

FORGOTTEN, BUT NOT GONE: RECOVERING MEMORIES OF EMOTIONAL  
STORIES

A Thesis

by

JUSTIN DEAN HANDY

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

December 2011

Major Subject: Psychology

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Approved by:

Chair of Committee,	Steven M. Smith
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## ABSTRACT

Forgotten, but Not Gone: Recovering Memories of Emotional Stories. (December 2011)

Justin Dean Handy, B.A., High Point University

Chair of Advisory Committee: Dr. Steven M. Smith

Laboratory methods for studying memory blocking and recovery include directed forgetting, retrieval-induced forgetting, and retrieval bias or memory blocking procedures. These methods primarily use word lists. For example, striking, reversible forgetting effects have been reported for both emotional (e.g., expletives) and non-emotional (e.g., tools) categorized lists of words. The present study examined forgetting and recovery of richer, more episodic materials. Participants studied a series of brief narrative passages varying in emotional intensity, such as a vignette involving torture or child abuse (emotional) vs. vignettes about cycling or insects (non-emotional). Free recall of the 1-word titles of the vignettes (e.g., Torture, Cyclist) showed a strong memory blocking effect, and cues from the stories on a subsequent cued recall test reversed the effect. In a second experiment, vignette-related pictures inserted into an incidental picture naming task triggered some recovery of initially forgotten vignettes, as shown on a post-test. Both emotional and non-emotional stories were susceptible to this reversible memory blocking effect.

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## 1. INTRODUCTION

Can potent emotional experiences be forgotten? And if so, could memories for these experiences resurface years later? For over two decades these questions fueled an academic civil war that saw both the laboratory and court rooms serve as theatre. At the center of the debate were bitterly contested clinical accounts describing dramatic recovery of long-buried histories of trauma and abuse; characteristically, these memories were often exhumed over the course of psychotherapy and used as evidence in a startling number of lawsuits that saw families torn apart by accusations of childhood sexual abuse. The proliferation of these cases in the early 1990's roused the suspicions of cognitive psychologists—many of whom called into question the accuracy of some memory recovery accounts. In particular, critics slammed many of the methodologies used in memory excavation (e.g., guided imagination, memory work, hypnosis) on the grounds that these techniques may foster false memories (see Lindsay & Read, 1994 for a review). Could vivid accounts of recovered memories of childhood abuse be mere artifacts of suggestive clinical practices? The implications of this charge were far-reaching and, in the years that followed, underscored a growing gulf between scientists and practitioners.

### **1.1 The False Memory Movement**

Among memory theorists, the legacy of the *memory wars* (Crews, 1995) endures

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This thesis follows the style of *Psychological Science*.

in continued efforts to uncover the realities of memory recovery. Historically, two competing theoretical accounts have figured prominently in the debate. In their book *The Myth of Repressed Memory*, Loftus and Ketcham (1994) offered a broad characterization of these two sides:

“On one side are the "True Believers," who insist that the mind is capable of repressing memories and who accept without reservation or question the authenticity of recovered memories. On the other side are the "Skeptics," who argue that the notion of repression is purely hypothetical and essentially untestable, based as it is on unsubstantiated speculation and anecdotes that are impossible to confirm or deny.” (p. 31)

Within the ranks of the so-called “Skeptics,” many contend that recovered memories of long-buried trauma may actually be *false* memories (e.g., Ceci & Loftus, 1994; Hyman, Husband, & Billings, 1995; Lindsay & Read, 1994; Loftus, 1993; Loftus & Ketcham, 1994; Loftus & Pickrell, 1995; Roediger & McDermott, 1995). In that, the false memory movement has been subserved by a rich history of experimental evidence underscoring the susceptibility of memory to distortion and confabulation. Researchers have demonstrated that memories often serve as imperfect reconstructions of the events they derive from (e.g., Bartlett, 1932; Münsterberg, 1908) and further, that our perceptions of events past can be dramatically influenced by misinformation (e.g., Loftus & Palmer, 1974). In that, convincing evidence for false memories has been produced in a variety of different contexts, notably by extra-list intrusions in categorized

list learning (Deese, 1959; Roediger & McDermott, 1995), as well as in imagination inflation and failures of reality monitoring (e.g., Johnson & Raye, 1981).

More germane to the recovered memory debate however were studies reporting memory illusions for autobiographical events. For example, in the “lost in the mall” studies (e.g., Hyman, Husband, & Billings, 1995; Loftus & Pickrell, 1995; Pezdek, Finger, & Hodge, 1997) participants were confronted with a series of events the experimenter claimed occurred at some point during their childhood. While most of the events were authentic, in so far as family members corroborated their occurrence, at least one event was fabricated by the experimenter. Given time and the endorsement of the memory’s authenticity by family members, participants came to accept the fabricated event as true and even generated details specific to the false event. While some have claimed the plausibility of the suggested event may attenuate the effectiveness of the memory plant (e.g., Pezdek, Finger, & Hodge, 1997; Mazzoni, Loftus, & Kirsch, 2001), false memories have been reported in naturalistic settings for emotional and distinctive events (e.g., Pynoos & Nader, 1989).

### **1.2 Blocked and Recovered Memories**

Compared to the expansive literature on false memories, fewer studies have directly addressed the nature of recovered memories. In that, critics have pointed to a lack of experimental evidence in undermining the authenticity of recovered memory accounts (e.g., Holmes, 1990; Kihlstrom, 2004; Roediger & Bergman, 1998). However, recovered memories continue to be reported. Importantly, many of these claims are accompanied by corroborating evidence that the abusive/traumatic episode did, in fact,

occur and was subsequently forgotten for some period of time (e.g., Schooler, Ambadar, & Bendiksen, 1997). The Recovered Memory Project (Cheit, 1997) represents the most comprehensive collection of corroborated cases of recovered memories, accounting for over 100 cases culled from past and present legal proceedings, as well as reports derived from clinical settings. Despite this compelling evidence, few laboratory-based studies have served to elucidate the phenomenology of memory recovery. What accounts for this paucity of experimental evidence?

In some respects, the biggest hurdle faced by researchers examining traumatic amnesia in the laboratory lies in overcoming theoretical preoccupations with the Freudian notion of “repression.” Indeed, escaping from Freud’s shadow has proven no small feat. Inherent in many classical conceptualizations of repression was the notion that banishing undesirable thoughts was achievable only through a specialized forgetting mechanism. Furthermore, this mechanism was assumed to operate outside of conscious awareness. Turning to Freud’s original definition of the phenomenon, a very different characterization of repression emerges. As defined by Freud in his article “Repression” (1915/1957), “the essence of repression lies simply in the function of rejecting and keeping something out of consciousness” (p. 147). Though Freud remained largely agnostic in defining repression as a conscious or unconscious process, many modern interpretations have taken the stance that unconscious motivations underlie repression and recovery of traumatic memories (for a review see Erdelyi, 2006).

A recent theoretical account of repression has provided researchers with an alternative to studying recovered memories absent the limitations imposed by

presumptions of unconscious forgetting mechanisms. The unified theory of repression (Erdelyi, 2006) approached repression from two fundamentally different perspectives. First, this treatment defined repression as a mechanism of goal-directed forgetting. When confronted with psychological distress, these processes mobilize to defend against the intrusion of painful or traumatic thoughts on consciousness. However, the theory predicts that these same processes can be observed in the absence of trauma. Most compelling is the notion that decoupling the mechanisms from the defense could in turn make repression amenable to laboratory study. Under this theoretical framework, Erdelyi (2000) encouraged a “synergistic integration of modern cognitive psychology and the psychodynamic tradition” (p. 70). In turn, memory theorists have examined how simple cognitive mechanisms may coalesce to produce the remarkable levels of forgetting characteristic of some memory recovery experiences.

At this point it is pertinent to address a number of definitional issues related to what will henceforth refer to as *blocked* and *recovered* memories. As defined by Smith and Gleaves (2006), a recovered memory is “a conscious memory of an event or an episode that one was previously unable to remember” (p. 301). Recovered memories must also meet three additional criteria: “(1) the event or episode in question must have been successfully encoded, (2) memory for the encoded events must be inaccessible for a time, and (3) conscious memory must occur sometime after the period of inaccessibility” (p. 301). Importantly, by definition a recovery experience need not proceed from trauma, repression, or the influence of unconscious mechanisms.

An underlying implication of laboratory-based studies of blocked and recovered memories is that the mechanisms that give rise to *normal* forgetting can be used to explain *abnormal* forgetting (e.g., Erdelyi, 2006; Smith & Gleaves, 2006). In that, study paradigms such as those used in directed forgetting (e.g., Bjork, 1972), retrieval-induced forgetting (e.g., Anderson, Bjork, & Bjork, 1994, 2000; Barnier, Hung, & Conway, 2004), and the think/no-think procedure (e.g., Anderson & Green, 2001; Depue, Banich, & Curran, 2006) have contributed to a growing evidence base underscoring the role simple cognitive mechanisms (e.g., interference and inhibition) could play in goal-directed forgetting of autobiographical memories. For instance, using the think/no-think procedure, Anderson and Green (2001) examined the mechanistic substrates of suppression—conceived of here as a conscious form of repression. They proposed that executive control processes could be recruited by individuals in the service of suppressing unwanted memories. Their data showed that repeated attempts to suppress some to-be-forgotten information produced memory deficits for that information in subsequent recall tests; additionally, as the number of successive suppression increased, so too did the memory impairments grow for the to-be-forgotten items.

Procedures such as the list method of directed forgetting (e.g., Basden, Basden, Morales, 2003), and the think/no-think method (e.g., Anderson & Green, 2001) produce reliable forgetting effects, accounting for memory deficits in the order of 5-20% (Smith & Gleaves, 2006). However, it is arguable whether the magnitude of these effects speaks to the remarkable levels of forgetting characteristic of recovered memory accounts.

