Retrieval-Induced Forgetting of Emotional Autobiographical Memories

BY

TARA ALAINE JOBE
B.A., University of Illinois at Chicago, 2009

THESIS

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Defense Committee:

Benjamin Storm, Advisor and Chair
Jennifer Wiley
Thomas Griffin
I dedicate my thesis to my parents, Steve and Penny, whom have been a constant source of support and encouragement. If not for them, I would have never been able to pursue all my dreams, academic and otherwise. I would also like to thank my sister, Brooke, and my fiancé, Kellen, whom have given me love, support, and laughter throughout this process.
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<td>BDI-II</td>
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SUMMARY

Retrieval-induced forgetting is a phenomenon in which the retrieval of an item from memory causes the forgetting of other related or competing items. This forgetting is thought to be the consequence of inhibitory processes that act to prevent unwanted competing responses from coming to mind when attempting to retrieve a target response. While Barnier, Hung, and Conway (2004) demonstrated that autobiographical events can be forgotten using a retrieval-induced forgetting paradigm, they failed to control for output order. The current study replicated Barnier et al. (2004) while controlling for output order to test whether the forgetting they observed was merely due to blocking-based output interference. After recalling positive and negative autobiographical memories using word cues, participants were asked to retrieve a subset of their originally reported memories. They were then tested on their ability to retrieve initially recalled memories. We predicted similar results to Barnier et al. (2004), such that people would show retrieval-induced forgetting for autobiographical memories that are followed by the retrieval of other, related memories. Results supported this hypothesis; people recalled positive and negative unpracticed memories from practiced cue word sets at a lower rate than unpracticed positive and negative memories from unpracticed cue word sets. By demonstrating forgetting while controlling for output interference it is clear that other mechanisms, such as inhibition, may be responsible for autobiographical retrieval-induced forgetting.
I. INTRODUCTION

Though forgetting may seem like the opposite of remembering, forgetting of certain unwanted or irrelevant information can actually help people remember other relevant or important information (Bjork, 1989). One way in which forgetting of information can occur is through the retrieval of other information in memory. This occurrence is known as retrieval-induced forgetting. Retrieval-induced forgetting is a phenomenon in which the retrieval of some information from memory causes the forgetting of other, related or competing information (Anderson, Bjork, & Bjork, 1994). The inhibitory account of retrieval-induced forgetting posits that when attempting to retrieve an item from memory, other related, but irrelevant items must be suppressed to facilitate the retrieval of the target memory (Anderson, 2003; Storm, 2011). This retrieval attempt later results in an inability to recall the suppressed items at the same rate as items that did not cause competition at retrieval (Anderson et al., 1994).

The standard retrieval-practice paradigm used to examine retrieval-induced forgetting consists of three phases (Anderson et al., 1994). In the first phase, participants study a series of category-exemplar pairs (e.g., fruits: lemon, weapons: tank, fruits: orange, weapons: sword). The pairs are typically presented one at a time for several seconds in an interleaved order. Participants are then asked to retrieve half the exemplars from half the categories via category-plus-two-letter-stem retrieval cues (e.g., fruits: le______). This selective retrieval practice creates three types of items: practiced exemplars from practiced categories (Rp+ items); non-practiced exemplars from practiced categories (Rp- items); and non-practiced exemplars from non-practiced categories (Nrp items). Finally, participants are given a category-cued recall test for all the exemplars from the
original study phase. The superior recall of Rp+ items relative to Rp- and Nrp items exhibits the benefits of retrieval practice, whereas the inferior recall of Rp- items relative to Nrp items reveals the costs of retrieval practice. These costs are evident in the decreased recall of Rp- items compared to Nrp (baseline) items.

While retrieval-induced forgetting has commonly been studied using category-exemplar word pairs, it is a robust finding that has been observed using a wide variety of procedures (e.g., semantic generation, Bäuml, 2002; autobiographical simulation, Storm & Jobe, under review; eyewitness memory, Shaw, Bjork, & Handal, 1995; mental imagery, Saunders, Fernandes, & Kosnes, 2009; creative problem solving, Storm, Angello, & Bjork, 2011; and language selection, Levy, McVeigh, Marful, & Anderson, 2007). Further, differences in retrieval-induced forgetting have been found between individuals and among certain clinical populations (e.g., Aslan & Bäuml, 2011; Storm & Angello, 2010; Storm & White, 2010). Differences in retrieval-induced forgetting have also been found to relate to the differential recall of negative autobiographical memories (Jobe & Storm, in prep). Specifically, people who exhibit higher levels of retrieval-induced forgetting also recall fewer negative autobiographical memories than people who show little to no retrieval-induced forgetting. This finding suggests that retrieval-induced forgetting may contribute to people’s ability to forget unwanted memories from their personal past.

**Theoretical accounts of retrieval-induced forgetting.** The two main accounts of retrieval-induced forgetting are the interference account and the inhibitory account. The interference account posits that retrieving an item from memory strengthens its accessibility, making it harder to retrieve other related items that have less accessibility. However, the inhibitory account of retrieval-induced forgetting suggests that retrieval-induced forgetting is the consequence of inhibitory processes that are activated during retrieval to resolve competition—
specifically, inhibition is used to prevent strong, yet contextually inappropriate items from interfering with the retrieval of target items (Anderson, 2003; Storm, 2011). According to this account, a given retrieval-practice cue may activate many items in memory, not only the target exemplar (Rp+ items), but also unwanted, non-target exemplars (Rp- items). Inhibition is elicited to suppress the non-target exemplars, thereby facilitating access to the target exemplar. Thus, retrieval-induced forgetting is believed to reflect an adaptive mechanism in memory that functions to resolve competition and facilitate retrieval.

One important finding that has provided evidence for the inhibitory account is that retrieval-induced forgetting is strength independent (e.g. Bäuml, 2002). For example, it has been shown that when merely re-presented with half the items from half the categories of the original study list, re-presentation-induced forgetting is not observed (see also Román, Soriano, Gómez-Ariza, & Bajo, 2009; Saunders et al., 2009). Storm, Bjork, Bjork, and Nestojko (2006) also demonstrated the strength independence of retrieval-induced forgetting by finding the standard forgetting effect after conducting an impossible retrieval-practice paradigm. The blocking account would not predict either of these results however, as according to that account re-presentation should strengthen accessibility and lead to forgetting, while items that are not successfully retrieved should not be strengthened, and thus not cause forgetting.

Retrieval-induced forgetting has also been found to be competition dependent (e.g. Anderson et al., 1994; Shivde & Anderson, 2001; Storm, Bjork, & Bjork, 2007; for a review see Storm, 2011). For example, Anderson and colleagues (1994) manipulated the associative strength of practiced and non-practiced items to a common category (e.g. fruit). They found that items of high associative strength (e.g. orange, lemon) suffered forgetting when other related items were practiced, but items of low associative strength (noncompetitive items; e.g. guava, lychee) did
not show retrieval-induced forgetting. Items of high associative strength should cause more competition at retrieval because they easily come to mind when prompted with a given category, thus they need to be inhibited more than items of low associative strength. This finding provides further support for the inhibitory account, which is now the most widely accepted account of retrieval-induced forgetting. However, other competing accounts are also argued to explain retrieval-induced forgetting (e.g. MacLeod, Dodd, Sheard, Wilson, & Bibi, 2003).

