

The Memorial Consequences of Retellings and Their Underlying Cognitive
Mechanisms: The Role of Selective Rehearsal and Connections to
Autobiographical Memory

by

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Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor of Philosophy in the Department of
Psychology and Neuroscience in the Graduate School
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ABSTRACT

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Abstract

Simply *recalling* a memory has very different consequences than *retelling* it. Accuracy is often emphasized when events are recalled; however, retelling an event in a conversational manner may compromise accuracy in order to make the story more entertaining (e.g., Dudukovic, Marsh, & Tversky, 2004), or to support a specific argument (e.g., Tversky & Marsh, 2000). I will focus on the memorial consequences and underlying mechanisms of retellings.

First, I will review research that shows the inaccuracies of retellings. In reviewing this research, I will identify possible underlying mechanisms that change memory through retellings, such as the following: schema-guided reconstruction, interference, transfer inappropriate processing, and retrieval-induced-forgetting.

Second, I will experimentally investigate possible cognitive mechanisms underlying these memorial changes. In the first experiment, I show that the elaborative nature of storytelling does not influence memory more so than simply selectively rehearsing that information. In the second and third experiments, I investigate how retelling autobiographical events influences qualitative aspects of memory. These two experiments suggest that retrieving autobiographical events influences memory quality, although the specific nature in which they are retold has no effect. I close by connecting these three experiments to the broader literature.

Dedication

To my parents, Roger and Judy Eslick, who taught me the value of hard work.

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1. A Brief History of Storytelling

Children, who will inherit the world. Children to whom, throughout history, stories have been told, chiefly but not always at bedtime, in order to quell restless thoughts; whose need of stories is matched only by the need adults have of children to tell stories to, of receptacles for their stock of fairy-tales, of listening ears on which to unload, bequeath those most unbelievable yet haunting of fairy-tales, their own lives; children -- they are going to separate you and me. -Graham Swift, *Waterland*, p. 6 (1983).

Humans are storytelling creatures. Rather than simply reciting past events as an isolated record of what occurred, we weave together tales that incite emotion and meaning in our intended audiences. As such, the same exact moment in history can be conveyed as one of triumph or defeat, depending on the sentiment the storyteller chooses to convey (Cronon, 1992). Because storytelling has an ability to color how we remember the past, it is not surprising that the topic of storytelling has contributed to a history of rich research— both on the level of a single person and across entire generations of people. For example, studies have examined story preferences before and after birth: researchers claim that infants prefer stories they heard in the womb to new stories told after birth (DeCasper & Spence, 1986). Other studies have investigated how older adults recount specific details of monumental events in their lives, as if no time has passed between the long-ago event and their retelling of it (Brown & Kulik, 1977). Stories also have a unique ability to span several generations of individuals. For example, stories of Odysseus's journey back to Greece after the Trojan War were first uttered in epic form circa 1300-

700 BC, were first put into writing around 800-700 BC (Homer, trans. 2003), and are still in print and used in classrooms to this day.

Over time, stories have taken the form of rhymes, fable, and folklore. Though the direct origin of rhymes and other traditions is sometimes lost, the wording and phrasing are preserved from generation to generation. For example, the counting-out rhyme *Eenie Meenie* has undergone only two systematic changes (involving the words “holler” and “tiger”), and though there have been other variations, the rhyme has remained relatively stable (Rubin, 1995).

However, a story is not always consistent as it is passed down through generations. Consider the story of “Poor Pearl.” Poor Pearl was a young pregnant woman with two lovers. In the story she was murdered and beheaded. A couple of things about the initial form of this story are inconsistent with the general formula for a ballad: for example, ballads typically involve one lover and the body is not mutilated (Rubin, 1995). Though the initial story might have carried more truth in the beginning, over the course of several years, the story became more consistent with other ballads and thus lost some of its uniqueness (Cohen, 1973).

Memories of personal histories may have the same underlying mechanisms as those evident in more stable oral traditions. However, it is difficult to neglect the obvious difference when comparing oral traditions to individual retellings. Though oral traditions span *several* generations of individuals, retellings often occur *within* an individual. However, these oral tradition’s ‘starting

point' was likely similar to that of an individual's simple retelling of an event. In this way, retellings can be thought of as a younger variation of more stable oral traditions. If the same basic mechanisms are involved during retellings and oral traditions, we would expect them to change in the same way, and be affected similarly by the discussion of the event itself. For instance, do we dismiss details in our stories in order to make them more consistent with other tales we tell?

The interest in the memorial consequences of telling a story is not new. As early as 1932, Bartlett experimentally examined memorial consequences associated with the method of repeated production. In his experiment, subjects read the *War of the Ghosts* folk-tale. Subjects were asked to reproduce the story several times, starting at 15 minutes after the initial acquisition. Interestingly, subjects' accounts of story details changed across reproductions: what were "canoes" became "boats" and what was "rowing" became "paddling." One subject even gave greater focus to the ghosts in subsequent reproductions and completely omitted the two characters that were present at the beginning of the story. However, the general form (outline) of the story was typically set in the first reproduction and rarely changed. Bartlett's early experiments are interesting because an emphasis was placed on *telling a story* rather than *accurate reproduction*. In fact, "The general argument is that rote memory, if it occurred would be biologically wasteful; but in fact the experimental results show that it rarely occurs." (Gauld & Stephenson, 1967, p. 40). In fact, subjects rarely use verbatim quotations unless they are specifically instructed to be accurate in their

stories (Wade & Clark, 1993). Studying the differences between accurate reproduction and storytelling has been revitalized in recent years (Marsh, 2007).

2. Factors Affecting Retellings

Travel back, for a moment, to the blissful days at your undergraduate institution. Imagine that you recently took an exam and you are either a) discussing it with your fellow classmates, or b) discussing it with your parents. If you are speaking to fellow classmates you may have described the test as easier than it actually was in order to appear more intelligent. On the other hand, if you are speaking to parents, disgruntled with the “C” in your class, you may recount the test as “unfairly difficult.” Later when thinking about the exam, you may remember feelings or details associated with your post-test conversation rather than the actual test. This type of memory error can occur in an array of experiences: discussing the events of a party, describing a person’s characteristics or personality (Tversky & Marsh, 2000) or even describing a face and later being unable to identify it (Schooler & Engstler-Schooler, 1990). In some cases, offering a biased perspective of someone can result in bias up to 40 weeks later (McGregor & Holmes, 1999). These are only a few examples of a number of events wherein describing or discussing an event has later consequences. There are many factors that take place during such discussion that can affect later memory for the event, long after the retelling takes place. In fact, Pasupathi (2001) proposed that speaker qualities, listener qualities and prior retellings all shape a retelling for an event, and our autobiographical memories are a result of these changing properties. That is, the age, behavior, knowledge, personality traits, and goals of both speaker and listener affect how an event is

retold in a conversational context (Pasupathi, 2001). Pasupathi also noted that the way conversations are told in the past may influence the way they are presently discussed.

Many real-world situations facilitate retelling rather than accuracy-based recalling. The specific audience to which an individual is speaking, and the exact goals of the speaker are two of the variables that can color the retelling of an event. Furthermore, a speaker's personal characteristics might influence what is said during the story, as well as the speaker's specific goals.

For instance, in 2004, Marsh and Tversky investigated accuracy in everyday conversations. In order to do this, they had subjects record "instances of talking about their own lives (retellings)" (p. 493) for a 4 week period. In each recording, subjects described both the original event and their retelling of it.

Second, subjects described the retelling of the event. They recorded the date and time of the retelling, followed by a description of the audience to whom the retelling was directed (friend, parent, teacher, etc.) and the specific purpose of the retelling (to avoid conflict, to entertain, to convey facts, etc.). Subjects also indicated the accuracy of their retelling and whether or not it contained any distortions. If distortions were noted, they were further classified as: exaggeration ("stretching or embellishment of the truth" p. 494), minimization ("reduction of the truth" p. 494), selectivity ("eliminating an important event detail" p. 494), or adding information ("including details or events that had not occurred" p. 494).

Surprisingly, 42% of the retellings were labeled as inaccurate; furthermore, a large percentage of stories (61%) were labeled as distorted. Retellings for social events were less accurate than retellings for jobs. That is, subjects were able to label something as inaccurate and/or distorted; a distorted retelling was not always labeled as inaccurate, but most retellings that were inaccurate were also labeled as distorted.

Thus, the results from Marsh and Tversky's experiment suggest that stories are told in different ways depending on the specific audience involved and the message being conveyed. Additionally, it is also important to note that a large portion of the retellings were judged as inaccurate from the subject's perspective and an even larger percentage of retellings were distorted in some way. It is not surprising then, that the fate of the initial memory trace may be affected.

Though Marsh and Tversky (2004) assessed "real world" retellings, the memorial consequences of retellings are often examined in the laboratory and usually entail the following order of events: 1) subjects read a story or watch a video, 2) subjects discuss all or part of the story/video in a "retellings phase," 3) final memory for the initial story/video is tested (memory may be assessed through cued recall or attribution tests in which subjects determine which attributes belonged to which item/character in the story/video). To date, retellings experiments have examined factors that vary in this sequence: the characteristics of the speaker (age, culture, etc.), the characteristics of the listener (age, status, etc), and factors, such as goals, that co-vary between the

specific speaker and listener situation (such as the message the speaker is trying to convey). The co-varying factors are labeled as such because it is difficult to disentangle whether speaker or listener qualities explain the most variance both in the retelling and the final memory performance. For example, the goals of the speaker are not immune to influence from the speaker herself. Even though the speaker has specific goals, the message may be slightly modified based on the speaker's characteristics; even then, the message may also be tailored to suit the audience who is listening. The following sections will review how characteristics of the listener, characteristics of the speaker, and factors co-varying between the speaker and listener influence the retelling and final memory performance.

2.1 Characteristics of the Listener

When we tell a story, we tailor it to suit our specific audience. Our audience might affect what information is included and the manner in which it is conveyed (Marsh & Tversky, 2004). For instance, the age of the listener may influence how we tell a story: we usually simplify complex information for younger audiences (Adams, Smith, Pasupathi, & Vitolo, 2002).

In 1998, Pasupathi, Stallworth, and Murdoch also investigated the effects of the listener. In their experiment, subjects viewed five movie clips immediately after which they provided a written recall of each event. Two of the events were then chosen, one of which was told to a distracted listener, and the other to an

attentive listener. Written recall of all five clips was tested three weeks after the initial session.

Compared to the initial recall, subjects speaking to attentive listeners actually included more information; however, less information was included when listeners appeared to be distracted. The increase in information was driven by the fact that subjects included more new information (information that was not present in their initial written recall) when speaking to an attentive listener. Subjects were also more likely to include elaborations when speaking to someone else, compared to what was initially written in their recall; this difference in elaborations between the written and spoken portions was greater when speaking to an attentive listener than to a distracted listener ($p=.10$).

The primary interest, however, is how well subjects retain information over time, especially information that may have been elaborated upon during the retelling phase. Are memories for these events less accurate because of the elaborations included during the retelling phase? In fact, events that were relayed to attentive listeners showed better memory than events relayed to distracted listeners. Delayed recall was higher for the distracted listeners when compared to no retelling, presumably because the retelling phase itself offers rehearsal. Additionally, subjects included more errors in their final recall when they had recounted the story to a distracted listener than when they had recounted a story to an attentive listener.

Regardless of whether the listener is attentive or distracted, the status of the listener may also affect what message is conveyed. For instance, Hyman (1994) investigated audience effects, specifically noting that the status of the audience itself can affect what individuals portray in the retelling portion. In his study, subjects read a story and later discussed it with an experimenter or another subject (peer). Hyman found that the specific audience did have an effect on how these stories were told: subjects who were conveying the story to an experimenter tended to be more narrative (e.g., they included more story details), while subjects conveying the message to a peer were more evaluative (e.g., when details were used, they specifically supported an opinion). Different retellings have also emerged for more unusual audiences: subjects discuss different aspects of an event when they are talking to a peer compared to when they are talking to a hypothetical Martian (Vandierendonck & Van Damme, 1988). Additionally, speakers will tailor their message based on the attitudes of the audience, and this message may bias the speaker's attitudes later (Sedikides, 1990).

These retellings are modified based on our knowledge of our audience characteristics, a process called *audience tuning*. In some cases, modifying our message based on our audience can bias our memory later (e.g., Echterhoff, Higgins, Kopietz, & Groll, 2008).

2.2 Characteristics of the Speaker

Though there has been an abundance of research suggesting ways in which we modify our message based on our specific audience, the characteristics of the speaker are largely unexplored. However, the age of the speaker may play an important factor in how memories are discussed. For example, memories of older adults are less variable across retrievals than memories of younger adults (Anderson, Cohen, & Taylor, 2000). Also the age of the speaker may affect the way in which they convey their message to their audience. For example, Adams and colleagues (2002), had older (mean age: 67.81) and younger (mean age: 20.47) women learn two stories: a simple story and complex story. After learning the stories, the women retold the story to a child or an experimenter. Adams and colleagues found that older women are more likely to simplify the complex story for the child than the younger women. Thus, the age of the woman predicted how the story was retold to the child. Experience in talking to children may explain these differences, as older adults typically have more experience talking to children than younger adults.

Not only do older adults discuss stories in different ways to different people, they also discuss their own autobiographical memories in different ways compared to younger adults. Anderson, Cohen, and Taylor (2000) had younger and older adults provide autobiographical memories in response to 16 cue words. After retrieving these memories, they rated certain aspects of them, such as how often they rehearsed the memory and how important and emotional the

memory was to them. In additional sessions, one four weeks after the initial retrieval and one eight weeks after, subjects were presented with the same cue words and were asked to retrieve the details of the initial memory. Anderson and colleagues found that older adults include more details in their memories, compared to younger adults. Also, when controlling for the age of the memory, older adults have more stable memories than younger adults; that is, they are less likely to change across repeated retrieval attempts.

Additionally, Hastroudi, Johnson, Vnek, and Ferguson (1994) found that the specific focus an individual takes while rehearsing differentially affects older and younger adults. For instance, in their study, older and younger adults acted out a play together. During this scene a director read lines to them, some of which the subjects were required to say aloud, and some of which they were simply required to think about. After the play, subjects were asked to rehearse the information twice: the first time they were asked to focus on certain aspects of the event and the second time they simply thought about the event. There were three conditions for the first rehearsal: subjects focused on factual aspects, such as what was said in the play; subjects focused on affective aspects, such as how they felt during the play; or subjects simply thought about anything they could remember from the play (the control condition). All subjects did the same task on the second rehearsal.

Hastroudi and colleagues found that subjects who focused on affective components of the scene had more difficulty distinguishing between information

that was actually said during the play and information that was merely thought about. And, overall, older adults had more trouble distinguishing between what they said during the play and what they simply thought about. However, when older adults were instructed to focus on factual aspects, their memory improved and was more similar to the younger adults' memory. Therefore, encouraging subjects of different ages to focus on specific aspects of an event increased their memory accuracy. That is, though older adults have more difficulty with this task, specifically directing them to focus on factual aspects of the event actually improved their memory.

The gender of the speaker may also influence what is told during a retelling. For instance, Ross and Holmberg (1992) suggest that wives have more vivid memories for shared past experiences compared to their husbands. These women reported reminiscing about the events more often than men, and their accounts of the event contained more affect. Because the qualities of their memories are different, as Ross and Holmberg suggest, retelling may have different consequences for men and women. For instance, if men do, in fact, have less vivid memories compared to women, discussing these stories might have a larger memorial consequence. For example, men may need to elaborate more to fill in the gaps in their stories, and these elaborations may later interfere with their original memories.

Besides age and gender effects, the specific characteristics of the speaker remain largely unexplored. However, there is some evidence that cultural

differences influence what individuals remember. That is, individuals in collectivist cultures tell stories that focus on group activities, whereas individuals in individualistic cultures tell stories centered on a main character or individual (Wang & Ross, 2005). However, these differences may be due to encoding accounts, as members of certain cultures may be more likely to direct their focus to culturally relevant actions (Wang & Ross, 2005). Regardless, there may be a cultural component to retellings: do the memorial consequences associated with retellings equally affect members of different cultures? It is possible that even if individuals in different cultures tell their story in different ways, the same underlying mechanisms may be at work. For example, individuals in collectivist cultures might still utilize a basic framework to guide retrieval (e.g., a schema, discussed later). Because the speaker's characteristics influence how information is conveyed, there may be memorial consequences, similar to how listener characteristics can influence the way something is ultimately remembered. Examining specific speaker qualities that influence both the retelling and the future memorial consequences should be explored in future research.

3. Co-varying Factors

Thus both the speaker and listener qualities can contribute to how a story is told. However, there are some situations in which the speaker or listener qualities are difficult to disentangle from other factors. For instance, if a speaker is trying to support a specific argument, or if they have a certain goal in mind (such as telling a good story), the story will be told in a slightly different way. As with the studies discussed above, if the story is modified during the retelling, memorial consequences for the original event may ensue. We will now turn our attention to experiments that evaluate these possibilities.

3.1 Goals and Listener Effects

There have been several experiments that examine factors that co-occur between speaker and audience situations. For example, in an attempt to provide evidence for a certain argument, a speaker may modify their retelling in order to support their case. Tversky and Marsh's (2000) experiment is a perfect example of this.

In their study, Tversky and Marsh had subjects form biased opinions of another person and then later tested their memory for that person's initial characteristics. Specifically, subjects read a story about two roommates. In the story, both roommates engaged in social, annoying, and neutral behaviors. After reading the initial story, subjects were asked to write about one of the roommates from either an annoying, social, or neutral perspective (the retelling phase).

Those writing from a social perspective wrote to “recommend the designated roommate for admission to a fraternity/sorority” (p. 5). Subjects writing from an annoying perspective “focused on the irritating characteristics of the roommate” (p. 6) and wrote as if they (the subject) were writing a letter of complaint to the Office of Student Housing. Subjects assigned to the neutral condition simply recalled as many details as they could remember about the assigned roommate.

During this retelling phase, subjects included more details that were consistent with their assigned perspective. That is, subjects recommending their roommate to a fraternity/sorority wrote about more social items, while those focusing on the annoying habits of the roommate included more annoying items. Subjects assigned to the neutral condition included an equal number of social and annoying items in their retellings. Additionally, subjects assigned to the annoying and social perspectives also included more elaborations (statements that went beyond what was initially stated in the story, such as “Rachel is bubbly” (p. 8; Tversky & Marsh, 2000)) that were consistent with their assigned perspective.

On the final memory test, Tversky and Marsh found that the assigned perspective during the retelling phase had a significant effect on correct recall. Specifically, subjects who wrote about the annoying attributes of the roommate in the retellings phase recalled more annoying facts of the discussed roommate. However, subjects who wrote about the social attributes in the retellings phase recalled more social facts of the discussed roommate. Subjects in the annoying

condition recalled more annoying items from the discussed character than the un-discussed character; however, the same comparison for the social condition followed this trend but did not reach significance. In Experiment 2, an attribution test also confirmed that the retelling phase had later memorial consequences: though not significant, a trend emerged suggesting that subjects often misattribute perspective-relevant details to the discussed character.

Other goals of the speaker can also influence the retelling. Dudukovic, Marsh, and Tversky (2004) investigated the purpose of the retelling, more specifically, how stories differ depending on whether the goal is to entertain or to be accurate. Their experiment consisted of three conditions. In all three conditions, subjects read a story. Critically, after reading the story, subjects in the “entertaining” condition were told to retell the story in “...an amusing manner” (p. 128) while those in the “accuracy” condition were told to retell the story in “...a precise manner” (p. 129). These two conditions retold the story during the first session, a second session two days later, and a third session four days after the first session. The third condition served as a no-talk control; these subjects simply read the story and recalled it four days later.

Interestingly, retellings from subjects in the entertaining group and the accuracy groups differed in several ways. First, subjects who retold the story to be entertaining included more emotion words and present tense verbs; however, subjects who focused more on accuracy included more sensory words and disfluencies (words such as “Um”). Secondly, independent coders judged

retellings with the goal to entertain as less accurate compared to accuracy-based retellings. Additionally, word counts indicated that entertaining retellings contained fewer disfluencies and were told with greater certainty than accurate retellings.

While retellings focused on accuracy were indeed judged as more accurate and detailed, entertaining retellings included more exaggerations and intrusions. On the final recall test, subjects in the accuracy condition were rated as more accurate than both of the other conditions. However, none of the groups were any more or less entertaining on the free recall test. The authors note this lack of a difference may be due to the nature of the recall task. Though the retellings phase was videotaped, the recall task was not. Certain properties present in the retellings were therefore lost on the written recall test (such as voice inflection and gestures). Furthermore, subjects in the entertaining condition and the no-talk condition included more exaggerations on the final recall than subjects in the accuracy condition. And, though subjects in the entertaining condition also included more intrusions during their retellings, they did not include more on the final recall test compared to the other conditions. Thus, a biased perspective affects how an event is retold which can distort subsequent memory for it.

3.2 Goals and Speaker Effects

Rather than modifying a story because of the audience, a speaker may also modify a story to achieve their own goal. Consider situations in which people

discuss the events in their lives to facilitate their own understanding of what occurred. Marsh, Tversky, and Hutson (2005) showed subjects a video clip of a violent film, after which they engaged in an affective focused retelling (they discussed their emotional reactions), a factual focused retelling (they discussed the events in the film) or a no talk control condition. Though subjects in the affective focus condition remembered their emotions better than subjects in the factual focus condition, they made a greater number of errors on a free recall test. Additionally, there were no differences in picture recognition across the 3 groups. Thus, focusing on certain aspects, such as emotion, facilitates memory for those same elements later on.

However, there is a paucity of research examining how speaker effects co-vary with goals, which is not surprising considering that little research has examined the influence of the speaker alone. Future research is needed to examine these co-varying factors.

4. A Retellings Model

The experiments discussed above provide evidence that retellings do not always accurately represent the initial event. Furthermore, a variety of factors affect the way in which a retelling differs from an initial memory: the audience to which a person is speaking, the goals of the speaker, the message the speaker is trying to convey, and the behavior of the listener can all have memorial consequences for the speaker. In the following sections, I will examine possible mechanisms that may be responsible for this memory distortion. For example, how does the information discussed in previous retellings interfere with future memory? How does the storytelling language used during a retelling influence performance on an accuracy-based test? How does the schematic nature of memory play into both the retellings and the final memory for the event? I will evaluate the memorial consequences of retellings based on these possible underlying mechanisms.

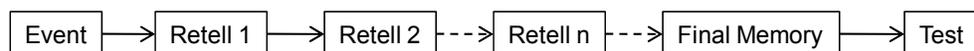


Figure 1: Basic retellings model.

The temporal order of what occurs during the retelling sequence is depicted in Figure 1 above. Typically, an event occurs (“Event”) which is followed by a number of retellings (“Retell 1, Retell 2, etc”). The delay between the Event and the first retelling (“Retell 1”) is not specified; for instance, an event may be retold immediately after it happened, a week after, or a year after. Furthermore,

the delay between each of the subsequent retellings is also not specified, as events may be recounted immediately, and then not rehearsed again for several days, weeks, or even years. Regardless of the specific delay, each retelling may influence how the final memory is reconstructed (“Final memory”). Finally, on an accuracy-based test of what actually occurred during the Event, a speaker must disregard each retelling and other potential sources of interference, and attempt to retrieve an accurate representation of the Event itself. Though these intervals (between the first and subsequent retellings) are variable in “real-world” situations, their length is influential in whether the Event is accurately retrieved. For instance, errors generated on retellings that are closer in time to the final memory test may cause greater interference than errors that were generated in one of the retellings occurring closer to the original Event (Loftus, Miller, & Burns, 1978). The goal of this review is to evaluate possible underlying cognitive mechanisms that may be responsible for potential sources of error that enter into this model after the initial encoding. For example, do subjects use schema-guided reconstruction to aid retrieval during each retelling and on the final memory test? If so, what are the memorial consequences of using this method? Do the erroneous details incorporated into earlier retellings interfere with accurate memory for the Event? If these erroneous details interfere, can memory for the Event still be accessed at all (such as through another retrieval method)? How are subjects able to disentangle embellished details that were mentioned on previous retellings from the actual details of the Event? Does the way in which a

person tells a story have a negative effect on the final memory test, especially if they are asked to talk about the Event in a different way on the final test? Does selectively retrieving certain details during a retelling inhibit the other details from coming to mind later? The following pages will answer these questions.

5. Retellings as Rehearsal

Repeated retrieval typically strengthens memory for the retrieved information (Rundus & Atkinson, 1970). Learning lists of words, or even stories and attempting to recount them verbatim is relatively normal in a laboratory setting, and rehearsing items in this way results in memorial benefits. However, many real world situations do not facilitate this type of accuracy-based retrieval. Our autobiographical memories are a result of a number of things including our own qualities as a speaker, the qualities of the person to whom we are speaking, and the stories we have told in the past (Pasupathi, 2001). These properties change from situation to situation (Pasupathi, 2001) and we often alter the story we tell based upon them (Marsh & Tversky, 2004). Thus, the retellings themselves should be viewed as a process of *selective rehearsal* in which some components are rehearsed and others are disregarded. Different components of the situation might warrant this type of selective rehearsal. For example, discussing an event with a friend results in a very different story than discussing the same event with a boss (Marsh & Tversky, 2004). Also, the purpose of the retelling might warrant the discussion of some events at the expense of others (Dudukovic et al., 2004). In fact, in laboratory list-learning experiments, the process of selective rehearsal that benefits memory for the rehearsed items can also have negative memorial consequences for the unrehearsed items (Anderson, Bjork & Bjork, 1994).

5.1 Grice's Conventions for Conversations

Because selective rehearsal can have later memorial consequences, it is important to first consider what factors influence selective rehearsal in a retellings context. Given Grice's "Conventions for Conversations," it is not surprising that conversational recall produces different results than accuracy-based retrieval. According to Grice's Conventions (Grice, 1975), speakers should focus on quantity, quality, relation, and manner. Speakers should share an adequate amount of information, but not too much (quantity). They should relay truthful information (quality), and share details relevant to the conversation (relation). And, finally, speakers should be clear in their contribution (that is, they should avoid wordiness and ambiguity) (manner). An accuracy-based recall violates at least three of the four assumptions (quantity, relation, and manner), and though quality is necessary in accuracy-based retrieval, it is not guaranteed in the context of a retelling. Accuracy-based retrieval within the context of a basic conversation, without doubt, involves more information than is necessary; miniscule facts are most likely not relevant to the conversation. Also, offering too much information might muddy a speaker's contribution. Each of these conventions is not immune to the factors that affect retellings, discussed earlier. Though the basic ideas hold true, each premise is difficult to disentangle from situational factors that may arise during each retelling. For example, the specific person to whom someone is speaking might affect the quantity of the information and the manner in which it is conveyed (Adams et al., 2002; Hyman, 1994;

Vandierendonck & Van Damme, 1988;). The goals of the speaker may also affect the quantity of information: speakers telling an entertaining story include less information in their story, compared to speakers telling an accurate story (Butler, et al., in prep). Furthermore, the goals of the situation may influence the quality of the information, as some things may be slightly embellished in order to support the speaker's argument (Tversky & Marsh, 2000). Finally, in attempts to keep the goals and details relevant to the current conversation, certain things are rehearsed and others are not (Tversky & Marsh, 2000).

5.2 Grain Size

Similar to how these situational factors affect what information is conveyed according to Grice's Conventions, they also influence the level of detail in the retelling. The level of detail that is reported is often referred to as "grain size." For example, precise statements such as, "the perpetrator was 6 ft. 4 in. tall" is considered a "precise" grain size and more general statements such as "the perpetrator was about 6 ft tall" is considered a "coarse" grain size. As with Grice's Conventions, situational factors might affect the specific grain size a speaker adopts during a retelling. For example, stories told to young children are often very different than stories told to older adults: when women retell complex stories to children, they will often simplify the complicated ideas in order to make the story more understandable for their audience (Adams et al., 2002). The simplification of these complex ideas most likely results in a coarser grain size.

The grain size adopted during the first retelling may also affect the grain size that is adopted in later retelling; this will be examined in the next section.