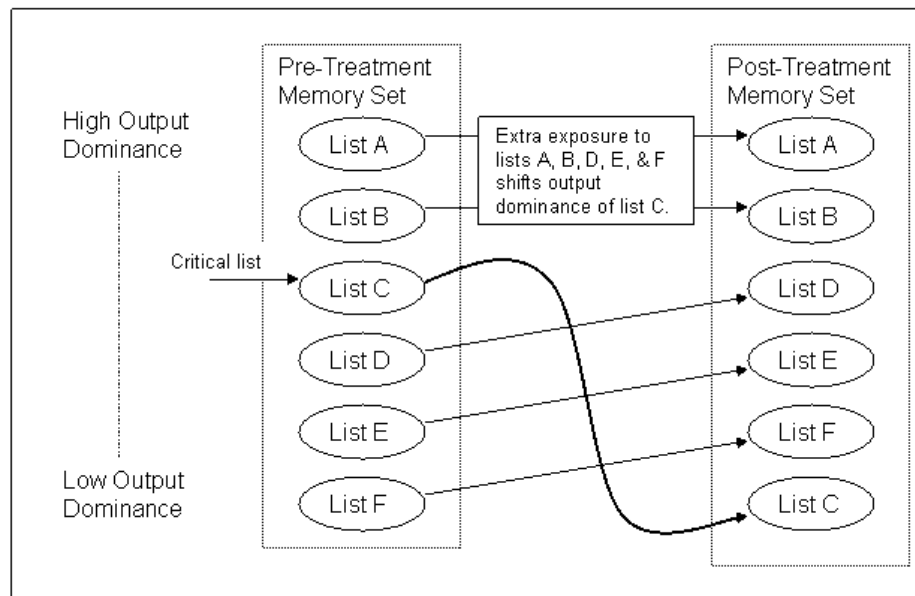
Furthermore, researchers' preoccupations with examining the dynamics of forgetting have left the question of *recovery* largely unexplored.

Smith and colleagues (Smith, Gleaves, Pierce, Williams, Gilliland, & Gerken, 2003) produced a study paradigm that successfully accommodated both memory blocking and recovery, in addition to providing comparisons between recovered and continuous memories. In this study, participants initially studied a large number of categorized word lists. For those participants in the forget condition, a small subset of the study lists were dropped out of the study set and they were re-exposed to the remaining lists for a number of trials. For participants in the control condition, following the initial study episode where they studied all of the word lists, they engaged in a series of non-verbal tasks for an equivalent amount of time. For both conditions, in a subsequent free recall test participants were instructed to recall as many of the categorized list names as they could remember. In a final cued recall test, participants in both conditions were provided with the category names to use as cues in retrieving category members for each of the study lists. The resulting forgetting effect, as measured by free recall of the category names, was staggering—participants in the forget condition accounted for a 35% deficit in recall performance compared to those in the control condition. This forgetting effect was reversible, however. Given the category names as retrieval cues, participants in both conditions were able to generate comparable numbers of category members.

The theoretical underpinnings of the comparative memory paradigm reside in simple cognitive mechanisms of interference (e.g., Roediger, 1974; Rundus, 1973) and



retrieval cueing (e.g., Tulving & Pearlstone, 1966). Specifically, the procedure was tailored to decrease the accessibility of select target memories while increasing the accessibility of memories competing with target memories for retrieval. By re-exposing participants in the forget condition to many filler lists, the experimenters manipulated the relative retrieval strength of those study items. In a free recall test, the study items with the greatest output dominance (the filler lists) were generated first, producing output interference for the critical study lists, and reducing the likelihood that those items would be retrieved. This theoretical account is consistent with an earlier model of word list recall by Rundus (1973). Figure 1 illustrates how shifts in output dominance, coupled with output interference effects combine to produce potential memory blocks.



**Figure 1.** *Shifting Output Dominance.* Graphic depiction of how output interference can contribute to shifts in output dominance. Note: Based on a figure originally published by Smith and colleagues (2003).

A later study by Smith and Moynan (2008) extended the use of the retrieval-biasing procedure to emotionally-salient materials. In their first experiment, in addition to many filler participants studied three critical lists and many filler lists; two of the critical lists were emotional (distinctive taboo words and non-distinctive emotional words, such as diseases and death-related words). Following initial encoding, those in the forget condition performed three additional tasks that re-exposed them to the filler lists only. In the control condition, participants completed a series of non-verbal tasks for an equivalent amount of time. Subsequently, participants' memory for the category names (e.g., curse words, tools, death words) was examined in a free recall test. In line with previous studies (e.g., Smith et al., 2003), a pronounced forgetting effect was observed even for the highly salient list of curse words. Specifically, the forgetting effect accounted for a 36% difference between conditions in recall of the critical curse word list name.

Apart from demonstrating dramatic forgetting effects resulting from the retrieval-biasing procedure, studies performed by Smith and colleagues (2003; 2008) also provided evidence for memory recovery. In addressing recovery, it is important to make the distinction between the accessibility and availability of memories. Tulving and Pearlstone (1966) demonstrated that well encoded memories can nonetheless pass into a state of inaccessibility. Given an adequate retrieval cue, an individual may once again be granted access to the particular memory trace. In their study, participants studied a series of categorized word lists. After study, participants received either a free recall or a cued recall test. Significant decrements in performance were noted between the two testing

conditions, most notably for those administered the free recall test. Tulving and Pearlstone concluded that supplying participants in the cued-recall condition with the category names as cues facilitated their accessing the appropriate study sets from memory. Absent any retrieval cues, participants in the free recall not only recalled fewer items, but drew from fewer categories. Smith and colleagues provided a similar account in characterizing the effects of interference on memory. The fact that the forgetting effects were largely reversible, having given participants the category names to use as retrieval cues, suggests that interference acts at the level of memory accessibility, rather than availability. This is a significant point to consider in light of commonalities shared among naturally-occurring recovered memory experiences; specifically, in a number of case studies documented by Schooler and colleagues (1997), recovered (or discovered) memories of traumatic abuse were often brought back to conscious awareness by virtue of some incidentally-encountered “trigger” in the environment. This portrait of naturalistic recovery can be contrasted with recovery experiences culled from clinical settings where therapists encourage active memory work in dredging up long-buried memories of trauma (see McNally & Geraerts, 2009). While some suggest that memory work, or the *effort to retrieve*, contributes to the formation of false memories (e.g., Ceci & Loftus, 1994), it is possible that the act of trying to remember some forgotten piece of information could elicit an authentic memory.

### **1.3 The Present Study**

As with the progression of research on false memories, the present research is part of a similar progression of work on blocked and recovered memories. Specifically,

blocked and recovered memories have been examined with categorized lists of words (e.g., Smith et al., 2003), and emotional lists of words (e.g., Smith & Moynan, 2008). Two experiments assessed whether powerful memory blocking effects could be elicited for naturalistic materials—brief narrative vignettes. Experiment 1 also tested whether such forgetting and recovery effects would be different for emotionally neutral versus emotional vignettes. In Experiment 2 these results were replicated and further examined the recovery effect by examining factors preceding a recovery experience. Specifically, whether or not cues were presented between the initial test and retest was manipulated and the intentionality of cue use was manipulated with instructions.

## 2. EXPERIMENT 1

In Experiment 1, the principle question of interest was whether the retrieval-biasing procedure responsible for producing powerful, reversible forgetting effects in previous studies of categorized lists (e.g. Smith, et al, 2003; Smith & Moynan, 2008) could be extended to produce forgetting with more naturalistic materials. After reading a series of 22 emotional and emotionally-neutral vignettes, participants in the forget condition completed three tasks re-exposing them to 18 of the vignettes, unaware of the fact that four critical vignettes had been dropped out of the study set. Participants in a control condition performed three non-verbal tasks (e.g., mazes, number search puzzles, mental rotation tasks) for an equivalent amount of time. Forgetting was assessed via a free recall test for the critical vignette titles. To assess memory recovery, participants completed a cued recall test in which they were provided with the critical vignettes for use as study cues.

Based on the magnitude of the forgetting effects produced in previous studies using the retrieval-biasing procedure (e.g., Smith et al., 2003), it was predicted that these effects would extend to memories for more naturalistic materials—specifically, series of vignettes. Furthermore, this forgetting effect will not be attenuated as a function of the emotionality of the vignette. In a previous study (Smith & Moynan, 2008), violent and obscene lists of curse words were observed to be equally susceptible to memory blocking effects. A final prediction addresses memory recovery. Because interference-based forgetting effects are theorized to influence the accessibility, rather than the

availability, of stored information, a significant recovery effect is expected in a cued recall test. Re-exposing participants to the critical vignette represents one of the most powerful memory cues possible for this task; as such, for participants in the forget condition, recall performance should be comparable to the control condition.

## **2.1 Method**

### ***2.1.1 Participants***

Sixty undergraduate students from Texas A&M University participated in the experiment for credit towards the completion of their introductory psychology course. Each 60-minute session included approximately 10 participants.

### ***2.1.2 Materials***

Twenty-eight vignettes were sampled from various amateur story compendiums across the internet. Of these, 22 vignettes were selected for use in the experiment. These vignettes varied both thematically and in terms of emotional intensity; half the vignettes contained subject matter involving unremarkable, everyday events (e.g., bike rides or insect encounters), whereas others were considerably more emotionally-upsetting in tone (e.g., gruesome depictions of torture or child abuse). Because of differences in story lengths, each vignette was edited to approximately one paragraph (approximately 131 words per story). However, while editing, care was taken to ensure that each short story remained a cohesive narrative despite appearing in a truncated form.

Additionally, each vignette was given a distinctive one-word title, which served as a descriptive “label” for each episode. The titles were selected with the restrictions that they were all single nouns, derivations of the core theme of each vignette, and not so

obvious that participants could guess the title based on their reading of the vignette. Appendix A contains the complete list of the vignettes. The titles used for each of the vignettes are located in Appendix B.

#### ***2.1.2.1 Critical Stories***

Four stories were selected as critical stories. To examine possible differences in forgetting and recovery rates associated with the emotionality of the stimuli, two of the critical stories were emotionally-evocative while the other two were judged to be affectively neutral. Of the emotional critical stories, the story titled “Torture” included a violent depiction of physical torture culminating in the victim’s shoulder being skewered by a hot iron, while “Pain” followed a young boy through his waking hours, having survived a night of repeated physical abuse from his parents. In contrast, the emotionally-neutral stories included a story titled “Cyclist” that chronicled a first bike riding experience, while “Insects” described a class demonstration by a bee-keeper.

#### ***2.1.2.2 Filler Stories***

An additional 18 stories were selected to be filler stories, and varied both thematically and in emotional valence. Nine of the stories were emotional and unpleasant, dealing with themes such as suicide, illness, and domestic violence. The remaining nine stories were affectively neutral, and included stories about sports, shopping, and wildlife encounters, and other relatively unremarkable events.

#### ***2.1.2.3 Norming Study***

To assess characteristics of the short story collection that could contribute to their memorability, a norming study was designed to examine each story’s valence

(pleasantness) and emotional intensity (level of arousal). A total of 56 undergraduate students participated in this study for credit towards the completion of their introductory psychology course. Approximately 10 participants attended each study session. No participant in the norming study took part in either of the experimental studies that followed.