The primary competing account against inhibition is the interference or blocking account of retrieval-induced forgetting. This account suggests that the retrieval of an item from memory strengthens that item’s accessibility making the item more likely to be retrieved in the future. This strengthening of accessibility in turn blocks other related items in memory during the final test, making it difficult to get around the stronger but inappropriate response to retrieve another, more appropriate response (Blaxton & Neely, 1983; Brown, 1981; Brown, Whiteman, Cattoi, & Bradley, 1985; J.R. Anderson, 1983; Raaijmakers & Shiffrin, 1981). While this account of retrieval-induced forgetting offers an alternative underlying mechanism than that suggested by the inhibitory account, retrieval-induced forgetting can be caused by both inhibition and interference, and separating the two can sometimes be difficult (Anderson & Levy, 2007). This difficulty is due to the correlated costs and benefits of inhibition and varying levels of forgetting across individuals. For example, if the word banana is inhibited to retrieve apple in response to the cue fruit: ap___, it will be harder to recall on a final test. However, during the final test apple may also be inhibited when attempting to retrieve banana in response to the cue fruit: b___. The cost of retrieving apple during retrieval practice is therefore mitigated by the correlated benefit of retrieving banana on the final test. Thus, someone who has good inhibitory control and is able to suppress competing items in memory may show no more forgetting than
someone who has poor inhibitory control and shows forgetting simply because they are unable to overcome interference on the final test.

Another reason why separating inhibitory-based forgetting from interference-based forgetting can be difficult in retrieval-induced forgetting studies is because researchers sometimes fail to control for output interference at final test. Output interference occurs when only category cues are used during the final test (without letter stems to cue a specific item in a category), which allow people to recall items within that category in any order they come to mind. Not surprisingly, people tend to recall items that were practiced first, which then interferes with the recall of unpracticed items from the practiced categories, resulting in the forgetting of these items compared to unpracticed items from unpracticed categories (e.g. Jakab & Raaijmakers, 2009; Williams & Zacks, 2001). This type of retrieval-induced forgetting could be due to blocking or interference occurring during the final test rather than competition during retrieval-practice. Other studies that control for output interference still show forgetting however, providing evidence against a wholly output-interference account of retrieval-induced forgetting (for a review, see Anderson, 2003). By demonstrating forgetting while controlling for output interference it becomes clear that other mechanisms, such as inhibition, may be responsible for the retrieval-induced forgetting effect.

**Retrieval-Induced Forgetting of Autobiographical & Emotional Memories**

Although the phenomenon of retrieval-induced forgetting has been observed using a variety of materials, there is currently little evidence that retrieval-induced forgetting can occur for autobiographical memories. Some studies have attempted to examine retrieval-induced forgetting of autobiographical memories but mixed results have made it difficult to derive any strong conclusions. In one of the first studies of retrieval-induced forgetting and
autobiographical information, Macrae and Roseveare (2002) found no evidence of retrieval-induced forgetting for self-referential information. They had people study various gifts from one of two categories (e.g. indoor: vase; outdoor: tent) by having them imagine either themselves or another person buying the gifts. They then had participants complete retrieval practice for half the gifts from one of the categories. Participants were given a category plus two letter stem (e.g. indoor: va___) as a cue for retrieving the target gift. This was followed by a final test using category plus one letter stem cues (e.g. indoor: v__). While no retrieval-induced forgetting was found for unpracticed items people imagined buying themselves, items that people imagined others buying did show retrieval-induced forgetting. They concluded that one boundary condition on retrieval-induced forgetting occurs when information is personally relevant.

This finding may not be entirely unexpected given the interconnectedness between memory and the self (Conway, 2005). Long-term memory serves to form a concept of the self, but also interacts with present goals and self-images to form the *working self*. Based upon this interaction between long-term memory and the self, it seems plausible that autobiographical memory may not be susceptible to the same type of forgetting observed in previous retrieval-induced forgetting experiments. This is because autobiographical memories may become so well integrated with one another and the working self that they do not compete during retrieval attempts, thus protecting them from retrieval-induced forgetting (Anderson, Green, & McCulloch, 2000). On the other hand, autobiographical memories may not suffer retrieval-induced forgetting because they are highly distinctive from other memories, which would also prevent them from competing (Smith & Hunt, 2000). However, Macrae and Roseveare (2002) are not the only researchers to examine the possible retrieval-induced forgetting of personally
relevant information, and other researchers have found that this type of forgetting for autobiographical is possible (Barnier, Hung, & Conway, 2004).

In their 2004 study, Barnier and colleagues attempted to demonstrate the forgetting of emotional autobiographical events through retrieval-induced forgetting by having people recall autobiographical memories using nine cue words that were of positive, negative, or neutral valence. They had participants elicit, practice, and recall various autobiographical memories from their past. In the elicitation phase, the experimenter read a list of nine words to participants and asked the participants to think of and verbally report various autobiographical memories associated with each word. Three of the nine words were of a negative valence (horrified, tragedy, sickness), three were of a positive valence (entertaining, excitement, happy), and the remaining three were of a neutral valence (patient, hardworking, polite). The nine words were read to each participant four times in a randomly assigned, counterbalanced order. Each time the participant heard a word, they were to think of a new episodic autobiographical memory in relation to that word, resulting in a total of four different memories for each of the nine words. Once the participant had thought of a memory, they provided the experimenter with a short (10-15 word) description of the memory. After describing each memory, the participants were asked to provide a “personal” cue word to summarize the memory, report their age at the time of the event, and provide ratings of clarity and emotional valence. The researchers did not impose a time limit on this task to ensure participants were able to elicit four memories for all words provided.

After four memories had been elicited for each of the nine words, the researchers then conducted a learning phase. In the learning phase, the experimenter read each cue word, along with an associated personal word and the entire autobiographical memory provided by the
participant, and then paused for 20 seconds during which the participant was supposed to make a mental connection between the cue word, personal word, and description. Each of the nine cue words were read with the four personal words and associated memories reported during the elicitation phase in a new random order so that the participant practiced all the memories they provided.

Following the learning phase, participants completed the retrieval practice phase. During this phase the experimenter read participants a subset of cue and personal word pairs, for which participants were to respond with the memory associated with that pair within 20 seconds. Two memories from three cue words (one of each emotional valence) were practiced and served as Rp+ items, while two other memories from three different cue words (again, one of each valence) were practiced but served as filler words. This created a total of 12 retrieval practice trials (comprised of half the memories from 6 of the 9 cue word sets), which were repeated for three rounds (36 trials total). In the first round of retrieval practice, participants were merely asked to say “yes” when they thought of the correctly associated memory, then report that memory as close to verbatim as possible to the experimenter. In the second round, participants were again to report the correctly associated memory, but were also asked by the experimenter to report any additional details they could remember about the event that they did not previously report. In the third and final round, after recalling the correct memory, participants were asked for further information about the event using three standard probes (Where were you?; Who were you with?; How did you feel?). If during any round of retrieval practice a participant gave no response or an incorrect response, the experimenter simply moved on to the next cue word – personal word pair without asking any further questions. Immediately following retrieval practice, participants completed two 5 minute distracter tasks including the Short Clerical Test.
(ACER) and the L-shaped Puzzle (Snodgrass & Burns, 1978).