5.3 Schema-guided Reconstruction

Thus, situational factors affect the specific way a speaker tells a story. When speakers modify their story based on these factors, story accuracy may suffer. As shown above, some situational factors are more conducive to accuracy-based retrieval than others. For instance, accurate information is more likely conveyed if subjects are instructed to give accurate retellings, whereas specific details are lost if subjects are instructed to give an entertaining retelling (Dudukovic et al., 2004). Likewise, if speakers change the level of detail for different audiences (Adams et al., 2002), the level of accuracy may also suffer. The level of accuracy or quality of a retelling may also depend on whether or not speakers activate a specific schema to aid them in retrieving information from the Event. A schema refers to a general framework used to guide reconstruction of past experiences, interpretation of new experiences, and predictions for the future. Subjects may also use a specific kind of schema called a *script*. A script refers to a general sequence of events, such as the events that usually occur when you visit a restaurant (ordering food, eating, paying, etc.) For example, Tversky and Marsh (2000) found that subjects activated an “annoying roommate schema” to guide them in reconstructing the story’s events. For example, this type of schema might include behaviors such as “leaves dirty dishes lying around” and “plays music too loudly.” Activating behaviors that fit with this

general schema guide construction later. Thus the activation of a specific schema affects the details to which subjects direct their attention during a retelling (Vandierendonck & Van Damme, 1988). Though the activation of a schema is useful in guiding reconstruction, it can also lead to the generation of errors (Bartlett, 1932; Bergman & Roediger, 1999). For instance, schema-consistent information might emerge in the retelling, not because it actually occurred, but because it follows given one's knowledge about the general events that *usually* occur (Bartlett, 1932; Bergman & Roediger, 1999). Likewise, elaborations may be incorporated into the first retelling simply because they are consistent with an individual's knowledge of a certain schema (Tversky & Marsh, 2000). The retrieval of such schema-consistent information on the first retelling has potential to interfere at later points on this temporal timeline (which is discussed in the next section).

5.4 Labeling

Similar to how schema activation can guide retrieval during a retelling, the attachment of labels can also guide retrieval. Labels may be particularly useful in guiding retrieval of events that are unclear or ambiguous. Unfortunately, however, as with schema-guided reconstruction, the use of labels is not immune to error. In 1932, Carmichael, Hogan, & Walter discovered that a post-encoding label influenced subjects' memory for ambiguous-looking line drawings. For example, they showed subjects a line connecting two circles. After viewing this drawing, half of the subjects read the label "eyeglasses" and the other half read

the label “dumbbell.” The label subjects read influenced their drawings of the object later: subjects who read that the picture was a pair of eyeglasses, produced drawings that were more similar to eyeglasses than the original drawing. Likewise, subjects who read that the picture was a dumbbell modified their drawings to be more consistent with that label. The biased memory that ensues from post encoding labeling has been replicated for simple line drawings (Brandimonte, Hitch, & Bishop, 1992), and even for more complicated material. For instance, providing names (i.e., labels) of famous people after reading passages can affect later memory as well (Dooling & Christiaansen, 1977).

Due to our need to understand and make sense of the complex world around us (Tversky, 2004), it is not surprising if we attach labels to events that may be unclear or ambiguous. The attachment of such labels guides encoding and later retrieval, but as with any “time saving” heuristic it is prone to errors. For example, imagine that the last time you were at a restaurant you saw a man and a woman having dinner together. As you were led to your table, you couldn’t help but notice that the woman was crying. Crying and other emotional expressions can sometimes be ambiguous: were they tears of happiness or sadness? Perhaps, you labeled them “tears of happiness.” The simple attachment of a “happy” label might bias your memory later on. Maybe you imagined a little black box sitting on the table. Likewise, if you labeled them “tears of sadness,” perhaps you imagined the woman handing the ring back to the man. The ambiguity of the initial event might affect the label that is subsequently attached to the event, and

this can have later memorial consequences. Are highly ambiguous events more or less likely to have labels attached to them? How does the attachment of such labels affect memory for the initial event? Experiments that manipulate the ambiguity of the initial event and the labeling of that event will answer these questions.

To summarize, a number of factors affect the specific information that is conveyed in the first retelling. Audience effects, goals, and the purpose of the retelling, can influence the way information is retold. These factors might affect which Conversational Conventions are followed, the grain size reported, the activation of specific schemas, or the use of certain labels. Thus, each of these factors can lead to selective rehearsal. However, the process of selective rehearsal can have both positive and negative memorial consequences. If the rehearsed information is correct, the memory trace will be strengthened; unfortunately, this strengthening may be at the expense of non-rehearsed information (Anderson, Bjork, & Bjork, 1994).

However, many real-world circumstances do not facilitate accuracy-based retrieval, such as when individuals put a certain “spin” on their stories (Marsh & Tversky, 2004) to make them more entertaining (Dudukovic et al., 2004) or to strengthen a certain argument (Tversky & Marsh, 2000). Roediger, Jacoby, and McDermott (1996) found that if errors are generated, negative memorial consequences will ensue, as rehearsal also strengthens these errors. In their experiment, subjects viewed a series of slides depicting a crime. After viewing

these slides, subjects read misleading information embedded in a narrative. Following this narrative, all of the subjects were instructed to write about the initial slides. The specific instructions were manipulated on this first recall test in a way that increased the probability that some subjects would produce information from both the narrative and the event. On a final memory test two days later, subjects who received those instructions later confused where they learned the information, and they believed that the information they generated during the first retelling actually occurred during the slide sequence. That is, errors generated on one memory test persisted to the next. It is possible that a similar persistence of errors could occur in the retellings sequence: If errors surface on the first retelling, will they persist to subsequent retellings? We will now turn our attention to factors that influence subsequent retellings. Additionally, because errors may enter into the model during the first retelling, we will examine factors that affect their persistence to later retellings.

6. The Generation of Subsequent Retellings and the Persistence of Errors

Thus far, I have shown that the first retelling is far from accurate rehearsal, and that factors influencing selective retrieval can also influence whether errors are generated on the initial retelling. Retellings for autobiographical events are not retold once – they are recounted a number of times over the course of several hours, days, months, or years (Hyman & Faries, 1992; Marsh & Tversky, 2004). Because stories are often told multiple times (to Retell n) and errors can enter into this model at Retell 1, two things must be considered. First, the way events are discussed on the first retelling might constrain the way they are discussed on future retellings. Second, the process of telling the story may influence its consistency across time. As we saw above, selective rehearsal can have both positive and negative effects on memory; it is possible that multiple retellings will work to further strengthen the rehearsed components, whether those components are accurate or not.

6.1 Constraints from Previous Retellings

There are some constraints that earlier retellings have on later retellings. We will first return to the concept of grain size, and examine how the grain size of information may change across retellings and how adopting specific grain sizes early on can have later memorial consequences. Next, we will turn to patterns of consistency across the retelling sequence.

As shown above, the grain size a person adopts may put constraints on the specific details that are conveyed on the first retelling. Generally, across time, broad statements are remembered, and specific details are lost (e.g., Conway, Cohen, & Stanhope, 1991). We might expect events to be recounted in less detail across time simply because coarse grain details (general ideas) are forgotten more slowly than precise grain details (more specific facts) (Goldsmith, Koriat & Pansky, 2005). However, the act of retelling may influence the change in grain size in different ways. If precise grain details are rehearsed on an earlier retelling, the simple process of retrieving these details may stabilize access to these details on future retellings, similar to the aforementioned benefits that result from accurate rehearsal. What would happen in the opposite scenario: that is, what are the later consequences of adopting a coarse grain answer early on? Can subjects return to more precise grain answers later in the retellings sequence? For example, after simplifying a story to a young child (coarse grain), can a speaker effectively retell the story in complex detail to a peer (precise grain)? It is not immediately clear how the grain sizes of earlier retellings influence the grain sizes of subsequent retellings. However, certain instructional manipulations may shed light on this issue. Presumably, accuracy-based instructions prior to a retelling will elicit “precise grain answers,” whereas instructions to entertain prior to a retelling will elicit “coarse grain answers,” much like in Dudukovic and colleagues’ experiment (2004). As discussed earlier, Dudukovic and others showed that adopting a certain retelling strategy can

influence later memory retrieval: telling an entertaining story can result in poorer memory for details. It is possible that once subjects adopt a particular grain size, it would be difficult to get them to switch to another on future reports (from coarse to detailed, and vice versa). Also, the simple act of retrieving information in one grain size may encourage use of the same grain size on future tests. Future research should examine the effects of switching grain size across multiple retellings.

As shown above, retrieval improves retention to the extent that it is accurate; the production of errors increases the likelihood that they will surface on future memory tests (Roediger et al., 1996). If grain size and labeling influence or distort the detail in which a memory is retold, these errors will likely persist to later retellings. Similarly, the activation of a schema and the possibility of schema-consistent intrusions during each retelling can influence errors as well. Referring back to the model, errors generated on Retell 1, may be reproduced on Retell 2, and so forth. For example at Retell n, a representation of an Event includes not only the Event itself, but could also include a subject's memory for the previous times they *retold* their story (Retell 1 and Retell 2). Thus, errors generated at Retell 1 and Retell 2 might interfere proactively and surface at Retell n. This is depicted as "Sources of Proactive Interference" in the model below (Figure 2).

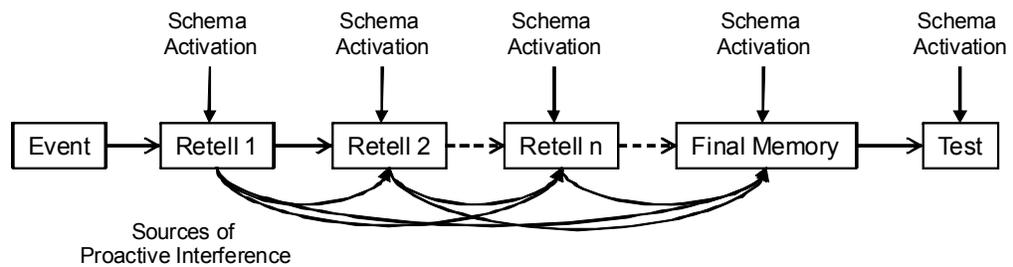


Figure 2: Sources of proactive interference in the retellings model.

The likelihood of errors generated on previous retellings interfering with subsequent retellings coincides with what would be expected given traditional theories of proactive interference (Anderson & Neeley, 1996). Proactive interference occurs when previously learned material influences more recently learned material. In the case of retellings, subjects may use the last time they told their story as a guide to remembering the original Event. If that retelling contained errors, those errors would interfere proactively and surface in the current retelling. Thus, when errors enter into the model at Retell 1 (due to the factors discussed above), they are likely to be generated on subsequent retrievals (Roediger et al., 1996).

6.2 Consistency across Retellings

As alluded to above, schema activation is a possible source of error, not only on the initial retelling, but on each of the subsequent retellings as well. Thus at each point along the model (at each retelling, the final memory, and the test), the activation of a schema may strengthen schema-consistent information because it is selectively rehearsed. Consider again, Bartlett's (1932) seminal study. In his experiment, subjects generated the folk tale several times.

Presumably, at each retelling, subjects would activate a script (a specific type of schema referring to the order of events) for the story, and over time, their memories became more consistent with this script. Thus, the script-consistent and schema-consistent errors generated from previous retellings may interfere with future retellings; additionally, if script and schema reconstruction guide retrieval at each point in the model, consistent errors might accumulate resulting in a final memory with script and schema-consistent errors. These results fit nicely with the results from Anderson et al. (2000) that were discussed earlier: details of older memories are less likely to change across repeated retrievals compared to younger memories, which are more unstable.

The stability that naturally occurs across individuals in oral traditions (Rubin, 1995) coincides with the schematic stability that occurs within an individual, but across multiple retrievals (Bartlett, 1932; Bergman & Roediger, 1999). In the case of Poor Pearl, discussed earlier, the story changed in order to be more consistent with other stories of the same type. In the case of Bartlett's *War of the Ghost* folk tale, stories became more consistent with the individual's knowledge of the world. Thus at each point in the model, a schema may be activated to guide retrieval. Errors generated from the activation of a schema on a previous retelling might persist to more recent retellings. Additionally, personal background knowledge can affect the specific schema that guides reconstruction. When we tell stories, we usually have a general idea of what *should* have occurred based on our knowledge of stability and change, and this can bias the

type of information that we remember (Ross, 1989). For instance, if you are trying to determine your friend's mood the last time you saw her, you may think more generally about what her mood is typically like. Is she usually a happy person? Using past knowledge about her mood consistency, you may deduct that she was most likely in a good mood during your last encounter. Applying schemas may be particularly useful for guiding the reconstruction of these stable factors.

In addition to underlying cognitive mechanisms, such as schema activation, that affect consistency across retellings, there are social components involved as well (Pasupathi, 2001). First, early papers on reward and punishment (Skinner, 1953) show that rewarding behaviors results in their repetition. Given this, it is not surprising that we retain story details that worked well with previous audiences. That is, if an audience found a certain part of a story particularly entertaining, we will include those details again and again, looking to the audience for approval (or reward). Second, cognitive dissonance may also be a social component that influences retelling consistency. Cognitive dissonance refers to the uncomfortable feeling people have when they concurrently hold two conflicting viewpoints (Festinger, 1957). For example, if you describe an event as "entertaining" to one audience, and "boring" to another, you may have feelings of cognitive dissonance for expressing two conflicting reports. Thus, consistency from one retelling to the next may simply arise out of efforts to avoid these negative feelings.

7. Factors Affecting Final Memory Test Performance

Thus far, I have shown how retelling a memory is far from recalling it. I have also discussed factors affecting the way a memory is retold (e.g., audience and listener effects, and the goals and purpose of the retelling). Additionally, I have examined factors that influence the persistence of errors on subsequent retellings and the consistency between retellings. I will now turn the attention to the final memory test. In real world situations, this test may refer to any time the original event is retrieved. Usually, memory tests in retelling paradigms emphasize accuracy-based recall. Recalling is used in favor of recognition, because subjects must generate their own retrieval cues; as such, the effects of retellings are often more pronounced on these types of tests (that is, there are smaller effects of retelling when recognition is used to assess accuracy; e.g., Tversky & Marsh, 2000). Thus on such a test, a subject must edit their answer for errors, and determine which pieces of information actually occurred during the event, and which pieces were merely generated afterwards in one of the retellings. Referring back to the model, the goal of the Test is to retrieve only information that occurred during the Event.

7.1 Schema-guided Reconstruction

As with other points in the model, schema-guided reconstruction may also bias memory for what occurred during the initial event (Bartlett, 1932; Bergman & Roediger, 1999). Because retrieval cues are not provided on recall measures, as

they are on recognition tests, subjects must generate their own retrieval cues. The activation of a schema is one way of doing so. Though schema-guided reconstruction has been evident in every retelling (first and subsequent) discussed thus far, there are some components unique to the test alone. For example, when subjects are asked for an accurate retrieval, they must determine what information actually occurred during the Event, and what information was merely generated along the way.

7.2 Interference from Previous Retellings

According to the aforementioned theories of proactive interference, information generated on previous retellings interferes with information generated on subsequent retellings. Another form of interference surfaces on the final test: *retroactive interference*. Retroactive interference occurs when recently learned material interferes with previously learned material. That is, the recently rehearsed information blocks access to earlier learned material (Anderson & Neely, 1996). In the case of retellings, the more recently rehearsed material (in each retelling) interferes with memory for the initial Event. This is depicted as “Sources of Retroactive Interference” in the model below (Figure 3).

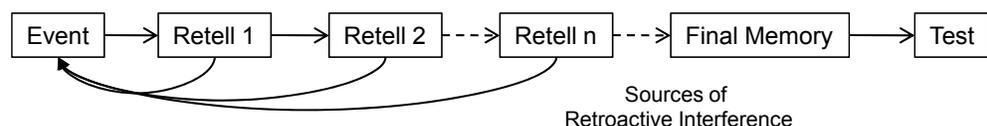


Figure 3: Sources of retroactive interference in the retellings model.

Retroactive interference is typically studied in list-learning paradigms (Anderson & Neely, 1996). In these studies, subjects learn two lists of words: List 1 and List 2. On a final memory test, subjects retrieve only words from List 1. Retroactive interference occurs when items from List 2 interfere with the retrieval of items from List 1. Eyewitness misinformation studies are an example of this paradigm in real-world situations. In these studies, subjects view an event (or read a story), after which they are exposed to post-event misleading information (usually in the form of a questionnaire). Later, subjects confuse the source of that misleading information, and attribute it to the initial event. The misinformation effect has been a popular topic of study for many years (Lofus, 2005), as it occurs in many real-world situations; the types of questions witnesses are asked after viewing a crime can modify their initial memory for that crime (Loftus & Palmer, 1974).

Errors on subsequent retellings may also arise from discussing the event with others (Gabbert, Memon, & Allan, 2003). Furthermore, when subjects generate this incorrect information on their own (as what might happen within the context of a retelling), they may later confuse the source of the information and incorrectly attribute it to the initial event, rather than to their own generation (Pickel, 2004). For instance, Ackil and Zaragoza (1998) found that subjects who were forced to confabulate answers after viewing an event later confused the source of their own confabulations and incorrectly believed that they had been components of the initial event. However, even in cases when subjects retrieve

detailed information on each retelling, accuracy is not guaranteed to persist to the later memory test. For instance, Lane and colleagues (2001) found that subjects who were exposed to inconsistent information after viewing an event, and then wrote detailed descriptions about the event were more suggestible than subjects who wrote general summaries. That is, subjects writing detailed descriptions were more likely to attribute the inconsistent post-event information to the event than subjects writing summary descriptions. Thus, if errors enter into the model at Retell 1 and those errors are later rehearsed in detail on later retellings, subjects may misattribute them to the actual Event rather than a past retelling.

This idea suggests that the accuracy of the final memory is dependent on both the number of retellings prior to it, and how accurate each retelling is in the temporal sequence. Because each retelling may contain errors from prior retellings (proactive interference), and the addition of new errors (that arise from schema-driven reconstruction), each retelling in the sequence may be more erroneous than the last. That is, the accuracy of the final memory is dependent on both the number of retellings prior to it, and how accurate those retellings are. An experiment manipulating the number of retellings and the retelling instructions (accurate vs. entertaining; Dudukovic et al., 2004; Wade & Clark, 1993) would shed light on this question. That is, if errors are generated when subjects are given entertaining instructions, what is the likelihood that those errors surface on multiple future retellings?

If accurate retrieval strengthens memory, we would expect an interaction between the number of retellings and the type of retelling instructions. If entertaining retellings lead to intrusions, errors would increase on each retelling; however, they would stabilize with accuracy-based instructions. Also, if entertaining instructions lead subjects to focus on specific information (such as only those aspects that were entertaining), we might see a similar result. Suengas and Johnson's (1988) work suggests that repeatedly thinking about certain aspects of an event can have negative consequences for other aspects. For instance, subjects who thought about the apperceptive qualities of an event (such as feelings and ideas they had while perceiving the event) showed reduced access to perceptual qualities later (such as voices and color). Subjects providing an entertaining retelling might have similar problems when attempting to access additional information.

There is also research that suggests that the emotionality of the Event and how often it is rehearsed can influence the final memory. For instance, Bohannon (1988) found that memories containing high emotionality *and* frequent rehearsal remain very vivid across time, compared to memories that *only* contain high emotionality *or* frequent rehearsal. Furthermore, the Fading Affect Bias suggests that negative feelings associated with unpleasant memories fade more quickly over time than the positive feelings associated with pleasant memories. When pleasant memories are discussed, the positive feelings associated with them fade less rapidly, whereas when negative memories are discussed, the negative

feelings associated with them fade more rapidly (Skowronski, Gibbons, Vogl, & Walker, 2004). Therefore, focusing on emotional aspects during a retelling may affect memory for the event. Future research should further examine the effects of emotions across multiple retellings.

It is also possible that in a situation with multiple retellings, errors generated on more recent retellings might affect the final memory more so than errors generated on older retellings. For example, are facts and errors generated on more recent retellings more predictive of final memory accuracy compared to facts and errors generated on older retellings? That is, do more recent retellings weigh more heavily on the final memory than older retellings? An experiment aimed at examining the number of retellings would also shed light on this issue, as errors can be tracked from each retelling to the next, and recency of each retelling may be a predictive factor for final memory accuracy. Long-term recency suggests that more recent events will be remembered in greater detail than events that occurred longer ago. For instance, you may remember the locations where you parked your car for the past three days, more easily than where you parked your car three months ago (Pinto & Baddeley, 1991). Therefore, the reconstruction occurring in more recent retellings is expected to have a greater influence on the final memory than earlier retellings.

The comparison of the retellings sequence to the misinformation effect paradigm is informative for other reasons. If there are ways to increase accuracy in a misinformation study, it is plausible to assume that those same methods

would improve memory accuracy in a retellings paradigm. One way to improve accuracy in misinformation paradigms is through the use of a source test (Lindsay & Johnson, 1989). A source test probes subjects' knowledge about where they learned specific information. For example, they may be asked whether the information was presented during the initial event (yes or no), or if it was presented after the event (yes or no). Source tests can also disentangle actually experienced information (e.g., the Event) from information that was merely internally generated (such as elaborations and intrusions that occur during the retellings). Memories for events that actually occurred usually contain greater perceptual detail than memories for events that were merely imagined (Johnson, Hashtroudi, & Lindsay, 1993). Additionally, memories for these imagined events have more cognitive operations associated with them (Johnson et al., 1993). Johnson and colleagues argue that subjects can use these differences to determine what events were experienced and what events were internally generated. It is possible that retellings can be viewed within the same framework. Subjects view an initial Event and discuss that event later. During each of these later discussions, subjects might have to monitor their output based on their audience, their goals, etc. The cognitive operations associated with this monitoring might be a useful cue in determining which details were generated during the retelling and which were actually perceived during the Event.

Additionally, literature on target monitoring suggests that subjects do, in fact, store contextual details about their retellings. Retrospective target monitoring, a specific type of target monitoring, occurs when subjects recall to whom and when (temporally) they told a specific piece of information (e.g., “I remember telling Jill about my new car yesterday”). The use of retrospective target monitoring may be useful in discriminating between actually perceived and internally generated events, because it includes not only a temporal source, but other source cues as well (such as where you were when you discussed certain information). For instance, subjects can remember to whom they told specific information, and at what time (Brown, Hornstein & Memon, 2006). If subjects can retrieve this type of information about the retelling, it may probe their memory for what was accurately retold and what was generated for the story.

Therefore, because giving subjects a source test improves accuracy in typical misinformation studies (Lindsay & Johnson, 1989) it is possible that offering a source component on the final memory test may improve accuracy in a retelling paradigm. That is, subjects could be directed to use the same cues that Johnson and colleagues examined (that is, differences in perceptual information and cognitive operations) in order to correctly determine the source of their memory (Were things actually experienced, or were they generated for a story?). The effect of this type of source test on final memory accuracy remains largely unexplored in the retellings literature.

7.3 Transfer Inappropriate Processing

There is also a possibility that a change in processing strategy may influence what type of information subjects produce on the final memory test. Transfer appropriate processing occurs when there is a match between the type of processing between encoding and retrieval, and this match can result in increased performance during retrieval. This type of phenomenon is best understood through example. Morris, Bransford, and Franks (1977) found that an orienting task that emphasized semantic properties (e.g., Is this word a body part?) resulted in better memory than an orienting task that emphasized rhyming properties (e.g., Does this word rhyme with “Tree”?). This is understandable considering that deep (e.g., semantic) encoding leads to better retrieval than shallow (e.g., rhyming) encoding (Craik & Lockhart, 1972). However, Morris and colleagues (1977) also found that an orienting task that emphasized rhyming (e.g., Does this study word rhyme with “Tree”?) resulted in better performance than an orienting task that emphasized semantic properties (e.g., Is this word a body part?), but only when the subsequent memory task also emphasized rhyming (e.g., Did you study a word that rhymes with “Tree”?). That is, similarities between the studying and testing emphasized the same type of cognitive processing.

Transfer inappropriate processing (TIAP) occurs when there is a switch in processing strategies between study and test, and this switch results in memory impairment. TIAP is exemplified in the verbal overshadowing paradigm. In typical

verbal overshadowing experiments, subjects view a face and then attempt to describe it. Subjects who describe the face actually have more difficulty selecting the face from a line-up than subjects who do not describe the face (Schooler & Engstler-Schooler, 1990; see Meisser & Brigham, 2001 for a review). The verbal overshadowing phenomenon is not limited to faces; it has emerged for taste (Melcher & Schooler, 1996) and even colors (Schooler & Engstler-Schooler, 1990).

Transfer inappropriate processing is thought to occur for faces because the processing strategies used for viewing a face are very different than those required to discuss a face. Usually, when viewing a face, subjects utilize a holistic processing strategy whereas during the verbalization, a featural processing strategy is utilized. When subjects process a face holistically, they process all components of the face in relation to others (e.g., how the eyes relate to the nose and mouth, etc.). However, featural processing typically focuses on specific components (e.g., the mouth was small). Furthermore, featural properties are often easier to put into words than more holistic properties. Presumably, the switch between holistic processing (on the initial acquisition) to featural processing (during the verbalization phase) results in impairment on a final memory test that emphasizes holistic processing (e.g., subjects are asked to choose the studied face among several unstudied lure faces).

This type of processing shift explains the difficulty subjects have in typical verbal overshadowing paradigms. For example, subjects who engage in a

perceptual task (i.e., completing a maze or listening to music) after viewing a face, have less memory impairment than subjects who engage in a verbal task (i.e., describing the face) (Finger, 2002). That is, there are benefits to processing the same type of information, even if the specific task is different (completing a maze versus viewing a face). When a certain type of processing is disrupted, such as what occurs when subjects are required to describe a face after viewing it, negative consequences ensue. Additionally, merely engaging in a verbal task, even if the task is to describe a different face, can also result in poorer memory compared to conditions in which a face was not described at all (Dodson, Johnson, & Schooler, 1997).

It is possible that a processing shift occurs between the retellings and the final memory test. For instance, each of the retellings might emphasize a different type of processing than the final memory test. I will refer to the processing occurring on each of the retellings as *storytelling-based processing* and the processing occurring on the final memory test as *accuracy-based processing*, both shown in the model below (Figure 4).

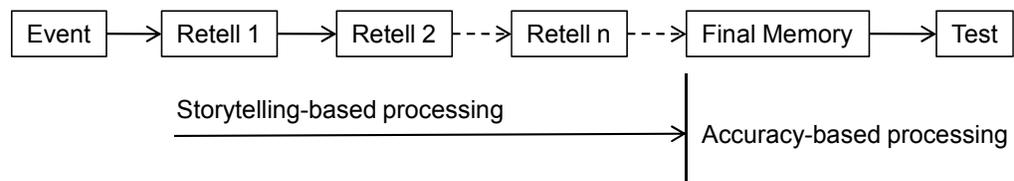


Figure 4: Two possible types of processing occurring within the retellings model: Storytelling-based processing and accuracy-based processing.

How is *storytelling-based processing* different from *accuracy-based processing*? First of all, previous research suggests that when people retell the events, they engage in a “language of storytelling,” which is very different from the language used in accuracy-based recall (Dudukovic et al., 2004). For example, accuracy-based retrieval includes more sensory words and disfluencies, and fewer emotion words, certainty words, words reflecting tentativeness, and discussion of affect, compared to entertaining-based retrieval (Dudukovic et al., 2004). Furthermore, Dudukovic and colleagues found that engaging in an entertaining storytelling perspective has consequences on the final memory test. The authors suggest that subjects switch from the entertaining organization in their stories to one that utilizes a chronological organization. While this switch increased the retrieval of items that were unrehearsed during the retelling portion, it actually lowered the retrieval of items that were consistent with the entertaining storytelling perspective. These results are consistent with Anderson and Pichert’s (1978) work that emphasizes the role of the perspective taken during retrieval: When subjects are asked to change their perspective between retrieval attempts, they retrieve more perspective-relevant details that were initially excluded. For instance, subjects recount different details depending on if they are assigned to tell a story from the perspective of a homebuyer or a burglar. After discussing the story once, they switch perspectives (from homebuyer to burglar, or vice versa). After switching perspectives, they are able

to retrieve additional perspective relevant details that were not retrieved on the initial attempt.

It is possible, however, that these tasks simply result in a change in cues rather than a shift in processing. For instance, having subjects switch from the homebuyer's perspective to a burglar's perspective might cue them to additional details that did not initially come to mind (e.g., large amounts of cash on the table). In the retellings framework, the shift from an entertaining retelling to accuracy-based recall on the final test may also affect what cues come to mind. In this case, subjects might organize their recall in a chronological order and recalling this order information might serve as additional retrieval cues. However, shifting the goal from the retelling to the final test may affect more than retrieval cues. A change in processing might result in qualitative differences (such as a "language of storytelling").

Thus, a storytelling-based processing shift might be responsible for poor performance on a final memory test that emphasizes accuracy-based processing, which leads us down another avenue for future research. For example, will a final test that emphasizes storytelling-based processing lead to better performance for subjects who engaged in a storytelling-based processing on each retelling? How will subjects who engage in an accuracy-based processing on each retelling fare on a test that emphasizes storytelling-based processing? It is important to note, however, how a test emphasizing storytelling-based processing differs from one that emphasizes accuracy-based processing.

As Koriat and colleagues (2000) note, “the quality of phenomenal experience may be critical in leading the rememberer to accept a memory as true” (p. 487). If we judge the veracity of our own memories based on their quality, others may judge our stories on the same dimension. Quality-rich stories may be rated as “more true” than quantity-rich stories. A test emphasizing a storytelling-based retrieval strategy should include *quality* as an accuracy measure rather than *quantity* (as an accuracy-based test would). For instance, subjects assigned to a storytelling-based retrieval strategy might be asked to “Tell a great story about the event” as a final test. Presumably subjects who engage in storytelling-based processing during the retelling *and* on the final test will perform better on measures of quality compared to measures of quantity.

