THE EFFECT OF REPEATED LYING ON FALSE MEMORY DEVELOPMENT

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by

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I. Introduction

To elicit an accurate account of a crime from an eyewitness, the individual being questioned must be motivated to respond truthfully. Unfortunately, perpetrators, as well as witnesses, are sometimes motivated to lie by willfully generating false information in an attempt to deceive the interviewer (Zuckerman, DePaulo, & Rosenthal, 1981). In a forensic setting, an individual may lie to avoid punishment or to protect others, and these deceptions can have serious consequences (Granhag & Vrij, 2005; Vrij, 2008). It is also the case that suspects are often interviewed on multiple occasions (Fisher, 1995; Kassin et al., 2007) in an effort to elicit the truth. Thus, it is not uncommon for lies to be repeated, rather than isolated events.

Given the importance of obtaining accurate and honest information from witnesses in forensic investigations, it is not surprising that much of the research on lying has focused on finding ways to effectively detect deception (Lykken, 1959; Reid, 1947; Sporer, 2004; Vrij, 2008; Vrij, Fisher, Mann, & Leal, 2008; see Ioannou & Hammond, 2014; Sip, Roepstorff, McGregor, & Frith, 2008; Vrij, Granhag, & Porter, 2010 for reviews). As a consequence of the focus on deception detection, much less attention has been paid to exploring what effects lying might have on the memory of the individual who provided the lie. Is it possible that lying might distort the memory of the individual that lies? Specifically, is it possible that an individual might come to believe their own lies, ultimately leading them to misremember that the lied about events actually happened? The first goal of this dissertation is to investigate whether lying might lead people to misremember their own lies as the truth. A second goal is to assess whether repeated lying increases the likelihood of developing false memories for one’s own lies.
1.1. Why might people come to develop false memories for their lies?

Intuitively, it would appear unlikely that people may come to believe their own lies. Consider the two requirements for a communication to be defined as a lie: (1) the individual must knowingly provide false information and (2) the false information is provided with the intention to deceive the target of the lie (Zuckerman et al., 1981; see also Vrij, 2008). By definition, a lie is not true and the individual that is lying explicitly knows this to be the case. Because information cannot be both a lie and the truth simultaneously, as long as people can remember that the lie “is a lie” they will not be prone to confusing their lies for the truth. There are a number of reasons to expect that people are likely to remember having lied. First, lying is more effortful than telling the truth (Berger, Karol, & Jordan, 1989; Sip, Roepstorff, McGregor, & Frith, 2008), and this effort can serve as a cue to having lied. Lying is also not socially condoned, and as a result, an individual who lies may feel guilt and anxiety during deception (Colwell et al., 2011; Ekman, 1993; Kappas, Hess, & Scherer, 1991; Slivken & Buss, 1984; Zuckerman et al., 1981). These are emotions that may render the episode especially salient in memory. Furthermore, when someone lies, they are also likely to closely monitor their perceived success to guide their continuing deception (DePaulo et al., 2003). This would also include monitoring their own feelings in an effort to minimize cues to their deception. The increased attention and monitoring that lying requires will likely serve to enhance memory for having lied. Finally, to avoid being caught in a lie, it is also critically important to be consistent in one’s lies. Given the knowledge that this may be necessary, and the negative consequences that may result if deception is discovered, a person is likely to carefully commit to memory what was true and what was false (DePaulo et al., 2003; Ekman, 2009; Rotenberg, Simourd, & Moore, 1989; Zuckerman et al., 1981). Collectively, these cues may later serve as a potent reminder that
the fabricated information is false. Presumably, a confident memory that the fabricated event was a lie would prevent someone from confusing their lies for the truth.