In the final phase of their experiment, Barnier and colleagues (2004) tested participants on their ability to remember all the memories they reported during the elicitation phase. The experimenter read each cue word aloud, and participants were asked to report all the memories they could recall that they originally associated with that cue word. Participants were given 60 seconds to recall memories from each of the nine cue words, and were allowed to report them in any order. The results revealed that participants demonstrated forgetting of Rp- items (unpracticed memories associated with the same cue words as practiced memories during retrieval practice) compared to their Nrp items (memories associated with cue words that were not used during retrieval practice). Specifically, Nrp items were recalled an average of 76% of the time, and Rp- items were only recalled an average of 63% of the time. Unfortunately, the authors did not test the effect by emotional valence, but the means suggest the retrieval-induced forgetting effect may be greater for positive and negative memories than neutral memories, with the largest forgetting effect being observed for negative memories. A follow-up study conducted by Wessel and Hauer (2006) also found retrieval-induced forgetting for negative memories, but not for positive memories.

Unfortunately, the experiments conducted by Barnier et al. (2004) and Wessel and Hauer (2006) give little insight into the underlying process that lead to the observed retrieval-induced forgetting effect. The main reason why no underlying process can be determined from the study conducted by Barnier and colleagues (2004) is because they failed to control for output interference (this was also true of the study conducted by Wessel & Hauer, 2006). By using the same cue word for four different memories, participants were able to recall Rp+ and Rp- items in any order during the final test. Due to the strengthening of Rp+ items during practice, people
likely recalled these items first, creating output interference for Rp- items at the time of test. For example, participants may have recalled the two practiced memories associated with the practiced cue *horrifying* prior to recalling the unpracticed memories associated with the same cue word. Thus, the forgetting of Rp- items compared to Nrp items might be explained by the strengthening of Rp+ items and their subsequent interference with Rp- items on the final test rather than the suppression of Rp- items during retrieval practice. Even when output order is not biased toward Rp+ items, category-cued recall tests can be poor measures of inhibitory-based forgetting due to their increased vulnerability to strength-based associative interference and strategy disruption (Dodd, Castel, & Roberts, 2006).

**Logic of the Present Study**

Although previous research has provided evidence that autobiographical memories can be forgotten via retrieval-induced forgetting, demonstrating that forgetting still occurs when controlling for output interference is both interesting and important because it extends previous work on autobiographical retrieval-induced forgetting and provides evidence that autobiographical memories may be forgotten via an inhibitory mechanism in memory. One might predict that inhibition would not act upon emotional autobiographical memories. As mentioned earlier, such memories may be highly distinctive, and thus be protected from inhibitory-based forgetting (Smith & Hunt, 2000). Likewise, emotional autobiographical memories may also be so well integrated into the working self that they cannot be forgotten through inhibitory-based retrieval-induced forgetting (Anderson et al., 2000). In both of these scenarios, these types of memories would not show forgetting because they would not compete when other related memories are retrieved (for a review, see Storm, 2011). However, one might also predict that people will forget emotional autobiographical memories through inhibitory-
based forgetting just as they do other types of items in memory. If personally-relevant emotional memories do not fall into one of the boundary conditions of retrieval-induced forgetting, they should compete during retrieval attempts just as other types of memories (e.g. semantic & non-autobiographical episodic memories) do, resulting in analogous forgetting. Further, emotional autobiographical memories may be especially susceptible to retrieval-induced forgetting since they are more emotionally arousing than other types of memories and thus might cause greater competition during retrieval attempts. If emotional autobiographical memories do cause greater competition, then they would need to be inhibited to an even greater extent than other unemotional non-self-relevant memories.

To investigate whether autobiographical memories can be forgotten by some means other than output interference, the present study used a design similar to that used by Barnier and colleagues (2004). Instead of using only a category-cued final test like Barnier et al. (2004), participants were tested using a cue word-plus-one-letter-stem. This design limited output interference making it easier to interpret the results. Based on the competition dependence of retrieval-induced forgetting and previous work on autobiographical memory, we predicted that retrieval-induced forgetting would be observed for both positive and negative memories when controlling for output order. Demonstrating an overall decrease in recall of Rp- items compared to Nrp items when controlling for output order would provide support against a purely interference based account of retrieval-induced forgetting for autobiographical memories.

II. METHOD

Participants

Fifty-two undergraduate students (13 males, 39 females) from the University of Illinois at Chicago’s introductory psychology subject pool received partial course credit for their
participation in this study ($M_{age} = 18.92$, $SD = 1.34$).

**Design**

The current experiment replicated Barnier et al. (2004) with only a few minor exceptions. These exceptions included removing the neutral cue word sets, adding three negative and three positive cue words, altering the final test to control for output order by using one letter stems as cues which subsequently tests the recall of the key words (or what Barnier et al. called “personal” words) as opposed to testing the memories directly, and adding two surveys following the completion of the retrieval-induced forgetting experiment.

We employed a within-subjects design with two independent variables: emotional valence (Positive, Negative) and item type (Rp+, Nrp+, Rp-, Nrp-). Four counterbalanced retrieval practice conditions were created to ensure that each positive and negative cue word served as each type of retrieval practice item. Participants were randomly assigned to one of these four counterbalanced conditions.

**Materials**

The three negative and three positive cue words from Barnier et al. (2004) plus another three negative (*painful, sad, embarrassed*) and three positive (*proud, pleased, inspired*) were randomly ordered to create a list of cue words for participants to retrieve episodic autobiographical memories from their past (see Appendix A). The six extra words were added to increase the number of observations, and thus power. These twelve words were also counterbalanced into four sets for retrieval practice so that each word served as an Rp+/Rp- cue word as well as a matched Nrp+/Nrp- cue word. These 12 cue words were also used to create another two counterbalanced lists for the final test in which Rp- memories and matched
Nrp memories (Nrp-) were tested in the first half of the list, while Rp+ memories and matched Nrp memories (Nrp+) were tested in the second half of the list. No cue word was ever presented more than once consecutively.

Other materials included Snodgrass’ and Burns’ (1978) L-shaped Puzzle (see Appendix B), which was simply used as a distracter task, and two surveys (see Appendix C): the Positive and Negative Affect Schedule (PANAS-X; Watson, Clark, & Tellegen, 1988) and the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996). These short surveys were used to assess personal affect and identify individuals who may be suffering from depression. Previous work has shown that people suffering from depression often fail to demonstrate the retrieval-induced forgetting effect (Groome & Sterkaj, 2010), so these measures were used to examine any possible interaction between affect and memory recall.

