEM=.10$

For cued recall, raw scores were converted into percent recalled of total data units. A 2 (condition, forget vs. control, between Ss) x 2 (paragraph type, distinctive vs. neutral, within Ss) mixed ANOVA was computed to test the effect of paragraph type (distinctive vs. neutral) for cued recall of paragraph content. This showed there was a significant difference in amount of recalled data units for each paragraph [$F(1, 46)=4.91$; $MSE=.004$; $p<.05$], but no difference for the interaction of paragraph and condition [$F(1, 46)=.28$; $MSE=.004$; ns, see Figure 8]. Neutral paragraphs were remembered better than distinctive paragraphs in cued recall, regardless of condition (see Table 5 for means). Responses were scored as 0, meaning no recall; 1, meaning recall of one paragraph but not the other; or 2, recall of both paragraphs.

An independent-samples t -test using percentage of idea units recalled as the dependent measure showed a trend in forgetting in cued recall of both types of paragraphs between the two conditions [distinctive: $t(46) = 1.51$, $p = .14$, $d = .57$; neutral: $t(46) = 1.72$, $p = .09$, $d = .69$].

TABLE 5

Means and Standard Errors for Free and Cued Recall in Experiment 2 as a Function of Condition and Paragraph Type

Distinctive		Neutral	
Free Recall	Cued Recall	Free Recall	Cued Recall
$M=.75$	$M=1.00$	$M=.85$	$M=1.48$
$SEM=.12$	$SEM=.03$	$SEM=.09$	$SEM=.44$

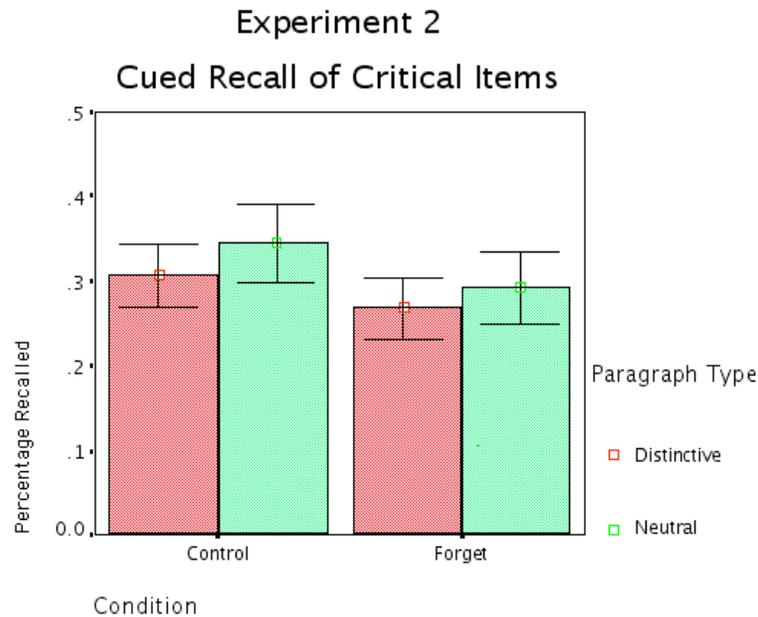


Fig. 8. Cued recall of critical paragraphs as a function of condition and paragraph type in experiment 2. Total data units recalled in critical paragraphs. Participants were given the paragraph title as a cue and wrote down as much as they could remember about that paragraph. Data are shown here as a percentage of the total possible data units. Error bars represent 95% confidence intervals.

Discussion

A clear forgetting and recovery effect was seen with the distinctive paragraphs in Experiment 2. Participants were not remembering the titles of the distinctive paragraphs in the forget condition, but when cued with those titles, they were able to recall details of the paragraphs easily. As free recall for titles was scored liberally, and participants were instructed to write down a brief description of the paragraph if they could not remember the title, it is unlikely that this result is due to an inability to remember the title alone.

While free recall for paragraph titles was lower in the forget condition than in the control condition, these differences were not significant. It is possible that with greater power this trend could reach significant levels. A forgetting effect was found in both experiments, but was greater for distinctive paragraphs. Although not quite significant, the results trended in that general direction.