Twenty-eight vignettes were projected for one minute each onto a large screen at the front of a classroom. Participants were cued after each story presentation to provide their ratings. For pleasantness, they were instructed to base their ratings on how the story made them feel. These ratings were to be based on a 9-point scale, with a rating of 1 indicating that they found the story to be generally unpleasant and a rating of 9 indicating that they found the story to be generally pleasant. Arousal ratings were also based on a 9-point scale such that a rating of 1 indicated that the story was extremely unarousing, and a rating of 9 indicated that the story was extremely arousing. Of the 28 short stories, 22 were selected for use in Experiment 1. Valence and arousal ratings for all 28 stories, including the emotional and non-emotional target stories, are located in Table 1.

**Table 1.** *Mean Valence and Arousal Ratings as a Function of Vignette Type.*

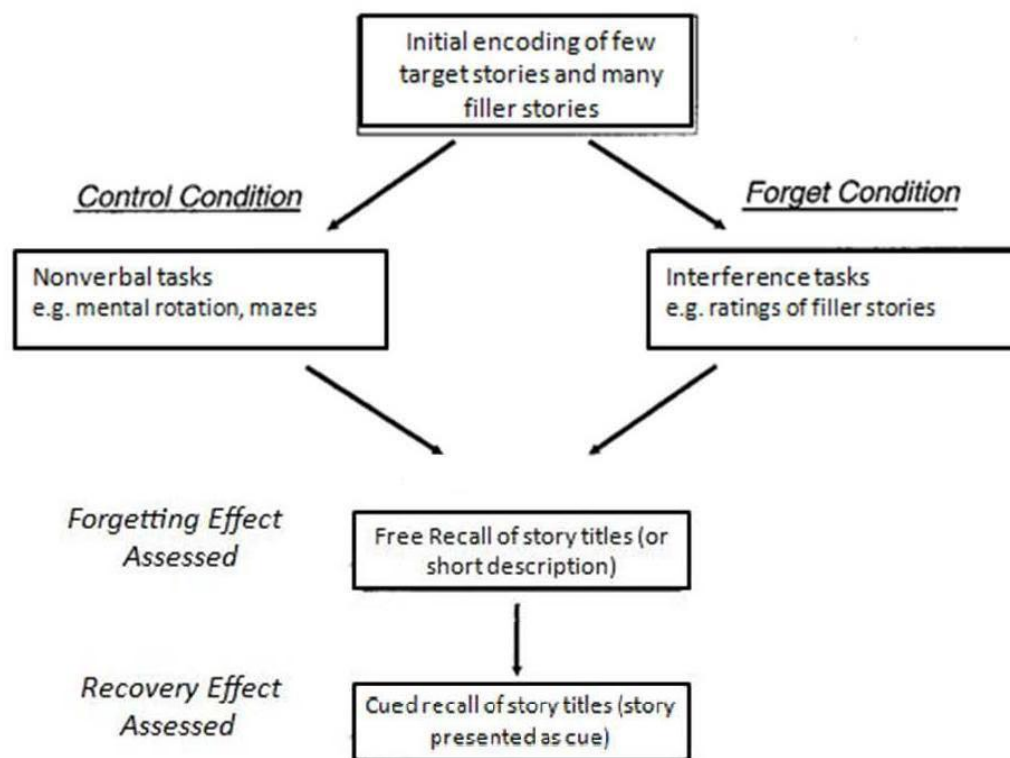
Measure	Story Type					
	Neutral Fillers	Emotional Fillers	Cyclist	Insects	Torture	Abuse
Valence	5.41*	2.75	6.43	5.05	1.59*	1.52*
Arousal	3.48*	5.02	4.48	3.25*	6.77*	4.86

\* indicates significance at  $p < .05$



### 2.1.3 Design

Participants were randomly assigned to either the control condition or the forget condition; condition assignment was a between-subjects variable. The dependent measures were the proportion of critical vignette titles generated on a free recall test, and the proportion of critical vignette titles generated on a cued recall test. In the present experiment, the procedure closely mimicked that of previous studies using the retrieval-bias method (e.g., Smith et al., 2003; see Figure 2).



**Figure 2.** A Basic Outline of the Retrieval-Bias Paradigm. Note: Based on a figure originally published in Smith and Moynan (2008).

## **2.1.4 Procedure**

### **2.1.4.1 Initial Encoding**

During the initial encoding phase, participants engaged in an incidental learning task in which each of the 22 short stories was shown in succession on a large projection screen using PowerPoint presentation software. Presentation order was randomized by valence (unpleasant or neutral)—the only stipulation being that the four critical stories appear in the middle of the presentation list. Before reading each story, participants were given 5 seconds to write down the story's title on their response form. This provisional step ensured that the story titles were adequately encoded. Next, both story and title were displayed together for 40 seconds; at the 30 second mark, a tone was issued to advise participants that they had 10 seconds remaining to finish reading. Following the story presentation, participants were instructed to rate how well each title was related to its story. Association ratings were based on a 5-point scale, with a rating of 1 indicating that the story and title were *not* well associated with one another, and a rating of 5 indicating the story and title were *highly* associated with one another. This procedure was repeated for each of the 22 short stories.

### **2.1.4.2 Intervening Tasks**

A 30-minute retention interval followed the initial encoding phase. Participants in the control condition completed a series of three non-verbal tasks, including mazes, number search puzzles, and mental rotation exercises. These tasks were intended to keep their attention engaged for the same amount of time as participants in the forget condition.

For those in the forget condition, a set of intervening tasks served to re-expose them to the 18 filler stories while facilitating forgetting of the four critical stories surreptitiously dropped from the presentation list. Participants completed a noun-counting task, an emotionality rating task, as well as a title completion task. Note that the order of story presentation differed between each of the three tasks, and the four critical stories were never encountered at any point over the course of the 30-minute retention interval.

In the noun counting task, participants were charged with counting the number of nouns that appeared throughout each story. Prior to each story presentation, its one-word title was presented in isolation for three seconds, and participants were given the opportunity to write the title on their response form. Each story was then presented for 30 seconds; a tone signaled participants when they had 10 seconds remaining to finish counting the nouns before the program moved on to the next story. Similarly, in the emotionality rating task, participants judged how emotional each filler story was on a 5-point scale. Similar to the first filler task, each story was presented one at a time and participants were given the opportunity to write down the story's title before completing their task. Each title was presented for three seconds and the participants were allowed 30 seconds to read the associated story before being prompted to judge how emotional the story was. Finally, for the title-completion task, each short story was once again presented for 30 seconds; after reading each story, participants were given a word-stem corresponding to the story's title. Given the first letter of the title, participants were

instructed to complete the word stem with the correct title corresponding to the story they had just read. In total, each task took approximately 10 minutes with instructions.

#### ***2.1.4.3 Free Recall Test***

Forgetting effects were examined in an unannounced free recall test that followed the interpolated filler tasks. For the test, participants were instructed to try and remember as many of the story *titles* as they could and record these, in any order, on their response form. During instructions, a heavy emphasis was placed on participants trying to recall all of the titles of all of the stories they had encountered throughout the entire experiment. Additionally, guessing was encouraged if they were unsure of any particular title. Participants were given five minutes for this test.

#### ***2.1.4.4 Cued-Recall Test***

To assess memory recovery, a cued-recall test was administered following the free recall test. For this test, participants received a two-page handout containing two of the critical stories on each page. The short stories were numbered and did not include their respective titles. Participants were instructed to try and recall the title for each of the short stories contained in the packet. As in the free recall test, guessing was encouraged if they were not certain of a particular story's title.

## **2.2 Results**

### ***2.2.1 Forgetting Effect Assessed***

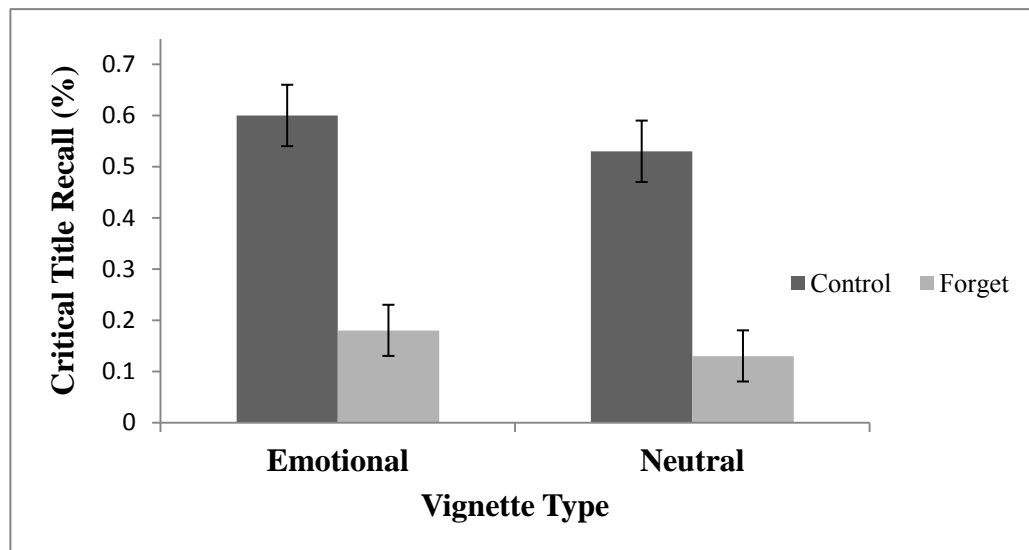
To assess the forgetting effect, a repeated measures ANOVA was computed using treatment condition (control versus forget) as a between-subjects factor and the proportion of critical vignette titles recalled (emotional versus emotionally-neutral) as

the dependent measure. As illustrated in Figure 3, the performance of participants in the forget condition ( $M = 0.16$ ,  $SE = 0.04$ ) was characteristically poorer than those in the control condition ( $M = 0.57$ ,  $SE = 0.04$ ) in an uncued recall test for the critical vignette titles,  $F(1, 57) = 42.38$ ,  $p < .0001$ ,  $MSE = 4.56$ , partial  $\eta^2 = 0.41$ . Importantly, the magnitude of the blocking effect—a 41% difference in recall performance between the two treatment conditions—was comparable to blocking effects reported in previous experiments utilizing the retrieval-biasing procedure with categorized word lists (e.g., Smith et al., 2003; Smith & Moynan, 2008). The emotional intensity of the vignette had no influence on recall performance for the critical titles (see Table 2). The absence of an advantage for emotionally-salient critical vignettes in recall was contrasted with a significant advantage in memory for emotional vignettes when assessing recall for titles collapsed across vignette types (filler and critical vignettes),  $F(1, 58) = 6.29$ ,  $p = .015$ ,  $MSE = 0.10$ , partial  $\eta^2 = 0.10$ .