**Procedure**

This experiment consisted of four primary phases including an elicitation phase, learning phase, retrieval practice phase, and a final test phase. A complete experimenter script can be found in Appendix D.

**Elicitation.** In the elicitation phase, participants were randomly assigned to one of four counterbalanced orders and were presented with the twelve cue words (6 positive and 6 negative) for a total of four times each. When each cue word was presented, the participants were asked to recall a unique episodic autobiographical memory associated with that cue word. Participants were instructed that each memory they provide must be different from all other memories both within a given cue word and across all cue words. Participants were given an unlimited amount of time to complete this task, but were told that they are to think of related memories as quickly as possible. Once a memory had been brought to mind, the participants were told to provide a
brief 10-15 word description of that memory. They were also asked to provide their age at the
time of the event and ratings of clarity and emotional valence (using a seven point scale).
Instead of having participants also create a personal word for each memory, the experimenter
created key words for each event to ensure that each key word within a cue word set (e.g.
horrified) began with a different letter. This was important for the final test in which the first
letters of the key words were used as cues for each specific memory. Once four memories were
recorded for each of the twelve cue words, participants began the learning phase.

**Learning.** In the learning phase, participants were read each cue word with the key words
the experimenter created and their associated autobiographical memories. These sets of cue
words, key words, and memories were presented in a new random order with no cue word being
given more than once consecutively. After hearing each cue word, key word, and memory set,
the experimenter paused for 20 seconds in which the participants were to create a mental
connection between the cue and key words and their associated memory. This was done once for
all 48 cue word – key word – memory sets.

**Retrieval practice.** Following the learning phase, participants completed the retrieval-
practice phase. In this phase, participants were provided with cue and key word pairs, and asked
to retrieve the correct memory associated with each pair. Half the memories from half the cue
words were practiced during this phase (two memories from three negative cue words and two
memories from three positive cue words for a total of 12 memories). Participants were given 20
seconds to recall each memory after the cue word – key word pair was presented. Three rounds
of retrieval-practice were conducted and the order of cue word – key word pairs varied between
each round. In the first round, participants simply reported the associated memory as close to
verbatim as possible to the experimenter. In the second round, participants were also asked to
provide any information they could remember about the event that they did not previously report. Finally, in the third round, participants were asked to provide further details regarding where they were, who they were with, and how they felt during each event after they recalled their description of each memory. Once all three rounds of retrieval practice were complete, participants were given the L-shaped puzzle (Snodgrass & Burns, 1978) as a 5-minute distracter task. If a participant finished this task before the 5 minutes elapsed they were told to continue looking for a better solution than the one they provided. The Short Clerical Test (ACER) was not administered as in Barnier et al. (2004) however, to prevent any possible verbal contamination.

**Final test.** Following the 5 minute distracter task, participants were asked to recall the key words and memories they practiced in the learning phase. Key words and memories were tested in a new, random order with Rp- and Nrp- items being tested in a block prior to Rp+ and Nrp+ items. To test each item, the experimenter provided participants with a cue word-plus-one-letter-stem from the key word, and participants were then given 15 seconds to recall the correct key word and memory associated with that cue word-plus-one-letter-stem. If the participant was able to recall the correct key word and associated memory in response to the cue word-plus-one-letter-stem, their response was marked as correct.

After the final test was complete, participants filled out the PANAS-X (Watson et al., 1988) followed by the BDI-II (Beck et al., 1996). These surveys were included to examine if individual differences such as personal affect or depression influenced the extent to which emotional autobiographical memories were forgotten through the retrieval of other related memories.
III. RESULTS

Ratings of Age, Clarity, and Emotion

The positive memories participants reported occurred at significantly older ages \((M = 16.47; SD = 1.74)\) than the negative memories reported \((M = 14.92; SD = 1.93)\), \(t(51) = 9.98, p < .001, d = 1.41\). Participants also rated their positive memories \((M = 5.92; SD = .63)\) as clearer than their negative memories \((M = 5.60; SD = 0.82)\), \(t(51) = 5.10, p < .001, d = .76\). Not surprisingly, positive memories \((M = 6.04; SD = .57)\) were rated as more positive on the emotionality scale than negative memories \((M = 2.53; SD = .71)\), \(t(51) = 22.42, p < .001, d = 3.13\).

Tests of Pearson’s correlation revealed no significant relationships between retrieval-induced forgetting of positive memories and age, clarity, or emotion (see Table 1). However, there was a significant correlation between retrieval-induced forgetting of negative memories and age, \(r(50) = .37, p < .05\), such that participants’ levels of retrieval-induced forgetting increased as their memories became more recent. No other relationships were found between retrieval-induced forgetting of negative memories and clarity or emotion.

Final Cued-Recall

The mean proportions of memories recalled on the final test are shown in Figure 1 as a function of emotional valence. A paired samples t-test indicated a negativity bias in overall recall, \(t(51) = -4.10, p < .001, d = -.54\). Participants recalled negative autobiographical memories \((M = .40; SD = .15)\) better than positive autobiographical memories \((M = .32; SD = .14)\).

To test the benefits of retrieval practice a 2 (Positive vs. Negative) x 2 (Rp+ vs. Nrp+) repeated measures Analysis of Variance (ANOVA) was conducted. This analysis revealed a significant main effect of valence, \(F(1, 51) = 9.28, p < .01\), as well as item type, \(F(1, 51) =\)
18.23, \( p < .001 \) (see Figure 2). Paired samples t-tests revealed that practiced positive memories \((M = .43; SD = .22)\) and practiced negative memories \((M = .49; SD = .24)\) were recalled significantly better than their respective baseline memories \((M = .29; SD = .20\) for positive Nrp+ memories; \(M = .38; SD = .25\) for negative Nrp+ memories), \(t(51) = 4.00, p < .001, d = .56,\) and \(t(51) = 2.44, p < .05, d = .34.\) No interaction was found between positive Rp+ and Nrp+ memories and negative Rp+ and Nrp+ memories, \(F(1, 51) < 1, ns.\)

A second 2 (Positive vs. Negative) x 2 (Rp- vs. Nrp-) repeated measures ANOVA was used to test retrieval-induced forgetting. This analysis revealed a significant main effect of valence, \(F(1, 51) = 12.91, p < .001,\) as well as item type, \(F(1, 51) = 15.56, p < .001\) (see Figure 3). A paired samples t-test revealed significant forgetting of unpracticed positive memories from practiced cue word sets \((M = .23; SD=.19)\) compared to positive memories from unpracticed cue word sets \((M = .32; SD=.20), t(51) = -2.80, p < .01, d = -.39.\) Likewise, unpracticed negative memories from practiced cue word sets \((M = .33; SD=.23)\) were forgotten compared to negative memories from unpracticed cue word sets \((M = .42; SD=.23), t(51) = -2.57, p < .05, d = -.36.\) Again, no interaction was found between positive Rp- and Nrp- memories and negative Rp- and Nrp- memories, \(F(1, 51) < 1, ns.\)

**Emotional Affect and Retrieval-Induced Forgetting**

As can be seen in Table 1, no significant relationships were found between retrieval-induced forgetting for positive and negative memories and scores on the BDI-II (Beck et al., 1996). There was also no significant relationship between retrieval-induced forgetting of positive memories and the PANAS-X (Watson et al., 1988; see Figure 4). However the relationship between retrieval-induced forgetting of negative memories and the PANAS-X showed a trend toward significance, \(r(50) = -.24, p = .09.\) Participant’s in more negative affective states (as
signified by more negative PANAS-X composite scores) demonstrated more retrieval-induced forgetting for negative autobiographical memories.