In cued recall, neutral paragraphs were remembered significantly better than distinctive ones. This is curious in light of the ratings of the different types of paragraphs. Participants in the rating experiment generated possible titles for the paragraphs. These showed an overall interrater reliability of .61 for both the neutral and distinctive paragraph titles, therefore it is unlikely that there was something inherently different about the titles of the distinctive vs. neutral paragraphs that would have caused a difference in remembering.

Distinctive paragraph titles were not found to be better or worse remembered than neutral titles in free recall. In cued recall, neutral paragraphs were recalled better, and no difference was seen for condition, although a trend toward forgetting was seen.

CONCLUSION

In two experiments, free recall of paragraph titles for negative affect, distinctive, and neutral paragraphs was tested, along with cued recall of the content of these paragraphs. The results raise a number of questions. No forgetting effect was found for neutral or for affective paragraph titles in the first experiment, although the means of the control condition were numerically higher than those of the forget condition. It is possible that low power contributed to the lack of a significant difference. While condition had no significant effect, participants recalled the titles of the affective paragraphs significantly better than the neutral ones. In cued recall, this situation was reversed; participants remembered the content of the neutral paragraphs significantly better than the content of the affective paragraphs. In the second experiment, no significant difference in recall of distinctive or neutral paragraph titles was found. Again, lack of power could be a culprit. However, in cued recall, recall of content of distinctive paragraphs was significantly lower than that for neutral paragraphs.

A rigorous screening procedure was used in the Pilot Experiment and Experiment 1 to prevent upsetting any participants who might have experienced traumas like those described in the affective paragraphs. No screening was done for Experiment 2. This could have led to a participant selection bias that affected the results.

Why was there a less powerful forgetting effect with the paragraph stimuli in this experiment compared to previous experiments done with categorized word lists? It is not immediately clear why these paragraph stimuli should produce different results compared to word list stimuli. Narrative paragraphs allow for more elaborative encoding

than do word lists. It is possible, therefore, that paragraphs are encoded with deeper processing, which would lead to a different pattern of recall.

For free recall of the distinctive paragraph titles, fuzzy trace theory (Brainerd & Reyna, 2002) provides a partial answer. In a word list, verbatim memory is needed to recall list items. However, this type of memory provides a weaker trace, thus leading to poorer recall than gist traces, which are stronger and more lasting. Paragraph titles needed to be recalled verbatim in the free recall task, and indeed, there was less recall of those titles in the forget condition. However, for fuzzy trace theory to provide a complete answer, we need to explain why titles for the affective paragraphs in the first experiment were remembered so well. Here, this explanation breaks down, and we must look elsewhere for an answer.

Perhaps a schema activation explanation would provide an answer to the unusual pattern of results (Townsend, 1980). Comparing the two experiments, titles of affective paragraphs were remembered better than distinctive or neutral paragraphs. Most participants undoubtedly had schemas for war and abuse scenarios. However, the neutral paragraphs were on a wide variety of topics. Few participants would be familiar with all of them, thus they would have fewer existing schemas to activate. The distinctive paragraphs, with their quirky topics, would not have any preexisting schemas at all, thus leading to worse title recall than the neutral paragraphs.

The superior recall of the affective paragraphs in Experiment 1 was significantly different from recall of the neutral paragraphs. This was a predicted result, and is consistent with other experimental findings.

Why were the results from the present experiments different than previous studies using word lists where a robust blocking and recovery effect was found? Smith & Moynan (2004) used word lists of expletives, death- and illness-related words. Participants forgot reading these lists in a free recall task, and remembered them in a cued recall task. As those stimuli are associated with strong affect, it is unlikely that the results from Experiment 1 are solely due to the fact that affective stimuli were used. Perhaps the narrative nature of a paragraph compared to a word list could be the answer. A narrative is easier to visualize and relate to previous experiences, thus leading to deeper processing. However, if that were the case, then participants should have not shown a forgetting effect with the distinctive paragraphs in Experiment 2. It may be the case that a first-person narrative describing an incidence of childhood sexual abuse and one describing war atrocities are inherently more emotional than word lists, even those that may use strongly affective words. This could lead to a higher level of arousal during encoding, which might help insulate these types of stimuli from forgetting effects during a laboratory experiment.