**Table 2.** Mean Recall Performance in Experiment 1 as a Function of Vignette Valence and Treatment Condition.

Treatment Condition	Story Type					
	Neutral Fillers	Emotional Fillers	Cyclist	Insects	Torture	Abuse
Control	0.52	0.59	0.57	0.50	0.53	0.67
Forget	0.82	0.87	0.10	0.17	0.13	0.23

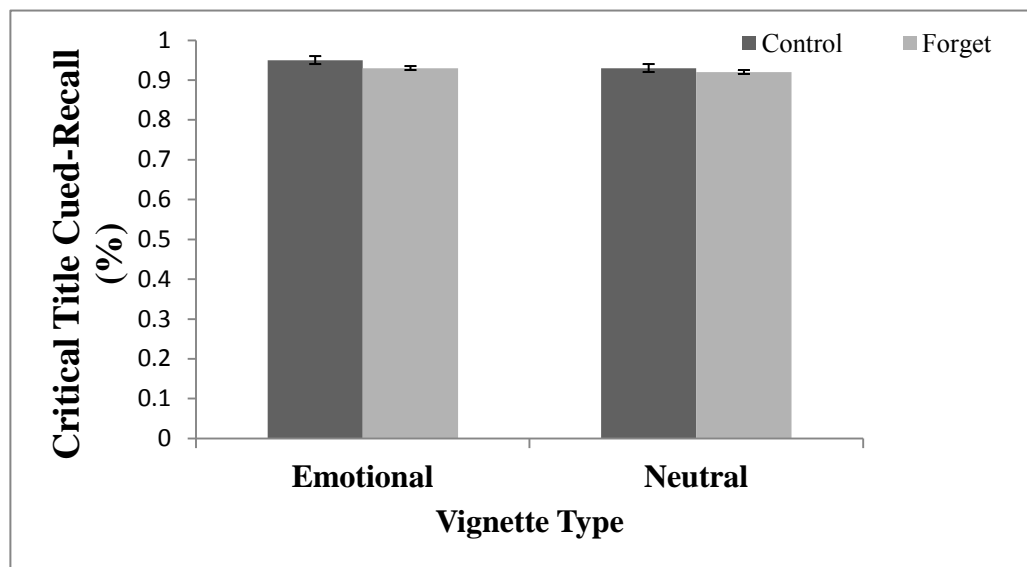
A second repeated measures ANOVA analyzed the proportion of filler vignette titles recalled as a function of treatment condition (control versus forget) and filler vignette emotionality (emotional versus emotionally-neutral). Participants in the forget condition ( $M = 0.84$ ,  $SE = 0.02$ ) significantly outperformed those in the control condition ( $M = 0.55$ ,  $SE = 0.02$ ) reflecting a 29% practice effect ( $F(1,57) = 91.29$ ,  $p < .0001$ ,  $MSE = 2.52$ , partial  $\eta^2 = 0.62$ ). There was also a significant main effect of vignette type. Titles derived from emotional filler vignettes ( $M = 0.73$ ,  $SE = 0.02$ ) were recalled significantly more often than those from emotionally-neutral filler vignettes ( $M = 0.67$ ,  $SE = 0.02$ ),  $F(1,57) = 4.63$ ,  $p < .05$ ,  $MSE = .10$ , partial  $\eta^2 = 0.08$ . Finally, there was not a significant interaction between treatment condition and filler vignette emotionality,  $F(1,57) = 0.15$ ,  $p = .697$ .



**Figure 3.** *Experiment 1 Forgetting Effect.* The proportion of target vignette titles recalled as a function of treatment condition and vignette emotionality.

### 2.2.2 Recovery Effect Assessed

As predicted, when participants were supplied with retrieval cues in a final cued recall test for the critical vignette titles, the forgetting effect was completely eliminated (see Figure 4). Participants in the control condition ( $M = 0.94$ ,  $SE = 0.03$ ) did not differ significantly from participants in the forget condition ( $M = 0.93$ ,  $SE = 0.03$ ),  $F(1, 58) = 0.16$ ,  $p = .688$ . Furthermore, there was no difference in cued recall as a function of emotionality,  $F(1,58) = 0.24$ ,  $p = .624$ . Of the 60 participants in both conditions, all but four were able to recall at least three of the four critical titles after the re-exposure.



**Figure 4.** *Experiment 1 Recovery Effect. Proportion of target vignette titles recalled in a cued recall test as a function of treatment condition and vignette emotionality.*

### 2.3 Experiment 1 Discussion

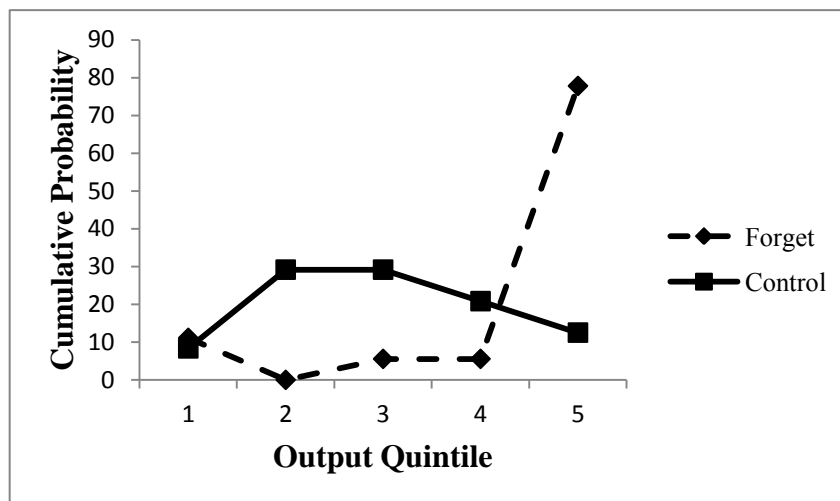
Previous studies have used interference as an explanatory mechanism for powerful, reversible forgetting effects in categorized list learning paradigms (e.g., Smith

et al., 2003). In subsequent studies, these effects were extended to lists of emotional and emotionally-neutral categorized lists (Smith & Moynan, 2008). Experiment 1 addressed whether interference-based forgetting effects could be produced for more naturalistic materials—richer, more episodic vignettes. As predicted, the retrieval-biasing procedure produced deficits in recall performance among participants in the forget condition, when compared to a control condition. Additionally, these impairments were observed for both emotional and emotionally-neutral critical vignettes. The null effect of emotionality for the critical vignettes in the forget condition runs counter to many previous studies claiming that emotional materials are highly memorable (for a review see Christianson, 1992). However, it is important to note that the typical emotional memory effect *was* observed for the filler vignettes. The magnitude of the forgetting effect (40%) was comparable (if not marginally larger) than effects observed in previous experiments (e.g., Smith et al., 2003). Averaged across three experiments, Smith and colleagues (2003) reported a 34% difference in recall performance for emotionally-neutral categorized word lists. In a later study by Smith and Moynan (2008) that incorporated emotionally-evocative study lists (e.g., lists of curse words, illnesses, and death-related words), a 36% (averaged across two experiments) difference in recall performance was reported between treatment conditions.

The theoretical underpinnings of the comparative memory paradigm attribute forgetting of critical items to interference produced by continually re-exposing participants to previously-studied materials. Output interference resulting from biasing retrieval away from the critical vignettes presumably affects the accessibility of these



memory traces in a subsequent test. Specifically, between treatment conditions the output dominance for the critical vignettes was predicted to be differentially affected by the retrieval-biasing procedure. As Figure 5 illustrates, among participants in the forget condition in Experiment 1, the critical vignette titles were recalled much later compared to the relative output position of the target titles in the control condition. Once again, this was true for both emotional and emotionally-neutral vignette titles.



**Figure 5.** *Experiment 1 Recall Output Position.* Recall of the critical vignette titles in a free recall test as a function of output position. Output order is segmented into quintiles, reflecting the first 20% of responses, the second 20% of responses, etc...

Regarding recovery, these dramatic levels of forgetting were reversible given adequate retrieval cues. Following the recall test, participants were re-exposed to the four critical vignettes in their entirety. When asked to produce the titles of each vignette, participants in both conditions were extremely successful in generating their respective

titles. In fact, cued recall performance was nearly identical between the control and forget conditions; participants in either treatment condition accurately recalled the critical vignette titles approximately 93% of the time.

Finally, Experiment 1 addressed a potential limitation of previous studies utilizing the retrieval-biasing procedure (e.g., Smith et al., 2003; Smith & Moynan, 2008) by insuring that recovery was for the *same* information that had been forgotten in a previous memory test. Smith and Moynan (2008) required participants to retrieve as many list names (e.g., *tools*) as they could remember. In a subsequent cued recall task, their participants were given the list names to use as retrieval cues in generating as many of the list members as possible. It could be argued that the authors were examining qualitatively different kinds of information in their two retrieval tasks. Specifically, deficits in recall for list names were assumed to reflect deficits in memory for an entire episode—in essence, drawing parallels to naturalistic cases where forgetting occurs at the for entire events (e.g., an episode of abuse at summer camp, the first day of high school, etc...). This is contrasted with the cued recall test, where the authors provided evidence that list items were recoverable given the provision of list names. While the authors demonstrated that details related to a once-forgotten episode could be recovered, they did not address recovery of the episode, itself. Admittedly, this is a fine distinction but one that warranted closer examination. The results of Experiment 1 therefore reflect memory blocking and recovery at the level of the *episode*, as represented by the vignette titles.

### 3. EXPERIMENT 2

Experiment 1 established that mass interference following an initial learning phase reliably produces forgetting of both emotional and non-emotional episodes, as evidenced by deficits in recall of critical vignette titles among participants exposed to a retrieval-biasing procedure. Furthermore, this forgetting effect was reversible; cuing participants with the critical vignettes aided in subsequent attempts to retrieve each of the critical titles. Having provided evidence that the memory blocking paradigm is amendable to more naturalistic materials, Experiment 2 served to further explore the phenomenological experience of memory recovery. Specifically, what factors accompany a recovery experience? Retrieval intent in the presence of memory triggers was experimentally manipulated, and the subjective report of awareness of recovered memories was assessed.

As in Experiment 1, Participants were given a series of emotional and non-emotional vignettes to read, after which the forget group was re-exposed to the remaining filler stories over the course of three intervening tasks. Memory for the story titles was tested twice using free recall; between these two tests, participants were given a picture-naming task in which they produced labels for a series of simple black-and-white line drawings. Critically, in one condition, pictures corresponding to core elements of the four critical stories were inserted throughout the picture naming task. Could these vignette-relevant images, inserted within a series of unrelated images, evoke memory recovery?

Additionally, a manipulation of retrieval intent was included as an exploratory variable thought to mediate the effective utilization of retrieval cues. Prior to completing the picture naming task, participants were either informed that some pictures may correspond to the vignettes they read earlier, or they were told nothing at all. Memory recovery in the latter case would therefore be a product of an incidental trigger, or independent associations formed by participants; reminiscence resulting from the extra instruction would presumably reflect the influence of memory work on recovery.