Although there are good reasons to expect that people will remember having lied, there is other evidence to suggest that people might be prone to forgetting having lied. In particular, a wealth of research has demonstrated that people’s ability to remember the source of information in memory is especially susceptible to errors. Whereas some aspects of our memories, such as their familiarity, are retrieved almost automatically, the retrieval of source specifying information is effortful, and requires the allocation of additional cognitive resources (Johnson, Hashtroudi, & Lindsay, 1993; Johnson, Kounios, & Reeder, 1994; see also Johnson, 2006; Lindsay, 2008 for reviews). As a consequence, the source of a memory is much more susceptible to interference and forgetting than memory for its content, thus leading people to make source misattribution errors. Examples of source misattribution errors - the tendency to misattribute a memory to a related source - abound in the cognitive literature. For example, it has repeatedly been shown that after witnessing an event, exposure to false information provided by another source (e.g., a co-witness, suggestive interview) may lead to false memories wherein the witness believes themselves to have seen the false suggested information (i.e., misinformation effect, Loftus, Miller, & Burns, 1978; Belli, Lindsay, Gales, & McCarthy, 1994; Drivdahl & Zaragoza, 2001; Frost, Ingraham & Wilson, 2002; Lindsay, 1990; Zaragoza & Lane, 1994; see Zaragoza, Belli, & Payment, 2006 for review). Hearing lists of semantically related words can prime a related but not presented word, causing the individual to believe themselves to have heard the primed word in the list (i.e., DRM paradigm; e.g., Deese, 1959; Roediger, & McDermott, 1995; Read, 1996; Shiffrin, Huber, & Marinelli, 1995; see Gallo, 2010; 2013 for reviews). In addition, there is a large literature documenting that people are prone to confusing
imagination with reality (i.e., imagination inflation; e.g., Garry, Manning, & Loftus, & Sherman, 1996; Goff & Roediger, 1998; Heaps & Nash, 1999; Johnson & Raye, 1981; Sharman, Garry, & Beuke, 2004; Thomas & Loftus, 2002; Wright, Loftus, & Hall, 2001). Given the variety of source misattribution errors that have been documented, it is possible that memory for the source of our lies may be susceptible to these errors as well.

Research on source monitoring has also identified circumstances where source memory is likely to be accurate, and those circumstances where it is likely to fail. One factor that disproportionately impairs source memory is the passage of time. Many studies have documented that, whereas people are quite good at rejecting information that comes from a discounted or questionable source (e.g., sensationalist tabloids) over the short term, with the passage of time, they sometimes come to accept discounted information as true, apparently because they remember the information but forget its source (e.g., Chrobak & Zaragoza, 2008, Jacoby, Kelly, Brown, & Jasechko, 1989; see also sleeper effects, e.g., Cook & Flay, 1978, Gruder et al., 1978; Hovland & Weiss, 1951). Source specifying information is also less likely to be available or accessible under conditions that constrain cognitive resources. For example, studies employing deadline procedures (where people are given an extremely short time window to respond) have demonstrated that memory for source can be impaired while familiarity is spared (Johnson et al., 1994). Similarly, when attentional resources are limited (e.g., during divided attention) the ability to encode or monitor source is diminished while familiarity remains intact, resulting in greater rates of misattribution errors (e.g., Reinitz, Morrisey, & Demb, 1994; Zaragoza & Lane, 1998). Based on this collective body of work, it appears possible that there may be circumstances where people remember the content of their fabrications, but do not
remember that the fabricated information is in fact a lie, thus predisposing them to misremember their lies as truth.

In the absence of memory that the fabricated information was a lie, it may be difficult for a person to distinguish a lie from the truth based on the content of the lie alone. Given the importance of constructing believable lies, an individual that lies will typically construct their lie within an otherwise truthful event and plausibly integrate the lie with known factual information (Gnisci, Caso, & Vrij, 2010; Leins, Fisher, & Ross, 2013; Strömwall & Willén, 2011). This overlap between the truth and the lies can render the true and false details more confusable (Garry et al., 1996, Zaragoza & Lane, 1994; see Mitchell & Zaragoza, 1996 for a discussion). Additionally, in constructing their lie, the individual is likely to mentally retrieve and reconstruct the original event. As a result, this can serve to further make the lie and truth more easily confused as there is now a version of the event in memory wherein the lie is linked with the true event. This can result in the individual retrieving the false version of the event when later attempting to retrieve the memory of the original truthful event.