Previous experiments using emotional stimuli have also had seemingly conflicting results. Christianson & Loftus (1987) found that after viewing a series of traumatic and nontraumatic slides, study participants had worse recall for details in the traumatic slides, but better gist recall compared to the nontraumatic slides. This result is similar to that found in Experiment 1. However, Heuer & Reisberg (1990) found that adding a negative emotional component to a story increased memory for both central and peripheral details. Schmidt (1991) attributed these results to activation of the

sympathetic nervous system, which causes memory for detail to be worse, but memory for gist is improved. This is a similar result to what fuzzy trace theory (Brainerd & Rena, 2002) would predict. But as discussed earlier, this is an inadequate explanation for all of the data, as exemplified by the good recall of the affective paragraph titles.

An experiment where all the filler stimuli are strong negative-affect paragraphs or similar quirky stories would help show whether these types of stimuli stand out in memory in some way, or whether they can truly be forgotten and later recovered. By making the filler stimuli more similar to the critical stimuli, we could see whether the differing tone of the neutral paragraphs was responsible for the different patterns of recall in the present experiments, or if there was something about the critical paragraphs that truly makes them processed differently in memory.

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APPENDIX A

PARAGRAPHS USED AS STIMULI

The Flesch-Kincaid Grade level is a measure of what grade the reader will have to have completed in order to comprehend the text, i.e., a grade level of 7 indicates that a person who has completed the 7th grade will be able to understand it. The Flesch-Kincaid Reading Ease Score is an indication of how difficult a given text is to read. Higher scores indicate an easier text. For comparison, comics typically get a score around 90, and legal language, such as that found in contracts, can score below 10.

Neutral

Clipper Ships

Clipper ships were the swiftest sailing ships that were ever put to sea and the most beautiful. These ships had their days of glory in the 1840s and 1850s. The first were built in Baltimore, but most were constructed in the shipyards of New England. It was Chinese tea that brought them into existence. Tea loses its flavor quickly when stored in the hold of a vessel, and merchants were willing to pay top prices for fast delivery. American shipbuilders designed clippers to fill this need. Then came the California Gold Rush of 1849, when Clippers took gold seekers from the East Coast to the West by way of Cape Horn. Clippers were built for speed, and considerations of large carrying capacity and economical operation were sacrificed for this purpose.

Flesch-Kincaid Grade Level: 10

Flesch-Kincaid Reading Ease Score: 55

Pollination

Many flowering plants woo insect pollinators and gently direct them to their most fertile blossoms by changing the color of individual flowers from day to day. Through color cues, the plant signals to the insect that it would be better off visiting one flower on its bush than another. The particular hue tells the pollinator that the flower is full of far more pollen than are neighboring blooms. Plants do not have to spend precious resources maintaining reservoirs of nectar in all their flowers. Thus, the color-coded communication system benefits both plant and insect. In some types of plants, blossoms change from white to red, others from yellow to red, and so on. These color changes have been observed in some 74 families of plants.

Flesch-Kincaid Grade Level: 10

Flesch-Kincaid Reading Ease Score: 53

Emotional

Rape

I was 8; I remember because I remember my second grade reading book being at his house that weekend. He took me into his room, and made me perform oral sex on him. He got angry when I couldn't fit the whole thing in my mouth. I remember him picking me up and putting me on the bed and telling me that he was going to teach me how to be a mommy. All I remember after that is an incredible burning pain, and him grunting when he ejaculated. I remember having blood in my underwear. I don't know if that is the first time he made me have sex with him, but I know it happened. If everything else is a lie, I know he did that.

Flesch-Kincaid Grade Level: 8

Flesch-Kincaid Reading Ease Score: 66

War

It was a war without glory. It was an enemy who rarely showed his face and murdered arbitrarily when he did, who used his school children as terrorists and brutally tortured his prisoners. It was the grunt who watched his friend's legs blown off by a booby trap, the helicopter nose-gunner presented with the gruesome aftermath of his handiwork on a village, the short-timer who fragged his field commander for ordering an impossible assault. It was the freckle-faced kid transformed into a steely-eyed killer being so inured to unspeakable acts of violence that stories of hacking off the ears of old women, smashing babies against tree trunks and castrating prisoners were met with icy indifference. It was wondering just how far one could push the envelope of sanity.