### **3.1 Method**

#### ***3.1.1 Participants***

A total of 160 undergraduate students participated in return for credit towards the completion of their introductory psychology course. Study sessions included approximately 10 participants per study session.

#### ***3.1.2 Materials***

With few exceptions, the stimuli used in Experiment 2 were identical to those used in Experiment 1. The most significant difference between experiments pertained to the titles associated with each of the vignettes. In order to address the concern of a possible word concreteness effect biasing recall of the vignette titles in Experiment 1, both the emotionally-neutral and emotionally-unpleasant sets of vignettes were assigned more concrete (e.g., “Insects,” “Pistol”) and less concrete titles (e.g., “Pain,” “Sport”). This change was based on the observation that the descriptive nouns selected as titles for the emotionally-neutral vignettes were generally more concrete than the titles selected for the emotionally-unpleasant vignettes. Table 3 contains the concreteness ratings for

all of the titles used in Experiment 2. For comparisons between the titles used in Experiments 1 and 2, refer to Appendix B.

**Table 3.** *Mean Title Concreteness Ratings as a Function of Vignette Type. Note: \* indicates significant difference at  $p < .05$*

Measure	Story Type					
	Concrete Fillers	Abstract Fillers	Torture	Insects	Riding	Pain
Concreteness	5.43*	4.28	5.13*	5.77*	4.29	4.55

For the picture naming task, 44 black-and-white line drawings were sampled from a set of picture norms originally published by Snodgrass and Vanderwart (1980). These line drawings are simple representations of common, everyday objects that are easily identifiable. Of the drawings sampled, four were selected to serve as retrieval cues for the four critical vignettes. For the vignette entitled “Torture,” the picture object selected was a knife. This selection corresponded to a pivotal event in the story in which the narrator describes having a hot knife stabbed into his shoulder. For the vignette entitled “Pain,” an image of a belt was selected. This image corresponded to a scene in the story describing a young boy’s reflections on an abusive episode where he’d been strangled with a belt. An image of a bee was used as a retrieval cue for the vignette “Insects,” as the story described a class trip to visit a beekeeper. Finally, an image of a bicycle was used as a potential memory trigger for the vignette “Riding.” For the

conditions in which vignette-relevant cues were not included, four other images were used in their place (a smoking pipe, a clock, a carrot, and a hairbrush).

### ***3.1.3 Design***

Presence of cues (yes or no) served as one between subjects variable. Task instruction served as a second between-subjects variable; specifically, whether or not participants were informed that the pictures may remind them of vignettes they read earlier was manipulated. Combinations of these tasks produced four groups: one group received the picture cues in the picture naming task, in addition to the instruction to think about the cues in the context of the vignettes they read previously; in a second condition, participants received the extra instruction absent any picture cues related to the four critical vignettes; in the third condition participants received the picture cues over the course of the picture naming task, but absent the instruction; finally, in the fourth condition, neither picture cues nor the extra instruction was given to participants over the course of the picture naming task. Reminiscence served as the dependent measure and is defined as the proportion of critical titles recalled on the second free recall test that were not recalled on the first free recall test.

### ***3.1.4 Procedure***

Experiment 2 was identical to Experiment 1 in terms of the initial encoding experience, and the assignment of participants to the interpolated tasks. For the control group, they completed a series of non-verbal tasks over the duration of the 30 minute retention interval. For participants in the forget condition, over three tasks they were re-exposed to 18 of the filler vignettes they read previously. Following the three

interpolated tasks, participants were given a free recall test, and were instructed to recall all the vignette titles they encountered throughout the entire experiment. As in Experiment 1, they were given five minutes to complete this task.

For the picture naming task, participants viewed a series of 40 simple black and white line drawings of various objects, and were given five seconds to name each. In one version of the picture naming task, four drawings corresponding to some central thematic element of the critical vignettes were inserted centrally in the presentation, with two filler items separating the subsequent display of each. For instance, the drawing of a belt was an associate of the story “Pain,” which chronicled a young boy the morning after enduring traumatic physical abuse by his parents; this abusive episode included being choked by a belt. In the other version of the picture naming task, four additional filler items were inserted in place of the pictures corresponding to the critical stories. While participants were given instructions for the picture naming task, they were either given an extra instruction informing them that some of the images may correspond to the vignettes they read earlier in the experiment, or were told nothing at all.

A second free recall test followed immediately after the picture naming task. Participants were once again instructed to write down as many of the vignette titles as they could remember, with particular emphasis placed on their attempting to recall all of the titles encountered throughout the entire experiment.

## 3.2 Results

### 3.2.1 Forgetting Effect Assessed

The predicted blocking effect was replicated in Experiment 2, as evidenced by a 44% difference in performance between treatment conditions (see Table 4). Once again, the forgetting effect was assessed using a repeated measures ANOVA. Treatment condition (control versus forget) served as a between-subjects factor. Target vignette emotionality (emotional versus emotionally-neutral) was the within-subjects factor. In a free recall test, participants in the forget condition ( $M = 0.18$ ,  $SE = 0.03$ ) generated significantly fewer critical story titles than participants in the control condition ( $M = 0.62$ ,  $SE = 0.03$ ),  $F(1, 158) = 131.16$ ,  $p < .0001$ ,  $MSE = 51.20$ , partial  $\eta^2 = 0.74$ . Unlike in Experiment 1, there was also a significant main effect of critical vignette emotional intensity. Critical emotional vignette titles ( $M = 0.50$ ,  $SE = 0.03$ ) were recalled more often than critical emotionally-neutral vignette titles ( $M = 0.30$ ,  $SE = 0.02$ ),  $F(1, 158) = 35.50$ ,  $p < .0001$ ,  $MSE = 3.40$ , partial  $\eta^2 = 0.18$ . Additionally, there was a significant interaction between vignette emotional intensity and treatment condition,  $F(1, 158) = 4.69$ ,  $p = .03$ ,  $MSE = 0.45$ , partial  $\eta^2 = 0.03$ .



**Table 4.** Mean Recall Performance in Experiment 2 as a Function of Vignette Valence and Treatment Condition.

<b><u>First Recall</u></b>						
Story Type						
Treatment Condition	Neutral Fillers	Emotional Fillers	Riding	Insects	Torture	Pain
Control	0.54	0.56	0.51	0.44	0.78	0.74
Forget	0.72	0.72	0.07	0.16	0.24	0.26

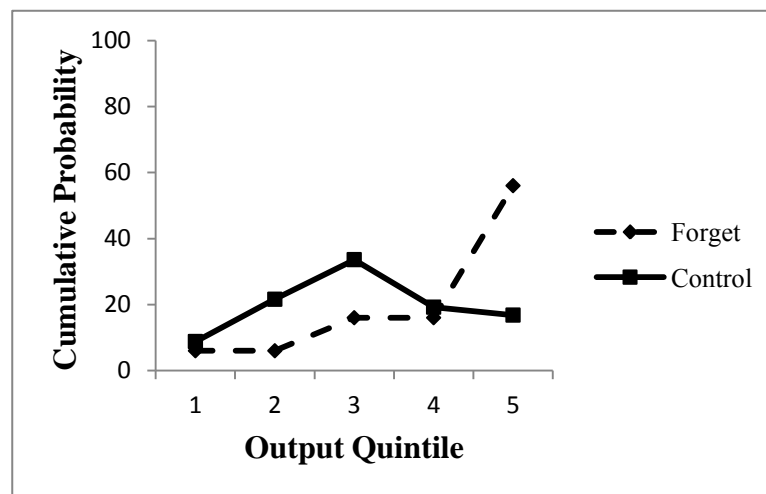
  

<b><u>Second Recall</u></b>						
Story Type						
Treatment Condition	Neutral Fillers	Emotional Fillers	Riding	Insects	Torture	Pain
Control	0.54	0.52	0.64	0.68	0.74	0.81
Forget	0.72	0.71	0.16	0.29	0.33	0.34

Finally, the forgetting effect could not be attributed to the concreteness of the target vignette titles. Target concrete titles ( $M = 0.40$ ,  $SE = 0.24$ ) were not recalled at a significantly greater rate than target abstract titles ( $M = 0.40$ ,  $SE = 0.24$ ),  $F(1, 158) = 0.04$ ,  $p = .836$ . This was true across control and forget treatment conditions,  $F(1, 158) = 0.69$ ,  $p = .407$ .

In regard to the relative output position of the critical vignette titles, as was observed in Experiment 1, increasing the accessibility of competing filler vignette titles resulted in a downward shift in output position for the critical vignette titles. For cases in which the critical vignette titles were generated in the forget condition, the average output position was 14.52 out of 17.72 total vignette titles recalled. For the critical

emotional vignette titles, the average output position was 13.80, while the average output position for the critical emotionally-neutral titles was 15.25. Figure 6 depicts the cumulative production levels of the critical vignette titles across quintiles of participants' responses; output position is represented as a function of the emotionality of the vignettes, as well as treatment condition.



**Figure 6.** *Experiment 2 Recall Test One Output Position. Recall of the critical vignette titles in the first free recall test as a function of output position.*

### 3.2.2 Recovery Effect Assessed

An initial analysis assessed differences in the net recall of the critical vignette titles between the two treatment conditions (control versus forget), independent of the interpolated picture-naming task manipulations. For both the control ( $M = 0.10$ ,  $SE = 0.02$ ) and forget ( $M = 0.09$ ,  $SE = 0.02$ ) conditions, the differences in recall performance between the initial and final free recall tests were negligible ( $t(158) = 0.27$ ,  $p = .78$ ). However, the hypermnesic<sup>2</sup> effect was still reflective of an approximate 10% increase in

net recall of the critical vignette titles in the final recall test for both treatment conditions. One potential limitation of using hypermnesia to assess memory recovery resides in the fact that the difference scores also take into account initially recalled critical vignette titles that were forgotten on the final test. Therefore, it was determined that reminiscence (see Payne, 1987) would provide a better measure of recovery as this calculation focused only on the proportion of critical vignette titles recalled in the second recall test that were not recalled in the first test.