**IV. DISCUSSION**

The current study was conducted to determine if it is possible for emotional autobiographical memories to be forgotten via inhibitory-based retrieval-induced forgetting. As predicted, people demonstrated retrieval-induced forgetting for both positive and negative autobiographical memories. Retrieval practice also resulted in facilitation of practiced memories, regardless of emotional valence. These results are nearly identical to those obtained by Barnier and colleagues (2004), but provide evidence that it is possible for emotional autobiographical memories to suffer inhibitory-based forgetting due to the nature of our final test. By using a one-letter stem to cue specific memories within a larger cue word set, we were able to control the order in which participants recalled their memories. Specifically, we controlled for output interference by testing Rp- and Nrp- items prior to Rp+ and Nrp+ items, and are thus able to provide evidence against a wholly interference-based account of autobiographical retrieval-induced forgetting.

Similar to many studies, a negativity bias was observed in overall recall (for a review, see Baumeister, Bratslavsky, Fikenauer, & Vohs, 2001). While there were no significant relationships found between people’s individual retrieval-induced forgetting scores and personal affect (as measured by the PANAS-X and BDI-II), the trend observed between retrieval-induced forgetting of negative memories and the PANAS-X (Watson et al., 1988) suggested that more negatively valenced moods may be associated with greater levels of forgetting for negative memories. One possible explanation for this finding is that being in a negative mood may create more competition during retrieval of negative memories and thus necessitate more inhibition. While previous results
suggest that people who are in a negative mood or suffer from depression do not exhibit retrieval-induced forgetting (Harris, Sharman, Barnier, & Moulds, 2010; Groome & Sterkaj, 2010) the relationship between mood, depression, and retrieval-induced forgetting is still unclear (Harris, Sharman, Barnier, & Moulds, 2010).

Some researchers have argued that it is important to remember negative events so they can serve as tools to guide future decisions and behaviors (e.g. D’Argembeau & Van der Linden, 2008). Therefore, it is somewhat surprising that Barnier and colleagues (2004) found retrieval-induced forgetting of both positive and negative autobiographical memories. If remembering negative events is necessary for an adaptive memory system (e.g. Schacter & Addis, 2007), then we should not see forgetting of negative memories. However, we replicated the results found by Barnier et al. (2004) after controlling for output order, which provides further evidence of autobiographical retrieval-induced forgetting and suggests that negative memories are no more protected from retrieval-induced forgetting than positive memories. Still, in both our study and the study conducted by Barnier et al. (2004), we only tested the recall of negative autobiographical memories following retrieval practice of other related negative memories. Future studies must be conducted to determine whether other types of retrieval, such as retrieval of related positive or neutral memories, can also lead to the forgetting of negative autobiographical memories. Such studies would reveal the conditions under which people can forget negative autobiographical memories via retrieval-practice and help determine the underlying mechanism(s) of any observed retrieval-induced forgetting.

**Future Directions**

By establishing that emotional autobiographical memories can suffer forgetting that is not solely interference-based, we have set the stage for future research that can help us understand
more about how personal and emotional memories are able to be forgotten. One way in which this might be done is by conducting an experiment that examines whether certain types of retrieval lead to more or less forgetting. By creating a retrieval practice in which people practice related memories of not only the same valence (as was done in the current experiment), but also the opposite valence (i.e., practicing positive memories related to negative memories or vice versa), we could learn more about the dynamics of retrieval-induced forgetting in the real world. If people do not exhibit retrieval-induced forgetting for negative autobiographical memories following retrieval practice of related positive memories, then perhaps negative memories are protected from forgetting to a certain extent. However, if people demonstrate greater retrieval-induced forgetting for negative memories when other related positive memories are practiced (as opposed to other related negative memories) it would show that negative memories are not different from positive memories in terms of their susceptibility to retrieval-induced forgetting. An increase in retrieval-induced forgetting of negative memories following retrieval practice of related positive memories would also suggest that retrieval-induced forgetting may benefit not only people’s ability to recall target information, but also their ability to forget memories that might otherwise lead to anxiety or even depression and post-traumatic stress disorder. If a mechanism in memory exists that allows people to forget negative memories, it could facilitate the maintenance of a positive working self (Conway, 2005) and prevent the development of disorders associated with recurring or intrusive memories (see Groome, Thorne, Grant, & Pipilis, 2008).

Conclusions

In the current study we demonstrated that output interference cannot be the sole cause of the retrieval-induced forgetting observed in Barnier et al. (2004). By using an item-cued final test we were able to control for output interference, which made it impossible for people to recall Rp+
items prior to Rp- items and thus suffer forgetting simply due to proactive interference. This finding extends previous work on retrieval-induced forgetting and provides insight into the role of retrieval-induced forgetting in real life situations. Still, the underlying mechanisms of autobiographical retrieval-induced forgetting have yet to be identified, and further research is necessary to determine the conditions in which people are able to forget personally relevant emotional memories. Although there are many factors that determine whether people remember or forget (e.g. the need to remember, the need to forget, competition, interference, etc.), this study helps rule out a wholly interference-based account of autobiographical retrieval-induced forgetting so we can move on to examine more interesting research questions.
TABLE I

Correlations between retrieval-induced forgetting for positive and negative memories, ratings of age at time of the event, clarity, and emotion, and scores on the PANAS-X (Watson et al., 1988) and BDI-II (Beck et al., 1996). Retrieval-induced forgetting is measured as percent forgotten compared to baseline, so more positive scores represent more retrieval-induced forgetting.