Finally, in the absence of memory for having lied, people may be likely to confuse their lies for reality because people have the default assumption that information they experience as “memories” are true (Brewer, 1996). This is a reasonable assumption given that it is relatively uncommon for people to learn that their “memories” are in fact false. Indeed, only approximately 20% of individuals report experiencing non-believed memories (Mazzoni, Scoboria, & Harvey, 2010), that is, mental experiences that have characteristics of true memories but that are judged as impossible for reasons such as their implausibility (e.g., flying unaided) or the fact that they conflict with other well-known facts.

1.2. Past Research on the Memorial Consequences of Lying
At present, there are relatively few studies examining whether the act of lying might have consequences for the memory of the person who lied. Of these, the majority have compared telling the truth to denials or feigning amnesia (acting as though they cannot remember). A consistent finding is that lying by denying or feigning amnesia leads to poorer memory for the target event than telling the truth (Bylin & Christianson, 2002; Christianson & Bylin, 1999; Otgaar, Howe, Memon, & Wang, 2014; Sun, Punjabi, Greenberg, & Seamon, 2009; van Oorsouw & Merckelbach, 2004; 2006; Vieira & Lane, 2013). However, these findings appear to reflect the memory enhancing effects of truth telling rather than memory impairing effects of denials; in the few studies that have included a control condition where participants are not asked about the target event, denial does not lead to poorer memory than not asking about the target event (Bylin & Christianson, 2002; Sun et al., 2009; van Oorsouw & Merckelbach, 2004; Vieira & Lane, 2013).

In contrast to research on denials, only a handful of studies have investigated false memory development due to the type of lies that are the focus of this dissertation, namely lying through fabrication (Bylin & Christianson, 2002; Pickel, 2004; Polage, 2004; 2012; Vieira & Lane, 2013). Lying through fabrication occurs when someone creates or invents new, false information that is presented as if it were true. As discussed below, each of these studies approached this question in a slightly different way.

For example, in the first study on the memorial consequences of fabricating lies, Bylin and Christianson (2002) had participants read a mock crime narrative and then asked participants to imagine themselves as the perpetrator. Participants were then assigned to one of four groups. Of relevance here are the groups that were asked to simulate memory impairment by fabricating details (i.e., lie by fabricating false details) and a no rehearsal control group. One week later,
participants returned and their memory was assessed with free recall, cued recall, and recognition tests. On all three measures, there was no effect of lying as the total number of false details recalled on free and cued recall tests, or falsely assented to on the recognition test, did not differ between the lie and no rehearsal control groups.

A recent study by Vieira and Lane (2013) investigated the effect of lying in a study where participants were asked to fabricate descriptions of objects that were never seen. Participants first studied a series of drawings depicting objects (e.g., a drawing of an apple). In the second phase, participants were given verbal labels for a series of objects, some of which referred to objects they had seen and others referred to objects they had not seen. Participants were instructed to truthfully describe some of the items they had seen, and to lie by fabricating descriptions of some of the objects they had not seen. Two days later, participants were given a source monitoring test in which they were asked to identify whether objects were previously seen as well as whether they were rehearsed (i.e., lied about). Vieira and Lane (2013) found no evidence that participants developed false memories for their lies: Relative to items which were unseen and never lied about, there was no difference in the rate at which participants falsely claimed to remember seeing the items they had lied about.

A study by Polage (2012) examined the effect of lying about childhood events on the perceived plausibility of having previously experienced those events, and found evidence consistent with the possibility that people might develop false memory for their lies. Participants were first given a survey with a number of childhood events (e.g., “Were you lost in a public place for more than an hour?”) and asked to rate the likelihood those events happened before the age of 10 (1 = definitely did not happen, 8 = definitely did happen). One week later, participants were asked to provide a story and answer questions about a series of childhood events, including
one from the prior survey which the participant had indicated was unlikely to have occurred, because the participant had given the event a rating of 3 or lower. For the unlikely event, the participants had to fabricate a story and later lie by presenting the fabricated story as though it were factual during an interview one week after having fabricated the story. One week after this interview, participants completed the survey rating the likelihood of childhood events a second time. The critical finding was that, when compared to their initial ratings of the unlikely childhood events, participants gave higher likelihood ratings to the childhood events they had fabricated a story about (a finding termed fabrication inflation, c.f. Garry et al., 1996), but did not give higher likelihood ratings to the childhood events they had not been asked to describe (however, see Polage, 2004 for evidence of fabrication deflation).