Using reminiscence as the measure of recovery, a 2 x 2 x 2 repeated measures ANOVA was performed; treatment condition (forget versus control) served as a between-subjects variable, while the presence of retrieval cues (yes or no) and the cue utilization instruction (yes or no) accompanying the interpolated picture naming task served as within-subjects variables. Participants in the control condition ( $M = 0.45$ ,  $SE = 0.05$ ) recovered significantly more initially unrecalled critical vignette titles in the retest than participants in the forget condition ( $M = 0.15$ ,  $SE = 0.03$ ),  $F(1, 136) = 32.68$ ,  $p < .0001$ ,  $MSE = 3.22$ , partial  $\eta^2 = 0.19$ . There were no differences in reminiscence (collapsing across the forget and control treatment conditions) that could be accounted for by the presence of retrieval cues in the interpolated picture naming task ( $F(1, 136) = 0.51$ ,  $p = .47$ ), nor by the provision cue utilization instructions ( $F(1, 136) = 0.22$ ,  $p = .63$ ). Finally,

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<sup>2</sup>The term hypermnesia (e.g., Payne, 1987) refers to a net increase in the number of critical items recalled in a final memory test, taking into account items that were not initially recalled, and those that were initially recalled but were forgotten on the retest.

there were no significant interactions between the presence of retrieval cues and treatment condition ( $F(1, 136) = 0.11, p = .74$ ), or between treatment conditions as a function of the presence of cue utilization instructions ( $F(1, 136) = 0.01, p = .75$ )

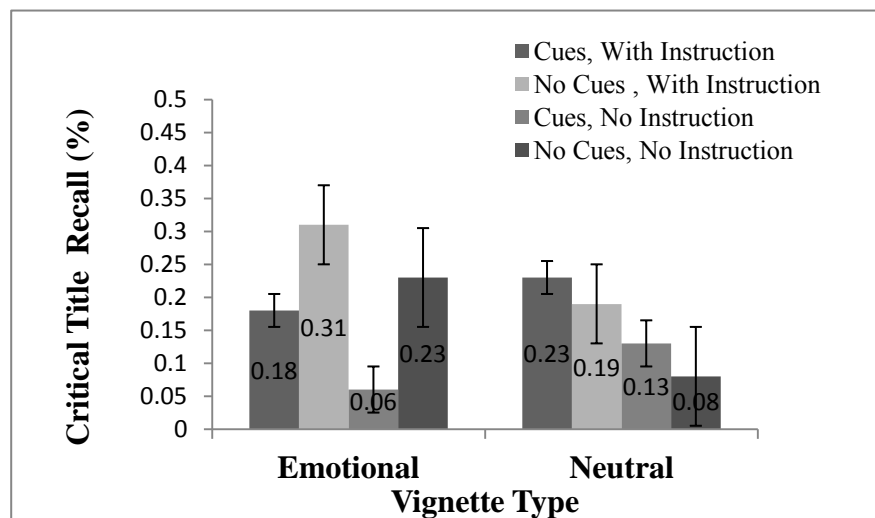
Reminiscence was also examined as a function of the emotionality of the critical vignettes. These analyses were confined only to the forget treatment condition, due to the limited number of participants in the control treatment condition that could be used for comparison purposes<sup>3</sup>. Forty-five of the 80 participants in the control condition initially recalled all of the critical emotional or emotionally-neutral vignette titles; analyses were not performed on the remaining 35 participants, as these comparisons would not have been representative of the sample as a whole.

To examine the degree to which the intervening picture naming task influenced recall performance on the second test, a 4 (interpolated task condition) x 2 (target vignette emotionality) repeated measures ANOVA was performed. It was hypothesized that providing participants with picture cues related to the target vignettes, accompanied by the extra study instruction to use the pictures to think about the vignettes, would provide a scenario most conducive to memory recovery. From there, a graded effect was anticipated, with the condition in which no picture cues were present, and participants

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<sup>3</sup>Reminiscence is calculated as the proportion of initially unrecalled items successfully recalled in a subsequent memory test. This calculation assumes that some study items were omitted (or forgotten) in the first test. Because the study paradigm involved so few critical vignettes in each of the emotional categories (two critical emotional vignettes, and two critical emotionally-neutral vignettes), the likelihood that the titles for these critical vignettes would be recalled initially was much greater than if many critical vignettes had been used. This was particularly true for the control condition, as many participants initially recalled all of the critical vignette titles from one or both of the emotional categories. Data for these participants was therefore removed, leaving only a limited number of participants in the control condition to compare to the forget condition.

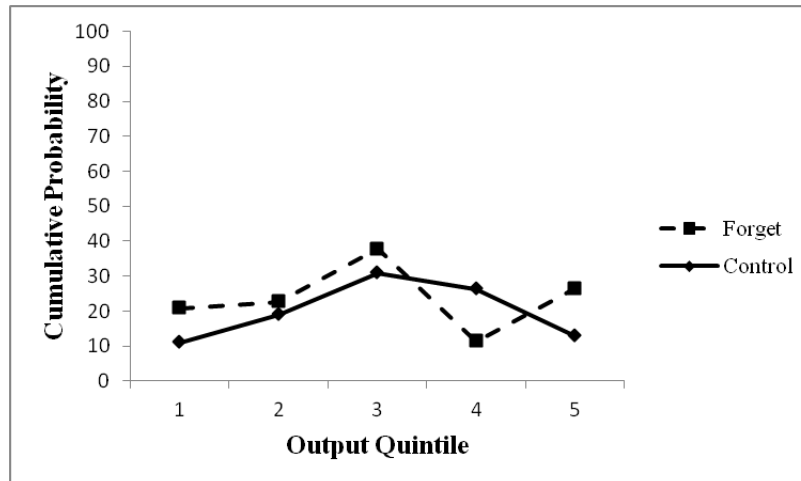
were not instructed to use the picture cues for any purposes, predicted to produce the least recovery of the critical vignette titles. The difference in interpolated task conditions was not significant for the critical emotional and emotionally-neutral vignette titles ( $F(1, 70) = 0.81, p = .37$ ), though there was some evidence suggesting the anticipated graded-effect of recovery as a function of interpolated task condition among the emotionally-neutral critical vignette titles (see Figure 7). Neither the presence of retrieval cues, nor



**Figure 7.** *Experiment 2 Reminiscence by Treatment Condition. Reminiscence in the forget condition as a function of cue presentation, cue utilization instruction, and emotionality of target vignette titles.*

the provision of the cue utilization instruction combined to produce significant differences in reminiscence for the critical neutral vignette titles, however. Examining reminiscence of the emotional critical vignette titles, as a function of retrieval cue presence and the provision of the cue utilization instruction, the pattern of results is less clear.

Regardless of the factors mediating memory recovery, the output positions of the recalled critical vignette titles in the second test depict a more evenly distributed pattern of responses across output quintiles for the forget condition (see Figure 8).



**Figure 8.** *Experiment 2 Reminiscence as a Function of Output Position. Reminiscence of the critical vignette titles in the second free recall test as a function of output position.*

### 3.3 Experiment 2 Discussion

In Experiment 2, the large forgetting effect observed in Experiment 1 and previous studies (e.g., Smith et al., 2003; Smith & Moynan, 2008) was successfully replicated. There was a 44% difference in recall of the critical vignette titles between participants in the forget and control conditions. However, contrary to Experiment 1, significant impairments for memories of the critical emotionally-neutral vignette titles were observed.

Across treatment conditions, the recovery rates (approximately 10%) were comparable when comparing the net increase in critical vignette titles generated in the

second recall test, relative to the first recall test. While the magnitude of this recovery effect was not as impressive as the near-complete recovery of the critical vignette titles observed in Experiment 1, some recovery was nonetheless observed. However, based on these results it was difficult to determine what mediated this recovery effect. A simple retesting effect cannot be ruled out, particularly when considering the similar rate of recovery between the two treatment conditions. As suggested in studies of incubated reminiscence effects (e.g., Smith & Vela, 1991), given a greater delay between testing, we might expect greater recovery rates. However, there is reason to doubt this conclusion, as previous studies (e.g., Smith et al., 2003) have reported the persistence of this interference-based forgetting effect over numerous days.

An additional question in Experiment 2 revolved around what participants knew about what they'd forgotten. This question was particularly relevant to participants in the forget condition that had overcome the memory block to recover some pieces of once-forgotten information. Overwhelmingly, participants in the forget condition were very cognizant of the critical vignette titles they had forgotten on the initial recall test. In the post-test questionnaire, the first question asked participants to look back over their second recall test and identify those responses they had not recalled on the first test. In every case, participants in the forget condition correctly circled the recovered critical vignette title.

## 4. CONCLUSIONS AND GENERAL DISCUSSION

### 4.1 Summary

Forgetting is an inescapable reality of mental life. Yet, some events carry such emotional weight that they seem almost unforgettable. Are we fated then, as William James once mused, to carry the vestiges of these experiences as "...scar[s] upon the cerebral tissues" (James, 1890, p. 670)? Or are there circumstances in which potent emotional experiences can be forgotten? And if so, can memories associated with these events return to consciousness? Quixotically, the answer to each of these questions appears to be "yes," though as this set of experiments has shown, the devil may be in the details.

In two experiments, a retrieval-biasing procedure produced powerful forgetting effects for richly-encoded vignettes. The magnitudes of the forgetting effects in both experiments were quite pronounced, accounting for a 40% difference in recall between control and forget conditions in Experiment 1, and a 44% difference in recall in Experiment 2. An initial study by Smith and colleagues (2003) produced similar impairments for categorized lists of words; a later study by Smith and Moynan (2008) extended these pronounced forgetting effects to violent and emotionally distinctive materials, producing memory impairments for lists of curse words. In the present study, vignettes containing a myriad of emotionally-arousing thematic elements were as likely as emotionally-neutral vignettes to be forgotten.



The theoretical underpinnings of the blocking effect, as proposed by Smith and colleagues (2003), attribute forgetting to simple mechanisms of interference. Specifically, shifts in output dominance of responses in a given memory set, coupled with output interference produced by strengthening competing responses, limit the accessibility of select items within the memory set. In the present experiments, participants read 22 vignettes in an initial study session. For participants in the forget condition, four target vignettes were dropped from the study list, and they were re-exposed to the remaining 18 vignettes over the course of three tasks. Re-exposing participants in the forget condition to the filler vignettes resulted in a dramatic downward shift in output position for the critical vignette titles on a subsequent free recall test. Comparatively, participants in the control condition did not show this pattern—across output positions, the probability of outputting a critical title was evenly distributed in both experiments.

Another major finding regarded the reversibility of the forgetting effect. As in previous studies (e.g., Smith et al, 2003; Smith & Moynan, 2008), given appropriate cues participants in the forget condition were able to successfully retrieve the critical vignette titles forgotten on a previous recall test. In Experiment 1, re-exposing participants to the critical vignettes facilitated the recall of the vignette titles. Importantly, performance in the cued recall test for the critical vignette titles was nearly identical between treatment conditions. Comparable performance between conditions on the cued recall test suggests that the interference-based forgetting effect operated on the

level of accessibility, rather than the availability, of critical vignette titles (e.g., Tulving & Pearlstone, 1966).