<table>
<thead>
<tr>
<th>Retrieval-Induced Forgetting</th>
<th>Positive Memories</th>
<th>Negative Memories</th>
</tr>
</thead>
<tbody>
<tr>
<td>PANAS-X</td>
<td>-.01</td>
<td>-.24</td>
</tr>
<tr>
<td></td>
<td>.92</td>
<td>.09</td>
</tr>
<tr>
<td>BDI-II</td>
<td>.10</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td>.48</td>
<td>.48</td>
</tr>
<tr>
<td>Age</td>
<td>-.07</td>
<td>.37*</td>
</tr>
<tr>
<td></td>
<td>.61</td>
<td>.01</td>
</tr>
<tr>
<td>Clarity</td>
<td>-.14</td>
<td>.16</td>
</tr>
<tr>
<td></td>
<td>.32</td>
<td>.26</td>
</tr>
<tr>
<td>Emotion</td>
<td>-.12</td>
<td>.19</td>
</tr>
<tr>
<td></td>
<td>.40</td>
<td>.18</td>
</tr>
</tbody>
</table>
Figure 1. Total proportion of positive and negative memories recalled at final test.
**Figure 2.** Proportion of positive and negative Rp+ and matched Nrp+ items recalled following retrieval practice.
Figure 3. Proportion of positive and negative Rp- and matched Nrp- items recalled following retrieval practice.
Figure 4. Relationship between individual scores on the PANAS-X (Watson et al., 1988) and retrieval-induced forgetting of positive and negative memories. Higher scores on PANAS-X represent more positive affect, while higher retrieval-induced forgetting scores represent greater forgetting.
References


Storm, B. C., & Jobe, T. A. (under review). Remembering the past and imagining the future: Examining the consequences of mental time travel on memory. *Memory*. 


Appendix A

Elicitation Phase Cue Word List

Positive
Entertaining
Excitement
Happy
Proud
Pleased
Inspired

Negative
Horrified
Tragedy
Sickness
Painful
Sad
Embarrassed
Appendix B

L-Shaped Puzzle (Snodgrass & Burns, 1978)

*Without lifting your pencil, draw a line that divides the following shape into four equal pieces.*
Appendix C

Surveys

Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988)

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way during the past few weeks. Use the following scale to record your answers:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>very slightly or not at all</td>
<td>a little</td>
<td>moderately</td>
<td>quite a bit</td>
<td>extremely</td>
</tr>
</tbody>
</table>

| ____ cheerful | ____ sheepish | ____ hostile | ____ angry |
| ____ sad | ____ sluggish | ____ frightened | ____ ashamed |
| ____ active | ____ amaze | ____ scornful | ____ confident |
| ____ angry at self | ____ lonely | ____ alone | ____ inspired |
| ____ disgusted | ____ distressed | ____ proud | ____ bold |
| ____ calm | ____ daring | ____ astonished | ____ at ease |
| ____ guilty | ____ shaky | ____ relaxed | ____ energetic |
| ____ enthusiastic | ____ sleepy | ____ alert | ____ fearless |
| ____ attentive | ____ blameworthy | ____ jittery | ____ blue |
| ____ afraid | ____ surprised | ____ interested | ____ scared |
| ____ joyful | ____ happy | ____ irritable | ____ concentrating |
| ____ downhearted | ____ excited | ____ upset | ____ disgusted w/self |
| ____ bashful | ____ determined | ____ lively | ____ shy |
| ____ tired | ____ strong | ____ loathing | ____ drowsy |
| ____ nervous | ____ timid | ____ delighted | ____ dissatisfied |
Beck Depression Inventory (Beck, Steer, & Brown, 1996)

**Instructions:** This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the one statement in each group that best describes the way you have been feeling during the past two weeks, including today. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

<table>
<thead>
<tr>
<th>1. Sadness</th>
<th>6. Punishment Feelings</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 I do not feel sad.</td>
<td>0 I don't feel I am being punished.</td>
</tr>
<tr>
<td>1 I feel sad much of the time.</td>
<td>1 I feel I may be punished.</td>
</tr>
<tr>
<td>2 I am sad all the time.</td>
<td>2 I expect to be punished.</td>
</tr>
<tr>
<td>3 I am so sad or unhappy that I can't stand it.</td>
<td>3 I feel I am being punished.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Pessimism</th>
<th>7. Self-Distaste</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 I am not discouraged about my future.</td>
<td>0 I feel the same about myself as ever.</td>
</tr>
<tr>
<td>1 I feel more discouraged about my future than I used to be.</td>
<td>1 I have lost confidence in myself.</td>
</tr>
<tr>
<td>2 I do not expect things to work out for me.</td>
<td>2 I am disappointed in myself.</td>
</tr>
<tr>
<td>3 I feel my future is hopeless and will only get worse.</td>
<td>3 I dislike myself.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Past Failure</th>
<th>8. Self-Criticalness</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 I do not feel like a failure.</td>
<td>0 I don't criticize or blame myself more than usual.</td>
</tr>
<tr>
<td>1 I have failed more than I should have.</td>
<td>1 I am more critical of myself than I used to be.</td>
</tr>
<tr>
<td>2 As I look back, I see a lot of failures.</td>
<td>2 I criticize myself for all of my faults.</td>
</tr>
<tr>
<td>3 I feel I am a total failure as a person.</td>
<td>3 I blame myself for everything bad that happens.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Loss of Pleasure</th>
<th>9. Suicidal Thoughts or Wishes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 I get as much pleasure as I ever did from the things I enjoy.</td>
<td>0 I don't have any thoughts of killing myself.</td>
</tr>
<tr>
<td>1 I don't enjoy things as much as I used to.</td>
<td>1 I have thoughts of killing myself, but I would not carry them out.</td>
</tr>
<tr>
<td>2 I get very little pleasure from the things I used to enjoy.</td>
<td>2 I would like to kill myself.</td>
</tr>
<tr>
<td>3 I can't get any pleasure from the things I used to enjoy.</td>
<td>3 I would kill myself if I had the chance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Guilty Feelings</th>
<th>10. Crying</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 I don't feel particularly guilty.</td>
<td>0 I don't cry anymore than I used to.</td>
</tr>
<tr>
<td>1 I feel guilty over many things I have done or should have done.</td>
<td>1 I cry more than I used to.</td>
</tr>
<tr>
<td>2 I feel quite guilty most of the time.</td>
<td>2 I cry over every little thing.</td>
</tr>
<tr>
<td>3 I feel guilty all of the time.</td>
<td>3 I feel like crying, but I can't.</td>
</tr>
</tbody>
</table>
11. Agitation
0 I am no more restless or wound up than usual.
1 I feel more restless or wound up than usual.
2 I am so restless or agitated that it's hard to stay still.
3 I am so restless or agitated that I have to keep moving or doing something.

12. Loss of Interest
0 I have not lost interest in other people or activities.
1 I am less interested in other people or things than before.
2 I have lost most of my interest in other people or things.
3 It's hard to get interested in anything.

13. Indecisiveness
0 I make decisions about as well as ever.
1 I find it more difficult to make decisions than usual.
2 I have much greater difficulty in making decisions than I used to.
3 I have trouble making any decisions.

14. Worthlessness
0 I do not feel I am worthless.
1 I don't consider myself as worthwhile and useful as I used to.
2 I feel more worthless as compared to other people.
3 I feel utterly worthless.

15. Loss of Energy
0 I have as much energy as ever.
1 I have less energy than I used to have.
2 I don't have enough energy to do very much.
3 I don't have enough energy to do anything.

16. Changes in Sleeping Pattern
0 I have not experienced any change in my sleeping pattern.
1a I sleep somewhat more than usual.
1b I sleep somewhat less than usual.
2a I sleep a lot more than usual.
2b I sleep a lot less than usual.
3a I sleep most of the day.
3b I wake up 1–2 hours early and can't get back to sleep.