Although these results are consistent with the conclusion that lying leads to false memories, they are far from conclusive. First, just because a participant gave a low likelihood rating to a childhood event on the initial survey, does not mean the childhood event never happened. Without some independent verification that the childhood event (i.e., getting lost in a public place) never happened, there is the possibility that when participants attempted to create a story about getting lost as a child, they recovered a previously forgotten memory of getting lost. By this alternative account, the increase in likelihood ratings is merely a reflection of recovering an earlier forgotten memory. Second, even if participants were fabricating stories about events that never happened to them, the measures reported in the Polage (2012) study do not directly assess participants’ belief in the lies they fabricated. Rather, it asks them to rate the likelihood that the event provided by the experimenter (e.g., getting lost in a public place) happened to them as a child. Hence, whether increased likelihood ratings reflect participants developing false memories for experiencing the events they fabricated, or instead reflects a change in participants’
perceptions of the incidence of these events happening to children in general, cannot be ascertained from Polage’s (2012) findings.

Other research has investigated the effect of lying on memory for recently witnessed events (Pickel, 2004). Participants first viewed a video of a robbery. Afterwards, some participants were interviewed during which they were asked to lie about the physical description of the robber, while truthfully describing other witnessed details such as the physical description of the clerk. Other participants were not asked about the video at that time. One week later participants were asked to truthfully answer questions about the video they had seen. Across two experiments, those who were asked to lie about the physical description of the robber produced an average of 4.9 incorrect details whereas those who had not been interviewed previously produced an average of 3.7 incorrect details, a finding consistent with the conclusion that lying can lead to false memories. Of the incorrect details reported, 32% matched the details participants had earlier fabricated. However, the increase in false details was small, and because participants were not asked specifically whether they remembered witnessing the false descriptions they had earlier provided, the extent to which they might have developed false memories for their lies is not clear.

Collectively, the studies that have investigated whether lying might lead people to develop false memories for their lies has produced somewhat ambiguous results. Two of the studies failed to find that lying led to false memory development (Bylin & Christianson, 2002; Vieira & Lane, 2013). The remaining studies provided evidence that is consistent with the conclusion that lying can leading to false memories (Pickel, 2004; Polage, 2004; 2012), but the effects were small and open to alternative interpretations. Thus, whether lying can lead to false
memories remains an open question. As a result, I set out to systematically investigate this question.

To investigate whether lying can lead people to develop false memories for their lies, I modified an existing paradigm that has been used to study a somewhat related topic - the effects of forced fabrication interviews on eyewitness memory. Forced fabrication refers to a coercive type of interview situation where, in an attempt to elicit desired information from a witness, the interviewer presses the witness to describe items or events they do not remember or that they never actually witnessed (e.g., asking a witness to describe the perpetrator’s weapon when the witness did not see a weapon). Prior research has shown that witnesses sometimes come to develop false memories for having witnessed those details they had earlier been pressed to fabricate under duress (Ackil & Zaragoza, 1998; 2011; Chrobak, Rindal, & Zaragoza, 2015; Chrobak & Zaragoza, 2008; 2013; Frost, Lacroix, & Sanborn, 2003; Hanba & Zaragoza, 2007; Memon, Zaragoza, Clifford, & Kidd; 2010; Zaragoza, Payment, Ackil, Drivdahl, & Beck, 2001; see Zaragoza, Rich, Rindal, & DeFranco, 2017 for review).