While Experiment 1 provided participants with the most potent retrieval cues possible (re-exposure to the critical vignettes), Experiment 2 examined the ability of more subtle retrieval cues to aid in overcoming memory blocks. Specifically, images corresponding to some central thematic element of the critical vignettes were inserted into an incidental picture-naming task participants completed prior to their second recall test. Additionally, some participants were told that the images they encountered in the picture naming task may remind them of the vignettes they read previously in the experiment. The recovery effects observed in Experiment 2 were less pronounced than those observed in Experiment 1. As measured by reminiscence, the recovery effect in Experiment 2 was approximately 15% for the forget condition. In that, it is difficult to determine what accounted for this recovery effect. Perhaps recovery was a simple function of retesting? Smith and Vela (1991) reported incubated reminiscence effects in a list learning paradigm that appeared to be a function of the interval between testing. Specifically, reminiscence was greater after a 10 minute interval than a 5 minute interval. Assessing the individual treatment conditions paints an even murkier picture of recovery. For both the control and forget conditions, none of the four treatment conditions produced significant differences in reminiscence. This was contrary to the prediction that providing participants with picture cues in addition to supplying the provisional instruction to use the cues in thinking about the previously-read vignettes would demonstrate the greatest recovery effects. While there was some indication of a

graded effect of picture cue/retrieval intent within the forget condition for the emotionally-neutral vignette titles, these differences were not significant. Less can be gleaned from assessing reminiscence for the emotional target titles. In fact, the presence of the picture cues seemed to do more harm than good in aiding in subsequent recall attempts.

#### **4.2 Future Directions**

While this set of studies advances the use of the retrieval-biasing procedure beyond the purview of simple, innocuous list learning paradigms, there are additional steps that could be taken towards greater ecological validity. Specifically, incorporating this paradigm into the study of autobiographical forgetting would serve to compliment certain false memory studies reporting memory implantation of autobiographical events (e.g., Loftus & Pickrell, 1995). In that, goal-directed autobiographical forgetting has been demonstrated in studies examining inhibitory mechanisms in retrieval-induced forgetting (e.g., Barnier, Hung, & Conway, 2004).

Future studies may also address individual differences in memory blocking and recovery under this theoretical framework. The existence of supposed “repressors” has been endorsed by a number of studies that have approached repression as a trait (e.g., Derakshan, Eysenck, & Myers, 2007; Myers, Brewin, & Power, 1998). These studies have found that repressors are not only more susceptible to forgetting undesirable, negatively-valenced information, but that this forgetting is particularly pronounced when the information is of an autobiographical or self-referenced nature.

In summary, in two experiments, a retrieval-biasing procedure was used to produce powerful forgetting of more naturalistic, ecologically-valid study materials. Given adequate retrieval cues, these initial memory blocks could be overcome. However, the magnitude of memory recovery appears to be mediated by the quality of the retrieval cue. In Experiment 1, re-exposing participants in the forget condition to the critical vignettes produced nearly perfect recovery. In Experiment 2, encountering more incidental cues in an intervening picture-naming task was not as conducive to recovery of once-forgotten memories in a subsequent memory test.

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## APPENDIX A

<b>Experiment 1</b>		<b>Experiment 2</b>	
<b>Emotional</b>	<b>Emotionally-Neutral</b>	<b>Emotional</b>	<b>Emotionally-Neutral</b>
Murder	Camping	Murderer	Camping
Hunger	Artist	Hunger	Creativity
Execution	Hospital	Execution	Hospital
Suicide	Vacation	Corpse	Beach
Survivor	Baseball	Crash	Sport
Terrorist	Wildlife	Terrorist	Perfume
Sickness	Instrument	Sickness	Music
Guilt	Children	Guilt	Children
Homeless	Nature	Pistol	Rollerskates
Torture	Insects	Torture	Insects
Abuse	Cyclist	Pain	Riding

## APPENDIX B

1. Terry and I were sleeping soundly after our first day of work on the trail crew. The evening before, Fred, our stern trail crew boss, had assigned each of us to bear watch. Around 3 a.m. we were awakened by a loud scrapping sound; the sound a bear might make trying to get into our wall tent. Both Terry and I were jolted awake at the same time, exchanged terrified glances, then yelled, "Fred, there's a bear outside!" Fred raised up on one elbow, looked disapprovingly at us sitting in our sleeping bags, then looked at his pocket watch hanging from a nail by his bed. "Why aren't you two on bear watch?" he said. Then he leisurely pulled his "toy" out of its holster. It was a cap-and-ball, long-barreled, 44 magnum. He spun the cylinder to make sure it was loaded, crawled out of his bag and nonchalantly ambled out of the tent. A moment later, a single shot shook the plywood walls.

2. "Wait!" I screamed. Before my hand fell upon Gavriilo, he stepped away from me and fired. The echo of two gunshots drove all other sound away, and from my vantage, I viewed the blood spreading from both Archduke and wife. I also heard the Archduke speak his last words. "Sophie. Sophie. Don't die," he said in German. "Stay alive for our children." As if this were a cue, the mob attacked. "Gavrilo!" I cried, trying to reach him through the gauntlet of bodies, "Gavrilo!" They knocked him to the ground and kicked him mercilessly. "Gavrilo!" Madly, I forced my way into the mob. In my furor, I reached the center, and there upon the ground lay Gavriilo, receiving blows like a dead man. "No!" I cried, but a police whistle wailed and I was thrust aside. Officers surrounded the assassin, lifted him to his feet-- for he yet lived--and bore him away.

3. "No!" I stated without apology, "I'm not giving you one red cent." The beggar flipped me off with a stream of profanity. He could swear all he wanted---I'd heard it all and seen it all. Yeah. I'll never forget the guy who bummed ten bucks off me and walked straight into the liquor store to buy booze... And this guy---trying the same thing. And he was swearing at me! Well, that was about to stop! I changed direction, spinning on him, but a gust of wind caught me and my hand swept to my nose involuntarily. The bum went silent and stared, as if expecting my reply. Without uncovering my nose, I pushed past him and headed for the McDonald's on the corner. Trying to keep as much distance as possible, I dropped the food on his lap. So, what changed my mind? I'll tell you. Like I said, I'd seen it all, and nobody---I mean nobody---ever faked a smell like that.

4. I watched her draw while the dust from the country road billowed around the passenger seat window. She held the red felt-tipped pen in her slight hand like it was an extension of herself. Small squares of yellow memo pad paper were scattered in her lap. It was all I could scrounge up in hopes of keeping a four year old sufficiently occupied for the drive to her grandmother's house. Red suns, smiling faces and sunflowers bobbed

gently with the moving car. Her face was somber and serious. I continued to drive on, glancing periodically at her as she sketched and ripped and arranged her tiny canvasses of art. "So tell me sweetie," I asked, "what's your favorite color?" "I love all the colors," she said, not taking her eyes from her work.

5. A man hobbled into the office pushing a vibrant-looking woman in a wheelchair. But as the woman entered, the door closed on a wheel and she was stuck. The man's wrinkles bent. Puffing, he tried to free her. The nurse hurried over and held the door while the man guided the chair. Once inside, the woman beamed and patted the man on the shoulder. His frown melted. She lifted her arms and he hugged her. Eyes bright, the woman wheeled herself to reception while the man bent slowly for a magazine and a seat. "Thank you for your help," the woman said. She glanced at the man, and continued with lowered voice and a wink, "Sometimes I need two navigators."

6. She shuffles up the steps with the last of her strength. Her pink sweatpants are tinged with brown, and her feet are buried in city-stained bunny slippers. Her eyes look like they've seen so much sadness they're forever doomed to apathy. They are eyes dazed with the work it takes to stay warm, and weary of the excess of privileged people. I'm looking at those glass eyes and thinking that she reeks of survival; that I'm too cold to move, and all I'm doing is waiting for the first train home. Out comes her wrinkled, begging hand. We turn out our pockets and find nothing. The mouth of the station swallows her descending, dejected frame.

7. The showing of the beehive had everyone's attention, and Bernie had to remind several of the boys not to touch it. It was fragile! Bernie continued his explanation. "But, even though there are thousands of species, there are only 2 kinds of bees: the social kind and the solitary kind. The bees that came from this hive were social bees, the kind that make honey. A whole bunch of 'em used to live here." Bernie went on to explain the intricacies of how honey is made and how bee-keeping as a hobby had become very popular. Two of the girls told him, they thought the hive was gorgeous. Mary Ann Hastings, angry cause Bernie's show and tell was better than hers, tried not to be interested in the beehive, but even she just had to take a good look at it ... you never got to see one up this close!!

8. As the warden stepped away, my senses heightened. I heard the men around me. This time, I listened. Some sniffed, some shuffled, some mumbled. They all breathed: life in, life out. Soon, there would be one less breath. "Ready!" the warden called. Guns swept upward. "Aim!" Bolts clacked back and forth. He paused, freezing the moment--- one I would remember for all my life, for all eternity. Everything stopped: the breathing, the shuffling, the mumbling. No motion. No sound. Nothing. "Fire!" My finger jerked. The moment was broken with our rifles cracking in unison. Blood flowed. Body slumped. I lowered my gun.

9. "The eternal ocean," he said aloud though the wind whipped the sound away. "Eternal. Everlasting. Never ending." He wiped his hand across his brow. "Unlike me." The sun glinted off the whitecaps, magnified as from a million mirrors. Though it blinded, he gazed into the glare, hoping with all his might that as the reflections washed over him, the great ocean too was somehow looking upon him. "See me," he said. "Take that part of me you see and remember. Remember so I might be eternal too." He listened, yet the ocean gave no answer---save the constant thrush of breakers rolling along the coast. Soon, a cloud extended its reach and blocked the sun, dissolving the glimmering reflections and breaking the spell they held over him.

10. Learning how to bicycle for the first time was a nerve racking independent moment. I was about five years old when my sister informed me that I was too old to still use a bike with training wheels. That was the time I decided not to depend on them anymore. Even though I had some doubt, my sister and I went outside and started to take the little wheels off my bike. With butterflies in my stomach, I slowly got on the bike, and with my shaky hands, I gripped the handles tightly. Meanwhile my sister was holding on to me to help keep my balance. I was so afraid she would let go, yet I was determined to do this on my own. Next with a little push from her, I started to peddle. The faster my bike went the faster my heart raced. Finally I looked back nervously and noticed that my sister let go of my bike a long time ago. I was so excited that I accomplished freedom on my bike.

11. A uniformed man stepped into the room pulling a gurney followed by a second attendant. He glanced at the body. "Pretty decomposed. We're gonna have to take it sheets and all." "Whatever," the detective responded with a wave. I remained standing as the ambulance attendants gathered the sheets around the body, lifted it gently from the bed, and laid it softly onto the gurney. The photographer, eyes upon the departing attendants, said, "You know, it's tragic when a man has to kill himself to get such kind treatment."