7.4 Inhibition

It is possible that inhibition is playing a role in the retelling model as well. We will examine the role of inhibition through the lens of the Retrieval-Induced Forgetting (RIF) paradigm. Retrieval induced-forgetting occurs when the retrieval of one item causes related items to be less accessible (Anderson, Bjork, & Bjork, 1994). For example, in typical RIF paradigms, subjects learn exemplars from several categories (Fruit – Orange; Fruit – Apple; Tree - Oak; Tree – Elm) (Anderson & Spellman, 1995). After learning these items, some of the exemplars in one of the categories are selectively rehearsed (Fruit – Orange). Retrieval-induced forgetting occurs when unrehearsed exemplars in a practiced category (Fruit – Apple), are remembered at lower rates than exemplars in unpracticed

categories (Tree – Oak; Tree – Elm). The effects of RIF are not short lived: inhibition is evident after a 24 hour delay, but only when the retrieval practice and final memory test occur in the same delayed session (MacLeod & Macrae, 2001). Such a situation might occur when subjects selectively retrieve information in a retelling context days after the initial event, and then have their final memory tested shortly thereafter. Proponents of inhibition use an independent probe technique to support their argument (Anderson & Spellman, 1995). For instance, practicing Fruit – Orange inhibits access to the word Apple. An independent probe technique would use a word besides Fruit to probe access to the word Apple, such as “Red – A_____”. If inhibition was at work, the item itself should not be accessible through other means. However, if the item were simply blocked by other interfering information (as would be suggested according to theories of interference; Anderson & Neely, 1996), the item would be accessible through other means.

Cuc, Kopel, and Hirst (2007) examined socially-shared RIF in a free-flowing conversation. Socially-shared RIF occurs when the selective details a speaker recounts can inhibit a listener’s memory for the items not discussed. Thus, even though a listener is not telling a story herself, what she hears someone else discuss can affect her own memory later. That is, when a speaker discusses some events in a story, but leaves out some related events, they essentially inhibit their own memory for those related, un-discussed events, in addition to the memory of those who are listening. As in typical RIF paradigms,

un-practiced, un-related events show better memory than related, but un-discussed events. Though Cuc and colleagues interpret their results within the framework of inhibition, the role of interference cannot be ruled out. That is, Cuc and others did not use an independent probe technique to support the role of inhibition. It is possible that the “inhibited” items are available through another means. For example, switching perspectives might increase accessibility to them (as in Anderson & Pichert’s (1978) experiment).

It is possible that the selective retrieval of information during each retelling might cause inhibition for similar, related items that were not retrieved. For example, if subjects discuss some of the positive things about a roommate at Retell 1, what happens to the negative aspects that were not discussed? Are they less accessible on future retellings? According to an inhibition account, they would be less likely to appear both on future retellings and on the final memory test. However, there is a lack of support in the retellings literature supporting inhibition as an underlying mechanism. For example in Tversky and Marsh’s (2000) experiment, subjects read stories about roommates who did both social and annoying things. During a retelling phase, subjects selectively retrieved either social or annoying things about one of the roommates. A final memory test showed that, on average, perspective relevant items were retrieved at higher rates for the discussed character than perspective irrelevant items. Additionally equal numbers of relevant and irrelevant information items were retrieved for the un-discussed character, and these were similar to levels of recall for irrelevant

details for the discussed character. This is not what would be expected according to an inhibition account. For example, if subjects retold perspective relevant details for one roommate (the positive, social details), it would result in inhibition for the perspective irrelevant details of the same roommate. This inhibition would result in poorer memory for the discussed irrelevant details, than any of the details (relevant or irrelevant) for the non-discussed roommate; this was not the case. A variation of the independent probe technique that is tailored to a retellings paradigm would be needed to further examine inhibition as a possible underlying mechanism.

To summarize, the retellings process includes selective rehearsal of both accurate and inaccurate information. This type of strengthening can affect performance on final memory tests. Additionally, factors that influence selective rehearsal were discussed, such as the use of different grain sizes or the activation of specific schemas. Furthermore, the process of telling a story can constrain the way it is told in the future. Finally, a number of factors influence final test performance. A schema might be activated on the final test to guide reconstruction, intrusions generated along the retellings sequence might interfere with memory for the Event, and a processing shift between the retellings and the final test can affect test performance. Though more empirical support is needed to fully evaluate inhibition, it was also examined as a possible underlying mechanism.

8. Interim Conclusions

The stories that our ancestors have passed down through generations (Rubin, 1995) and the stories we retell from our own personal experiences (Marsh & Tversky, 2004) are a unique aspect of being human. We modify the story we tell based on situational factors (audience, goals, etc). Additionally, previous retellings may constrain the future stories we tell: adopting a grain size, activating a schema, and attaching a label might affect what we include from Retell 1 to Retell 2. The process of retelling was shown to manipulate final memory for the Event. Also, a number of underlying cognitive mechanisms have been evaluated as possible explanations for these memorial consequences. Subjects may use schemas to guide their reconstruction on the final test, which may influence the intrusions of schema-consistent information. Erroneous details produced during retellings interfere with memory for the Event, similar to how misleading post-event information interferes with memory in eyewitness memory paradigms. Furthermore, tests emphasizing different methods of processing might shed light on how the method of storytelling is different from the method of accuracy-based retrieval. Additionally, inhibition was also evaluated as a potential mechanism within this retellings framework. The proposed model identifies each of these mechanisms and depicts how they would result in memorial consequences. Future research should examine the memorial consequences associated with multiple retellings, and the memorial consequences associated with adopting specific grain sizes. Furthermore, these

mechanisms should be extended to examine the memorial consequences associated with discussing autobiographical memories. In the following pages, I further explore selective rehearsal as a possible mechanism. In addition, I examine how retellings influence qualitative aspects of autobiographical memories.

9. The Cognitive Mechanisms of Retellings: An Investigation of the Role of Selective Rehearsal

9.1 Rehearsal in Memory Research

As discussed above, repeated rehearsal is a powerful way to strengthen memory for the rehearsed items (Rundus & Atkinson, 1970). Studies supporting this notion typically utilize paradigms in which subjects learn lists of words and subsequently attempt to recount them verbatim. For example, in a simple word learning experiment, Rundus and Atkinson found that the number of times an item was rehearsed was related to later memory: items that subjects rehearsed with greater frequency were more likely to be remembered on a final memory test. Retrieval is a very powerful aspect of the memory process, and the situations surrounding how or when a subject retrieves can influence what a person ultimately remembers (see Roediger & Guynn, 1996). In fact, retrieval is so powerful that in laboratory paradigms, subjects benefit more from retrieving information than simply studying it. More specifically, research on the *testing effect* shows that taking a test (i.e., retrieving the information) improves a student's performance on later tests, even if no feedback is given about their performance (see Roediger & Karpicke, 2006a for a review).

Though retrieval occurs within a retellings context, the type of retrieval is generally selective. That is, we usually do not retrieve everything we can remember; instead we retrieve the parts of the experience that fit with our current storytelling goal. Generally, selectively retrieving information boosts memory for

that information on a later test, as compared to information that was not selectively retrieved. Specifically, when subjects learn an initial list of word pairs, and then selectively retrieve some of those word pairs, they show improved memory later (as compared to word pairs they did not selectively retrieve) (Anderson & Spellman, 1995).

I am interested in the role of selective rehearsal within a retellings context. More specifically, one goal in the first experiment is to understand how it contributes to the memorial changes that occur after a retelling. As mentioned above, Tversky and Marsh's experiment about the two roommates examined whether telling biased stories influences subjects' later memory for what they previously read. This experiment is useful for understanding the role of selective rehearsal within a retellings framework. In the retellings phase, subjects were telling stories with a specific goal in mind. In complying with that goal, they selectively retrieved information. For example, subjects writing to refer the roommate to a sorority retrieved more social aspects of that roommate, but did not retrieve information irrelevant to that goal (e.g., annoying characteristics). Tversky and Marsh found that subjects had better memory for characteristics that were relevant to the roommate they discussed in their retelling, compared to the roommate they did not discuss. Additionally, the amount of information that subjects relayed in their stories was predictive of the amount of information they retrieved on the final memory test. That is, these data suggest memorial

differences that a process of selective rehearsal can explain: greater retrieval in the stories was related to greater final recall.

What is also important, however, is how subjects performed who discussed story information in a neutral way. These subjects were told to retrieve everything they could about only one of the characters; in doing so, they were still selectively rehearsing information about a specific roommate, but in an unbiased way. In their retellings, these subjects retrieved equal amounts of information: social and annoying (which corresponded to the two perspectives in the biased condition), and neutral behaviors. Interestingly, on the final recall test, these subjects did not show benefits of selective rehearsal. That is, on the test, they retrieved information from both roommates equally well, regardless of which one they previously rehearsed.

Overall, in Tversky and Marsh's experiment, subjects benefited from selective rehearsal, but only when they are telling a story; selectively rehearsing information in a neutral way did not strengthen memory. Though these results are informative in understanding the general process of selective retrieval in a storytelling setting, the experiment did not specifically control for it. That is, subjects in the biased storytelling conditions were instructed to retrieve story details that fit with their storytelling goal, whereas subjects in the neutral storytelling condition retrieved everything about a particular roommate. This design does not isolate the specific effects of selective rehearsal because subjects are not selectively rehearsing the same information in each condition.

Because this was not the case, we cannot tell how the storytelling process influenced memory above and beyond the way in which selective rehearsal benefits memory.

9. 2 Experiment 1: Overview

Selective rehearsal, as it typically occurs in basic memory paradigms is both similar to and different from the type of selective rehearsal that typically occurs in a storytelling context. In both cases, subjects are rehearsing only parts of the information they initially learned. However, in typical memory experiments, subjects are usually instructed to be accurate in their rehearsal, whereas in a storytelling context, subjects may have goals other than accuracy. That is, subjects might tell a good quality story, at the expense of telling an accurate story and in doing so their story may contain more elaborations. Though selective rehearsal is occurring within this storytelling context, the elaborations and distortions (that typically come with telling a good quality story) may be responsible for these memorial changes. Experiment 1 aimed to more fully understand how selective rehearsal in a storytelling context differed from basic selective rehearsal that does not include the critical storytelling aspect. That is: is selective retrieval leading to the memorial changes, or is it specific to the storytelling nature of the retrieval? In Experiment 1, I created two fictional stories that allowed me to examine these two types of retrieval: selective retrieval with a storytelling goal that encouraged subjects to elaborate and expand (as is typical during storytelling) and selective retrieval that did not encourage elaboration.

In the study, all subjects read the stories. After reading, subjects selectively rehearsed story information. Critically, however, was the manner in which they selectively rehearsed information. Some subjects were instructed to retrieve in a story-like fashion, one that encouraged them to elaborate and share their own opinions. Other subjects were instructed to retrieve by simply listing the information, which did not encourage them to elaborate or to share their opinions. The stories were written in a way that allowed subjects to elaborate on the material, and to give their own opinions – as is typical in a storytelling context (this type of elaborative rehearsal would be difficult had subjects encoded simple word lists). However, subjects could easily rehearse story information in a list format as well.

Of interest is how these two types of selective rehearsal influence subjects' memory on a final free recall test for story information. In both situations, subjects are selectively retrieving story information. If the memorial consequences are due to selective rehearsal, there may be no differences between the groups on the final test (as both are selectively retrieving information). However, if there is something special about the *story* subjects are telling as they selectively rehearse that information, differences might emerge between the two groups. Subjects rehearsing the information in a list format should show memorial benefits for the rehearsed material, as is expected given prior research. Most important is how selectively retrieving in an elaborative fashion influences performance on a final test. Subjects telling elaborative stories

are expected to rehearse the same story information (as subjects listing the information); however, because they are telling a *story*, they may include more than factual information; their rehearsal might include elaborations and opinions that may lead to memorial consequences on a final memory test. This design will allow us to determine if there is something special about the *storytelling* component that boosts memory even more, or on the flip-side, leads to even more memorial consequences (due to the generation of elaborations, etc). If the process of telling a story does not influence memory more than simply selectively retrieving that information, then there will be no differences on a final memory test. The first study examined these possibilities.

9.3 Method

9.3.1 Subjects

One-hundred-four subjects participated in exchange for \$18. Subjects were tested alone, or in groups of no more than three people.

9.3.2 Design

This experiment had a 2(rehearsal: yes, no) x 2(rehearsal type: list, elaborate) design. Rehearsal was manipulated within-subjects and counterbalanced across subjects; rehearsal type was manipulated between-subjects and counterbalanced across subjects. Of interest was subjects' performance on a final free recall memory test, given these factors.

9.3.3 Materials

I created two short fictional stories. One story (the “house story”) was told from the perspective of a real estate agent attempting to sell a house to a couple. In the story, the characters and the agent visited two houses (a brick house and a white house). The other story (the “restaurant story”) was about two friends who liked to try different restaurants around the United States. In the story, they visited a restaurant in Alaska and another one in Georgia. Embedded in each story were 8 critical pieces of information (4 for each house and restaurant). These critical items were always positive features about the houses/restaurants. For example, in the first story, subjects read, “Once you were in the kitchen you noticed David carefully inspecting the granite countertops” (“granite countertops” was the critical information).

The house story was 483 words long and the restaurant story was 557 words long. Though both stories contained positive features about the houses and restaurants, they were otherwise non-emotional and not eventful. See Appendix A for each story.

The attribution test consisted of 24 items: Each of the 16 critical items was included, in addition to 8 new items. That is, 16 of the items were from the stories (e.g., granite countertops) and 8 were new (e.g., parquet floors).

9.3.4 Procedure

As shown in Figure 5 below, the experiment consisted of 4 critical phases: the story reading phase, the rehearsal phase, the final free recall phase, and the

attribution test phase. The experiment also included two filler tasks, described below. The entire experiment was computerized using DirectRT (Jarvis, 2006a) and MediaLab (Jarvis, 2006b) software.

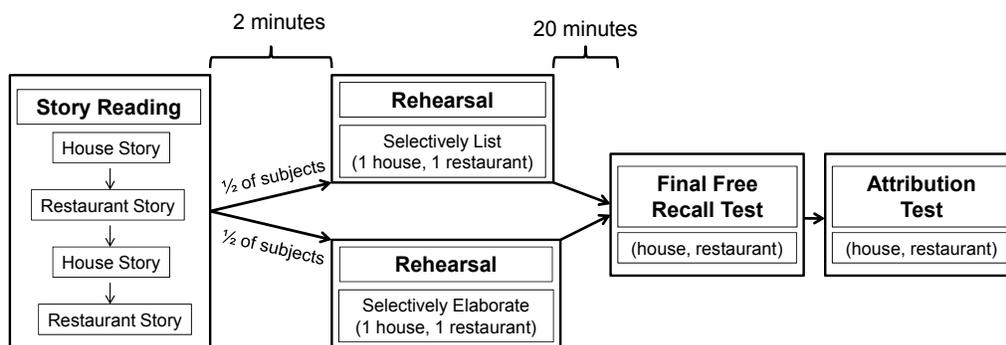


Figure 5: Experimental procedure used in Experiment 1.

After giving informed consent, subjects were told that they would read two short stories (the story reading phase). They were instructed to remember the details of each story, as their memory for them would be tested at various points throughout the study. Subjects read the house story first and the restaurant story second. To ensure that subjects encoded story information, after reading both stories once, they read them in the same order again. Sentences appeared one at a time on the computer, and subjects advanced through them at their own pace (they were not allowed to go back after advancing). Six catch trials were embedded in each story, in order to ensure that subjects were paying attention. On these trials, subjects were asked to type the last sentence they just read, before moving onto the next sentence. Catch trials occurred for different sentences the second time subjects read the stories; in both cases, they never occurred after sentences containing critical items. After the story reading phase,

subjects completed an unrelated filler task for 2 minutes that involved solving 2 brainteasers.

Subjects then completed the rehearsal phase. In this phase, subjects retrieved information about one house and one restaurant. Specifically, after reading the stories, they were randomly assigned to selectively retrieve information about the first house and the first restaurant, or the second house and the second restaurant. Critically, as half of the subjects selectively retrieved this information, they typed a coherent, elaborative story (the elaborate condition); the other half of subjects simply typed the same information in a list format (the list condition). When writing about the house story, subjects were told to imagine that they were a real estate agent, trying to sell the house on a website. Furthermore, subjects in the elaborate condition (who retrieved information about the first house) read the following instructions:

“Please provide a tour (in words) of the brick house, being sure to describe and expand upon all of its positive qualities. Both your opinions and concrete details are important to potential buyers, as is the way this house comes across in words. Write in a way that provides a visual guide for the potential buyer, starting with the positive features of the exterior and then guiding them through each of the rooms inside.”

Subjects in the listing condition read: “Please list the positive features of the brick house, being sure to note all of its positive qualities, as details are really

important to potential buyers. Begin your list with the positive features on the exterior, and then list the features for each of the rooms inside.”

For the restaurant retelling, subjects were instructed to imagine that they were writing a review of the restaurant for a popular tourism website. Prior to telling their stories, subjects in the elaborate condition read:

“Please write an advertisement for Iceberg Café, being sure to describe and expand upon all of its positive qualities. Both your opinions and concrete details are really important, as is the way this restaurant comes across in words. Write in a way that provides a visual guide, starting with all the positive things that happened when you first arrived at the restaurant and then throughout the course of your meal.”

Whereas subjects in the listing condition read: “Please list the positive features for Iceberg Café, being sure to note all of its positive qualities, as details are important on your test. Begin your list with the positive things that happened when you first arrived at the restaurant and then throughout the course of your meal.”

Subjects always selectively retrieved information about the house story first and then the restaurant story (there was no delay between each retelling); furthermore, they worked on their stories/lists for a minimum of seven minutes for each the house story and restaurant story. Following the rehearsal phase, subjects completed a second unrelated filler task for 20 minutes in which they solved 20 brainteasers.

The third critical phase, the final free recall phase, consisted of two final free recall tests. In this phase, subjects were told to “remember as many of the details as possible from the original story” and “not to worry about the exact wording or order” of what they remembered. They always retrieved for the house story first, and then the restaurant story. There was no minimum/maximum time limit for each of these free recall tests: subjects simply advanced to the next part of the experiment when they were finished typing.

After the final free recall phase, subjects moved on to the attribution test phase. During this phase, subjects completed the attribution test. First, they were presented with critical items from the house story, in addition to the 4 new items. All the items appeared one at a time in randomized order, and subjects were instructed to determine whether the item belonged to the first house, the second house, or neither house. After all of the house items, subjects were presented with critical items from the restaurant story, in addition to the 4 new items. As before, items appeared one at a time in randomized order; subjects determined whether they belonged to the first restaurant, the second restaurant, or neither restaurant.

At the conclusion of the experiment, subjects were debriefed and paid.

9.4 Results

All results are significant at the $p < .05$ level, unless noted otherwise.

9.4.1 Catch Trial Performance

To ensure that subjects were carefully reading the stories, I analyzed their responses for each of the catch trials. Two independent coders coded these responses on a 3-point scale (0=they did not remember anything; 1=they retrieved the main idea, but missed specific details; 2=they retrieved the entire sentence) and a third coder resolved discrepancies. Overall, subjects were quite accurate on these trials ($M = 1.84$, $SD = .26$); however 4 subjects scoring less than 2 standard deviations below the mean were removed; therefore the data below reflect one hundred subjects.

9.4.2 Coding: Selective Rehearsals and Final Recall

Two condition-blind coders determined whether the 16 critical items were present or absent in each subject's story/list and recall. For coding purposes, each item was broken down into two components: the physical item (the "item") (e.g., countertops) and the adjective (the "descriptors") that described the object (e.g., granite). Furthermore, coders recorded to which house/restaurant these items were attributed. As shown in Table 1 (below), coder agreement was significantly high; a third coder resolved all discrepancies.

Table 1: Cohen's Kappa for coding agreement.

		Item	Attribution	Descriptor
House Story	Selective Rehearsal	.90	.92	.92
	Final Recall	.90	.91	.94
Restaurant Story	Selective Rehearsal	.93	.92	.94
	Final Recall	.96	.95	.94

Coders also indicated if subjects elaborated upon items in the story. More specifically, a response was coded as a story-specific elaboration if it was connected to story information, but also included additional details that were not in the story. For example, if a subject wrote that “David loved the beautiful granite countertops” they were elaborating on story information: the granite countertops. The story does not indicate how David felt about the countertops, nor does it indicate that they were beautiful; thus this response would be counted as 2 story-specific elaborations.¹ Extra-story elaborations were considered as well: these were elaborations that went above and beyond the story, but were not tied to a specific item. For example, if a subject wrote, “The couple thought the brick house was much better than the white house,” they were making a general statement about the brick house that was not mentioned in the story at all. This response would be coded as 1 extra-story elaboration.

¹ Cohen's Kappa was not computed for elaborations (item-specific or extra-story) because these numbers reflected counts of items. The numbers generated did not fall into a symmetric cross-tabulation matrix. However, on average, the correlation between coders was high: $r=.69$.

9.4.3 Selective Rehearsal

Story Information Retrieved: Correct Attributions

In the rehearsal phase, subjects were asked to selectively retrieve information from one house and one restaurant. However, they were instructed to retrieve this information in either an elaborative storytelling fashion, or simply by listing it. See Appendix B for an example of what subjects generated. To determine if rehearsal instruction influenced the likelihood that subjects remembered story information, I analyzed the proportion of critical items and descriptors retrieved. First, I examined information that they correctly remembered from the story (that is, information that actually belonged to the house and restaurant they were instructed to write about). Overall, subjects telling elaborate stories included a greater proportion of items in their selective rehearsals ($M=.66$), compared to subjects who simply listed the information ($M=.56$), $t(98)=2.56$, $SED=.04$. However, subjects telling stories did not include more of these items' descriptors ($M=.60$), as compared to those who listed the information ($M=.52$), $t(98)=1.72$, $SED=.04$, $p=.09$. Although the means were in the same direction, the difference was not yet significant. Thus, the subjects' goal during the selective rehearsal phase influences the likelihood that they correctly retrieve information. Elaborating on story information tends to improve the amount of correct information retrieved.

Story Information Retrieved: Misattributions

When subjects wrote their stories and lists, they were instructed to selectively retrieve information from only one house and one restaurant. The above analysis showed that subjects are generally quite good at remembering story information and using it to support their argument in their stories or lists. However, it is also possible that subjects may retrieve information from the *other* house/restaurant; they may use something in their argument despite it belonging to the other house/restaurant. That is, if subjects were instructed to write about the first house, did they retrieve information from the second house and use it in their stories and lists as well? Misattributing story information in this way was low, and subjects who listed story details, ($M=.10$) retrieved items from the incorrect house/restaurant at a similar level to subjects elaborating on story information ($M=.10$), $t<1$. Similarly, no differences emerged for the descriptors (list: $M=.08$; elaborate: $M=.07$), $t<1$.

To summarize, subjects telling elaborate stories tended to included more correct information in their stories, as compared to subjects who listed information. That is, they retrieved more information from the house/restaurant they were instructed to write about. However, they did not make more mistakes and incorrectly include more information from the other house/restaurant (that they were not supposed to be writing about). The elaborate process of storytelling generally improved retrieval of correct information in the selective rehearsal phase.

Elaborations

Though subjects in this experiment had the same general goal (sell a house and advertise a restaurant), subjects in the elaborate storytelling condition were specifically instructed to tell an elaborate story while those in the listing condition simply listed the same information. In order to determine if subjects who were instructed to tell stories were indeed being more elaborate, I counted the total number of elaborations generated during the selective rehearsal phase. These were elaborations that were tied to correctly attributed items/descriptors. As expected, subjects in the elaboration condition elaborated more upon story information ($M=5.60$) compared to subjects who listed information ($M=2.11$), $t(98)=7.39$, $SED=.47$. Subjects telling stories also generated more extra-story elaborations ($M=13.42$) compared to subjects in the listing condition ($M=5.96$), $t(98)=5.29$, $SED=1.41$. Therefore, the instruction manipulation was producing more elaborations in the elaborate storytelling condition, as one would expect.

9.4.4 Does telling a story influence later memory?

Final Recall: Correct Attributions

Subjects who told elaborate stories included more information in their stories, as compared to subjects who listed the same information. Though there were benefits, there were also costs: subjects included more elaborations in order to comply with their storytelling goal. Of critical interest is how this process of elaborative selective rehearsal influences later memory, as compared to the process of selectively listing information. In order to examine this, I computed

separate 2(rehearsal: yes, no) x 2(rehearsal type: list, elaborate) ANOVAs on the proportion of items and descriptors retrieved on the final memory test. For this analysis, I held subjects to a strict criterion of remembering both the item/descriptors in addition to which house/restaurant they belonged. For example, in this analysis, a subject would get credit if they remembered that the white house had granite countertops (for both the item (countertops), and the descriptor (granite)). That is, if they correctly attributed story information to the house or restaurant they rehearsed in the rehearsal phase, this data would contribute to the “rehearsed” cell in the table below. On the other hand, if they correctly attributed story information to the house or restaurant they did not rehearse, this data would contribute to the “unrehearsed” cell in the table below. However, if they remembered that one house had granite countertops, but they forgot which house, they did not get credit. Similarly, if they wrote that the brick house had granite countertops, when in fact it did not, they did not get credit.

All relevant data are in Table 2 (below). As before, there was a main effect of rehearsal: Regardless of the type of rehearsal, subjects remembered more items if they belonged to the rehearsed house/restaurant ($M=.56$), than if they did not ($M=.45$), $F(1, 98)=22.67$, $MSE=.03$, $\eta_p^2=.19$. The same pattern held for the items’ descriptors: subjects were more likely to retrieve them and correctly attribute them if they belonged to the rehearsed house/restaurant ($M=.50$), than if they did not ($M=.39$), $F(1, 98)=17.77$, $MSE=.03$, $\eta_p^2=.15$.

Furthermore, subjects who told stories during the rehearsal phase tended to retrieve a greater number of descriptors ($M=.48$) as compared to subjects who listed during the rehearsal phase ($M=.41$), $F(1,98)=3.49$, $MSE=.08$, $\eta_p^2=.03$, $p=.07$. However, this difference was not significant for item retrieval (elaborate: $M=.54$; list: $M=.47$), $F(1, 98)=2.73$, $MSE=.08$, $\eta_p^2=.03$, $p=.10$.

To summarize, telling a story tended to improve subjects' memory for information in the stories. More powerful, however, were the effects of selective rehearsal: regardless of how subjects rehearsed information, they showed better memory for story information if it was previously rehearsed than if it was not. The interaction between rehearsal and the specific rehearsal instruction was not significant for either the items, or the descriptors (both $F_s < 1$).

Table 2: Final Recall. Proportion of items and descriptors recalled and correctly attributed.

	Rehearsal	Rehearsal Type		<i>M</i> (<i>SE</i>)
		List	Elaborate	
Items				
	Rehearsed	.52 (.03)	.60 (.03)	.56 (.02)
	Unrehearsed	.42 (.03)	.47 (.03)	.45 (.02)
	<i>M</i> (<i>SE</i>)	.47 (.03)	.54 (.03)	
Descriptors				
	Rehearsed	.45 (.03)	.55 (.03)	.50 (.02)
	Unrehearsed	.37 (.03)	.42 (.03)	.39 (.02)
	<i>M</i> (<i>SE</i>)	.41 (.03)	.48 (.03)	

Note: Standard Errors in parentheses

I also examined each story separately, in order to determine if either the house or restaurant story was driving the effects above. As a reminder, the

house story was read first, and the restaurant story was read second; furthermore, subjects always retrieved information from the house story first and the restaurant story second. Separate 2(rehearsal: yes, no) x 2(rehearsal type: elaborate, list) ANOVAs were computed for the house and restaurant stories. Results are largely consistent with those above with one exception. Above, the effects of elaborating on story information were only marginally significant for items ($p=.07$) and their descriptors ($p=.10$). However, it is obvious that the house story is driving these effects. Rehearsing the house story in an elaborative way increased the number of items retrieved ($M=.63$), as compared to listing the same information ($M=.54$), $F(1, 98)=3.72$, $MSE=.11$, $\eta_p^2=.04$, $p=.06$. The same pattern was true for descriptors as well, with elaborating ($M=.56$) improving later memory more so than listing ($M=.46$), $F(1, 98)=4.51$, $MSE=.10$, $\eta_p^2=.04$. However, elaboration did not influence retrieval of information from the restaurant story. Subjects were no more likely to retrieve items from the restaurant story after elaborating on it ($M=.45$) as compared to after listing it ($M=.41$), $F<1$. Similarly, subjects were equally likely to retrieve descriptors from the restaurant story after listing ($M=.36$) and elaborating ($M=.41$), $F(1, 98)=1.24$, $MSE=.11$, $\eta_p^2=.01$, $p=.27$. All other findings are consistent with those above.