Situations where eyewitnesses might lie about a witnessed event are similar to the forced fabrication paradigm, in that in both cases the witness fabricates events that never happened. However, suggestive interviews involving forced fabrication differ from lying in a number of critically important ways. First, in the suggestive interviews, participants are asked to describe events that the interviewer claims happened even though the events they are asked to describe are in fact fictitious (this is the suggestion). Hence, although witnesses are aware that they do not remember the event(s) they are being asked to report - and hence are merely speculating - they are led to believe that the events they are being asked to describe did in fact transpire. In contrast, a lie is an event that the person lying knows to be false. Fabrications that are explicitly
known to be false may be less likely to result in false memories, because they are more likely to be remembered as “false.” Second, when a witness is pressed by an interviewer to speculate or fabricate, they are forced to provide a response to satisfy the interviewer, rather than motivated to lie. When participants are forced to fabricate, they frequently resist doing so before eventually acquiescing to the experimenter by providing their fabricated response only after considerable resistance (Ackil & Zaragoza, 2011; Zaragoza et al., 2001). Overt resistance (e.g., “That didn’t happen”) is associated with reduced false memory development (Ackil & Zaragoza, 2011) or no false memory (Zaragoza et al., 2001). In contrast, when lying, the person is motivated to fabricate information to deceive another and there will be no memory of the discomfort that comes from resistance. In addition, it is often the case that people lie because they find the truth unacceptable. That is, they wish the lie were true. The motivations behind lying might also predispose people to develop false memories for their lies. For instance, studies of the “wishful thinking” bias (Gordon, Franklin, & Beck, 2005) have shown that individuals are biased to misattribute positive predictions to sources deemed more reliable (e.g., the New York Times) than the actual, albeit less reliable source (e.g., the National Enquirer). Thus, an individual when lying may be biased to accepting their lies as the truth. Further, given that a person who is lying is motivated to deceive, they are likely to create more believable and elaborative fabrications relative to individuals that are forced to fabricate. This elaboration process can result in fabrications that are more similar to, and thus more confusable with, genuine experienced events (Drivdahl & Zaragoza, 2001; Thomas et al., 2003; Zaragoza, Mitchell, Payment, & Drivdahl, 2011). As a result, the absence of resistance and the presence of motivation when lying may increase the rate of false memory development relative to forced fabrication.

1.3. Preliminary Studies: Can Lying Lead to False Memories?
To assess whether people might come to develop false memories for their lies, I conducted two preliminary studies where I modified the forced fabrication paradigm in three ways: (1) I explicitly informed participants when they were being asked questions about fictitious details/events that they never witnessed, (2) I instructed participants to make up a plausible response to the fictitious question and specifically referred to this as “lying”, and (3) I explicitly instructed participants to come up with a believable response that would deceive someone else into believing that they were telling the truth about everything they described. Hence, in my study, participants were fully aware that they were lying and they were actively trying to deceive someone else with their lies.

In the preliminary studies, all participants viewed an eyewitness event and were later asked a series of questions about what they witnessed (see Figure 1). Some questions asked about fictitious details or events that were never witnessed (hereafter Lie questions; e.g., describing where a person was bleeding from when the individual was never shown to be bleeding). The participants were instructed to lie by fabricating false information when answering these questions. Participants then returned either 4 weeks later (Preliminary study 1) or 1 week later (Preliminary study 2) and their memory for the eyewitness event was assessed with a yes/no recognition test. The test was constructed such that the participant was asked whether they had previously witnessed the false details they had earlier fabricated (i.e., their lies), as well as other fictitious details that were new (control). The measure of false memory for lies was the extent to which participants incorrectly claimed to remember witnessing the fabricated items they had not seen, but had instead generated when asked to lie. If lying results in false memories for the fabricated events, false assents to having witnessed the lies should exceed the base rate of false assents in the control condition.
Figure 1. Design of preliminary studies 1 and 2.

As illustrated in the left side of Figure 2, following a 4-week retention interval, participants developed false memories of having witnessed the fictitious details and events they had earlier lied about: they falsely assented to having previously witnessed their own fabricated details more often than they assented to false details they had not previously been asked about. Likewise, participants also incorporated their lies into a narrative recall of the witnessed event when tested using free recall. However, as illustrated in the right side of Figure 2, when participant’s memory was assessed after only 1 week, there was no evidence of false memory development: false assents to having witnessed the events described in their lies did not differ from the base rate of false assents. Rather, participants accurately rejected their prior lies as not witnessed. Collectively, the results of these preliminary studies I have conducted show no evidence of false memory one week following the lie, but reliable false memory effects four weeks after lying, thus demonstrating that lying can lead to false memories but it takes time for lies to develop into false memories. These findings are consistent with the conclusion that, over
time, participants remember the content of their fabrications, but forget that they are lies. Consequently, they start to confuse their lies for the truth.