12. Mary Daley, a loyal fan of the Cooper City Little League, understood the value of calling a game (even a close one) on account of darkness. "No sense playing when it's too dark to see the ball," she always said. "The field will still be there tomorrow." There was a game most every summer evening in Cooper City. Mary never missed one. Her big old Victorian overlooked Cooper City Memorial Field; her back yard, the perfect spot to park a lawn chair. She cheered for the boys and girls on both teams, even when the littlest ones ran to third base after whacking the ball off the tee.

13. Several hours later I heard the door open. Footsteps made their way towards my defiled body. He whispered in my ear the same thing. I replied with a wail of pain. It was followed by a punch in the face. I spat blood on the floor. I heard him move about the room, and then I heard some clanging metal. He walked back over. Pain shot through my shoulder as I felt a hot knife stab into my skin. I could smell my own skin burning, and then he went for the other shoulder. I was too weak to speak, all I could do was cry in

pain. Anymore pain and I was going to die. I felt rivers of red stream down my shoulders from the wounds. He left again. Now all I could think of was my little girl. Such a sweet innocent child who did not deserve to have her father taken from her.

14. She slept on the grass, and the skunk's nose twitched while it explored the books spilling from her backpack. Had someone happened by at that moment, no doubt they would have hesitated, faced with the illusion that the little creature was contemplating "Philosophy," "World History," and "An Approach to Physics." But, as it was, the only thing that passed was a breath of wind, and it wafted over her, carrying her perfume into the skunk's busy nostrils. Berry perfume. He scampered up to her flowing hair---slipping as he crossed the philosophy text---and shook his head in an attempt to determine the source of the scent---for surely nothing he saw here resembled a patch of berries.

15. My thoughts wandered as I prayed. I let the vision of that night come---not welcoming it, but allowing it. There was Molly, reading her dinosaur book in the back seat. She asked about the Tyrannosaurs Rex. Her mother turned back to answer. Leslie only took her eyes off the road for an instant. She never saw the truck. But I did. In the passenger seat, I jammed my foot instinctively against the floorboard, but the brake wasn't there. I watched helpless as the truck flew toward us. My last memory was glass brushing across my face. I'll always wonder what Leslie and Molly's last memories were. Probably something about a giant dinosaur eating unsuspecting victims. Just like that semi ate them.

16. As his eyes focused against the early morning light filtering in through the blinded windows, he became aware of the throbbing in his head; in his arms; his back. Last night was one of those long drawn out fight nights with his mother. Another battle he had no chance of winning and even less of avoiding. A few tears of self-pity flooded, unheeded, down his puerile face. He was only ten years old and felt his situation was hopeless. Nobody could save him from her madness. Nobody would even listen. His stepfather, a weak man under the total control of his wife, actually choked him. He felt at his throat as the memory brought back the fear. He swallowed and felt the stabbing of the injured trachea. Greg rolled over again and let the momentum carry him off the bed and onto the floor. He tried to use his legs, but they failed him.

17. Meanwhile, each day the little birch leaf turned more and more golden. "We are quite beautiful," he whispered to the other leaves. "But I am afraid we will have to leave with the others. Who knows where the wind will take us?" "Have faith," answered the cabbage in the garden. "I, too, am at my best. See how plump and purple I am? See how the sun shines in the water droplets that cling to me? But I have heard from the stones that my days are numbered. I will not be here next week. I will be gone. I could fear the worst, but I have courage." "Courage? What is courage?" "Courage is what makes you happy even when everything changes. Courage is the cord to the unchangeable."

18. I squeezed my little girl's hand as the television blared across the airport lobby, "AMERICA IS UNDER ATTACK!" Our travel plans dissolved in the flames boiling upwards from the twin towers in New York, looking for all the world like the burning tips of gargantuan matches. Shock finally relented to parental instinct. I knelt in front of Marsha, hugging her and kissing her cheek. But her eyes were empty, as if any emotion would have been trivial when the whole world was burning down. "They hate us, Daddy. They did it because they hate us. I don't know what else you want me to say." Neither did I. How had those monsters robbed my baby of her heart?

19. She arrives alone. Her coach, our interpreter, delayed by storms, leaves us three to toss our languages across a canyon. In one week she'll compete at Symphony Hall. Twenty years old, a celebrity of her island nation. Leo and I are her volunteer parents with a baby grand and a room for rent where she unpacks her animist religion, a shrine of rocks on the dresser top. But downstairs she freezes at the brim of the piano room, eyes wide to the pine planks. She's unwilling to meet the piano until another day has passed. When she steps toward the piano at last, she avoids the knots like a child in a sidewalk game. Her song is cluttered, the sound of a biker avoiding the pedals. She's spooked.

20. I kept telling myself it wasn't my fault. I punched the mattress with both fists. Leaping from the bed, I stomped toward the kitchen and fell into a chair at the table, clanking a spoon into the cereal bowl. I'd eaten half the bowl before I saw the pattern forming. The surviving flakes floated in a lake of milk, clumping together into that shape---the mark I couldn't get out of my mind. "It wasn't my fault!" I yelled as I shoved the bowl away. I had craned my neck skyward to see him. Firemen swarmed, trying to get their air bag placed while police pushed against us. That's when I got the idea. I cupped my hands to my mouth and hollered, "Jump!"

21. "There's the Vineyard," he says. It's an island spec he sees. A scrap of land two miles away. It's October, and I'm too cold to correct him. Words tonight pose risk. Even now, I'm embarrassed for letting the supper wine speak through me. At the restaurant we've left, a baby sat with her mother. Father was deaf and motioned for mother to eat. He'd hold the baby, while it cooed and let spittle fall on her dimpled chin. We waved to the girl, smiled at the parents, and talked softly of our dreams. Dancing and acting. Living in Boston. Learning to cook meals like the swordfish we'd eaten. At dessert, I let go: Let's have a baby, I said. He squeezed my hand. Gladly.

22. She rolled me in front of the computer and hooked up my IV. Standing over me, our gazes met. The question was there, in her eyes. I needed to hear it, even if it was illegal for her to ask. She turned away. The question went unspoken. So did the answer. She left, and I was alone with the machine that would determine if today was my day to die. I had, after all, been fighting three years for this. Three long years of hospitals, chemotherapy, nausea, lost weight, drugs, familial pity... Nothing helped, and the pain kept coming. I was tired of it all. I held my finger over the button.

23. “You can’t get away from me, Fanny!” He yelled. BANG! BANG! BANG! The shots were deafening. Fanny dropped the gun; it was smoking. She stood over the motionless body. They had had another volatile argument. He beat her profusely; she was still suffering from the previous beatings. Fanny managed to get to the gun, and shoot him point blank in the chest. “You monster! I hope you are dead!” She uttered. Fanny didn’t know what she was going to do next. She was trembling and scared. Within minutes, she heard sounds of blasting sirens. There were pounding knocks at the door. Fanny stepped over the body, walking slowly to open the door. The police entered and immediately saw the body.

24. My porch is ten feet from the sidewalk. I sit with my toes spread out on the warm cement and watch the hypnotic stride of the first boy's blades coming toward me. He is effortless. Shiny blond hair and new brand-name clothes with surfer logos from head to toe, as perfect as a movie. His face is like a fighter pilot's, I think as he flies by, far ahead of the others. He doesn't look at me. He eyes the end of the street where he is headed - not a through street, but there's a path to the beach there. He's acutely aware of being the fastest, the best: it's important to him, I'm sure by his unsmiling face that does not even seem to enjoy the ease and grace with which it speeds on those thin wheels.

25. Carla's pocket has sprung a hole. Her car keys and loose change rattle around in the hem of her coat. People in the mall parking lot stare as she flips the coat up waist-high to burrow her fist deep inside the silk lining, chasing elusive objects. Her daughter, Becca, stares fascinated. Four years old, she has a new passion for holes, crannies, basements and otherwise secret compartments. The pair of shoes Carla's spent all afternoon searching for dangle from Becca's limp wrist. Carla locates the car keys, but not the loose change. The mall car park is full of milling pedestrians. A reeking Santa rings a bell as an elf holds out a tin-can for charity. Carla walks past, apologetic. Muddy snow lies in puffed tracks. The wind snaps.

26. Tom pulled the whistle as we hit a turn, and the side door shot open, and this ragged hobo hopped in. He was black with soot, and had sticks and leaves in his beard and hair. "I'm takin' over this train," he said. Tom jumped for his revolver, but the hobo was faster, and cracked Tom's head with a little pipe he was carrying. Tom fell, and the hobo grabbed the gun and cracked my jaw with it, which wasn't fair because I didn't do anything. The struggle woke Jim, and he jumped at the hobo, but the hobo was faster, and Jim got shot through the shoulder. He staggered a bit, like we were running over some bad rail, and the hobo shoved him backward out the door into the trees. Then he tied Tom and me to the seat. My chin throbbed. The pistons beat up and down, up and down.

27. Nothing is saved from the snowdrift. Boots skid from curbs into filthy meringues of ice. Singly or in single pairs the hooded figures slush along the usual troughs, passing the yellow sign of St. Hubert's Grill. A giant butler-cock invites me to cheese fries



doused in broth, but I'm pushing on, thanks. Headlights swing shadows over the tracked snow. On a last-light hill the streetlamps petrify trees in rings of amber and ash-blue, their branches shocked like veins in marble. The frost-capped dome of St. Joseph's Oratory - patina-green belly injected by a cross - blimps over Citizens Bank. Twilight crumbles the clouds like chalk. I think of Salinger's De Daumier-Smith and the "cold, white summits of his profession," and also of Christ, whose glorious death makes all us victims jealous. For every master a coterie of burnouts, for every risen messiah a million peasant carpenters wrapped in canvas, dumped together in limy holes. A man stares me down as the ribbons of our breath twist and expire. A Mercedes trundles past on a flat tire, not stopping, and suddenly some lady gongs a trashcan with her cane. My fingers flexing in my pocket find a shopping list.

28. The light turned green and Smitty drove through the intersection, through the entrance, and followed a cobblestone drive until they reached the parking lot. Rebecca brought paperwork to prove that she owned plot #1193, but when she tried to show the papers to the front-desk attendant, he didn't want to see them and handed her a map of Grassy Hills. After studying the map, they decided to walk to the section of the cemetery where her plot could be found, a place called "Orchard Mound." It was mid-morning, and sunlight broke through the leafy canopy creating a wave of emerald swatches. Rebecca stopped and admired a carved tombstone with twin granite urns holding crimson roses. She read the epitaph: "Dana Wilcox, a loving mother and wife."

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