Final Recall: Misattributions

The above analysis examined story information retrieved on the final recall test, but held subjects to a strict criterion of remembering the items/descriptors in addition to which house/restaurant they belonged. I also examined whether

subjects recalled information, but attributed it to the *wrong* house/restaurant. That is, what is the likelihood that subjects made misattributions *to* the rehearsed and unrehearsed house/restaurant? Returning to the example above, the story referred to granite countertops in the white house. If a subject rehearsed the brick house in the rehearsal phase, and wrote that the brick house had granite countertops on the final recall test, this data would contribute to the “rehearsed” cell in the table below. On the other hand, if another subject rehearsed the white house in the rehearsal phase, and wrote that the brick house had granite countertops on the final recall test, this data would contribute to the “unrehearsed” cell in the table below, as the item is attributed *to* the house that was not rehearsed in the rehearsal phase.

To examine how rehearsal and rehearsal type influenced this type of misattribution, I computed separate 2(rehearsal: yes, no) x 2 (rehearsal type: list, elaborate) ANOVAs on the proportion of items and descriptors retrieved on the final recall test that were assigned to the *wrong* house/restaurant.

All results are shown below (Table 3). Subjects were more likely to misattribute items to the rehearsed house/restaurant ($M=.06$) than to the unrehearsed house/restaurant ($M=.03$), $F(1, 98)=8.31$, $MSE=.01$, $\eta_p^2=.08$. The descriptors also followed this trend (rehearsed: $M=.05$; unrehearsed: $M=.02$), $F(1, 98)=4.95$, $MSE=.01$, $\eta_p^2=.05$. No other significant effects emerged for either items or descriptors (all $F_s < 1$).

When the house and restaurant story were analyzed separately, the house story produces similar results as those above. However, rehearsing story information has no effect on misattributions for the restaurant story. This was true for both the items ($M_s=.05$ and $.03$), $F(1, 98)=1.68$, $MSE=.01$, $\eta_p^2=.02$, $p=.20$, and the descriptors ($M_s=.03$ and $.03$), $F<1$.

Table 3: Final Recall. Proportion of items and descriptors recalled and misattributed.

Items	Rehearsal Type			$M(SE)$
	Rehearsal	List	Elaborate	
Rehearsed		.06 (.01)	.06 (.01)	.06 (.01)
Unrehearsed		.02 (.01)	.03 (.01)	.03 (.01)
$M(SE)$.04 (.01)	.04 (.01)	
Descriptors				
Rehearsed		.05 (.01)	.05 (.01)	.05 (.01)
Unrehearsed		.02 (.01)	.02 (.01)	.02 (.01)
$M(SE)$.04 (.01)	.03 (.01)	

Note: Standard Errors in parentheses

Total Amount Attributed in Recall

Each of the analyses reported above held subjects to a strict criterion. First, subjects only received credit for a piece of story information if they *also* remembered to which house/restaurant that information belonged (correct attribution). Second, data was only included when subjects assigned items or descriptors to the *wrong* house/restaurant (misattribution). In order to examine the effects of rehearsal and rehearsal type more generally, I combined these two

measures which yielded the total proportion of items and descriptors that were retrieved and attributed to each the rehearsed and unrehearsed house/restaurant (regardless of whether they were attributed correctly or incorrectly). That is, did subjects have a bias to report that story information belonged to the rehearsed or unrehearsed house? To answer this question, I computed separate 2 (rehearsal: yes, no) x 2(rehearsal type: list, elaborate) ANOVAs on the total proportion of items/descriptors assigned to the rehearsed and unrehearsed house/restaurant.

As shown below (Table 4), a main effect of rehearsal emerged for both items and descriptors: Subjects tended to attribute more story information (both correctly and incorrectly) to the house or restaurant they rehearsed in the rehearsal phase, as compared to the house/restaurant they did not rehearse. This was true for both items (rehearsed: $M=.62$; unrehearsed: $M=.47$), $F(1, 98)=24.90$, $MSE=.04$, $\eta_p^2=.20$, and the descriptors (rehearsed: $M=.55$; unrehearsed: $M=.42$), $F(1, 98)=18.98$, $MSE=.04$, $\eta_p^2=.16$.

Elaboration had little influence on the retrieval of items ($M_s=.51, .58$), $F(1, 98)=2.93$, $MSE=.08$, $\eta_p^2=.03$, $p=.09$. However, elaborating had more of an influence on the descriptors. Elaborating improved the proportion of descriptors retrieved ($M=.52$) more so than listing them ($M=.45$), $F(1, 98)=3.53$, $MSE=.08$, $\eta_p^2=.03$, $p=.06$. No significant interactions emerged, both $F_s < 1$.

When the house and restaurant story are analyzed separately, a slightly different pattern of results emerged. The effects of rehearsal for each story were similar for both items and descriptors ($p_s < .05$). In each story, subjects tended to

attribute more information to the house/restaurant they rehearsed in the rehearsal phase, as compared to the house/restaurant they did not rehearse. However, telling elaborative stories influenced the retrieval of information from the house and restaurant story in different ways. Elaborating influenced retrieval of both the items and descriptors for the house story. More specifically, subjects who elaborated on house story information tended to attribute a greater proportion of items ($M=.68$), as compared to those who listed house story information ($M=.58$), $F(1, 98)=5.50$, $MSE=.09$, $\eta_p^2=.05$. This same pattern emerged for the items' descriptors: Elaborating on story information increased the likelihood that subjects would retrieve and attribute story information ($M=.60$), as compared to subjects who simply listed that information ($M=.49$), $F(1, 98)=6.25$, $MSE=.10$, $\eta_p^2=.06$. In contrary, when subjects elaborated on information from the restaurant story, the process of telling an elaborative story had no influence on later retrieval of items ($Ms=.45$ and $.48$), or descriptors ($Ms=.40$ and $.43$) both $Fs<1$.

Table 4: Final Recall. Total proportion of items and descriptors attributed in recall.

	Rehearsal	Rehearsal Type		<i>M(SE)</i>
		List	Elaborate	
Items				
	Rehearsed	.58 (.04)	.66 (.04)	.62 (.03)
	Unrehearsed	.45 (.03)	.50 (.03)	.47 (.02)
	<i>M (SE)</i>	.51 (.03)	.58 (.03)	
Descriptors				
	Rehearsed	.50 (.04)	.59 (.04)	.55 (.03)
	Unrehearsed	.39 (.03)	.45 (.03)	.42 (.02)
	<i>M (SE)</i>	.45 (.03)	.52 (.03)	

Note: Standard Errors in parentheses

Final Recall: Elaborations

Though subjects telling stories generated more elaborations in their stories, they tended to remember more story information on the final recall test. A critical question, however, is whether there is a cost to having generated those elaborations in their stories? That is, although they have better memory for story information later, will they also generate more elaborations on the final recall test? In order to determine these possible costs, I counted the number of elaborations generated on the final recall test that were related to story information and extra-story elaborations (which went above and beyond what was mentioned in the story).

Table 5: Final Recall. Total number of story-specific elaborations.

Rehearsal	Rehearsal Type		<i>M</i> (<i>SE</i>)
	List	Elaborate	
Rehearsed	.99 (.12)	.56 (.12)	.78 (.09)
Unrehearsed	.56 (.13)	.79 (.13)	.68 (.09)
<i>M</i> (<i>SE</i>)	.78 (.08)	.68 (.08)	

Note: Standard Errors in parentheses

As shown in Table 5, a significant interaction emerged for elaborations tied to story material, $F(1, 98)=5.91$, $MSE=.92$, $\eta_p^2=.06$. This interaction was driven by the fact that subjects in the list condition made more elaborations for information rehearsed in the rehearsal phase ($M=.99$), than information that was not rehearsed ($M=.56$), $t(49)=2.52$, $SEM=.17$. However subjects who told stories generated equal numbers of elaborations on the final memory test regardless of whether they rehearsed that information in their stories ($M_s=.56$ and $.79$) $t(49)=1.09$, $SEM=.21$, $p=.28$. No other significant findings emerged, $F_s < 1$. Additionally, retrieval instruction (elaborate, list) had no effect on extra-story elaborations: Subjects telling stories included the same number of extra-story elaborations on the final recall test ($M=2.06$) as subjects listing information ($M=2.82$), $t(98)=1.46$, $SED=.52$, $p=.15$. One should note, however, that these specific results reflect a *count* of items, and not proportions; therefore, they should be interpreted with caution.

9.4.5 Connections across Retellings and Recall

Of additional interest is how the retrieval of a specific item during the retellings phase influenced the likelihood that it was also retrieved on the final recall test. As noted above, previous research has linked the likelihood of retrieving a story detail on a final recall test to the likelihood of retrieving that same detail during the retellings phase. If this probability is high, it would suggest that subjects benefited from rehearsing information: That is, if they retrieved something in their stories, they were also likely to retrieve it on the final recall test. Previous research has linked this probability to the specific retelling goal. Subjects who told a story with an accuracy-based goal tend to remember more of the same details on the final recall test that they also wrote about during the retellings, as compared to subjects who retold with an entertaining goal (Dudukovic et al., 2004). In the current experiment, this conditional probability was quite high but unrelated to retelling condition: subjects in the elaborate story retelling condition were just as likely to retrieve items (and correctly attribute them) on their retellings and the final recall test ($M=.85$) as subjects in the list condition ($M=.85$), $t < 1$. The same pattern held for the descriptors: Subjects in each retelling condition (list: $M=.78$; elaborate: $M=.85$) were equally likely to retrieve a given descriptor on both their retelling and the final recall test, $t(98)=1.17$, $SED=.05$, $p=.25$.

Related to this probability, is the probability that something was retrieved on the final recall test that was *not* retrieved during the retelling portion.

Dudukovic and colleagues found that this probability was also related to retelling instruction. More specifically, they found that subjects in the entertaining condition were more likely to retrieve something on the final recall, given that it was not retrieved during the retellings portion, compared to subjects in the accurate condition. In the current experiment, this conditional probability was not related to retelling instruction. That is, subjects in the elaborate ($M=.13$) and listing ($M=.09$) retelling conditions were equally likely to remember items on the final recall after not retrieving them during the rehearsal phase, $t < 1$. The same pattern held for the descriptors: subjects who told stories ($M=.09$) were no more likely than subjects in the listing retelling condition ($M=.04$) to retrieve descriptors on the final recall after failing to retrieve them on the retelling, $t(98)=1.77$, $SED=.03$, $p=.08$.

Taken together, these results suggest that subjects benefited from rehearsing story information in their retelling, but that these benefits were unrelated to the retelling goal. That is, selective rehearsal benefited subjects in both retelling conditions in the same way: if they retrieved something in the stories, they tended to retrieve it later on.

9.4.6 Attribution Test

On the final recall test, subjects generally showed benefits of having previously rehearsed information. Recall tests are more sensitive measures of memory because subjects have to generate their own retrieval cues. In order to examine if the effects of selective rehearsal extended to recognition memory as

well, I analyzed attribution test data. Specifically, I computed a 2(rehearsal: yes, no) x 2(rehearsal type: elaborate, list) ANOVA on the proportion of questions subjects correctly answered on the attribution test (see Table 6). Overall, subjects were much better attributing story details if they belonged to the house/restaurant that was rehearsed in the retellings phase ($M=.86$), than if it was not ($M=.78$); this resulted in a main effect of rehearsal, $F(1,98)=14.05$, $MSE=.02$, $\eta_p^2=.13$. No other significant findings emerged: retelling instruction did not influence performance on the attribution test [$F(1,98)=1.40$, $MSE=.04$, $\eta_p^2=.01$, $p=.24$] nor did retelling instruction and rehearsal interact, $F_s<1$.

Furthermore, subjects were more likely to misattribute items on this test to the house/restaurant they rehearsed in the rehearsal phase ($M=.18$) as compared to the house/restaurant they did not rehearse ($M=.10$), $F(1,98)=14.98$, $MSE=.02$, $\eta_p^2=.13$. However, there were no effects of elaboration, $F(1, 98)=1.56$, $MSE=.03$, $\eta_p^2=.12$, $p=.22$. The interaction between rehearsal and rehearsal type was not significant, $F<1$.

Table 6: Attribution Test. Proportion of story details correctly attributed.

Rehearsal	Rehearsal Instruction		<i>M</i> (<i>SE</i>)
	List	Elaborate	
Rehearsed	.84 (.02)	.88 (.02)	.86 (.02)
Unrehearsed	.77 (.03)	.79 (.03)	.78 (.02)
<i>M</i> (<i>SE</i>)	.80 (.02)	.84 (.02)	

Note: Standard Errors in parentheses

9. 5 Discussion

Though the specific retrieval instruction did not interact with rehearsal, several important findings emerged. First, subjects generally had better final recall for story information that was rehearsed in the retellings phase, than information that was not. This basic rehearsal effect of retelling a story is consistent with other findings in the literature (Tversky & Marsh, 2000). Additionally, elaborating during the retellings phase tended to improve subjects' memory: Though not yet significant, the pattern of results suggest that subjects remembered more information on the final recall test, compared to subjects who listed the information. It is possible that the process of storytelling caused subjects to think of the material in a deep and meaningful way, and deep, meaningful processing generally benefits later memory for that material (Craik & Lockhart, 1972). Additionally, subjects who told stories included more elaborations in their stories, but they were able to edit them out of their final memories and did not generate them again on a final memory test.

The critical interaction between rehearsal type (list vs. elaborate) and rehearsal did not emerge. That is, subjects who told stories did not benefit from rehearsal more so than subjects listing the information, even though they benefited overall. This lack of an interaction suggests that the rehearsal benefits of retrieving story information are similar, regardless of whether that selective rehearsal also involved the storytelling component. That is, though subjects elaborating in their stories have better memory overall, they do not show greater

benefits of selective rehearsal than subjects listing the information. This is the key result: In this experiment, I controlled for selective rehearsal in order to examine the effects of storytelling above and beyond that of selectively rehearsing information. These results suggest that the storytelling component does not lead to more benefits for the selectively rehearsed information, as compared to the process of simply listing that information. That is, the benefits of telling a story are not specific to the rehearsed information (if this was the case, the interaction would be significant).

Adding a delay between the retellings phase and the final memory test may elucidate the specific mechanism involved during retellings. At a short delay, telling a story functioned similarly to a process of typical selective rehearsal. Though the stories differed from the lists in the amount of story information included in them, they also differed in the number elaborations. It is possible that after a delay, subjects may forget the source of these elaborations and be more likely to wrongly believe that they read about them in the stories. Typical findings in eyewitness misinformation studies support this idea. In these experiments, subjects view slides and afterwards read a narrative containing information inconsistent with those slides (i.e., misinformation) (e.g., Loftus et al, 1978). On a final memory test, subjects usually confuse what they read about in this narrative with information they encountered in the slides. Importantly, if a delay occurs between the presentation of the misinformation and the final memory test, subjects forget having read misleading information in questions and instead

attribute it to the initial event (Higham, 1998). In a related experiment, Roediger, Jacoby, and McDermott (1996) found that when subjects generated errors on one task, those specific errors were likely to persist to a final delayed memory test. In my experiment, though storytelling did not have a larger effect for the rehearsed information than the unrehearsed (as compared to the listing condition), it is possible that memorial differences might emerge after a delay.

Furthermore, though both groups of subjects had the same general goal, the process of storytelling might have activated a schema that subjects may later use to aid them during the final recall test. As discussed above, Tversky and Marsh's (2000) subjects activated an "annoying roommate" schema that aided them when reconstructing the events in the story. In my experiment, all subjects were instructed to sell a house, but it is possible that the process of storytelling activated a schema while the process of listing did not. Because schemas guide retrieval, it is possible that schema-activation during the selective rehearsal phase was underlying the memorial differences between the list and elaborate conditions in that phase of the experiment. Schema-activation helps to guide reconstruction, but it can also lead to schema-consistent errors (Bartlett, 1932; Bergman & Roediger, 1999). Though adding a delay between the rehearsal phase and the final recall test will explore possible source confusion, it will also shed light on the influence of schema activation during retellings. Subjects who elaborate during the rehearsal phase may include more schema-consistent

information in their final recall (Tversky & Marsh, 2000). After a delay, memories may be even more schema-consistent for subjects who tell elaborative stories.

10. Retellings and Autobiographical Memory

10.1 Memory Accuracy versus Quality

Because all of us converse and discuss with others, retellings research has direct implications for everyday life. It is relatively easy to think of a time when we modified our stories for a specific purpose, and in doing so, we provided our listener with a less-than accurate representation of what we actually experienced. Tying such real-world research questions to laboratory paradigms is useful because it allows researchers to more fully understand the cognitive mechanisms underlying these memorial changes. For example, laboratory retellings experiments allow researchers to examine how selective rehearsal (Experiment 1; Marsh & Tversky, 2000) and other mechanisms such as schema-driven processing (Tversky & Marsh, 2000) influence the memorial consequences that occur after a retelling. In studying these underlying cognitive mechanisms, researchers often elect to use a dependent measure associated with accuracy. That is, assessing the amount (or quantity) of information retrieved and comparing it to information that is forgotten or distorted allows us to draw conclusions about *how* retellings change memory. As shown in Experiment 1, when subjects are given a certain goal (such as to tell a convincing story), they often add a number of details to support their point; these details were not included in the original event. Determining how the types of errors introduced during a retelling relate to the original event helps researchers understand the roles of certain mechanisms underlying these memorial changes. For instance,

on a final memory test, do subjects generate new errors that are consistent with their retelling goal? If so, perhaps the process of telling a story activates a schema, which subjects then use to guide their retrieval on a final memory test.

Though understanding accuracy within a retellings context is important, there is much more to understanding memory than the traditional accuracy-based approach can offer. More recently, research has begun exploring other dependent measures, such as memory quality (Koriat et al., 2000). As Koriat and colleagues (2000) note, “the quality of phenomenal experience may be critical in leading the rememberer to accept a memory as true” (p. 487). The quality of a story may also lead others to regard a certain experience as true. In eyewitness testimony literature, the quality of an account that an eyewitness delivers is influential in whether jurors believe a testimony. When a prosecutor’s eyewitness delivers a testimony that includes a number of vivid details, mock jurors rate that eyewitness as more credible, than when the prosecutor’s eyewitness remembers fewer details (Bell & Loftus, 1988).

As discussed above, retellings is a form of selective rehearsal; this process of selectively rehearsing information has later implications for memory accuracy (Experiment 1). Though selective rehearsal influences the amount or quantity of information retrieved, rehearsal can also influence qualitative aspects of memory. For example, when subjects are instructed to elaborate about a specific event, they are more likely to later say that it was “true”; surprisingly, this occurs for events that subjects actually experienced and those that are imagined

(Kealy, Kuiper, & Klein, 2006). In this case, subjects use qualitative aspects of memory in order to determine their truth value.

Discerning between real and imagined events based on qualitative aspects of memory is the basis of the Reality Monitoring Framework (Johnson & Raye, 1981). According to this framework, subjects determine whether an event was generated internally or externally, based on the qualitative aspects associated with it. Memories that are remembered with a number of perceptual details are typically regarded as true; however, events associated with a number of cognitive operations (such as thought processes) are often regarded as internally generated (or imagined). In fact, Johnson (1997) notes: "Many source-monitoring decisions are made rapidly or heuristically on the basis of qualitative characteristics of activated memories" (p. 142).

Thus, the quality of a memory is one important criterion that helps us determine whether or not that memory is true (Ross, 1997). The process of retelling an event changes the quantity of information retrieved. However, it is also possible that it will change the quality of information remembered. If this type of change occurs, there are two points worth noting. First, retellings are known to include distortions and errors (Marsh & Tversky, 2004). Second, however, the simple act of retelling an event might increase qualitative aspects of that memory, such as the perceptual details retrieved. Taking these two points together suggests that though retellings may be inaccurate, the very process of telling a story might boost the rememberer's confidence that those errors are

correct simply because storytelling may increase the vividness of a memory. In order to better understand this process, the first step is to evaluate whether retellings change qualitative aspects of memories. To determine the effects of retellings on memory quality, I stepped away from laboratory-encoded events and into the domain of autobiographical memory. Autobiographical memories are typically associated with higher levels of perceptual qualities (such as whether the memory involves sound or smell), as compared to events that are imagined in the laboratory (Johnson et al., 1988). Thus, autobiographical memories are the perfect tool to use in order to understand how retellings influence qualitative aspects of memory.

10.2 Autobiographical Memories and Memory Error

Though we like to believe that our personal memories are free from error, we know this is not the case, even though they may be very detail-rich. The pages above have outlined only a few studies that show memories we encode in the laboratory can be riddled with error. Bartlett's (1932) subjects forgot events and changed details in their memory for the *War of the Ghosts* and Tversky and Marsh's (2000) subjects' memory was biased after telling a biased story. Similar to these memories that were encoded in the laboratory, autobiographical memories are not immune to memory distortions, even when our recollection of them is very vivid. Even flashbulb memories become less consistent overtime. In fact, though we believe these detail-rich memories are highly accurate, they decline at rates similar to everyday memories (Talarico & Rubin, 2003).

Thus, autobiographical memories can also be distorted, similar to how events encoded in the laboratory can be distorted. And the quality of these memories can also change as a result of laboratory manipulations. For instance, when subjects experience an event in the laboratory, and then rate qualitative characteristics about it (such as its clarity), the rating process influences how they think about that event later, as compared to if they did not rate the event (Suengas & Johnson, 1988). Similarly, studies suggest that rating autobiographical events can change the way we think about them. For example, when subjects are asked to retrieve and rate qualitative aspects of their memories, the process of rating changed certain aspects of their memory (Rubin, Boals, & Klein, 2010). That is, they indicated less emotional distress about the very negative event, as compared to a control group that did not rate the memories.

To summarize, memory quality is an important characteristic of memory to consider because it is an influential factor in determining a memory's veracity. In the current experiment, I am interested in understanding how retellings change qualitative aspects of memory. In order to evaluate this, I have moved outside of the laboratory and into the domain of autobiographical memory. To evaluate qualitative aspects of these memories, I used the Autobiographical Memory Questionnaire (AMQ: Rubin, Schrauf & Greenberg, 2003). This questionnaire consists of 18 questions, each paired with a scale. For example, subjects were asked "As I remember the event, I feel as though I am reliving the original event"

or “As I remember the event, I can feel now the emotions that I felt then.” For these items, subjects indicated their responses on a scale from 1 (“not at all”) to 7 (“as clearly as if it were happening right now”). This set of scales measures qualitative aspects of memory (related to visual details, the spatial layout, and the rememberers’ confidence in the accuracy of the memory). It is commonly used to assess qualitative aspects of autobiographical memories (e.g., D’Argembeau & Van der Linden, 2008; Boals & Perez, 2009), and the various scales are supported by the Basic Systems Model of Episodic Memory (Rubin, 2006). To simplify these scales, I computed composite scores based on theoretical groupings and past research (Talarico & Rubin, 2003; Sheen, Kemp, & Rubin, 2001; D’Argembeau & Van der Linden, 2006). For simplicity’s sake, I will only report findings for each of the composite scores. See Appendix C for the complete AMQ and Appendix D for the composite groupings.

Furthermore, to imitate real-world scenarios in which people retrieve information from their past, I instructed subjects to retrieve autobiographical memories in an entertaining or factual way. As Marsh and Tversky (2004) noted, people have different reasons for telling stories about events that happen to them. In their diary study, they found that people retell memories to both relate facts ($M=.58$) and to entertain their audience ($M=.38$). Other studies indicate that when subjects are asked to tell entertaining stories, their stories contain different information than if they are asked to retell accurate stories (Butler et al., in prep). More specifically, subjects who tell accurate narratives include more details that

typically happen for a particular event, as compared to subjects who have a goal to entertain. For example, if a student in an accurate rehearsal condition remembers a time when they recently went to class, they might include such details as getting out their class notes and other related material. On the other hand, stories that are intended to entertain an audience include more emotional words, as compared to narratives written with an accuracy goal (Butler et al., in prep). Entertaining stories also include fewer references to sensory details (Dudukovic et al., 2004).

Because an entertaining story versus factual retrieval instruction should result in different types of stories, they should influence autobiographical memories in different ways. For instance, if entertaining stories focus more on apperceptive qualities, subjects might lose access to perceptual qualities (Suengas & Johnson, 1988). Thus, it is possible that entertaining stories will make a memory less detailed, which may result in subjects giving lower ratings on these scales after retelling the memory, compared to before retelling it. That is, subjects may feel less like they are reliving the event, and they may be less likely to remember perceptual qualities (such as seeing the event in their mind, or visualizing its spatial layout). On the other hand, if subjects tell an accuracy-based story, they may be more likely to retrieve sensory details (Butler et al., in prep). If this is the case, subjects telling accurate stories should be more likely to feel as if they are reliving the event after they tell their stories, and they may be more likely to retrieve specific perceptual details.

10.3 Experiment 2: Overview

To preview, subjects in Experiment 2 completed the Autobiographical Memory Questionnaire (AMQ; Rubin, Schrauf, & Greenberg, 2003) two times. Critically, after completing the AMQ once, subjects rehearsed half of their memories (the other half served as controls). Furthermore, half of subjects told entertaining stories about their memories, while the other half rehearsed these events in a factual way.

Of interest in this experiment is how telling a story changes qualitative aspects of memories, specifically how telling an entertaining story versus retrieving the information in a factual way influences these ratings before and after that rehearsal (that is, the change over time). Also important, however, is whether simply rehearsing a memory (with either retrieval instruction: factual or entertaining) changes qualitative aspects of memories.

10.4 Method

10.4.1 Subjects

One hundred and sixteen Duke University undergraduates participated in exchange for monetary compensation or for partial credit towards a course requirement. Subjects were tested alone or in groups of no more than three people.

10.4.2 Design

This experiment had a 2 (memory rehearsal: yes, no) x 2 (rehearsal instruction: factual, entertaining) x 2 (time: AMQ ratings given at time1 versus time 2) design. Because each subject gave AMQ ratings both before and after the rehearsal, this variable was manipulated within-subjects. The other 2 factors (memory rehearsal and rehearsal instruction) were manipulated and counterbalanced between-subjects. That is, subjects told stories about 5 of the 10 memories (the other 5 served as control memories).

10.4.3 Materials

The Autobiographical Memory Questionnaire (Rubin et al., 2003) consisted of 19 statements and questions that assessed various memory characteristics. Eighteen of these questions were paired with a corresponding scale (which differed, depending on the item). For example, subjects rated the following statement “As I remember the event, I feel as though I am reliving the original event” on a scale of 1 (not at all) to 7 (as clearly as if it were happening right now). The only item not paired with scale was “Please date the memory (month/day/year) as accurately as you can.”

To probe subjects’ memory, I utilized the Galton-Crovitz word cuing technique (Crovitz & Schiffman, 1974). Ten items served as memory word cues: haircut, road trip, Thanksgiving, SAT, graduation (adapted from Butler, et al), movie, shopping, restaurant, class, and party (adapted from Bower, Black, & Turner, 1979). These items were chosen because they are relevant events to our

subject population, and thus most people would be able to think of memories related to them.

The Retellings Assessment Questionnaire (modified from Marsh & Tversky, 2004) consisted of six items that asked subjects to rate various qualities of their retellings such as: “How detailed do you think your retelling was, compared to the original event?” and “Did you add something in your retelling that was not part of the original event?” Each question was paired with a 1-5 scale; see Appendix E for a list of the questions and their respective scales.

10.4.4 Procedure

As shown in Figure 6 (below), the experiment consisted of 5 critical phases: the generation phase, the first rating phase, the rehearsal phase, the retelling assessment phase, and the final rating phase.

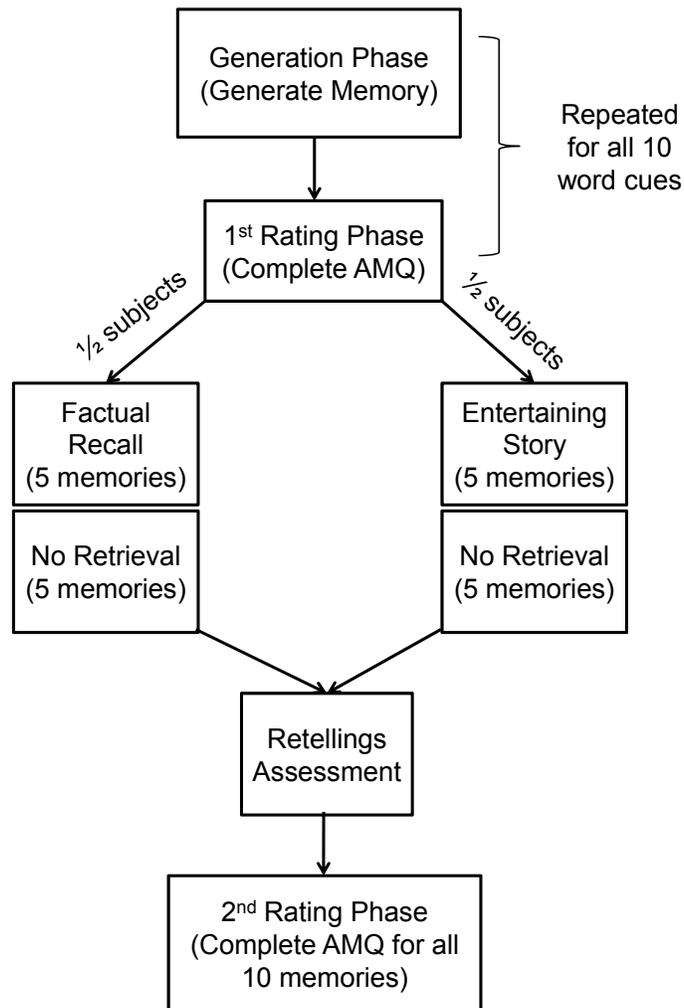


Figure 6: Experimental procedure used in Experiment 2.