![Graph showing mean proportion of false assents as a function of Retention interval and Item Type. Error bars represent within-subjects 95% confidence intervals.](image)

**Figure 2.** Mean proportion of false assents (“yes” in video) as a function of Retention interval (Study 1 – 4 weeks, Study 2 – 1 week) and Item Type (Lies vs. Control). Error bars represent within-subjects 95% confidence intervals (Loftus & Masson, 1994).

1.4. Repeated Lies

Given that lying can lead to false memories, and that repeated questioning is common in forensic interviews (Fisher, 1995, Kassin et al., 2007), an important question is what effect repeatedly lying might have on false memory development. Repeated lying may occur in many contexts over different temporal intervals. For instance, a person may have to repeat their lies multiple times during a single interview, resulting in an immediate repetition of the lie. Lies may also be provided repeatedly across multiple interviews, resulting in delayed repetition of the lie.

Presently only one study (Vieira & Lane, 2013) has investigated the effect of repeatedly lying on false memory development. However, Vieira and Lane (2013) found no evidence that lying led to false memories, and this was true for lies that were provided once as well as those
that were repeated. Thus, the effect of repeatedly lying could not be discerned, as they found no evidence of false memories as a result of lying in any condition. However, given the results of my preliminary studies, Vieira and Lane’s (2013) failure to find evidence of false memory for lies after a 2-day retention interval may not be all that surprising. In the preliminary studies reported above, I found no evidence of false memory development one week after lying, but I did find evidence of false memory development 4 weeks after lying. Hence, it may be that false memories for lies start to emerge after longer retention intervals, and it will therefore require longer retention intervals to assess whether repeatedly lying has different consequences for memory than lying once.

Although Vieira and Lane (2013) failed to find that repeating lies affects false memories, there is other evidence that repeating falsehoods exacerbates false memory development. For example, repeated exposure to misleading information increases false memories for having witnessed the misleading details in an eyewitness event (Foster, Huthwaite, Yesberg, Garry, & Loftus, 2012; Zaragoza & Mitchell, 1996). Likewise, repeated imagination increases susceptibility to believing that previously imagined actions had been performed (Goff & Roediger, 1998). Additionally, research on the illusory truth effect has also shown that information that is repeated is rated as more truthful relative to new information (Begg, Anas, & Farinacci, 1992; Begg, Armour, Kerr, 1985; Hasher, Goldstein, & Toppino, 1977; Reber & Schwarz, 1999). Of particular relevance to the question of interest is a pair of studies in which some of the repeated statements (e.g., obscure facts) were labeled as false (Begg et al., 1992; Mitchell, Dodson, & Schacter, 2005). Despite an instruction that some statements were false and could thus be discounted, these statements were nevertheless rated as more truthful than new statements. Although the level of truth rating did not equal that of repeatedly encountered true
statements, it is still important to note that previously encountered information can be rated as more truthful than new information despite awareness at the time of encoding that the information was false.

Collectively, these findings can be explained by an increase in familiarity due to repetition (e.g., the illusory truth effect, Begg et al., 1992). This increase in familiarity due to repetition is a likely consequence of repeated lying as well. When lying repeatedly, a person must retrieve from memory the false information they had previously provided. A large body of research has demonstrated that retrieval practice improves memory retention (e.g., Roediger & Karpicke, 2006; Whitten & Bjork, 1977; see also Roediger & Butler, 2011 for review). Thus, through repeated lying, false details will be retrieved and rehearsed, enhancing memory for the content of the false details. This heightened familiarity and memory for the false content may be mistaken as evidence that the lied about event was true, thus resulting in a false memory.