17. Irritability
0 I am no more irritable than usual.
1 I am more irritable than usual.
2 I am much more irritable than usual.
3 I am irritable all the time.

18. Changes in Appetite
0 I have not experienced any change in my appetite.
1a My appetite is somewhat less than usual.
1b My appetite is somewhat greater than usual.
2a My appetite is much less than before.
2b My appetite is much greater than usual.
3a I have no appetite at all.
3b I crave food all the time.

19. Concentration Difficulty
0 I can concentrate as well as ever.
1 I can't concentrate as well as usual.
2 It's hard to keep my mind on anything for very long.
3 I find I can't concentrate on anything.

20. Tiredness or Fatigue
0 I am no more tired or fatigued than usual.
1 I get more tired or fatigued more easily than usual.
2 I am too tired or fatigued to do a lot of the things I used to do.
3 I am too tired or fatigued to do most of the things I used to do.

21. Loss of Interest in Sex
0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I am much less interested in sex now.
3 I have lost interest in sex completely.
Appendix D

Experimenter Script

(Adapted from Barnier, Hung, & Conway, 2004)

Elicitation Phase:

You will now take part in an experiment examining individual differences in the ability to remember and think about autobiographical events. I will say various cue words one at a time and your job will be to recall a specific memory of something that happened to you from any time in your past as quickly as possible. The memories you think of should be unique, single events that you have experienced, typically measured in seconds, minutes, or even hours, but not days. You should think of a new, different memory for each cue word. The cue words I will present to you will also be repeated several times, and you should think of a unique, different memory for each presentation.

You can take as long as necessary to think of each memory, but remember that your task is to do so as quickly as possible. Once you have thought of a unique autobiographical memory for a cue word, tell me a short 10-15 word description of that memory. After you have provided a description of your memory, tell me approximately how old you were at the time of the event. You will also be asked to provide ratings about your memory. First you will be asked how clear your memory is of the event on a scale of 1-7, where 1 equals not at all clear and 7 equals extremely clear. Then you will be asked how positive or negative your memory is of the event using a scale of 1-7, where 1 equals very negative, 4 equals neither positive nor negative, and 7 equals very positive. Do you have any questions regarding this task?
Learning Phase:

In this next phase you will spend time learning associations between the cue words, a key word that summarizes your memory, and the memories you provided. I will read a cue word, key word, and memory, then pause for 20 seconds to allow you time to form a connection between the words and your memory. You do not need to say anything during this phase as you will simply be creating mental connections between each set I provide. Any questions?

Retrieval-Practice Phase:

Round 1-

In this phase I will repeatedly present a number of the cue word and key word pairs, then ask you to provide the correct autobiographical memory associated with that cue word and key word pair. You will be given 20 seconds to retrieve the appropriate memory. When you think of the correct memory, provide me with the description of that event you provided earlier. Please try to recall your description as close to verbatim as possible. If you cannot think of the correct memory after 20 seconds, we will simply move on to the next cue word and key word pairing. Any Questions?

Round 2-

I will now present cue word and key word pairings again, and your task is still to retrieve the correct autobiographical memory associated with that pair. However, this time after you recall the memory I will ask you to provide any additional details you can remember about the event that you did not recall before. Any questions?
Round 3-

You will now practice retrieving memories using the cue word and key word pairs once more, but this time after you recall a memory, I will ask you to tell me more about where you were, who you were with, and how you felt during the event. Any questions?

Distracter Task:

You will now work on this puzzle for five minutes. Do the best you can to solve it, but it is ok if you are not able to within the allotted five minutes. Any questions?

Final Test:

You will now be tested on your ability to remember the memories you provided in the first phase of the experiment. You will be given a cue word, plus the first letter of your key word, and be asked to recall both the key word and the correct autobiographical memory associated with that cue word and key word pair. Please recall the description of the memory as close to verbatim as possible. You will be given 15 seconds to recall each key word and description of your memory. Any questions?

Postexperimental Surveys:

In this last portion of the experiment you simply need to fill out two brief surveys. Each survey has instructions at the top regarding how to use the scales. Please do not skip ahead and be sure to complete all pages of these surveys in order. Once you have completed both surveys, please seal them in this envelope so your answers will remain completely confidential. Someone other than myself will code your surveys. Do you have any questions regarding this task?
Appendix E

Additional Results and Discussion

Final Test Scoring Variation

To ensure the retrieval-induced forgetting observed on the final test did not vary as a function of coding, we reanalyzed the data to include all responses in which the appropriate memory was provided as being correct, regardless of the recall of key words. Paired samples t-test revealed no significant differences in retrieval-induced forgetting of positive memories, t(51) < 1, ns, or negative memories, t(51) < 1, ns, regardless of the type of coding.

Comparison of Recall for Highly Emotional Positive and Negative Memories

A second set of paired samples t-tests were ran to compare recall of the two most emotional positive and negative memories from the Rp- and Nrp- conditions. Results revealed no significant forgetting of positive Rp- items (M = .24; SD = .43) as compared to positive Nrp- items (M = .29; SD = .46), t(51) < 1, ns, d = .08. Likewise, forgetting was also not observed between negative Rp- items (M = .34; SD = .48) and negative Nrp- items (M = .36; SD = .48), t(51) < 1, ns, d = .03. These results suggest that highly emotional memories are less susceptible to retrieval-induced forgetting than less emotional autobiographical memories, possibly due to their distinctiveness.
INSTITUTIONAL REVIEW BOARD APPROVAL FORM

University of Illinois
At Chicago

Approval Notice
Continuing Review

September 29, 2011

Tara Jobe, BA
Psychology
1007 W Harrison, M/C 285
Chicago, IL 60612
Phone: (312) 805-1992

RE: Protocol # 2009-1097
“Memory Retrieval and Intrusions”

Dear Ms. Jobe:

Your Continuing Review was reviewed and approved by the Expedited review process on September 26, 2011. You may now continue your research.

Please note the following information about your approved research protocol:

Protocol Approval Period: September 26, 2011 - September 24, 2012
Approved Subject Enrollment #: 3000 (832 Subjects enrolled)

Additional Determinations for Research Involving Minors: The Board determined that this research satisfies 45CFR46.404, research not involving greater than minimal risk.

Performance Sites: UIC

Research Protocol:

a) Research Protocol: Memory Retrieval and Alteration09/29/2011

Informed Consent:

a) Memory Retrieval & Intrusions; Version 1.2, 09/28/2011
b) Debriefing Form: Memory Retrieval and Intrusions (no footer)

Parental Permission:

a) A waiver of parental permission has been granted under 45 CFR 46.116(d) and 45 CFR 46.408(c); however, as per UIC Psychology Subject Pool policy, at least one parent must sign the Blanket Parental Permission document prior to the minor subject’s participation in the UIC Psychology Subject Pool.

Your research meets the criteria for expedited review as defined in 45 CFR 46.110(b)(1) under the following specific category:

(7) Research on individual or group characteristics or behavior (including but not limited to research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices and social behavior) or research employing survey, interview, oral history, focus

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group, program evaluation, human factors evaluation, or quality assurance methodologies.