Flesch-Kincaid Grade Level: 15

Flesch-Kincaid Reading Ease Score: 32

Distinctive

Trial

Attorney Regina Lynch has subpoenaed a rottweiler to appear as a witness in her client, Michael Monroe's, trial. The Warren County, New Jersey, man was charged with stealing 58 cents from the car of David Laman. Sasha the rottweiler, who is Laman's dog, was in the car when Monroe allegedly broke into it and stole the money. "I want the jury to see how big and mean the dog is so they can see that no one would dare get into that car when the dog was in there," she explains. The county has so far spent \$16,000 to

bring Monroe to justice. It is very curious why the law system would spend so much time and money on such a silly case, and for a theft of only 58 cents!

Flesch-Kincaid Grade Level: 10

Flesch-Kincaid Reading Ease Score: 65

Tower

It's hard to imagine a 31-foot tower in the middle of the Illinois prairie that's not a cell phone tower or part of an electricity line. But if you check out Farmer David Johnson's field, you'll find one. Johnson purchased 11 Swiss mountain goats for his farm. The trouble is, there weren't any mountains for hundreds of miles, so the goats, who love to climb to the highest peaks, were forced to stay on the flatland. That is, until Johnson built a tower containing 5,000 handmade bricks, 276 concrete steps and a copper turret. Now, the goats can climb up and down the spiral staircase to their hearts' content. "I think there are only two goat towers in the world, and mine is the highest," says Johnson proudly.

Flesch-Kincaid Grade Level: 9

Flesch-Kincaid Reading Ease Score: 63

APPENDIX B
SCREENING FORM⁴

Please make up a 4-digit number that you will remember for the Subject ID.

Subject ID: _____ *Sex:* _____

- | | | |
|--|---|---|
| 1. Do you read more than 250 pages of text a week? | Y | N |
| 2. Do you listen to hip-hop or rap music on a regular basis? | Y | N |
| 3. Do you find sexual words/expletives to be offensive in printed materials? | Y | N |
| 4. Have you ever experienced something which you have perceived as violent which affects your daily functioning? | Y | N |
| 5. Have you ever been hospitalized for an injury? | Y | N |
| 6. Is your major literature based? | Y | N |
| 7. Do you find censorship unwarranted in most cases? | Y | N |
| 8. Have you ever experienced sexual harassment? | Y | N |
| 9. Do you speak more than one language? | Y | N |
| 10. Do you read magazines and tabloids on a regular basis (once a week or more)? | Y | N |
| 11. Do you find pornography to be offensive? | Y | N |
| 12. Do you feel that concerns about environmental damage are unwarranted? | Y | N |
| 13. Is your daily functioning affected by material with explicitly violent or sexual content? | Y | N |
| 14. Do you read printed or on-line news reports more than once a week? | Y | N |
| 15. Do you feel there is a bias towards reporting sexually explicit or violent stories in the news? | Y | N |
| 16. Have you ever had a threatening sexual experience? | Y | N |
| 17. Do you write more than 10 pages of text per week? | Y | N |
| 18. Would you vote for a female candidate for a high public office? | Y | N |

⁴ Critical questions were #'s 3, 4, 13, and 16. A *yes* response to any of these questions would prohibit the participant from being included in the experiment.

APPENDIX C

TOTALS FROM STRICT AND LENIENT SCORING OF FREE RECALL

Condition	Control		Forget	
	Affective	Neutral	Affective	Neutral
Strict Scoring	8	10	14	12
Lenient Scoring	11	5	8	3
None Correct	2	6	0	7
	21	21	22	22

Totals of correctly recalled titles using strict and lenient scoring from free recall of paragraph titles in Experiment 1. $N=21$ in the control condition, and $N=22$ in the forget condition. Each cell represents the number of participants. Using strict scoring criteria, participants had to give at least recall at least one title verbatim. Using lenient criteria, participants could recall either the gist or a verbatim title. In the Control condition especially, lenient scoring was needed to be able to include more participant responses.

Condition	Control		Forget	
	Distinctive	Neutral	Distinctive	Neutral
Strict Scoring	14	14	5	13
Lenient Scoring	4	5	2	2
None Correct	8	7	15	7

Totals of correctly recalled titles using strict and lenient scoring from free recall of paragraph titles in Experiment 2. $N=26$ in the control condition, and $N=22$ in the forget condition. Each cell represents the number of participants. Using strict scoring criteria, participants had to give at least recall at least one title verbatim. Using lenient criteria, participants could recall either the gist or a verbatim title. In the Forget condition especially, lenient scoring was needed to be able to include more participant responses.

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