After giving informed consent, subjects were told that they would read a series of word cues that corresponded to typical events. For each of the word cues, they were asked to type a 2-3 word description of a memory; this was the **generation phase**. For example, for the cue word “haircut” they read: “We would like you to think about a time when you got a haircut. Think about a memory of a time when you got a haircut that comes to mind most easily or comes to mind

first. Think of a 2-3 word description or label that you could use to remember this event later.” The exact description generated was unimportant; it was simply used to remind subjects of the memory they chose during the later parts of the experiment. After generating each memory, subjects completed the entire AMQ for that memory (the **first rating phase**), before moving on to the next word cue. Each AMQ item appeared on the screen with its respective scale, one at a time, and subjects used the mouse to click on their rating. They completed these scales at their own pace, and the items appeared in the same order each time. The process of generating memories and rating them reiterated (generation, rating, generation, etc.) until subjects generated all 10 memories and completed the AMQ for each of them.

The third phase consisted of the **rehearsal phase**. During this part, subjects wrote about 5 of their 10 memories. Critically, half of the subjects were instructed to tell entertaining stories about their memories, and half were instructed to tell about the event in a factual way. Subjects writing entertaining stories were asked to “Please write about the event in a funny and interesting way,” while subjects in the factual retrieval condition were asked to “Please write about the event in a detailed and accurate way.” Subjects were also given the opportunity to skip the retellings phase for specific events if they did not feel comfortable writing about them. Because 10 subjects chose to skip every single memory, their data was replaced. Events that subjects chose to skip were not included in the final analysis.

After telling their stories, subjects completed the Retellings Assessment Questionnaire in the **retellings assessment phase** for each of the retold memories.¹ During this part of the experiment, the label they previously generated appeared with each question and each question's scale (one at a time) and subjects used the mouse to click on their response. All six questions appeared in the same sequential order for one event before going on to the next one.

During the final phase, the **second rating phase**, subjects completed the entire AMQ once again for each memory. Finally, at the end of the experiment subjects were debriefed.

10.5 Results

All results are significant at the $p < .05$ level, unless otherwise indicated.

10.5.1 Skip Rates

In the rehearsal phase of the experiment, subjects had the chance to skip writing about specific memories if they did not feel comfortable doing so.

Subjects in the entertaining rehearsal condition wrote stories for about 83% of the memories, and subjects writing about events in a factual way wrote about 90% of the memories. This difference was not significant, $t(114) = 1.52$, $SED = .04$, $p = .13$. As a reminder, subjects were instructed to write about 5 of the 10

¹ Due to a programming error, sometimes these questions appeared for all memories – regardless of whether subjects told stories about them. Because the subjects did not have stories to rate for the control memories, I only analyzed data from the rehearsed stories.

memories; therefore on average, most subjects decided to write about at least 4 out of 5 of these memories.

10.5.2 Characteristics of the Memories Retrieved

I then analyzed characteristics of the memories that subjects retrieved in order to ensure they were not systematically different prior to the rehearsal phase. Therefore, if any differences do emerge on the AMQ, we can be certain that they were not due to underlying differences among the memories before the rehearsal phase. All means are in Table 7. For each of these scales, separate 2 (rehearsal instructions: factual, entertaining) x 2 (memory retold: yes, no) ANOVAs were computed.

Table 7: Characteristics of the Event. Average ratings on a scale of 1= “Not at all” to 7= “As much as any memory” (with exception of “Age” which is reported in average number of days since event) (Experiment 2).

	Memory	Retrieval Instruction		<i>M</i> (<i>SE</i>)
		Factual Recall	Entertaining Story	
Age of Memory (in days)				
	Rehearsed	423.88 (48.31)	365.53 (48.31)	394.71 (34.16)
	Control	483.51 (51.65)	386.72 (51.65)	435.12 (36.52)
	<i>M</i> (<i>SE</i>)	453.70 (37.32)	376.13 (37.32)	
Significance				
	Rehearsed	3.10 (.18)	2.92 (.18)	3.00 (.13)
	Control	3.06 (.15)	2.94 (.15)	3.00 (.11)
	<i>M</i> (<i>SE</i>)	3.07 (.14)	2.93 (.14)	
Prior Rehearsal				
	Rehearsed	3.66(.15)	3.92 (.15)	3.79 (.11)
	Control	3.76 (.15)	3.74 (.15)	3.75 (.11)
	<i>M</i> (<i>SE</i>)	3.71 (.14)	3.83 (.14)	
Accuracy				
	Rehearsed	4.99 (.13)	5.28 (.13)	5.14 (.09)
	Control	4.90 (.12)	5.08 (.12)	4.99 (.08)
	<i>M</i> (<i>SE</i>)	4.94 (.11)	5.18 (.11)	

Note: Standard Errors in parentheses

Age of Memory

Subjects in the factual and entertaining rehearsal conditions retrieved memories of similar ages ($M_s=453.70$ and 376.13), $F(1, 114)=2.16$, $MSE=161556.38$, $\eta_p^2=.02$, $p=.14$. No other findings were significant, $F_s<1$.

Significance of Events

There were no differences with respect to the significance of the cued events (all $F_s < 1$). Events were rated as equally significant, regardless of whether or not they were rehearsed, or whether subjects in the factual versus entertaining condition generated them.

Rehearsal of Memories Prior to the Experiment

Subjects reported similar levels of prior rehearsal for events that were later rehearsed and those that were not (control events); furthermore, subjects in the accurate and entertaining conditions indicated similar rates of rehearsal (both $F_s < 1$). The interaction between the specific rehearsal instruction, and whether an event was retold was also not significant, $F(1, 114) = 2.26$, $MSE = .52$, $\eta_p^2 = .02$, $p = .14$.

Accuracy

I also assessed how accurate subjects believed their memories were prior to rehearsing them. Subjects who rehearsed in a factual way indicated that their memories were no more distorted than subjects telling entertaining stories, $F(1, 114) = 2.38$, $MSE = 1.39$, $\eta_p^2 = .02$, $p = .13$. Though rehearsed memories were rated to be slightly more accurate than control memories, $F(1, 114) = 3.87$, $MSE = .33$, $\eta_p^2 = .03$, $p = .05$, no interaction emerged between rehearsal and rehearsal instruction, $F < 1$.

In summary, the memories that subjects generated were similar with regards to their age, their significance, how often subjects reported rehearsing

them prior to the experiment, and whether subjects believed they were distorted (i.e., their accuracy). No significant two-way interactions emerged. Therefore, we can assume that any significant effects discussed below are due to a combination of memory rehearsal and rehearsal type.

10.5.3 Characteristics of the Stories

Story Quality

Before turning to the results of primary interest, I first assessed whether subjects in the experiment were following the instructions. That is, did subjects who were instructed to tell entertaining stories in fact tell more entertaining stories than subjects in the factual retrieval condition? In order to answer this question, two condition-blind independent coders rated how entertaining each story was on a 1 (“not at all entertaining”) to 5 (“very entertaining”) point scale. The coders’ responses were significantly correlated with one another ($r=.52$), therefore, I averaged responses across coders for each of the retrieval conditions. Overall, subjects who were in the entertaining rehearsal condition told more entertaining stories ($M=3.00$), compared to subjects in the accurate condition ($M=2.49$), $t(114)=3.36$, $SED=.15$. Thus, according to this measure, subjects were adequately following the instructions of telling entertaining stories versus retrieving in a factual way (see Appendix F for examples).

Language Use

In addition to examining how retrieval differed according to coders’ ratings, I also analyzed each response using the Linguistic Inquiry and Word Count

(LIWC) program (Pennebaker, Booth, & Francis, 2007). The LIWC software analyzes whether written responses include different types of pre-determined word categories (such as words related to the senses, emotion certainty, etc). Following Dudukovic et al. (2004), I specifically examined the word count and word categories related to certainty (e.g., “always”), tentativeness (e.g., “perhaps”), past tense, present tense, affect, sensory words, and disfluencies (e.g., “Um”). Dudukovic and colleagues reported that differences on these scales contributed to a “Language of Storytelling” (see Chapter 7). For these seven categories, I corrected for multiple-comparisons, yielding a p of .0065. Even at this strict criterion, subjects who told entertaining stories included slightly more affect words, as compared to subjects in the accuracy-based retrieval condition, $t(114)=2.76$, $SED=.27$, $p=.007$. Specifically, subjects in the entertaining condition included more overall affect words (on average, 4.72% of the total words in their stories were affect words) as compared to subjects in the accuracy-based retrieval condition (3.96%). Subjects in the entertaining condition also tended to tell their stories with greater certainty (stories contained 1.12% words related to certainty), as compared to subjects retrieving in an accurate way (.82%), $t(114)=2.55$, $SED=.12$, $p=.01$; however, this difference was not significant at the strict $p=.0065$ criterion. Subjects in the entertaining and accuracy-based retrieval conditions included a similar percentage of disfluencies, $t(114)=1.38$, $SED=.03$, $p=.17$. Similarly, there were no differences in any of the other five word categories, all $ts<1$.

Retellings Assessment

Another question concerns whether or not subjects admitted to distorting their stories in some way. In a related study, researchers found that subjects admit to distorting a surprising percentage of their real-life retellings (61%) (Marsh & Tversky, 2004). It is plausible that subjects who were specifically instructed to tell an entertaining story actually exaggerated or distorted certain details in order to comply with that goal. However, because subjects in the factual condition were instructed to be accurate in their stories, they should not have indicated that their stories were distorted or inaccurate. To determine whether subjects admitted to distorting their stories, I compared responses on the Retellings Assessment Questionnaire for subjects telling entertaining stories versus rehearsing in a factual way. For example, do subjects who tell entertaining stories admit to exaggerating their stories more so, compared to subjects who told accurate stories?

Table 8 (below) shows that subjects in both conditions generated similar ratings on this questionnaire. Subjects in the entertaining condition did not rate that their rehearsals were any less detailed ($M=2.69$) or more distorted ($M=1.65$), than subjects in the factual condition (detailed: $M=2.68$; distorted: $M=1.60$), $t_s < 1$. Similarly, subjects did not report that they were more selective in their rehearsal (factual $M=2.23$, entertaining $M=2.36$), nor did they minimize certain things (factual $M=2.25$, entertaining $M=2.30$), $t_s < 1$. Additionally, both groups rated that

their rehearsals were equally exaggerated (factual $M=1.43$, entertaining $M=1.55$), $t(114)=1.28$, $SED=.09$, $p=.20$), and they were equally likely to add details (accurate $M=1.16$, entertaining $M=1.24$) $t(114)=1.09$, $SED=.07$, $p=.28$. Though coders indicated that subjects in the entertaining condition were indeed telling more entertaining stories, their stories were no different than subjects who rehearsed in a factual way. These null findings are examined further in the discussion.

Table 8: Average ratings on the Retellings Assessment Questionnaire. Scales are based on individual questions (Experiment 2).

	Rehearsal Instruction	
	Factual Recall	Entertaining Story
Detailed	2.68 (.09)	2.69 (.07)
Exaggerated	1.43 (.06)	1.55 (.07)
Distorted	1.60 (.08)	1.65 (.07)
Added Details	1.16 (.05)	1.24 (.05)
Minimized	2.25 (.09)	2.30 (.10)
Selective	2.23 (.09)	2.36 (.09)

Note: Standard Errors in parentheses

10.5.4 Retellings and Memory Quality.

Does telling an entertaining story about an event influence memory differently than retrieving the event in a detailed way? Separate 2 (rehearsal instruction: factual, entertaining) x 2 (memory rehearsed: yes, no) x 2 (rating: time 1 versus time 2) ANOVAS were computed on each composite score. As a reminder, the composite scores (discussed earlier) were: 1) recollection, 2)

belief, 3) story, 4) visual details, and 5) other sensory details. As discussed above, these scores were based on typical groupings in the literature, and a correlation matrix on the current data supports these groupings (see Appendix G: AMQ items within each composite score correlate highly with one another). For example, responses on the “reliving scale” correlate highly with responses on the “traveling back in time” scale and “emotions” scale.

Across the composite scores, results revealed no higher order interactions ($p > .09$) for the instruction manipulation; therefore, the results below collapse across retrieval instruction (See Table 9). Importantly, there were no baseline differences prior to the rehearsal for memories that were later rehearsed and those that were not (p s of .08 or greater); therefore, these results focus on the critical question of whether ratings changed from before to after the rehearsal (time 1 versus time 2) for rehearsed and control memories.

Table 9: Average ratings on composite scores (Experiment 2)

	Memory	AMQ Rating		<i>M</i> (<i>SE</i>)
		Time 1	Time 2	
Recollection	Rehearsed	4.42 (.09)	4.53 (.10)	4.48 (.09)
	Control	4.30 (.09)	4.26 (.10)	4.28 (.09)
	<i>M</i> (<i>SE</i>)	4.36 (.08)	4.40 (.09)	
Belief	Rehearsed	5.05 (.08)	4.94 (.08)	4.99 (.07)
	Control	5.00 (.07)	4.77 (.08)	4.89 (.07)
	<i>M</i> (<i>SE</i>)	5.03 (.07)	4.85 (.07)	
Story	Rehearsed	4.05 (.11)	4.14 (.11)	4.09 (.10)
	Control	3.91 (.11)	3.85 (.11)	3.88 (.10)
	<i>M</i> (<i>SE</i>)	3.98 (.10)	3.99 (.10)	
Visual Details	Rehearsed	5.27 (.08)	5.20 (.08)	5.23 (.08)
	Control	5.20 (.08)	5.01 (.09)	5.10 (.08)
	<i>M</i> (<i>SE</i>)	5.23 (.07)	5.10 (.08)	
Other Sensory Details	Rehearsed	4.18 (.10)	4.28 (.11)	4.23 (.10)
	Control	4.07 (.10)	4.05 (.11)	4.06 (.10)
	<i>M</i> (<i>SE</i>)	4.12 (.09)	4.16 (.10)	

Note: Standard Errors in parentheses

Recollection

Overall, subjects gave higher ratings ($M=4.48$) to memories they wrote about as compared to memories they did not ($M=4.28$), $F(1, 115)=8.38$, $MSE=.55$, $\eta_p^2=.07$. However, this main effect was qualified by a significant interaction between memory rehearsal and rating (time 1, time 2), $F(1,$

115)=5.83, $MSE=.10$, $\eta_p^2=.05$. Feelings of recollection increased after rehearsal for memories that were retrieved, $t(115)=1.96$, $SEM=.05$, $p=.05$, while it remained constant for control memories $t<1$. Thus, the process of rehearsing autobiographical events increases feelings of recollection, while feelings of recollection remain similar from the first to the second rating for control memories. The main effect of rating time was not significant, $F<1$.

Belief

Overall, subjects gave higher ratings of “Belief” to memories on the first rating ($M=5.03$), as compared to the second rating ($M=4.85$), $F(1,115)=27.48$, $MSE=.12$, $\eta_p^2=.19$; however this main effect was qualified by a significant interaction between rating time and rehearsal, $F(1,115)=4.72$, $MSE=.08$, $\eta_p^2=.04$. Though feelings of Belief decreased significantly from the first to second rating for both rehearsed, $t(115)=2.48$, $SEM=.05$, and control memories, $t(115)=6.12$, $SEM=.04$), this difference was greater for control memories, $t(115)=2.17$, $SEM=.05$.

Story

Subjects were more likely to think of events as narrative stories if they rehearsed them ($M=4.09$), than if they did not ($M=3.88$), $F(1,115)=9.48$, $MSE=.53$, $\eta_p^2=.08$. The interaction between rehearsal and rating was not significant, $F=2.77$, $MSE=.24$, $\eta_p^2=.02$, $p=.10$, nor was the main effect of rating, $F<1$. I will return to the failure to find a significant interaction for this measure in the discussion.

Visual Details

The process of rehearsing an autobiographical event influenced whether visual details came to mind. First, a main effect of rehearsal emerged: more visual details were retrieved for rehearsed memories ($M=5.23$) than control memories ($M=5.10$), $F(1, 115)=4.19$, $MSE=.48$, $\eta_p^2=.04$. A main effect also emerged for time: more details were retrieved the first time subjects rated their memories ($M=5.23$), compared to the second time ($M=5.10$), $F(1, 115)=11.32$, $MSE=.17$, $\eta_p^2=.09$. A significant interaction between these two variables qualified these main effects, $F(1,115)=7.10$, $MSE=.07$, $\eta_p^2=.06$. Rehearsing an event maintained the level of visual details retrieved (M s of 5.27 and 5.20), $t(115)=1.40$, $SEM=.05$, $p=.16$, and there were no differences between ratings before versus after the rehearsal. However, visual details for control memories actually dropped (from $M=5.20$ before the rehearsal phase, to $M=5.01$ after), $t(115)=4.51$, $SEM=.04$.

Other sensory details

Memories that were rehearsed were given overall higher ratings on scales assessing sensory details ($M=4.23$), compared to memories that were not rehearsed ($M=4.06$), $F(1,115)=5.19$, $MSE=.65$, $\eta_p^2=.04$. However, the interaction between rehearsal and rating did not reach significance, $F(1, 115)=2.63$, $MSE=.16$, $\eta_p^2=.02$, $p=.11$. No other findings emerged, $F<1$.

10.6 Discussion

Rehearsing an autobiographical event influenced memory quality, regardless of whether subjects were rehearsing that event in a factual way versus entertaining way. Rehearsal increased feelings of recollection and maintained the retrieval of visual details. While belief generally decreased from the first rating to the second, this decrease was much smaller for rehearsed memories. While it is interesting that the process of rehearsing autobiographical events in this way influenced qualitative aspects of memories, it is still open to question as to why the specific retrieval instruction had no effect on memory. To investigate this issue, I computed an exploratory regression analysis (discussed below).

Surprisingly, rehearsing autobiographical events did not influence whether or not subjects thought of those events in a story-like fashion; there were no differences on ratings given at time 1 versus time 2 as a function of whether those memories were rehearsed. As a reminder, subjects were included in the analyses if they rehearsed at least one memory (that is, only subjects who skipped every single memory were replaced). I re-analyzed these results, and held subjects to a stricter criterion of rehearsing at least 2 memories. When I removed 4 subjects who rehearsed only one memory, the interaction between rehearsal and time emerges, $F(1,111)=7.96$, $MSE=.17$, $\eta_p^2=.07$. This interaction was driven by the fact that subjects gave higher ratings the second time they rated memories ($M=4.12$), as compared to the first ($M=3.99$), if they rehearsed

them $t(111)=2.20$, $SEM=.06$. However, ratings did not change for control memories ($M_s=3.92$ and 3.83), $t(112)=1.59$, $SEM=.06$, $p=.12$.

10.6.1 Qualities of the Stories

Language Use

Coders gave higher entertainment ratings to stories that were written with the goal to entertain, as compared to responses generated in response to an accuracy-based goal. These results are consistent with Dudukovic and colleagues' (2004) findings. In addition, Dudukovic and colleagues correlated entertainment ratings with LIWC results (for each of the word categories listed above with the exception of word count) and found that stories written with the goal to entertain were rated as more entertaining when they included more affect words. However, these stories were negatively correlated with disfluencies and words indicating past tense: Entertaining stories that contained more disfluencies and more references to the past were rated as less entertaining. On the other hand, Dudukovic and colleagues found that entertainment ratings assigned to responses generated with an accuracy goal were not correlated with any of the LIWC scales. As discussed above, the different use of language in stories intended to entertain may contribute to a "Language of Storytelling" in which stories are told with more affect, greater certainty, and fewer disfluencies.

In my experiment, entertainment ratings assigned to stories generated in the entertaining story condition were largely consistent with Dudukovic and colleagues' results. As shown in Table 10, entertaining stories were rated as

more entertaining when they were told in the present tense and with more certainty and affect. However, stories were rated as less entertaining when they included more past tense verbs. The only inconsistency between my findings and those of Dudukovic and colleagues is the following: In my study, entertainment rating was significantly related to disfluencies (stories that included more disfluencies were rated as more entertaining). However, this same correlation was negative in Dudukovic and colleagues' experiment. The basic pattern of results suggests that the same general factors contribute to a language of storytelling; at least on this level, the entertaining responses and accuracy-based responses are somewhat qualitatively different.

Table 10: Correlations between LIWC categories and coders' entertainment rating

	Rehearsal Instruction	
	Factual Recall	Entertaining Story
Disfluencies	-.13	.33*
Certainty	.28*	.44**
Tentativeness	.18	.21
Affect	.01	.28*
Past Tense	-.38**	-.44**
Present Tense	.21	.51**
Senses	.12	.02

** significant at $p < .01$

* significant at $p < .05$

Retellings Assessment Questionnaire

While we might expect subjects in the entertaining condition to admit to exaggerating and distorting their stories on the Retellings Assessment Questionnaire, these results are consistent with previous findings. Prior research suggests that subjects become more aware of exaggerations and distortions when they write the same story in both an entertaining and factual way (Butler et al., in prep). In this case, when subjects rated their entertaining stories, they could use their accurate stories for comparison. Similarly, in Marsh and Tversky's (2004) diary study, subjects admitted to adding additional information and exaggerating in stories that were intended to entertain, as compared to stories intended to convey facts (which included fewer exaggerations and additions). However, in the current experiment, subjects did not have the comparison (from writing about the story in both ways), and therefore their estimations of distortions and exaggerations are not significantly different.

10.6.2 Exploratory Regression Analysis

As mentioned above, rehearsing autobiographical memories influenced qualitative aspects of memories, regardless of whether subjects retrieved their stories in a factual or entertaining way. As expected, entertaining stories were judged to be more entertaining than factual recalls, and yet writing about the event in a factual versus an entertaining way led to no higher order interactions for the composite scores. Therefore, while I expected the entertaining story versus factual recall instruction manipulation to result in qualitatively different

stories, it is possible that the instructions still led to similar stories. If the stories were similar, then the entertaining/factual instruction manipulation would have led to similar changes in ratings on the composite scores. In order to evaluate this possibility, I computed a multiple-regression analysis. In the first step of the model, I entered dummy codes for each subject.² In the second step of the model, I held constant both the qualities of the memory (age, frequency, rehearsal prior to experiment, etc.) and ratings given before the rehearsal (at time 1). The third and final step of the model examined whether subjects' responses on the Retellings Assessment Questionnaire, in addition to the coders' ratings of entertainment and the number of words in the narratives, predicted time 2 ratings. Because this was an exploratory regression analysis, I computed separate regression analyses for each of the composite scores, discussed above. All results discussed are from the final and third model, as it accounted for a significant change in variance above that of the other two models; this was true for each of the separate regressions computed (shown below in Table 11). As shown in the table below, time 1 ratings were significant predictors of time 2 ratings. Looking at the unique contribution of ratings on the Retellings Assessment Questionnaire revealed one important point: Subjects' report of detail on the Retellings Assessment Questionnaire consistently accounted for variance in each of the composite scores. That is, higher detail ratings were

² This was necessary because ratings on the Retellings Assessment Questionnaire predicted movement for composite scores for each memory individually (that is, each line of data represented a memory, and several lines belonged to the same subject).

associated with higher feelings of recollection, higher feelings of belief, and the retrieval of both visual and other sensory details.

Table 11: Story qualities predict change in composite scores (Experiment 2).

		Recollection	Belief	Story	Visual Det.	Other Sensory Det.
		β	β	β	β	β
Memory	time1	0.40 **	0.41 **	0.34 **	0.45 **	0.45 **
Characteristics	age of memory	-0.05 *	-0.11 **	-0.10 **	-0.07 **	-0.02
	significance	-0.01	-0.01	0.04	-0.02	0.03
	rehearsal	0.13 **	0.06 *	0.11 **	0.14 **	0.08 **
	accuracy	0.01	0.00	-0.01	0.00	0.01
	Model R ² Change	0.23 **	0.28 **	0.18 **	0.24 **	0.24 **
Story Qualities	detail	0.20 **	0.22 **	0.18 **	0.16 **	0.14 **
	exaggeration	-0.09 **	-0.02	-0.06 *	-0.09 **	-0.10 **
	distorted	-0.02	-0.10 **	-0.05	0.01	-0.03
	added details	-0.02	-0.04	-0.02	-0.03	-0.06 *
	minimized	-0.06	-0.09 **	-0.03	-0.13 **	-0.08 **
	selective	0.06 *	0.06 *	0.04	0.05	0.06 *
	# of words	0.06	0.11 **	0.04	0.04	0.13 **
	entertaining	0.05	0.01	0.07 *	0.02	0.01
Model R ² Change	0.05 **	0.06 **	0.04 **	0.04 **	0.04 **	

** Significant at $p < .05$

* Significant at $p < .10$

I also examined the zero-order and semi-partial correlations for each of the independent variables in the model with the dependent composite scores. As shown in Appendix H, several scales are significantly correlated with the dependent composite scores. For example, the amount of distortion is negatively correlated to feelings of recollection ($r=-.27$). Similarly, coders' rating of entertainment is significantly related to feelings of recollection: more entertaining stories are related to higher ratings on scales assessing recollection ($r=.29$). However, when each of the Retellings Assessment questions are factored into the same model, the unique proportion of variance explained in the composite scores drops substantially (distortion $r=-.01$; entertainment rating $r=.03$). In order to better understand the influence of entertainment rating and distortion, I computed a Principle Components Analysis, which revealed that questions in the Retellings Assessment Questionnaire load onto three factors. First, exaggeration, distortion, and adding details load onto the same factor (Factor 1 in the model below). Second, subjects' rating of detail, the number of words in the response, and the coders' entertainment value are all related to an underlying second factor (Factor 2). Finally, minimizing and selectivity are related (Factor 3). I saved these factors as z-scores and then computed the each regression again; I entered these scores into the third step of the model (the first and second parts of the model were similar to above).

As shown in Table 12, both the first and the second factors predict movement for each dependent composite score. That is, the factor including

exaggeration, distortion and adding details is negatively related to the composite score. When exaggeration, distortion, and adding details are computed into a single factor they predict decreases for recollection, and so forth. Importantly, when level of detail, number of words, and entertainment value are loaded onto the same factor, this factor significantly predicts increases on the scales. That is, higher levels of detail, number of words, and entertainment value are related to higher feelings of recollection, belief, etc.

Critically, it is important to note that level of detail and entertainment value load onto the same underlying factor. Subjects in the factual rehearsal condition were instructed to retrieve their memories in a detailed and accurate way, while subjects in the entertaining rehearsal condition were instructed to retrieve their memories in an interesting and entertaining way. Because the level of detail and entertainment rating are both related to the same underlying factor, it is not surprising that the instruction manipulation did not lead to differences on these composite scores.

Table 12: Factor scores predict change in composite scores (Experiment 2).

		Recollection	Belief	Story	Visual Det.	Other Sensory Det.
		β	β	β	β	β
Memory Characteristics	time1	0.40 **	0.41 **	0.34 **	0.46 **	0.46 **
	age of memory	-0.07 **	-0.14 **	-0.11 **	-0.08 **	-0.04
	significance	-0.01	-0.01	0.04	-0.01	0.05
	rehearsal	0.14 **	0.06 *	0.11 **	0.15 **	0.08 **
	accuracy	0.01	0.01	0.00	-0.01	0.01
	Model R ² Change	0.23 **	0.28 **	0.18 **	0.24 **	0.24 **
Story Qualities	factor 1	-0.14 **	-0.16 **	-0.13 **	-0.13 **	-0.17 **
	factor 2	0.25 **	0.30 **	0.24 **	0.19 **	0.22 **
	factor 3	-0.04	-0.08 **	-0.03	-0.10 **	-0.04
	Model R ² Change	0.04 **	0.05 **	0.03 **	0.03 **	0.04 **

** Significant at $p < .05$

* Significant at $p < .01$

Factor 1: exaggeration, distorted, added details

Factor 2: detail, # of words, entertaining

Factor 3: minimized, selective

10.6.3 Conclusions

To summarize, rehearsal influenced qualitative aspects of autobiographical memory; however, the specific way in which memories were rehearsed had no effect. This lack of a difference between rehearsal instructions may be due to the fact that the level of detail in the stories and the entertainment value are related to the same underlying factor. I expected that subjects who were instructed to retrieve in a factual way would indeed include more details in their stories (Butler et al., in prep), and the increase in details generated during the rehearsal should have resulted in an increase in feelings of recollection, belief, and so forth. However, if entertaining stories included fewer sensory details, subjects in this rehearsal condition should have given lower ratings on across composite scores at time 2 (e.g., Suengas & Johnson, 1988). However, this was not the case: the way in which a story was told does not have an effect, but the simple process of rehearsing a memory does. Level of detail significantly predicted ratings for time 2 composite scores, but subjects rated their memories as equally detailed regardless of their rehearsal instruction. In the third experiment, I more fully explored the relationship between level of detail in stories and the resulting effects on memory. That is, if the level of detail in which subjects are instructed to tell their stories is manipulated, are there resulting effects on qualitative aspects of memory?