Please note the Review History of this submission:

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<th>Review Process</th>
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<td>09/21/2011</td>
<td>Continuing Review</td>
<td>Expedited</td>
<td>09/26/2011</td>
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Please remember to:

→ Use your research protocol number (2009-1097) on any documents or correspondence with the IRB concerning your research protocol.

→ Review and comply with all requirements on the enclosure, "UIC Investigator Responsibilities, Protection of Human Research Subjects"

Please note that the UIC IRB has the right to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

Please be aware that if the scope of work in the grant/project changes, the protocol must be amended and approved by the UIC IRB before the initiation of the change.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact OPRS at (312) 996-1711 or me at (312) 355-2764. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Betty Mayberry, B.S.
IRB Coordinator, IRB #2
Office for the Protection of Research Subjects

Enclosures:
1. UIC Investigator Responsibilities, Protection of Human Research Subjects
2. Data Security Enclosure
3. Informed Consent Document(s):
a) Memory Retrieval & Intrusions; Version 1.2, 09/28/2011

cc: Jon D. Kassell, Psychology, M/C 285
    Benjamin Storm, Faculty Sponsor, M/C 285
VITA

Tara Alaine Jobe
University of Illinois at Chicago
Department of Psychology (M/C 285)
1007 W. Harrison St.
Phone: (312) 805-1992
tjobe2@uic.edu

EDUCATION

Fall 2009-Present: Doctoral Program, University of Illinois at Chicago
Major: Cognitive Psychology
Advisor: Benjamin C. Storm, Ph. D.
B.A. 2009: University of Illinois at Chicago
Major: Psychology with High Departmental Distinction
Minor: Philosophy
Cum Laude with Honors

HONORS AND AWARDS

UIC LAS Student Travel Award (November, 2011)
UIC Psychology Departmental Travel Award (November, 2010)
UIC Graduate Student Council Travel Award (November, 2010)
UIC Psychology Departmental Travel Award (April, 2010)
UIC Graduate College Student Presenter Award (April, 2010)
Psi Chi Membership (National Honors Society in Psychology)
Sigma Tau Honor Society (National Honors Society for Transfer Students)
Dean’s List, University of Illinois at Chicago (Fall 2007-Spring 2009)

PUBLICATIONS


Storm, B. C., & Jobe, T. A. (2012). Remembering the past and imagining the future: Examining the consequences of mental time travel on memory. Memory.

CONFERENCE PRESENTATIONS


**RESEARCH EXPERIENCE**

**Master's Thesis Research: The role of Individual Differences in Inhibitory Control on Unwanted Memories (Fall 2010 - Spring 2011)**
Advisor: Benjamin C. Storm, Ph.D., University of Illinois at Chicago, Chicago, IL.
People's ability to forget sad, painful, or traumatic memories varies individually. These studies examine one possible mechanism by which negative memories might be forgotten- namely, retrieval inhibition.

**Research Apprenticeship: The role of Inhibition in Autobiographical Memory (Fall 2009 - Spring 2010)**
Advisor: Benjamin C. Storm, Ph.D., University of Illinois at Chicago, Chicago, IL.
Forgetting is a critical and adaptive function of memory. Inhibitory processes allow for the suppression of outdated and irrelevant information in order to retrieve new, relevant information. Inhibitory ability varies among individuals and may play a role in the suppression of emotional memories. These studies explore the relationship between inhibitory ability and recall of emotionally valenced autobiographical memories.

**Independent Research: Inhibitory Processes in Past and Future Episodic Generations (Spring 2009)**
Advisor: Benjamin C. Storm, Ph.D., University of Illinois at Chicago, Chicago, IL.
Investigated the role of inhibitory processes in the generation of episodic events in past recollections and future simulations. Developed materials and was involved in data collection, entry, and analysis.

**Research Assistant: Inhibitory Processes and Retrieval-Induced Forgetting (Fall 2008)**
Principal Investigator: Benjamin C. Storm, Ph.D., University of Illinois at Chicago, Chicago, IL.
Tested for retrieval-induced forgetting (RIF) of exemplar pairs when impossible retrieval
cues were given during retrieval practice. Involved mainly in data collection. Learned standard RIF methodology and basic research procedures.

SUMMARY OF TEACHING EXPERIENCE

**PSCH 353 - Laboratory in Cognition and Memory**  
Teaching Assistant (Spring 2012, Fall 2010)  
Duties: Planned and presented class lectures, aided in discussions, project proposals, and experiments. Graded exams, papers, and projects.

Guest Lecture: Writing in APA Style (Spring 2012)  
Guest Lecture: Retrieval-Induced Forgetting (Spring 2012)  
Guest Lecture: Writing a Method Section (Fall 2010)  
Guest Lecture: Counterbalancing (Fall 2010)

**PSCH 343 - Statistical Methods in Behavioral Science**  
Teaching Assistant (Fall 2011, Summer 2011, Spring 2011)  
Duties: Taught two discussion sections with 20 students each. Led discussions, activities, and reviews of tests. Proctored and graded exams and papers.

**PSCH 352 - Cognition and Memory**  
Teaching Assistant (Summer 2010)  
Duties: Aided in lectures and discussions. Proctored and graded exams and papers.

Guest Lecture: Autobiographical Memory (Fall 2010)  
Guest Lecture: Retrieval-Induced Forgetting (Fall 2009)

**PSCH 242 - Research Methods in Psychology**  
Teaching Assistant (Fall 2009)  
Duties: Taught two discussion sections with 25 students each. Led discussions, activities, and reviews of tests. Proctored and graded exams and papers.

MENTORING EXPERIENCE

**Undergraduate Mentor (Fall 2009 - Fall 2011)**  
Coordinated the activities of undergraduate research assistants (listed below). Trained students on ethical and methodological requirements of research. Helped students prepare for presentations and graduate school.
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<tr>
<th>Assistant</th>
<th>Term</th>
<th>Project</th>
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<tr>
<td>Patricia Tiffin</td>
<td>Fall 2009</td>
<td>RIF and Mental Time Travel</td>
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<td>Lauren Hallerud</td>
<td>Spring 2010</td>
<td>RIF of Emotional Autobiographical Memories</td>
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<td>Nghi Le</td>
<td>Spring 2010</td>
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<td>Dominika Bielinska</td>
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<td>Tami Marron</td>
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<td>Sidney Avila</td>
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<td>Morgan Gleasman</td>
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<tr>
<td>Kelly Santoyo</td>
<td>Fall 2011</td>
<td>Autobiographical Retrieval-Induced Forgetting</td>
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**PROFESSIONAL DEVELOPMENT**

- Association for Psychological Science Student Affiliate
- Midwestern Psychological Association Graduate Student Member
- Psi Chi (National Honors Society in Psychology)

**ADDITIONAL SKILLS & CERTIFICATION**

- SPSS Data Analysis, SAS Data Analysis, MS Word, MS Excel, MS PowerPoint