There are, however, reasons to expect that repeated lying, relative to lying once, might actually reduce false memories for the lies. Repeated lying is likely to enhance memory for having lied and the associated cues that indicate having lied (e.g., anxiety associated with lying, decision processes involved in deciding to lie, memory for fabricating). Memory for having lied is a highly diagnostic cue to the true source of the lie. If an individual clearly remembers that the information is lie, it will prevent them from believing that the lied about event happened (i.e., it should prevent false memory development) because the event cannot be both a lie and the truth simultaneously.

1.5. Present Studies

Given that there are reasons to expect that repeatedly lying may both increase and decrease false memories for lies, I sought to empirically assess the effects of repeated lying on
eyewitness memory. To assess the effects of repeated lying, in Experiment 1 I modified the paradigm I employed in the preliminary studies reported above by asking participants to provide some lies once and to consistently provide others lies three times. Participants viewed an edited movie clip, and then answered questions about the event both immediately and two days later. Some of the questions were about actually witnessed events (Truth questions) but other questions were about fictitious (i.e., not witnessed) details and events (Lie questions). Hence, to answer the Lie questions, participants were required to lie by fabricating a response, and participants were explicitly instructed to do so. Participants were asked some of the Lie questions once (1x condition), and they were asked other Lie questions three times total across the two sessions (3x condition). The subset of questions that a given participant was not asked served as the Control condition (see Table 1). Participants then returned 4 to 5 weeks later and were asked to truthfully report their memory for the original video on both free recall and recognition tests. The measures of false memory were (a) Incorrectly reporting lies on free recall and (b) Falsely assenting to their lies on the recognition test. In addition, the confidence with which participants falsely assented to their prior lies was also assessed because false reports that are held with high confidence are more likely to impact forensic investigations and jury decisions (Brewer & Burke, 2002; Sauer, Brewer, Zweck, & Weber, 2010; Tetterton & Warren, 2005; Wells, Ferguson, & Lindsay, 1981). Thus, participants were also asked to rate how confident they were when identifying a detail as part of the witnessed event. Finally, to obtain a more comprehensive assessment of the effects of repeated lying on participants’ memory, their accurate memory for having provided their fabrications as a response to the questions was also assessed.
Table 1

*Experiment 1 Lie Manipulation*

<table>
<thead>
<tr>
<th>Item Type</th>
<th>Session 1</th>
<th>Session 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 1</td>
<td>Day 3</td>
</tr>
<tr>
<td>1x Lie</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3x Lie</td>
<td>Lie 2(^{nd}) time</td>
<td>Lie 3(^{rd}) time</td>
</tr>
<tr>
<td>Control</td>
<td>----</td>
<td>----</td>
</tr>
</tbody>
</table>

Finally, a secondary goal of the current study was to explore potential individual differences in susceptibility to developing false memories for one’s lies. In spite of the practical relevance to the legal system, little is known about individual differences in susceptibility to false memory development. As a first step toward this goal, in Experiment 1, I assessed whether there might be a relationship between dissociative experiences (as measured by performance on the Dissociative Experiences Scale or DES; Bernstein & Putnam, 1986) and susceptibility to developing false memories for one’s lies. Prior research has demonstrated a relationship between dissociative experiences (e.g., driving and having no memory for the drive) and susceptibility to false memories resulting from suggestive interviews (Hyman & Billings, 1998) as well as lying (Polage, 2012), such that those who were more prone to dissociative experiences were more likely to evidence false memories. It has been proposed that people who are prone to dissociative experiences are less successful in monitoring the source of their memories because they may set a lower criterion level for deeming memories to be true (Hekkanen & McEvoy, 2002). Although admittedly exploratory, Experiment 1 sought to assess whether individual
differences in dissociative experiences might also predict the tendency to develop false memories for one’s own lies.