11. Memory Quality and the Effects of Telling Specific versus General Stories

Experiment 2 suggests that if we rehearse autobiographical events in a detailed way that process of detailed rehearsal influences qualitative aspects of memory. As discussed in Chapter 5, the level of detail included in a memory is typically called the “grain size” of information (e.g., Koriat and Goldsmith, 1996). As a reminder, memories that include specific details are typically referred to as “precise-grain” while memories that are more general are referred to as “coarse-grain.” For example, a statement such as “the man was 6 ft. 4 in. tall” is considered “precise grain” because it includes very detailed information. On the other hand, a statement such as: “the man was about 6 ft. tall” is considered “coarse grain” because it is much less specific, though it still conveys useful information.

Because precise grain answers are so specific, there is a greater chance of being incorrect, as compared to more general, coarse answers. Generally, people weigh the cost of being wrong with the need to convey the most information (Goldsmith, Koriat, & Pansky, 2005); in our everyday conversations, we generally try to convey enough information while still being accurate (Grice, 1975). However, there are many real-world situations in which we may modify the grain size or detail in our stories. As discussed above (See Chapter 5), we might adjust the level of detail in our stories for different audiences. Adams and

colleagues (2002) showed that we'll simplify stories for children. Similarly, stories with different goals might naturally incorporate different grain sizes of information. Subjects who tell entertaining stories generally include less information in those stories, while subjects who are instructed to retell in an accurate way include more original story details (Dudukovic et al., 2004). Above, I related this type of accuracy-based rehearsal goal to a precise-grain response and an entertaining storytelling goal to a coarse-grain response. If subjects tell very general stories in a retellings phase, they may not remember specific details associated with an event.

11.1 Experiment 3: Overview

In Experiment 3, my goal was to more fully evaluate how the grain size adopted during a retelling influenced qualitative aspects of memory. The regression analysis in Experiment 2 supports the idea that stories told with different levels of detail might influence qualitative aspects of memory. Because I wanted to examine the effects of grain size, specifically, I held the general storytelling goal constant: all subjects told entertaining stories. However, half of the subjects told detailed stories (precise-grain); the other half told general (coarse) stories. I predicted that the process of telling precise versus general stories would have different qualitative effects on memory. First, drawing from the regression analysis in Experiment 2, detailed stories should increase average ratings on the composite scores (from before the retelling to after it). Second, however, the general process of rehearsing a memory might also influence

qualitative aspects of memory (as it did in Experiment 2). Therefore, subjects in the general storytelling condition may also give higher ratings after the retelling, as compared to before. However, this increase should be greater for those telling specific stories.

11.2 Method

11.2.1 Subjects

Eighty-four subjects participated in exchange for course credit. Subjects were tested in groups of no more than five subjects.

11.2.2 Design

Similar to Experiment 2, Experiment 3 consisted of a 2 (memory retold: yes, no) x 2 (retelling instruction: specific, general) x 2 (time: ratings given before or after the retelling) design. As before, time was manipulated within-subjects; the other 2 factors were manipulated and counterbalanced between-subjects. Of interest is whether telling precise versus general stories leads to differences on time 2 composite AMQ scores.

11.2.3 Materials

The AMQ consisted of the same questions used in Experiment 2. Four additional scales were added that specifically asked subjects to rate memory qualities associated with detailed versus general stories. These items were: 1. "My memory overall is: 1=vague to 7=very vivid." 2. "My memory for the event involves specific visual details: 1=not any to 7=a lot." 3. "When thinking about this event, the people/places/objects in it are distinct entities, rather than pieces of a

general scene: 1=distinct entities to 7= general scene.” 4. “My memory for the specific actions within the event are: 1=very dim to 7=very sharp.” The first and second questions were derived from Johnson, Foley, Suengas & Raye (1988).

Experiment 3 included 8 word cues, instead of 10: haircut, road trip, Thanksgiving, (adapted from Butler, et al), movie, shopping, restaurant, class, and party (adapted from Bower, Black, & Turner, 1979). The word cues of SAT and graduation were removed because these were skipped at a higher rate in Experiment 2, and because they were generally associated with older memories (which may be difficult to retrieve in a very detailed way).

Subjects completed the same retellings assessment questionnaire as subjects in Experiment 2.

11.2.4 Procedure

The experimental procedure was exactly the same as in Experiment 2. As shown in Figure 7 below, the procedure consisted of five critical phases: the generation phase, the first rating phase, the retellings phase, the retellings assessment, and the second ratings phase. The procedural methods were exactly the same as in Experiment 2, with the following changes: Subjects generated eight memories instead of 10; furthermore, they wrote narratives for half of those (yielding 4 stories). The only other change is the specific retelling instruction (discussed below).

Subjects in Experiment 2 retold their stories in an accurate or entertaining way. In Experiment 3, however, subjects retold their stories in either a precise,

detailed way or general way. All subjects were told to pretend that they were writing an entertaining email to a friend. Subjects telling precise stories were told “For each event, we want you to think carefully about the specific details of your experience” and “Your friend would really love to hear every last detail of your experience, so try to be as precise and as detailed as you possibly can.”

Subjects telling more general stories were asked to “Think about the event as a whole” and that “Your friend only has a moment to read your message, so try to convey enough information to explain your experience, without bothering your friend with the specific details about your memory.”

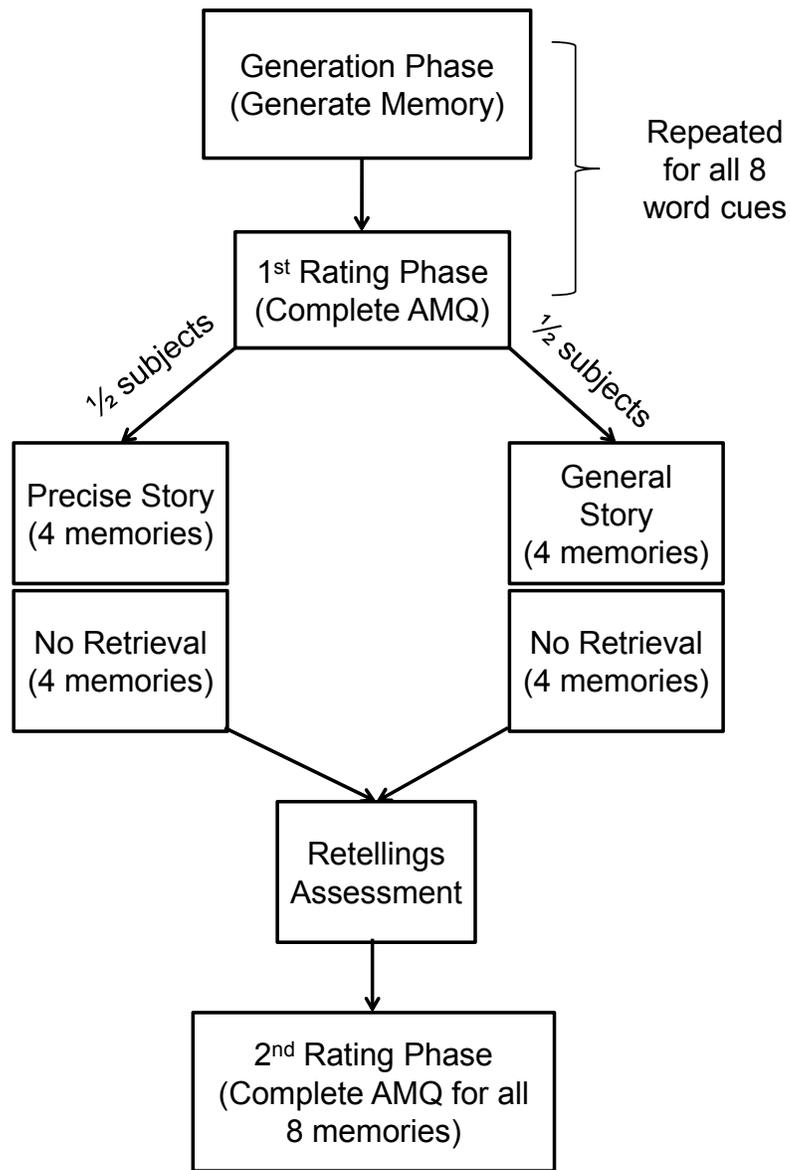


Figure 7: Experimental procedure used in Experiment 3.

11.3 Results

11.3.1 Skip Rates

Because subjects now retold 4 as opposed to 5 memories, I held them to a stricter criterion: In order to be included in the analysis, they had to rehearse at

least two memories. Two subjects only wrote about one memory, and so their data was replaced. Subjects in the specific storytelling condition told stories for about 84% of their memories, while those in the general storytelling condition told stories for about 91% of their memories; this difference was marginally significant, $t(82)=2.00$, $SED=.04$, $p=.05$.

11.3.2 Characteristics of the Memories Retrieved

As in Experiment 2, in order to ensure any differences that emerged were due to the experimental manipulations and not underlying differences in the memories, I examined the age, significance, rehearsal prior to the experiment, and accuracy of the memory. All relevant means are located in Table 13 below.

Age of Memory

Subjects who told specific stories generated memories of similar ages, as compared to those who told general stories, $F(1,82)=1.24$, $MSE=265020.91$, $\eta_p^2=.02$, $p=.27$. Control and rehearsed memories were of similar ages, and rehearsal and rehearsal instruction did not interact (both $F_s < 1$).

Significance

Similar to Experiment 2, subjects in the specific and general storytelling conditions retrieved equally significant events ($F < 1$). Furthermore, events that were later rehearsed were rated as no more or less significant compared to control memories, and the interaction between these two variables was also not significant ($F_s < 1$).

Rehearsal prior to Experiment

Subjects also indicated that they rehearsed autobiographical events at similar rates prior to Experiment 2, $F(1, 82)=1.97$, $MSE=1.99$, $\eta_p^2=.02$, $p=.16$, and there was no difference within rehearsal instruction. Furthermore, there were no differences between rehearsed and control memories, and the interaction between these two factors was not significant (all other $F_s < 1$).

Accuracy

Subjects in the specific versus general storytelling conditions rated their events as equally accurate, $F < 1$. Rehearsed and control memories were also equally accurate, $F(1, 82)=1.05$, $MSE=.35$, $\eta_p^2=.01$, $p=.31$. The interaction between rehearsal instruction and rehearsed versus control memory was also not significant, $F(1, 82)=1.71$, $MSE=.35$, $\eta_p^2=.02$, $p=.20$.

Summary

Similar to Experiment 2, there were no differences among memories with regard to their significance, rehearsal prior to the experiment, or their accuracy. Thus, any significant differences are not due to any of these factors.

Table 13: Characteristics of the Event. Average ratings on a scale of 1= “Not at all” to 7= “As much as any memory” (with exception of “Age” which is reported in average number of days since event) (Experiment 3).

	Memory	Retrieval Instruction		<i>M</i> (<i>SE</i>)
		Detailed Story	General Story	
Age of Memory (in days)				
	Rehearsed	461.82 (76.27)	305.50 (76.27)	383.61 (53.93)
	Control	324.96 (73.31)	304.09 (73.31)	314.53 (51.84)
	<i>M</i> (<i>SE</i>)	393.39 (56.17)	304.80 (56.17)	
Significance				
	Rehearsed	2.66 (.19)	2.70 (.19)	2.68 (.13)
	Control	2.69 (.18)	2.64 (.18)	2.66 (.12)
	<i>M</i> (<i>SE</i>)	2.67 (.16)	2.67 (.16)	
Prior Rehearsal				
	Rehearsed	3.69 (.19)	4.08 (.19)	3.88 (.13)
	Control	3.83 (.18)	4.05 (.18)	3.94 (.12)
	<i>M</i> (<i>SE</i>)	3.76 (.15)	4.06 (.15)	
Accuracy				
	Rehearsed	5.27 (.15)	5.40 (.15)	5.33 (.11)
	Control	5.29 (.15)	5.19 (.15)	5.24 (.11)
	<i>M</i> (<i>SE</i>)	5.28 (.14)	5.29 (.14)	

Note: Standard Errors in parentheses

11.3.3 Characteristics of the Stories

Detail Ratings

In order to determine if subjects did indeed tell precise/general stories in order to be consistent with their retelling goal, two condition-blind, independent coders rated each story on a scale of 1=not at all detailed to 5=extremely detailed. Coders' ratings correlated significantly ($r=.74$); therefore, their scores

were averaged across subjects. Though subjects assigned to tell a detailed story were expected to have more detailed stories, this was not the case: Subjects who told precise stories did not have more detailed stories ($M=3.59$), as compared to subjects who told general stories ($M=3.40$), $t(82)=1.10$, $SED=.17$, $p=.27$. See Appendix I for sample stories.

Language Use

As in Experiment 2, I also evaluated language use in each of the subjects' stories using the LIWC software (Pennebaker, Booth, & Francis, 2007). In this examination, there were no a priori predictions of how specific versus general stories would differ based on the LIWC categories. Therefore, I examined each of the 80 word categories which yielded a corrected p value of .00065. At this corrected p -value, no significant findings emerged. Thus, according to the LIWC results, specific and general stories used similar language (all $ps >.03$).

Retellings Assessment Questionnaire

Similar to Experiment 2, subjects in Experiment 3 also completed the retellings assessment questionnaire. Though the results in the above section indicate no differences in coders' ratings of detail, it is possible that subjects in the detailed versus general storytelling conditions differed when asked to indicate the quality of their own stories. All relevant means are located below in Table 14. Subjects who wrote general stories indicated that they were more selective, than subjects who wrote specific stories, $t(82)=2.04$, $SED=.19$. Because subjects who told general stories were instructed to not bother with specific details, it is likely

that they had to be more selective in deciding what to convey. No other differences emerged between retelling instruction. As in Experiment 1, retelling condition did not influence ratings on the other scales. Subjects who told specific stories did not indicate that their stories were any more detailed, nor did they add details into their stories (both $t_s < 1$). Similarly, retelling condition did not differ with respect to exaggeration, $t(82)=1.70$, $SED=.10$, $p=.09$, distortion, $t(82)=1.02$, $SED=.11$, $p=.31$, or minimizing ratings, $t(82)=1.72$, $SED=.19$, $p=.09$. I will return to these results in the Discussion.

Table 14: Average ratings on the Retellings Assessment Questionnaire. Scales are based on individual questions (Experiment 3).

	Rehearsal Instruction	
	Specific Story	General Story
Detailed	2.45 (.12)	2.55 (.11)
Exaggerated	1.55 (.08)	1.37 (.07)
Distorted	1.61 (.09)	1.51 (.06)
Added Details	1.24 (.06)	1.20 (.07)
Minimized	2.42 (.14)	2.10 (.13)
Selective	2.26 (.13)	2.64 (.14)

Note: Standard Errors in parentheses

11.3.4 Retellings and Memory Quality

To determine if retelling a story in a specific or general way influenced memory quality, the same composite scores which were used in Experiment 2 were also used in Experiment 3. Again, these were composites for: recollection,

belief, narrative, visual details, and other sensory details. Because Experiment 3 included 4 additional scales, I computed a correlation matrix to determine whether to place these 4 scales with the existing composites. The scale assessing overall vividness of the memory correlated highly with scales assessing recollection; therefore the composite of recollection now includes vividness (see Appendix J for the correlation matrix). Additionally, memory for visual details and specific actions within the event both correlated highly with individual scales in the composite for visual details; therefore, these two scales are included in that composite. The only question that did not highly correlate with any of the existing scales was: “When thinking about the event, the people/places/objects in it are distinct entities rather than pieces of a general scene.” Because this scale did not correlate highly with any of the existing scales, its results are analyzed separately.

There were no higher order interactions of retrieval instruction, except where noted below (for belief and specific/general); thus as with Experiment 2, the results collapse across retrieval instruction (see Table 15). Furthermore, there were no baseline differences between rehearsed and control memories on the first rating ($ps > .17$).

Table 15: Average ratings on composite scores (Experiment 3).

	Memory	AMQ Rating		<i>M</i> (<i>SE</i>)
		Time 1	Time 2	
Recollection	Rehearsed	4.40 (.12)	4.66 (.13)	4.53 (.12)
	Control	4.38 (.11)	4.39 (.11)	4.38 (.11)
	<i>M</i> (<i>SE</i>)	4.39 (.10)	4.52 (.11)	
Story	Rehearsed	4.13 (.14)	4.44 (.14)	4.29 (.13)
	Control	4.08 (.13)	4.17 (.14)	4.13 (.13)
	<i>M</i> (<i>SE</i>)	4.11 (.13)	4.30 (.13)	
Visual Details	Rehearsed	5.19 (.10)	5.23 (.11)	5.21 (.10)
	Control	5.15 (.09)	5.08 (.11)	5.11 (.10)
	<i>M</i> (<i>SE</i>)	5.17 (.09)	5.16 (.10)	
Other Sensory Details	Rehearsed	4.35 (.13)	4.47 (.14)	4.41 (.13)
	Control	4.21 (.11)	4.15 (.13)	4.18 (.12)
	<i>M</i> (<i>SE</i>)	4.28 (.11)	4.31 (.13)	

Note: Standard errors in parentheses

Recollection

Overall, subjects indicated higher feelings of recollection for memories when they rated them the second time ($M=4.52$), as compared to when they rated them the first time ($M=4.39$). This emerged as a significant main effect of time: $F(1, 83)=8.64$, $MSE=.18$, $\eta_p^2=.09$. The main effect of rehearsal was only marginally significant, $F(1, 83)=3.34$, $MSE=.55$, $\eta_p^2=.04$, $p=.07$; however, a significant interaction emerged between time and rehearsal, $F(1, 83)=11.57$,

$MSE=.10$, $\eta_p^2=.12$. Telling a story about an autobiographical event increased feelings of recollection after telling that story ($M=4.66$) as compared to before telling it ($M=4.40$), $t(83)=3.82$, $SEM=.07$. However, feelings of recollection for control memories remained constant (M s of 4.38 and 4.39), $t<1$. Thus, the process of telling a story (regardless of the specific manner in which it was told) increased subjects' feelings of recollection, while feelings of recollection for control memories remained unchanged.

Story

Subjects were more likely to think of their memories as stories the second time they rated them ($M=4.30$) as compared to the first ($M=4.11$), $F(1, 83)=10.15$, $MSE=.32$, $\eta_p^2=.11$. In addition, subjects tended to give higher ratings for rehearsed memories ($M=4.29$) as compared to control memories ($M=4.13$), $F(1, 83)=3.67$, $MSE=.58$, $\eta_p^2=.04$, $p=.06$. However, a significant interaction between these two variables qualified their main effects, $F(1, 83)=6.29$, $MSE=.15$, $\eta_p^2=.07$. Not surprisingly, subjects were much more likely to think of their memories as stories if they rehearsed them: ratings increased significantly from before the rehearsal ($M=4.13$) to after it ($M=4.44$), $t(83)=3.72$, $SEM=.08$. However, there was no change for control memories (time 1: $M=4.08$; time 2: $M=4.17$), $t(83)=1.34$, $SEM=.07$, $p=.19$.

Visual Details

A significant interaction emerged between rehearsal and time, $F(1, 83)=5.59$, $MSE=.05$, $\eta_p^2=.06$. This significant interaction was driven by a

difference between rehearsed and control memories at time 2, $t(83)=2.05$, $SEM=.08$. That is, retold memories included more visual details ($M=5.23$) as compared to control memories ($M=5.08$) at time 2. There were no differences between time 1 versus time 2 ratings for either retold ($t<1$) or control memories, $t(83)=1.68$, $SEM=.04$, $p=.10$. Nor were there any differences between rehearsed and control memories at time 1, $t<1$. Neither the main effect of rehearsal, $F(1, 82)=1.74$, $MSE=.48$, $\eta_p^2=.02$, $p=.19$, nor time emerged, $F<1$.

Other sensory details

On average, subjects retrieved more sensory details for memories that were rehearsed ($M=4.41$), as compared to memories that were not ($M= 4.18$), $F(1, 83)=5.26$, $MSE=.85$, $\eta_p^2=.06$. However, a significant interaction between rehearsal and time qualified this finding, $F(1, 83)=4.35$, $MSE=.15$, $\eta_p^2=.05$. This interaction was driven by a significant difference between rehearsed ($M=4.47$) and control memories ($M=4.15$) at the second rating, $t(83)=2.82$, $SEM=.11$. However, rehearsing a memory did not increase ratings from time 1 to time 2, $t(83)=1.57$, $SEM=.08$, $p=.12$. Similarly, ratings for control memories did not differ from time 1 to time 2, $t<1$.

Belief

Overall, subjects gave higher ratings on scales assessing belief prior to telling stories ($M=5.09$), as compared to after ($M=4.99$), $F(1,82)=6.36$, $MSE=.14$, $\eta_p^2=.07$. Several higher order interactions qualified this main effect. First, a significant interaction emerged between retrieval and whether subjects rated their

memories before or after that retrieval, $F(1, 82)=4.61$, $MSE=.10$, $\eta_p^2=.05$.

Subjects' ratings of belief in their memories decreased significantly for control memories the second time they rated them ($M=4.89$) compared to the first ($M=5.07$), $t(83)=3.28$, $SEM=.05$. However, telling a story maintained feelings of belief for those memories from the first rating ($M=5.11$) to the second ($M=5.08$), $t<1$.

As shown in Table 16, two higher-order interactions emerged with instruction condition. First, instruction interacted with time, $F(1, 82)=3.96$, $MSE=.14$, $\eta_p^2=.05$, $p=.05$. Collapsing across whether a memory was a rehearsed or a control memory, reveals that subjects in the specific retelling condition gave higher ratings the first time they rated their memories ($M=5.11$), as compared to the second ($M=4.93$), $t(41)=3.35$, $SEM=.05$. However, there was no difference in ratings for subjects in the general retelling condition (M s of 5.07 and 5.05), $t<1$.

Second, a significant interaction emerged for instruction and rehearsal, $F(1, 82)=5.94$, $MSE=.41$, $\eta_p^2=.07$. Collapsing across whether subjects rated their memories before or after telling stories about them, revealed that subjects who told general stories gave higher ratings to their retold memories ($M=5.20$), as compared to their control memories ($M=4.92$), $t(41)=3.31$, $SEM=.09$; however, there were no differences for subjects who told specific stories, $t<1$. An interaction between rehearsal, rehearsal instruction and time did not emerge, $F<1$.

Table 16: Average ratings for feelings of Belief

	Memory	AMQ Rating		<i>M</i> (<i>SE</i>)
		Time 1	Time 2	
Specific Story	Rehearsed	5.04 (.13)	4.94 (.14)	4.99 (.13)
	Control	5.17 (.13)	4.92 (.14)	5.05 (.13)
	<i>M</i> (<i>SE</i>)	5.11 (.12)	4.93 (.14)	
General Story	Rehearsed	5.18 (.13)	5.23 (.14)	5.20 (.13)
	Control	4.96 (.13)	4.87 (.14)	4.92 (.13)
	<i>M</i> (<i>SE</i>)	5.07 (.11)	5.05 (.13)	

Note: Standard errors in parentheses

Distinct/General

Instructing subjects to tell general versus specific stories resulted in a significant 3-way interaction between time, rehearsal, and rehearsal type on the scale assessing whether people, places, and objects were distinct, as opposed to pieces of a general scene, $F(1, 82)=7.49$, $MSE=.53$, $\eta_p^2=.08$ (See Table 17). For subjects telling specific stories, there was no higher order interaction between rehearsal and time, $F(1, 41)=2.28$, $MSE=.59$, $\eta_p^2=.05$, $p=.14$. However, a significant 2-way interaction between time and rehearsal emerged for subjects in the general storytelling condition, $F(1, 41)=5.83$, $MSE=.47$, $\eta_p^2=.12$. No baseline differences emerged for rehearsed and control memories prior to the rehearsal, $t<1$. However, subjects tended to give lower ratings at time 2 ($M=3.17$) as compared to time 1 ($M=3.64$) for memories that were retold, $t(41)=3.08$,

$SEM=.15$. As a reminder, higher ratings on this scale indicated that subjects thought of events as a general scene, while lower ratings indicated that they thought about people/places/objects as distinct entities. This finding is counterintuitive to what the rehearsal instructions predict; I will return to this in the Discussion below.

Table 17: Average ratings for Distinct/General.

	Memory	AMQ Rating		<i>M</i> (<i>SE</i>)
		Time 1	Time 2	
Specific Story	Rehearsed	3.52 (.24)	3.72 (.24)	3.62 (.22)
	Control	3.53 (.22)	3.37 (.21)	3.45 (.20)
	<i>M</i> (<i>SE</i>)	3.53 (.20)	3.54 (.20)	
General Story	Rehearsed	3.64 (.24)	3.17 (.24)	3.41 (.21)
	Control	3.61 (.22)	3.66 (.21)	3.63 (.20)
	<i>M</i> (<i>SE</i>)	3.63 (.20)	3.41 (.20)	

Note: Standard errors in parentheses

11.3.5 Regression Analysis

Because coders' ratings for detail did not differ as a function of rehearsal instruction, I computed another regression analysis to explore whether any other factors were driving differences on these scales. Similar to the regression analysis in Experiment 2, I first computed dummy codes to correct for variance within versus between-subjects. Second, I controlled for characteristics of the memory (age, rehearsal prior to the experiment, etc.). Finally, I evaluated characteristics of the stories (number of words, detail rating, and ratings on the

Retellings Assessment Questionnaire). As shown in Table 18, time 1 ratings significantly predicted time 2 ratings, similar to Experiment 2. Of specific interest, however, is whether characteristics of the stories predicted unique variance in the time 2 ratings, holding characteristics of the memory constant.

Similar to Experiment 2, the level of detail significantly predicts time 2 ratings for 4 of the 5 composites scores. That is, more detailed stories were related to increased feelings of recollection, belief, and the retrieval of visual and sensory details.

Table 18: Story qualities predict change in composite scores (Experiment 3).

	Recollection	Belief	Story	Visual Det.	Other Sensory Det.	
	β	β	β	β	β	
Memory Characteristics	time1	0.41 **	0.39 **	0.15 **	0.42 **	0.42 **
	age of memory	-0.06	-0.11 **	-0.13 **	-0.19 **	-0.09 **
	significance	0.09 **	0.07	0.08	0.11 **	0.01
	rehearsal	0.02	0.06	0.07	0.03	0.02
	accuracy	0.11 **	0.12 **	0.20 **	0.03	0.10 *
	Model R ² Change	0.18 **	0.22 **	0.09 **	0.21 **	0.16 **
Story Qualities	detail	0.17 **	0.11 **	0.10	0.11 **	0.16 **
	exaggeration	-0.03	0.01	-0.04	-0.04	-0.06
	distorted	0.03	-0.06	0.02	-0.04	0.08 *
	added details	-0.03	-0.03	-0.03	-0.01	-0.07
	minimized	-0.04	-0.07	-0.15 **	-0.09 *	-0.03
	selective	0.06	0.05	0.12 **	0.05	0.09
	# of words	0.08	0.13 *	0.11	0.13 *	0.03
	detail rating (coders')	0.05	0.00	-0.04	-0.05	0.08
	Model R ² Change	0.02 **	0.02 **	0.02	0.02 **	0.02 **

** Significant at $p < .05$

* Significant at $p < .10$

As with Experiment 2, I also computed a Principle Components Analysis on the scales for the Retellings Assessment Questionnaire. As shown in Appendix K, several items on the Retellings Assessment Questionnaire had high zero-order correlations with the dependent composite scores. For example, coders' average detail rating correlated highly with feelings of recollection and belief (recollection $r=.25$, belief $r=.20$). However, when all Retellings Assessment questions are factored into the same model, coders' ratings can no longer explain a significant proportion of variance in the composite scores (semi-partial $r_s=.02$ for recollection and $.00$ for belief). As with the second experiment, I computed a Principle Components Analysis to determine which Retellings Assessment questions loaded onto the same underlying factors. The factor analysis returned 3 factors. First, the number of words in a response, and both the subjects' and coders' assessment of detail loaded onto the same factor (Factor 1, below). Similarly, ratings of exaggeration, distortion, and added details were related (Factor 2). Finally, ratings of minimizing and selectivity were also highly related (Factor 3). When each of these factors was entered into the model on the third step (as opposed to the individual questionnaire scores), it became clear that Factor 1 predicted a significant proportion of variance in each of the composite scores. That is, the combination of the number of words in the story, and the level of detail (generated by the subjects and the coders) predicted increases in feelings of recollection, belief, and so forth. Though there were no

effects of the detailed versus general storytelling condition in the experiment, the level of detail still significantly predicted time 2 ratings (See Table 19).

Table 19: Factor scores predict change in composite scores (Experiment 3).

		Recollection	Belief	Story	Visual Det.	Other Sensory Det.
		β	β	β	β	β
Memory Characteristics	time1	0.39 **	0.39 **	0.12 *	0.42 **	0.40 **
	age of memory	-0.08 **	-0.11 **	-0.14 **	-0.19 **	-0.11 **
	significance	0.11 **	0.07	0.09	0.11 **	0.02
	rehearsal	0.03	0.07	0.09	0.04	0.02
	accuracy	0.13 **	0.13 **	0.19 **	0.03	0.11 **
Story Qualities	Model R ² Change	0.18 **	0.22 **	0.09 **	0.21 **	0.01 **
	factor 1	0.23 **	0.19 **	0.13 *	0.15 **	0.19 **
	factor 2	-0.01	-0.06	-0.04	-0.07	-0.02
	factor 3	0.01	-0.02	-0.01	-0.03	0.04
	Model R ² Change	0.02 **	0.01 **	0.01	0.01 **	0.01 **

** Significant at $p < .05$

* Significant at $p < .10$

Factor 1: # of words, detail, detail rating (coders')

Factor 2: exaggeration, distorted, added details

Factor 3: minimized, selective

11.4 Discussion

11.4.1 Ratings for detail

Subjects were instructed to tell either very specific stories that included many details, or general stories that did not include every last detail. I predicted that coders would give higher detail ratings to subjects who were instructed to tell detailed stories, as compared to subjects who were instructed to tell general stories. However, this was not the case. If the stories were qualitatively similar, then it is not surprising that only one 3-way interaction emerged between rehearsal, rehearsal instruction, and time. Unfortunately, we cannot rule out the possibility that subjects were not adequately following the instructions.

11.4.2 Retellings Assessment

Ratings on the Retellings Assessment Questionnaire are largely consistent with Experiment 2, with one exception. Subjects who told general stories indicated that they were more selective in their stories as compared to subjects who told detailed stories. This difference is understandable given the retelling instruction. These subjects were instructed to think of the event as a whole and to not worry about specific details. Therefore, in order to comply with that goal, they may have been more careful about what information, specifically, to convey.

As in Experiment 2, no differences emerged on scales assessing level of detail, exaggerations, distortions, adding details, or minimizing. These results are consistent with Butler et al. (in prep); in between-subjects designs when subjects

retold in only one way, they gave similar ratings on these scales. As in Butler et al, presumably differences on these scales may have emerged if subjects were instructed to tell a story both ways (that is, first in a general way, and then in a specific way). The grain size literature suggests that subjects who tell detailed stories may sacrifice accuracy in order to comply with that goal (that is, their answers may be more detailed, but slightly inaccurate) (Goldsmith, Koriat, & Pansky, 2005). It is possible that if subjects retold a story both ways, they would rate their detailed stories as having a higher level of detail; however, these same stories may also be more exaggerated or distorted. Having the experience of telling a general story in addition to a detailed story may make subjects more aware of adding details and including other distortions.

11.4.3 Conclusions

Similar to Experiment 2, the process of telling stories influenced qualitative aspects of memory. Telling entertaining stories increased feelings of recollection, and maintained feelings of belief, as compared to control memories. The specific instruction manipulation (detailed versus general) only emerged as a 3-way interaction for one scale: Whether the people/places and objects were distinct entities or members of a general scene. Surprisingly, this interaction was driven by the fact that subjects who told general stories were more likely to think of objects as distinct entities, as opposed to members of a general scene. At first glance, this finding is counterintuitive to what one would expect, given the specific retellings instruction. However, subjects in the general retelling condition

admitted to being more selective in their stories on the Retellings Assessment Questionnaire. One possibility is that this instruction caused them to more carefully evaluate the memory in order to determine what to include versus leave out of their stories. This process may have drawn their attention to more specific details.

The current experiment was a within-subjects design, and subjects did not have the benefit of rehearsing their memories in both a general *and* a specific way. This may be one reason why there were not more effects of the specific versus general story instruction. As discussed above, subjects did not differ on any questions on the Retellings Assessment Questionnaire (except selectivity). According to the grain size literature, coarse, broad statements are better remembered than specific details (Conway, Cohen, & Stanhope, 1991). When subjects are instructed to tell a precise story that includes many details, they may sacrifice accuracy in order to comply with that goal; they may have more details in their story, but it's more likely that those details are slightly inaccurate compared to broader statements. That is, they might add details, or exaggerate certain things; however, subjects did not differ on these scales. It is quite possible, however, that subjects added details but were just not aware of it. If subjects had the opportunity to write about stories in both a specific *and* a general way, more differences between rehearsal instruction may have emerged.

12. General Discussion

We often admit to distorting information that we relay to others (Marsh & Tversky, 2004), and prior research has shown that telling such biased stories can lead to memorial consequences (Tversky & Marsh, 2000). However, it is still unclear what underlying cognitive mechanisms are contributing to these memorial changes. In the first experiment, I examined the role of selective rehearsal. When we tell stories to others, we will often selectively retrieve information for a number of reasons. As we tell a story, we might selectively retrieve parts of a memory that fit with our personal goals (such as the subjects in Tversky & Marsh, 2000), or we may modify our message for a certain audience (Vandierendonck & Van Damme, 1988). The first experiment sought to more fully understand how selective rehearsal contributes to the memorial consequences typically associated with retellings. That is, do memorial consequences result because subjects are selectively rehearsing the information in their stories? Or, is there something special about the storytelling component? In the first experiment, I controlled for selective rehearsal and examined how telling a *story* influenced later memory. Selective rehearsal led to memorial changes, but the elaborative component of telling a good story did not lead to greater differences in memory for the rehearsed material. That is, the mechanism leading to memorial changes in typical retellings experiments is very similar to selective rehearsal.

Though these results suggest that selective rehearsal influences memory during the process of telling a story, there may be other contributing mechanisms at work as well. As discussed above, it is also possible that subjects activate a schema that guides them in retrieving information for their stories. For example, as in Tversky and Marsh's studies (2000), subjects may have activated an "annoying roommate" schema that guided them when they were selectively retrieving information.

However, schema-driven processing and selective rehearsal are likely not the only mechanisms underlying the memorial changes that occur after a retelling. Another possibility is that subjects simply forget that they mentioned something in their stories and instead attribute that information to their initial memory; this is similar to what is typically found in the misinformation literature. For instance, Loftus and Palmer (1974) showed subjects may forget that they encountered something in the "misinformation phase" of the experiment and instead attribute it to the original event. The same may be true for retellings: Subjects may forget that a specific anecdote or detail was generated during their *story* and was *not* a property of their original memory.

Examining how a delay (between the retelling and the final memory test) influences memory in a retellings context will evaluate both of these possible mechanisms. Over time, memories tend to become more schematic (Bartlett, 1932), and it is likely that subjects' memory in Experiment 1 will also become more schematic after a delay. In this case, it may be more fruitful to carefully

examine the types of errors subjects make on a final memory test. For example, do subjects tend to generate errors on the final memory test that fit with a “Sell a house” schema? Also important is how the process of telling an elaborate story versus simply selectively rehearsing information in a list format influences the retrieval of schema consistent information. Though elaborative storytelling in Experiment 1 did not influence memory on an immediate test, differences may emerge after a delay. The process of elaborative storytelling may activate a schema during that retelling; subjects may use a similar schema to guide their retrieval on a final test. Therefore, subjects who told elaborative stories may generate more schema-consistent errors on a delayed final memory test.

Furthermore, if subjects who previously elaborated do indeed produce more schema-consistent errors on a final memory test, it is possible that they will attribute these errors to the original event. When a delay is inserted between the presentation of the misleading information and the final memory test in misinformation experiments, subjects tend to believe that the misinformation was part of the original event (Higham, 1998). If subjects who tell elaborative stories activate a schema on the final memory test, which leads them to produce more schema-consistent errors, these subjects may very well likely incorrectly attribute more of these errors to their original memories. This type of source confusion would suggest that retroactive interference is influencing subjects’ ability to remember the original story: The errors generated in the stories may interfere retroactively with memory for the original story (See Chapter 7).

In addition to retroactive interference and schema-driven processing, other mechanisms may be at work in the retellings process as well. For example, proactive interference may influence memory when stories are told multiple times. When remembering an event, subjects may also retrieve the last time they told their stories in addition to retrieving their memory for the original event itself. In this case, the memory is a combination of the actual event and the other stories produced since that event occurred. Proactive interference would occur when errors generated on previous stories interfere proactively with other stories the subject generates. A study which examines the production of errors across multiple retellings would be needed to examine this possibility.

Future studies should also examine whether inhibition influences memory within a retellings context. As discussed in Chapter 7, inhibition would occur if the process of telling a story about some aspects of an event would make other, related aspects less accessible. For example, in Tversky and Marsh's (2000) study about the two roommates, subjects selectively retrieved either social or annoying qualities of one of two roommates (the other roommate was not discussed). According to inhibition accounts (e.g., Anderson, Bjork, & Bjork, 1994), telling a story about the social attributes of one roommate may inhibit the retrieval of the annoying attributes of that roommate; these annoying attributes would be retrieved at a lower rate than any of the attributes of the non-discussed roommate. However, Tversky and Marsh's results did not support this idea: Subjects remembered similar amounts of perspective irrelevant information for

each the discussed and the non-discussed roommates. Experiment 1 was not designed to test inhibition as a mechanism, but it could be easily modified to evaluate this possibility. For example, the stories could be modified to contain both positive and negative features of each house/restaurant. After reading these stories, subjects would tell an elaborate story or list the positive features of one of the houses and one of the restaurants. Inhibition would occur if retrieval of the negative features of the rehearsed house/restaurant were retrieved at a lower rate than both the positive and negative features of the unrehearsed house/restaurant. This type of experiment would also utilize an independent probe technique (see Chapter 7), to ensure that any differences in memory were in fact due to inhibition and not due to other possibilities (such as interference).

The first experiment was designed to evaluate the underlying mechanisms involved in the retellings process. The second and third experiments examined how rehearsing qualitative aspects of autobiographical memories influences those memories. In these two experiments, subjects retrieved and wrote about events from their personal past. In order to mimic why people tell stories in the real world (as in Marsh & Tversky, 2004), subjects retrieved their autobiographical memories in either a detailed or entertaining way (Experiment 2). Results indicated that simply rehearsing an autobiographical memory influences qualitative aspects of that memory; however, the specific way (detailed versus entertaining) in which that memory was rehearsed does not have any effect on memory quality. The exploratory regression analysis

computed for Experiment 2 indicated that another factor may be more influential in changing qualitative aspects of memory: the level of detail in which it was retrieved. In Experiment 3, the level of detail in which subjects were instructed to write about their memories was directly manipulated. This manipulation (specific versus general stories) had little influence on the qualitative characteristics of those memories; however, simply rehearsing these memories (in either way), influenced memory quality. Both of these experiments show that rehearsing autobiographical memories influences memory quality; however, the specific nature in which they are rehearsed (entertaining, accurate, specific, or general) has little effect on memory quality.

To summarize, in both Experiments 2 and 3, the simple process of retrieving and writing about personal memories influenced qualitative aspects of those memories, regardless of the specific way in which subjects discussed them. Because rehearsing events changes qualitative aspects of memories, there are two points worth noting. First, telling stories is a natural part of our daily conversations (Marsh & Tversky, 2004). Second, the quality of the experience we retrieve may be a critical factor in whether or not we think of an event as true (Koriat et al., 2000). Thus, we often tell stories and this process of telling stories may influence qualitative aspects of memories, which in turn may influence whether or not we regard them as true. We know from laboratory paradigms (Experiment 1, see also Dudukovic et al., 2004) that retellings can be a source of elaborations and errors. However, if the process of rehearsing autobiographical

events (as in Experiments 2 and 3), changes qualitative aspects of these memories, these rich qualitative characteristics may give subjects confidence that their memories are true, when in fact they are not. Future studies should examine how retelling autobiographical memories influences both memory quality and accuracy, and more specifically the relationship between these two dependent measures. Measuring accuracy for autobiographical memories is difficult because researchers are not present for the original event and therefore cannot code stories and final memories for correctness. However, other studies have examined consistency in retrieval over time as a way to measure accuracy for personal memories (Talarico & Rubin, 2003). Future studies employing similar methods will allow us to more fully understand how retellings change autobiographical memory. If subjects tell stories about autobiographical events, do their memories change in more ways than measures of quality can capture? That is, when asked to remember the original event, are the details that they remember consistent with previous retrieval attempts? Or is the retrieval of certain details less consistent over time? Examining how consistency relates to both memory quality and subjects' own confidence in their memories will be useful in understanding the relationship between quality and accuracy for autobiographical events.

It is important to note that each of the studies reported above was designed to understand how retellings influence memory more generally – that is, beyond the scope of these laboratory paradigms and into retellings for real-world

events. However, in order to investigate the possible cognitive mechanisms underlying the memorial changes that result from retellings (Experiment 1) and how retellings influence autobiographical memories (Experiments 2 and 3), subjects' memories were tested in the laboratory. While laboratory designs allow researchers to carefully control the conditions surrounding the encoding, retellings, and the final memory test, more studies are needed that examine how retellings influence memory in more naturalistic settings. For example, some research suggests that subjects may tell stories slightly differently when talking to a peer versus when talking to an experimenter (Hyman, 1994). In order to mimic real-world situations, subjects were instructed to retrieve memories in either an entertaining or factual manner (Experiment 2). These instructions were chosen because diary studies suggest that subjects typically tell stories to relay facts or to entertain their audience (Marsh & Tversky, 2004). However, this does not rule out the possibility that subjects may tell slightly different stories in our studies, as compared to those that they tell to their friends. More research is needed to bridge what we know about how retellings influence memory in laboratory settings and how retellings influence memory in more naturalistic settings.

On another note, in each of the studies above, subjects did not know the nature of the retelling prior to the encoding phase (in Experiment 1) or prior to the generation phase (Experiments 2 and 3). In real-world scenarios, the situations in which we find ourselves may influence the specific stories we choose to tell. For example, if we feel compelled to tell a particularly entertaining story we may

choose a story that already lends itself to being entertaining for our audience. Butler and colleagues (in prep) found that subjects choose less typical events when they know they will be retelling those events in an entertaining way later in the experiment. However, in order to ensure any changes in memory quality were due to the retelling and not due to underlying differences in the type of memory selected, subjects were not aware of the retelling goals prior to the generation phase in Experiments 2 and 3. Even though subjects did not have prior knowledge of the retelling goal, subjects in the entertaining condition told more entertaining stories as compared to subjects rehearsing in a detailed way (Experiment 2). Other avenues of research should examine how knowing the goal prior to the retelling influences later memory. For example, if subjects choose “entertaining memories” for “entertaining stories,” does the process of retelling still influence qualitative aspects of those memories?

Telling stories is a natural part of daily conversations and it is a gift that has been passed down for generations and generations. However, when we *tell stories*, our goals are quite different than when we are instructed to accurately *recall*. The goal of this dissertation was to understand more about this process of storytelling and how it differs from accuracy-based retrieval. In addition, it sought to understand how retellings influence memory for autobiographical events. Although we have mastered the art of modifying our stories for daily conversations, we are not yet immune to their negative consequences on memory.

APPENDIX A

House story used in Experiment 1

“Hello,” you said approaching a couple climbing out of a car, “I will be showing you around this brick house today.”

“We really appreciate it,” David said.

“Sure is hot outside today,” David said, making small talk as everyone approached the brick house.

“It sure is!” you exclaimed. “But, there is a kidney-shaped pool around back,” you said as you unlocked the door. David and Karen stepped inside and began examining the property.

“Let’s head into the kitchen,” you said. Karen and David followed you down the hall to the kitchen and they spent several minutes looking around it.

“You’ll see that the backyard is fenced in,” you said as you led them through the back door to the yard.

“How about the bedrooms? Can we have a look at those?” Karen asked after briefly inspecting the backyard.

“Of course,” you said, leading them down the hallway. “These bedrooms are spacious,” you stated as you motioned into a doorway.

“You’ll also notice the light fixtures in these rooms. There are energy-efficient light fixtures in each bedroom,” you said, directing their gaze to the

ceilings. After inspecting the other rooms, you stepped outside to allow Karen and David to discuss the house in private.

“What do you think about this brick house?” you overheard Karen say.

“It’s all right,” David responded.

“Well, I think that we should keep looking,” Karen commented, “and come back to this brick house later if we want.”

After they discussed the house in private, they approached you and told you that they’d like to keep looking.

“I’m showing another house at this time. Would you like to stop there on your way home?” you asked.

“That’d be perfect,” David said.

David and Karen got back into their car and followed you to the next location.

“Notice the terracotta roof,” you said directing their attention to the roof of the white house as they got out of the car. You led them up to the front door.

“You’ll notice the cathedral ceilings,” you mentioned as you unlocked the door and pointed upwards. You showed Karen and David around the living and dining areas. Once you were in the kitchen, you noticed David carefully inspecting the granite countertops.

“Why don’t we take a look at the backyard?” you said, leading them both outside.

“Look at the lake with the dock,” David said.

You nodded. After a few minutes of inspecting the backyard, they followed you back inside to see the bathrooms and the rest of the white house. After touring the rest of the house, you stepped aside to let David and Karen talk about the white house in private. You waited patiently in the next room as Karen and David discussed. Within a few minutes, they came and told you their decision.

“These two houses have been really great,” David said, “But I think that we’d like to keep looking.”

Restaurant story used in Experiment 1

“Hmmm...” you said, scanning the online menus. You and your friend Jordan were trying to decide where to eat dinner on your trips. You had scheduled a trip to Anchorage, Alaska this weekend and another to Atlanta, Georgia the next.

“I think that we should try Iceberg Cafe in Alaska, and in Atlanta we should go to Peach Mountain Grill,” you said.

“That sounds good,” Jordan said.

After the long flight to Alaska you and Jordan settled into your hotel. Soon after, you headed out to try the cuisine at Iceberg Cafe.

“Hello,” Jordan greeted the maitre d’. “Two for non-smoking, please.”

“Alright,” the maitre d’ responded, “I can seat you near the live band playing tonight; is that OK?”

You and Jordan nodded as you followed her to your table. Once you were seated, you saw that your table also offered a downtown view.

“My name is Jennifer, and I’ll be your server tonight at Iceberg Cafe,” a woman said as she approached your table.

“I would just like to point out that we serve breakfast until 10 PM,” Jennifer said as she handed both of you menus. Jennifer left for a few minutes so you and Jordan could peruse your menus. After you decided what to order, you looked around at the Claude Monet reproductions that adorned the walls.

“Are you ready to order?” Jennifer asked as she sat 2 glasses of water on the table. After you each placed your order, you and Jordan chatted as you waited for the food to come.

“The salmon,” a man said, placing a dish in front of you. “And, the sirloin steak,” he said, placing a dish in front of Jordan.

You both started your meals. When you both finished your meals, the server brought the bill. After you paid your bills, you headed back to the hotel.

“I’m looking forward to trying that restaurant, Peach Mountain Grill,” Jordan said the next weekend after both of you arrived in Atlanta.

“It looks like they have an outdoor dining area,” Jordan said, motioning to some tables and chairs, as you both approached the restaurant.

“Welcome to Peach Mountain Grill,” the maitre d’ said as you walked through the door.

“We’d like a table for 2, please,” you said as you greeted the maitre d’.

“Right this way,” she said as she led you to your table.

“There’s a flatscreen TV. It looks like I can check on the scores for the Duke basketball game,” Jordan commented as you were led to your table.

“And this is where you’ll be seated tonight,” the maitre d’ said as she motioned to a table and you both sat down.

“Hello, my name is Mike, and I’ll be your server today at Peach Mountain Grill,” a man said handing you menus and 2 glasses of water. “I’d like to point out that we offer daily-caught seafood. Also, you should save room for dessert. Here at Peach Mountain Grill we have a selection of European desserts,” Mike said.

“Hmm...” you muttered as you looked through your menu, “I think that I’ll just have the classic burger with fries.”

“Me too,” Jordan replied.

You chatted as you waited for the food to arrive. When you each finished your burgers, Mike brought the bill. After paying for your food, you headed back to the hotel.

APPENDIX B

Example response from subject in the elaborative story condition (Experiment 1).

The white house is a very nice house. It has a cathedral roof which would make you feel like a princess and a prince living in it. The bedrooms are with energy-efficient ceilings so it will not only save energy for you but for the entire human race. There is a lake with dock in the backyard. You can enjoy your afternoon tea there by the lake with your beloved one. What a romance! The countertops in the kitchen are granite. The living and dining rooms are very spacious. This white house is your home!

Example response from subject in the listing rehearsal condition (Experiment 1).

Outside
-terracotta roof
-on a pond/lake
-has a dock
Inside
-has cathedral ceilings
-has multiple bedrooms
-living room
-dining room
-kitchen with granite counters

APPENDIX C

Autobiographical Memory Questionnaire used in Experiments 2 and 3 (Rubin, Schrauf, & Greenberg, 2003).

1. As I remember the event, I feel as though I am **reliving** the original event.
2. As I remember the event, I can **hear** it in my mind.
3. As I remember the event, I can **see** it in my mind.
4. As I remember the event, I or other people are **talking**.
5. As I remember the event, I know its **spatial layout**.
6. As I remember the event, I can feel now the **emotions** that I felt then.
7. As I remember the event, I can recall the **setting** where it occurred.

Scale: 1=not at all, to 3=vaguely, to 5=distinctly, to 7=as clearly as if it were happening right now.

8. Sometimes people know something happened to them without being able to actually remember it. As I think about the event, I can actually **remember** it rather than just knowing that it happened.
9. As I remember the event, it comes to me **in words**.
10. As I remember the event, I feel that I **travel back to the time** when it happened, that I am a subject in it again, rather than an outside observer tied to the present.
11. As I remember the event, it comes to me in words or in pictures as a **coherent story** or episode and not as an isolated fact, observation, or scene.
12. This memory is **significant** for my life because it imparts an important message for me or represents an anchor, critical juncture, or a turning point.**
13. Would you be **confident** enough in your memory of the event to testify in a court of law.

Scale: 1=not at all, to 3=vaguely, to 5=distinctly, to 7=as much as any memory.

The items below have individual scales.

14. I **believe** the event in my memory really occurred in the way I remember it and that I have not imagined or fabricated anything that did not occur.

Scale: 1=100% imaginary; 7=100% real.

15. Since it happened, I have **thought or talked** about this event.**

Scale: 1=not at all; 7=as often as any event in my life.

16. If another witness to the event, who you generally trusted, existed and told you a very different account of the event to what extent could you be **persuaded** that your memory was wrong.

Scale: 1=not at all; 3=in some details; 5=in some main points; 7=completely.

17. To the best of your knowledge, is the memory of an event that occurred once at one particular time and place, a **summary or merging** of many similar or related events, or for events that occurred over a fairly continuous extended period of time lasting more than a day?

Scale: 1=once; 2=merging; 3=extended.

18. Please **date** the memory (month/day/year) as accurately as you can. Please fill in a month, day, and year even if you must estimate. If the memory extended over a period of time, report the approximate middle of the period.**

19. To what extent is your memory of the event **distorted** by your beliefs, motives, and expectations rather than an **accurate** reflection of the event as a neutral observer would report it? **

Scale: 1=100% distorted; 7=100% accurate.

Note: **These items were used to assess qualities of the initial memory, and were therefore not used to determine change over time, as a function of rehearsal instruction.

APPENDIX D

Composite groupings for Experiments 2 and 3.

Recollection

1. As I remember the event, I feel as though I am **reliving** the original event.
2. As I remember the event, I feel that I **travel back to the time** when it happened, that I am a subject in it again, rather than an outside observer tied to the present.
3. As I remember the event, I can feel now the **emotions** that I felt then.
4. My memory overall is (very **vague** to very **vivid**).*

Belief

1. Would you be **confident** enough in your memory of the event to testify in a court of law.
2. I **believe** the event in my memory really occurred in the way I remember it and that I have not imagined or fabricated anything that did not occur.
3. If another witness to the event, who you generally trusted, existed and told you a very different account of the event to what extent could you be **persuaded** that your memory was wrong.**
4. Sometimes people know something happened to them without being able to actually remember it. As I think about the event, I can actually **remember** it rather than just knowing that it happened.

Story

1. As I remember the event, it comes to me **in words**.
2. As I remember the event, it comes to me in words or in pictures as a **coherent story** or episode and not as an isolated fact, observation, or scene.

Visual Details

1. As I remember the event, I can **see** it in my mind.
2. As I remember the event, I know its **spatial layout**.
3. As I remember the event, I can recall the **setting** where it occurred.
4. My memory for the event involves specific **visual details***
5. My memory for the **specific actions** within the event are (very dim to very sharp).*

Other Sensory Details

1. As I remember the event, I can **hear** it in my mind.
 2. As I remember the event, I or other people are **talking**
-

*These scales are unique to Experiment 3.

**This was reverse scored before averaged into the composites.

APPENDIX E

Retellings Assessment Questionnaire used in Experiments 2 and 3 (Modified from Marsh & Tversky, 2004).

1. How detailed do you think your retelling was, compared to the original event?

- 1=Not Very Detailed, containing almost none of the details of the original event
- 2=Somewhat Detailed, containing few of the details of the original event
- 3=Fairly Detailed, containing some of the details of the original event
- 4=Very Detailed, containing most of the details of the original event
- 5=Completely Detailed, containing almost all of the details of the original event

2. How exaggerated do you think your retelling was, compared to the original event?

- 1=Not Exaggerated, where almost none of the details have been exaggerated
- 2=Somewhat Exaggerated, where a few of the details have been exaggerated
- 3=Fairly Exaggerated, where several of the details have been exaggerated
- 4=Mostly Exaggerated, where most of the details have been exaggerated
- 5=Completely Exaggerated, where almost all of the details have been exaggerated

3. How distorted do you think your retelling was, compared to the original event?

- 1=Not Distorted, where almost none of the details are inaccurate and/or distorted
- 2=Somewhat Distorted, where a few of the details are inaccurate and/or distorted
- 3=Fairly Distorted, where several of the details are inaccurate and/or distorted
- 4=Mostly Distorted, where most of the details are inaccurate and/or distorted
- 5= Completely Distorted, where almost all of the details are inaccurate and/or distorted

4. Did you add something that was not part of the original event?

1=Did not add anything that was not part of the original event

2=Added a few things that were not part of the original event

3=Added a lot of things that were not part of the original event

4=Most of the story consisted of things that were not part of the original event

5=The entire story consisted of things that were not part of the original event

5. Did you minimize events in your retelling?

1=Not at all minimized, the events in the story were portrayed very accurately

2=Somewhat minimized, the events in the story were portrayed somewhat accurately

3=Fairly minimized, the events in the story were portrayed fairly inaccurately

4=Very minimized, the events in the story were portrayed somewhat inaccurately

5=Completely minimized, the events in the story were portrayed very inaccurately

6. Were you selective in your retelling?

1=Not at all selective

2=Somewhat selective

3=Fairly selective

4=Very selective

5=Completely selective

APPENDIX F

Sample retrieval from subject in the factual rehearsal condition (Experiment 2).

My friends Dan and John, and I went to see The Dark Knight in Imax a week after it came out. They both had never seen it before, but it was my second time seeing it. The movie theater was packed, and I saw some of my high school classmates. We sat down in the very comfortable chairs and the movie started. The opening scene was a fullscreen IMAX shot and it took my breath away. The entire movie I had to crane my neck up to see the screen fully. My neck was sore afterwards. The movie was amazing, but some annoying guys were talking in front of us. The movie was fairly long, and immediately after it ended, we left.

Sample retrieval from subject in the entertaining retrieval condition (Experiment 2).

I arrived at the Northgate movie theater, thankful that I didn't get mugged by a group of prowling ruffians outside. I purchased the ticket (only 6.50 for a student ticket - awesome!), and walked in to the dude who rips the ticket and commands you quite absent mindedly (like he would rather be anywhere else) where to go. He did, however, tell me I had to throw away my Starbucks. Bummer, vanilla lattes are delicious. Never the less, I went to the theater, which is more or less empty - Northgate has like a million huge theaters that rarely have more than 10 people in them.

I was pretty excited; the previews made the film look awesome. So the movie started, and as it progressed, I became less and less impressed (I didn't think it was terribly good - I won't ruin it for you if you haven't seen it, but the claws looked impressively fake, especially when he, wolverine, looks at them in the mirror). When I left, I was glad I saw it, but glad I got a student discount.

Note: All identifying names have been replaced

APPENDIX G

Table 20: Correlations among AMQ scales (Experiment 2).

Scale	rel	tra	emo	r/k	conf	bel	per	wds	stry	see	spa	set	tkl	hea
reliving	1.00													
travel	0.67 **	1.00												
emotions	0.73 **	0.61 **	1.00											
remember/ki	0.58 **	0.48 **	0.44 **	1.00										
confidence	0.60 **	0.44 **	0.55 **	0.54 **	1.00									
belief	0.46 **	0.41 **	0.28 **	0.64 **	0.68 **	1.00								
persuasion	-0.23 *	-0.23 *	-0.15	-0.35 **	-0.40 **	-0.55 **	1.00							
words	0.50 **	0.44 **	0.52 **	0.32 **	0.39 **	0.24 **	-0.14	1.00						
story	0.64 **	0.68 **	0.62 **	0.65 **	0.62 **	0.56 **	-0.27 **	0.59 **	1.00					
seeing	0.74 **	0.60 **	0.60 **	0.78 **	0.63 **	0.61 **	-0.36 **	0.32 **	0.65 **	1.00				
spatial	0.55 **	0.42 **	0.49 **	0.60 **	0.52 **	0.44 **	-0.23 *	0.18	0.46 **	0.74 **	1.00			
setting	0.53 **	0.51 **	0.47 **	0.73 **	0.49 **	0.52 **	-0.26 **	0.19 *	0.55 **	0.85 **	0.76 **	1.00		
talking	0.65 **	0.66 **	0.67 **	0.50 **	0.50 **	0.38 **	-0.24 *	0.69 **	0.75 **	0.58 **	0.48 **	0.48 **	1.00	
hearing	0.78 **	0.68 **	0.74 **	0.48 **	0.57 **	0.39 **	-0.26 **	0.74 **	0.77 **	0.59 **	0.42 **	0.40 **	0.87 **	1.00

** Significant at $p < .01$

* Significant at $p < .05$

APPENDIX H

Table 21: Zero-order, partial, and semi-partial correlations for memory characteristics and story qualities with each composite score (Experiment 2).

		Recollection			Belief			Story				
		Zero order	Partial	Semi-Partial				Zero order	Partial	Semi-Partial		
Memory	time1	0.73	0.46	0.23	time1	0.75	0.42	0.21	time1	0.73	0.39	0.19
	age of mem	-0.18	-0.09	-0.04	age of mem	-0.29	-0.18	-0.09	age of mem	-0.17	-0.17	-0.08
	importance	0.34	-0.02	-0.01	importance	0.23	-0.02	-0.01	importance	0.38	0.06	0.03
	rehearsal	0.39	0.18	0.09	rehearsal	0.30	0.09	0.04	rehearsal	0.42	0.16	0.07
	accuracy	0.36	0.02	0.01	accuracy	0.51	0.01	0.00	accuracy	0.33	-0.01	-0.01
Story	detail	0.46	0.27	0.13	detail	0.52	0.29	0.14	detail	0.36	0.25	0.12
	exaggeration	-0.11	-0.13	-0.06	exaggeration	-0.17	-0.03	-0.01	exaggeration	-0.07	-0.09	-0.04
	distorted	-0.27	-0.02	-0.01	distorted	-0.37	-0.13	-0.06	distorted	-0.20	-0.07	-0.03
	added det.	-0.10	-0.04	-0.02	added det.	-0.18	-0.06	-0.03	added det.	-0.02	-0.03	-0.02
	minimized	-0.09	-0.08	-0.04	minimized	-0.20	-0.13	-0.06	minimized	-0.05	-0.04	-0.02
	selective	0.08	0.09	0.04	selective	-0.06	0.09	0.04	selective	0.11	0.05	0.02
	words	0.30	0.07	0.03	words	0.36	0.11	0.05	words	0.24	0.05	0.02
	entertaining	0.29	0.06	0.03	entertaining	0.30	0.01	0.01	entertaining	0.26	0.09	0.04
		Visual Details			Other Sensory Details							
		Zero order	Partial	Semi-Partial				Zero order	Partial	Semi-Partial		
Memory	time1	0.72	0.49	0.28	time1	0.75	0.53	0.29				
	age of mem	-0.23	-0.11	-0.05	age of mem	-0.19	-0.04	-0.02				
	importance	0.22	-0.02	-0.01	importance	0.32	0.05	0.02				
	rehearsal	0.31	0.18	0.09	rehearsal	0.38	0.11	0.05				
	accuracy	0.38	-0.01	0.00	accuracy	0.32	0.02	0.01				
Story	detail	0.49	0.20	0.10	detail	0.39	0.20	0.09				
	exaggeration	-0.16	-0.12	-0.06	exaggeration	-0.12	-0.14	-0.07				
	distorted	-0.28	0.01	0.00	distorted	-0.25	-0.04	-0.02				
	added det.	-0.09	-0.05	-0.02	added det.	-0.05	-0.09	-0.04				
	minimized	-0.16	-0.17	-0.08	minimized	-0.05	-0.11	-0.05				
	selective	-0.02	0.06	0.03	selective	0.11	0.09	0.04				
	words	0.37	0.04	0.02	words	0.29	0.13	0.06				
entertaining	0.34	0.02	0.01	entertaining	0.21	0.01	0.00					

APPENDIX I

Sample story from subject in the specific storytelling condition (Experiment 3).

My friend Anne invited me last minute to see this movie which I'd forgotten was coming out completely. We got in the theater where we made lots of jokes about the previews and shoved popcorn in our mouths before we decided to save some for later. It was a big group of us so we were critiquing everything including when the movie finally started. Despite our jokes there were some scenes that left us all completely silent. And when it was done our good mood resumed as we declared this to be a decent film and piled back into the car.

Sample story from subject in the general storytelling condition (Experiment 3).

We got to the movie theater, and waited in line. As I ordered the tickets, the guy told me it was sold out, but as I turned to walk away he told me he was just joking. Matt waited in line for the concession stand as me, Bryan, and Aaron went to get seats. I chose the seats because I wanted to have a spot to put my feet up. Matt came back with candy and nachos. I didn't partake in the eating because I thought the nachos looked gross. The movie itself was somewhat disappointing and depressing. I did not like it very much. On the way out I went to the bathroom and then we left.

Note: All identifying names have been replaced.

APPENDIX J

Table 22: Correlations among AMQ scales (Experiment 3).

Scale	rel	tra	emo	ovr	r/k	conf	bel	per	wds	stry	see	spa	set	v/d	s/a	tlk	hea	d/g
reliving	1.00																	
travel	0.82 **	1.00																
emotions	0.80 **	0.74 **	1.00															
overall	0.81 **	0.72 **	0.74 **	1.00														
remember/know	0.60 **	0.57 **	0.56 **	0.75 **	1.00													
confidence	0.67 **	0.57 **	0.54 **	0.78 **	0.65 **	1.00												
belief	0.53 **	0.50 **	0.39 **	0.67 **	0.69 **	0.64 **	1.00											
persuasion	-0.29 **	-0.24 *	-0.14	-0.47 **	-0.34 **	-0.42 **	-0.49 **	1.00										
words	0.57 **	0.62 **	0.66 **	0.58 **	0.44 **	0.49 **	0.36 **	-0.10	1.00									
story	0.71 **	0.76 **	0.70 **	0.73 **	0.68 **	0.58 **	0.45 **	-0.18	0.64 **	1.00								
seeing	0.74 **	0.61 **	0.65 **	0.79 **	0.73 **	0.63 **	0.56 **	-0.30 **	0.39 **	0.60 **	1.00							
spatial	0.61 **	0.55 **	0.51 **	0.71 **	0.73 **	0.59 **	0.60 **	-0.32 **	0.33 **	0.48 **	0.85 **	1.00						
setting	0.56 **	0.50 **	0.48 **	0.67 **	0.78 **	0.54 **	0.63 **	-0.28 **	0.29 **	0.50 **	0.81 **	0.87 **	1.00					
visual details	0.62 **	0.55 **	0.57 **	0.75 **	0.68 **	0.60 **	0.60 **	-0.36 **	0.34 **	0.50 **	0.85 **	0.80 **	0.78 **	1.00				
specific actions	0.77 **	0.72 **	0.75 **	0.87 **	0.73 **	0.73 **	0.63 **	-0.43 **	0.58 **	0.68 **	0.77 **	0.65 **	0.64 **	0.79 **	1.00			
talking	0.77 **	0.72 **	0.76 **	0.76 **	0.67 **	0.63 **	0.52 **	-0.24 *	0.62 **	0.70 **	0.69 **	0.61 **	0.56 **	0.62 **	0.81 **	1.00		
hearing	0.87 **	0.77 **	0.81 **	0.80 **	0.59 **	0.69 **	0.49 **	-0.25 *	0.70 **	0.74 **	0.67 **	0.53 **	0.48 **	0.56 **	0.82 **	0.87 **	1.00	
distinct/general	-0.20	-0.22 *	-0.19	-0.24 *	-0.19	-0.12	-0.32 **	0.19	-0.17	-0.15	-0.25 *	-0.25 *	-0.23 *	-0.28 *	-0.20	-0.10	-0.09	1.00

** Significant at $p < .01$

* Significant at $p < .05$

APPENDIX K

Table 23: Zero-order, partial, and semi-partial correlations for memory characteristics and story qualities with each composite score (Experiment 3).

		Recollection			Belief			Story				
		Zero order	Partial	Semi-Partial	Zero order	Partial	Semi-Partial	Zero order	Partial	Semi-Partial		
Memory	time1	0.78	0.47	0.21	time1	0.77	0.45	0.21	time1	0.65	0.16	0.08
	age of mem	-0.19	-0.12	-0.05	age of mem	-0.29	-0.19	-0.08	age of mem	-0.17	-0.20	-0.10
	importance	0.28	0.15	0.06	importance	0.14	0.11	0.05	importance	0.22	0.11	0.05
	rehearsal	0.34	0.04	0.01	rehearsal	0.24	0.08	0.04	rehearsal	0.27	0.09	0.04
	accuracy	0.43	0.16	0.06	accuracy	0.57	0.16	0.07	accuracy	0.35	0.24	0.12
Story	detail	0.42	0.24	0.10	detail	0.35	0.15	0.06	detail	0.25	0.11	0.05
	exaggeration	-0.16	-0.05	-0.02	exaggeration	-0.22	0.01	0.01	exaggeration	-0.08	-0.05	-0.02
	distorted	-0.28	0.05	0.02	distorted	-0.36	-0.09	-0.04	distorted	-0.23	0.02	0.01
	added det.	-0.12	-0.05	-0.02	added det.	-0.21	-0.04	-0.02	added det.	-0.08	-0.04	-0.02
	minimized	-0.10	-0.05	-0.02	minimized	-0.14	-0.09	-0.04	minimized	-0.15	-0.16	-0.08
	selective	-0.03	0.08	0.03	selective	0.02	0.07	0.03	selective	-0.07	0.15	0.07
	words	0.17	0.08	0.03	words	0.17	0.12	0.05	words	0.12	0.09	0.04
	detail (coders')	0.25	0.06	0.02	detail (coders')	0.20	0.00	0.00	detail (coders')	0.14	-0.03	-0.02
		Visual Details			Other Sensory Details							
		Zero order	Partial	Semi-Partial	Zero order	Partial	Semi-Partial					
Memory	time1	0.83	0.47	0.20	time1	0.73	0.51	0.25				
	age of mem	-0.30	-0.34	-0.14	age of mem	-0.28	-0.15	-0.07				
	importance	0.27	0.19	0.07	importance	0.17	0.01	0.00				
	rehearsal	0.30	0.05	0.02	rehearsal	0.25	0.03	0.01				
	accuracy	0.44	0.04	0.02	accuracy	0.36	0.14	0.06				
Story	detail	0.43	0.16	0.06	detail	0.32	0.21	0.09				
	exaggeration	-0.22	-0.07	-0.03	exaggeration	-0.11	-0.09	-0.04				
	distorted	-0.35	-0.06	-0.02	distorted	-0.23	0.12	0.05				
	added det.	-0.16	-0.01	-0.01	added det.	-0.07	-0.11	-0.05				
	minimized	-0.10	-0.13	-0.05	minimized	-0.12	-0.04	-0.02				
	selective	0.03	0.08	0.03	selective	0.02	0.12	0.05				
	words	0.19	0.13	0.05	words	0.05	0.03	0.01				
detail (coders')	0.21	-0.06	-0.02	detail (coders')	0.17	0.08	0.03					

References

- Ackil, J. K., & Zaragoza, M. S. (1998). Memorial consequences of forced confabulation: Age differences in susceptibility to false memories. *Developmental Psychology, 34*, 1358-1372.
- Adams, C., Smith, M. C., Pasupathi, M., & Vitolo, L. (2002). Social context effects on story recall in older and younger women: Does the listener make a difference? *Journals of Gerontology: Series B: Psychological Sciences and Social Sciences, 57B*, 28-40.
- Anderson, M. C., Bjork, R. A., & Bjork, E. L. (1994). Remembering can cause forgetting: Retrieval dynamics in long-term memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 20*, 1063-1087.
- Anderson, M. C., & Neely, J. H. (1996). Interference and inhibition in memory retrieval. In E. L. Bjork & R. A. Bjork (Eds.), *Memory* (pp. 237-313). San Diego: Academic Press, Inc.
- Anderson, M. C. & Spellman, B. A. (1995). On the status of inhibitory mechanisms in cognition: Memory retrieval as a model case. *Psychological Review, 102*, 68-100.
- Anderson, R. C., & Pichert, J. W. (1978). Recall of previously unrecalable information following a shift in perspective. *Journal of Verbal Learning & Verbal Behavior, 17*, 1-12.
- Anderson, S. J., Cohen, G., & Taylor, S. (2000). Rewriting the Past: Some factors affecting the variability of personal memories. *Applied Cognitive Psychology, 14*, 435-454.
- Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge: Cambridge University Press.
- Bell, B. E., & Loftus, E. F. (1988). Degree of detail of eyewitness testimony and mock juror judgments. *Journal of Applied Social Psychology, 18*, 1171-1192
- Bergman, E. T., & Roediger, H. L., III. (1999). Can Bartlett's repeated reproduction experiments be replicated? *Memory & Cognition, 27*, 937-947.

- Boals, A., & Perez, A. S. (2009). Language use predicts phenomenological properties of Holocaust memories and health. *Applied Cognitive Psychology, 23*, 1318-1332.
- Bohannon, J. N. III. (1988). Flashbulb memories for the space shuttle disaster: A tale of two theories. *Cognition, 29*, 179-196.
- Bower, G. H., Black, J. B., & Turner, T. J. (1979). Scripts in memory for text. *Cognitive Psychology, 11*, 177-220.
- Brandimonte, M. A., Hitch, G. J., & Bishop, D. V. M. (1992). Influence of short-term memory codes on visual image processing: Evidence from image transformational tasks. *Journal of Experimental Psychology: Learning, Memory, & Cognition, 18*, 157-165.
- Brown, A. S., Hornstein, S., & Memon, A. (2006). Tracking conversational repetition: An evaluation of target monitoring ability. *Applied Cognitive Psychology, 20*, 85-95.
- Brown, R., & Kulik, J. (1977). Flashbulb memories. *Cognition, 5*, 73-99.
- Butler, A. C., Marsh, E. J., & Hutson, M. (In Preparation). Retellings of autobiographical memories.
- Carmichael, L., Hogan, H. P., & Walter, A. A. (1932). An experimental study of the effect of language on the reproduction of visually perceived form. *Journal of Experimental Psychology, 15*, 73-86.
- Cohen, A. B. (1973). *Poor Pearl, poor girl! The murdered girl stereotype in ballad and newspaper*. Austin: University of Texas Press.
- Conway, M. A., Cohen, G., & Stanhope, N. (1991). On the very long-term retention of knowledge acquired through formal education: Twelve years of cognitive psychology. *Journal of Experimental Psychology: General, 120*, 395-409.
- Craik, F. I. M. & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning & Verbal Behavior, 11*, 671-684.
- Cronon, W. (1992). A place for stories: Nature, history, and narrative. *The Journal of American History, 78*, 1347-1376.

- Crovitz, H. F., & Schiffman, H. (1974). Frequency of episodic memories as a function of their age. *Bulletin of the Psychonomic Society*, 4, 517-518.
- Cuc, A., Koppel, J., & Hirst, W. (2007). Silence is not golden: A case for socially shared retrieval-induced forgetting. *Psychological Science*, 18, 727-733.
- D'Argembeau, A., & Van der Linden, M. (2006). Individual differences in the phenomenology of mental time travel: The effect of vivid visual imagery and emotion regulation strategies. *Consciousness and Cognition*, 15, 342-350.
- D'Argembeau, A., & Van der Linden, M. (2008). Remembering pride and shame: Self-enhancement and the phenomenology of autobiographical memory. *Memory*, 16, 538-547.
- DeCasper, A., & Spence, M. J. (1986). Prenatal maternal speech influences newborns' perception of speech sounds. *Infant Behavior and Development*, 9, 133-150.
- Dodson, C. S., Johnson, M. K., & Schooler, J. W. (1997). The verbal overshadowing effect: Why descriptions impair face recognition. *Memory & Cognition*, 25, 129-139.
- Dooling, D. J., & Christiaansen, R. E. (1977). Episodic and semantic aspects of memory for prose. *Journal of Experimental Psychology: Human Learning & Memory*, 3, 428-436.
- Dudukovic, N. M., Marsh, E. J., & Tversky, B. (2004). Telling a story or telling it straight: The effects of entertaining versus accurate retellings on memory. *Applied Cognitive Psychology*, 18, 125-143.
- Echterhoff, G., Higgins, E. T., Kopietz, R., & Groll, S. (2008). How communication goals determine when audience tuning biases memory. *Journal of Experimental Psychology: General*, 137, 3-21.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Evanston, IL: Row, Peterson.
- Finger, K. (2002). Mazes and music: Using perceptual processing to release verbal overshadowing. *Applied Cognitive Psychology*, 16, 887-896.
- Gabbert, F., Memon, A., & Allan, K. (2003). Memory conformity: Can eyewitnesses influence each other's memories for events? *Applied Cognitive Psychology*, 17, 533-543.

- Gauld, A., & Stephenson, G. M. (1967). Some experiments relating to Bartlett's theory of remembering. *British Journal of Psychology*, *58*, 39-49.
- Goldsmith, M., Koriat, A., & Pansky, A. (2005). Strategic regulation of grain size in memory reporting over time. *Journal of Memory and Language*, *52*, 505-525.
- Grice, H. P. (1975). Logic and conversation. In H. Geirsson & M. Losonsky (Eds.), *Readings in Language and Mind*. (pp. 121-133). Cambridge, MA: Blackwell Publishers.
- Hashtroudi, S., Johnson, M. K., Vnek, N., & Ferguson, S. A. (1994). Aging and the effects of affective and factual focus on source monitoring and recall. *Psychology and Aging*, *9*, 160-170.
- Higham, P. A. (1998). Believing details known to have been suggested. *British Journal of Psychology*, *89*, 265-283.
- Hyman, I. E., Jr. (1994). Conversational remembering: Story recall with a peer versus for an experimenter. *Applied Cognitive Psychology*, *8*, 49-66.
- Hyman, I. E., Jr., & Faries, J. M. (1992). The functions of autobiographical memory. In M. A. Conway, D. C. Rubin, H. Spinnler, & W. A. Wagenaar (Eds.), *Theoretical Perspectives on Autobiographical Memory* (pp. 207-221). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Jarvis, B. G. (2006a). DirectRT (Version 2006.2.0.16) [Computer software]. New York: Empirisoft Corporation.
- Jarvis, B. G. (2006b). MediaLab (Version 2006.1.41) [Computer software]. New York: Empirisoft Corporation.
- Johnson, M. K. (1997). Identifying the origin of mental experience. In M. S. Myslobodsky (Ed.), *The Mythomanias: The Nature of Deception and Self-deception* (pp. 133-180). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Johnson, M. K., Foley, M. A., Suengas, A. G., & Raye, C. L. (1988). Phenomenal characteristic of memories for perceived and imagined autobiographical events. *Journal of Experimental Psychology: General*, *4*, 371-376.
- Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin*, *114*, 3-28.

- Johnson, M. K., & Raye, C. L. (1981). Reality Monitoring. *Psychological Review*, 88, 67-85.
- Kealy, K. L. K., Kuiper, N. A., & Klein, D. N. (2006). Characteristics associated with real and made-up events: The effects of event valence, event elaboration, and individual differences. *Canadian Journal of Behavioural Science*, 38, 158-175.
- Koriat, A. & Goldsmith, M. (1996). Monitoring and control processes in the strategic regulation of memory accuracy. *Psychological Review*, 103, 490-517.
- Koriat, A. M., Goldsmith, M., & Pansky, A. (2000). Toward a psychology of memory accuracy. *Annual Review of Psychology*, 51, 481-537.
- Lane, S. M., Mather, M., Villa, D., & Morita, S. K. (2001). How events are reviewed matters: Effects of varied focus on eyewitness suggestibility. *Memory & Cognition*, 29, 940-947.
- Lindsay, D. S., & Johnson, M. K. (1989). The eyewitness suggestibility effect and memory for source. *Memory & Cognition*, 17, 349-358.
- Loftus, E. F. (2005). Planting misinformation in the human mind: A 30-year investigation of the malleability of memory. *Learning & Memory*, 12, 361-366.
- Loftus, E. F., Miller, D. G., & Burns, H. J. (1978). Semantic integration of verbal information into a visual memory. *Journal of Experimental Psychology: Human Learning and Memory*, 4, 19-31.
- Loftus, E. F., & Palmer, J. C. (1974). Reconstruction of automobile destruction: An example of the interaction between language and memory. *Journal of Verbal Learning and Verbal Behavior*, 13, 585-589.
- MacLeod, M. D., & Macrae, C. N. (2001). Gone but not forgotten: The transient nature of retrieval-induced forgetting. *Psychological Science*, 12, 148-152.
- Marsh, E. J. (2007). Retelling is not the same as recalling: Implications for memory. *Current Directions in Psychological Science*, 16, 16-20.
- Marsh, E. J., & Tversky, B. (2004). Spinning the stories of our lives. *Applied Cognitive Psychology*, 18, 491-503.

- Marsh, E. J., Tversky, B., & Hutson, M. (2005). How eyewitnesses talk about events: Implications for memory. *Applied Cognitive Psychology, 19*, 531-544.
- McGregor, I., & Holmes, J. G. (1999). How storytelling shapes memory and impressions of relationship events over time. *Journal of Personality and Social Psychology, 76*, 403-419.
- Meissner, C. A., & Brigham, J. C. (2001). A Meta-analysis of the verbal overshadowing effect in face identification. *Applied Cognitive Psychology, 15*, 603-616.
- Melcher, J. M., & Schooler, J. W. (1996). The misremembrance of wines past: Verbal and perceptual expertise differentially mediate verbal overshadowing of taste memory. *Journal of Memory and Language, 35*, 231-245.
- Morris, C. D., Bransford, J. D., & Franks, J. J. (1977). Levels of processing versus transfer appropriate processing. *Journal of Verbal Learning and Verbal Behavior, 16*, 519-533.
- Pasupathi, M. (2001). The social construction of the personal past and its implications for adult development. *Psychological Bulletin, 127*, 651-672.
- Pasupathi, M., Stallworth, L. M., & Murdoch, K. (1998). How what we tell becomes what we know: Listener effects on speakers' long-term memory for events. *Discourse Processes, 26*, 1-25.
- Pennebaker, J. W., Booth, R. J., & Francis, M. E. (2007). *Linguistic Inquiry and Word Count: LIWC 2007*. Austin, TX: LIWC (www.liwc.net).
- Pickel, K. L. (2004). When a lie becomes the truth: The effects of self-generated misinformation on eyewitness memory. *Memory, 12*, 14-26.
- Pinto, A. C., & Baddeley, A. D. (1991). Where did you park your car? Analysis of a naturalistic long-term recency effect. *European Journal of Cognitive Psychology, 3*, 297-313.
- Roediger, H. L., III, & Guynn, M. J. (1996). Retrieval processes. In E. L. Bjork & R. A. Bjork (Eds.), *Memory: Handbook of perception and cognition*. San Diego, CA: Academic Press.

- Roediger, H. L., III., Jacoby, J. D., & McDermott, K. B. (1996) Misinformation effects in recall: Creating false memories through repeated retrieval. *Journal of Memory and Language, 35*, 300-318.
- Roediger, H.L., III., & Karpicke, J. D. (2006a). The power of testing memory: Basic research and implications for educational practice. *Perspectives on Psychological Science, 1*, 181-210.
- Ross, M. (1989). Relation of implicit theories to the construction of personal histories. *Psychological Review, 96*, 341-357.
- Ross, M. (1997). Validating Memories. In N. L. Stein, P. A. Ornstein, B. Tversky, & C. Brainerd (Eds.), *Memory for Everyday and Emotional Events*. (pp. 49-82). Mahway, NJ: Lawrence Erlbaum Associates.
- Ross, M., & Holmberg, D. (1992). Are wives' memories for events in relationships more vivid than their husbands' memories? *Journal of Social and Personal Relationships, 9*, 585-604.
- Rubin, D. C. (1995). *Memory in oral traditions: The cognitive psychology of epic, ballads, and counting-out rhymes*. New York: Oxford University Press.
- Rubin, D. C. (2006). The basic-systems model of episodic memory. *Perspectives on Psychological Science, 1*, 277-311.
- Rubin, D. C., Boals, A., & Klein, K. (2010). Autobiographical memories for very negative events: The effects of thinking about and rating memories. *Cognitive Therapy and Research, 34*, 35-48.
- Rubin, D. C., Schrauf, R. W., & Greenberg, D. L. (2003). Belief and recollection of autobiographical memories. *Memory & Cognition, 31*, 887-901.
- Rundus, D., & Atkinson, R. C. (1970). Rehearsal processes in free recall: A procedure for direct observation. *Journal of Verbal Learning and Verbal Behavior, 9*, 99-105.
- Schooler, J. W., & Engstler-Schooler, T. Y. (1990). Verbal overshadowing of visual memories: Some things are better left unsaid. *Cognitive Psychology, 22*, 36-71.
- Sedikides, C. (1990). Effects of fortuitously activated constructs versus activated communication goals on person impressions. *Journal of Personality and Social Psychology, 58*, 397-408.

- Sheen, M., Kemp, S., & Rubin, D. C. (2001). Twins dispute memory ownership: A new false memory phenomenon. *Memory & Cognition, 29*, 779-788.
- Skinner, B. F. (1953). *Science and human behavior*. New York: The Free Press.
- Skowronski, J. J., Gibbons, J. A., Vogl, R. J., & Walker, W. R. (2004). The effect of social disclosure on the intensity of affect provoked by autobiographical memories. *Self and Identity, 3*, 285-309.
- Suengas, A. G., & Johnson, M. K. (1988). Qualitative effects of rehearsal on memories for perceived and imagined complex events. *Journal of Experimental Psychology: General, 117*, 377-389.
- Swift, G. (1983). *Waterland*. New York: Poseidon Press.
- Talarico, J. M., & Rubin, D. C. (2003). Confidence, not consistency, characterizes flashbulb memories. *Psychological Science, 14*, 455-461.
- Tversky, B. (2004). Narratives of space, time, and life. *Mind & Language, 19*, 380-392.
- Tversky, B., & Marsh, E. J. (2000). Biased retellings of events yield biased memories. *Cognitive Psychology, 40*, 1-38.
- Vandierendonck, A., & Van Damme, R. (1988). Schema anticipation in recall: Memory process or report strategy? *Psychological Research, 50*, 116-122.
- Wade, E., & Clark, H. H. (1993). Reproduction and demonstration in quotations. *Journal of Memory and Language, 32*, 805-819.
- Wang, Q., & Ross, M. (2005). What we remember and what we tell: The effects of culture and self-priming on memory representations and narratives. *Memory, 13*, 594-606.

Biography

Andrea Nicole Eslick was born in Boone, Iowa on December 22, 1983. She completed her Bachelor of Science degree in May 2006 at Iowa State University in Ames, Iowa, where she majored in Psychology and minored in Statistics. She received her Masters of Arts degree in Psychology from Duke University in May 2009.

Publications

- Eslick, A. N., Fazio, L. K., & Marsh, E. J. (2011). Ironic effects of drawing attention to story errors. *Memory, 19*, 184-191.
- Bottoms, H. C., Eslick, A. N., & Marsh, E. J. (2010). Memory and the Moses illusion: Failures to detect contradictions with stored knowledge yield negative memorial consequences. *Memory, 18*, 670-678.
- Eslick, A. N., Kostic, B., & Cleary, A. C. (2010). True and false memory for color names versus actual colors: Support for the visual distinctiveness heuristic in memory for color information. *The Quarterly Journal of Experimental Psychology, 63*, 1104-1126.
- Marsh, E. J. & Eslick, A. N. (2009). A review of *Why don't students like school? A cognitive psychologist answers questions about how the mind works and what it means for the classroom*, by D. T. Willingham. *Educational Horizons, 87*, 206-210.
- Marsh, E. J., Eslick, A. N., & Fazio, L. K. (2008). False Memories. In J. Byrne (Series Ed.) & H. L. Roediger, III (Vol. Ed.), *Learning and memory: A comprehensive reference: Vol. 2. Cognitive psychology of memory* (pp. 221-238). Oxford: Elsevier.

Awards/Honors

Duke University, Preparing Future Faculty: Fellow

National Science Foundation, Graduate Research Fellowship: Honorable Mention