With regard to the main predictions for Experiment 1, I expected to replicate the finding from the preliminary studies that participants would freely recall and falsely assent to having witnessed their fabricated lies at a level that exceeds the base rate of such errors. The question of primary interest was what effect, if any, repeatedly lying (relative to lying once) would have on false memory development.
II. Experiment 1

2.1. Method

Participants and design. A total of 112 participants (80 female) completed the experiment in partial fulfillment of an introductory psychology course requirement. One participant was removed from analysis for failing to follow directions, resulting in a final sample of 111 participants. Sample size was based on an a-priori power analysis (G* Power 3; Faul, Erdfelder, Lang, & Buchner, 2007) to detect an effect size $d_z = .27$ (estimated from recognition data in Preliminary Study 1), at $\alpha = .05$, $1-\beta = .80$ indicating a necessary sample of 111 participants. Repetition of lies was manipulated within-participants with items counterbalanced across conditions such that each Lie item served equally often in the Control (0x), 1x, and 3x conditions.

Materials and procedure. Participants entered the lab and informed consent was collected. Participants were informed that the purpose of the study was to determine how lying affects memory. Participants completed all three days of the study in the same laboratory and completed all phases of the study individually on computers.

Session 1

Phase 1: Eyewitness event. Participants viewed an edited 13-minute video from the movie “Looking for Miracles” (Grant & Sullivan, 1989) that portrays the adventures of two brothers at a summer camp (e.g., someone getting bitten by a poisonous snake, a bullying incident, other misdeeds by counselors and campers).
Phase 2: Lie manipulation. Participants were next asked a series of short-answer questions about the witnessed event in chronological order. The questions appeared individually on the computer screen and participants entered their responses at their own pace using the keyboard. A response was required before participants could advance to the next question.

For each participant, 8 of the questions were Truth questions (drawn from a pool of 12 – see Appendix A) that queried participants about details that were witnessed in the video. The primary manipulation was that each participant also received 8 Lie questions (drawn from a pool of 12 Lie questions – see Appendix A) that queried participants about events that clearly never happened in the video. For example, some participants received the Lie question “After Delaney (a counselor) fell, he was bleeding. Where was he bleeding from?” Responding to this question required that participants fabricate a lie, because the video never depicted him bleeding.

Participants were explicitly instructed to lie by fabricating an answer to the questions about these fictitious details/events. No more than 3 Lie or 3 Truth questions occurred consecutively. To assist participants in identifying questions that required them to lie, the 8 Lie questions about fictitious events were always presented against a yellow background, whereas the Truth questions and all other information provided in the session was presented using a gray background. Presenting the Lie questions against a yellow background ensured that participants were fully aware which questions asked about details that were not in the video, and reinforced that responding to these questions required them to lie. Participants were also informed that their task was to convince another set of participants that all of the details they described (both truths and lies) were part of the witnessed event, thus participants’ goal was to deceive. Participants were instructed to provide both detailed and believable lies.
As shown in Table 1, each participant answered 4 of their Lie questions once (1x), and 4 of their Lie questions three times (3x), with the 4 Lie questions that each participant was not asked serving as the not asked Control (0x). Similarly, for each participant, 4 Truth questions served in each of the 0x, 1x and 3x conditions. Because repetition of both Truth and Lie questions was manipulated, neither answering questions nor answering questions repeatedly was diagnostic of having lied. Questions were counterbalanced such that, across the experiment, each question was used equally often in the 1x, 3x, and Control (0x) conditions. This means that other participants were required to respond to both True and Lie questions that a given participant was not asked, and vice versa.

**Phase 3: Immediate repetition.** After completing the initial lie manipulation, participants were required to answer 4 of the Lie questions and 4 of the Truth questions from Phase 2 a second time (see Table 1). Participants were informed in advance that they may be asked the same question multiple times, and that they should be consistent in their responses to repeated questions so that their responses would be viewed as believable. They were instructed that the exact wording of the response did not have to match verbatim, but the key content of the response should be consistent when asked a question multiple times. On all of the repeated questions, no background cue was used to differentiate the Lie and Truth questions. I did this to mirror real world situations involving repeated lies, where a person must retrieve from memory a previous answer and do so without an external cue to indicate the veracity of their original response.

**Session 2**

**Phase 4: Delayed repetition.** Participants then returned two days later and were again asked the same subset of 4 Lie questions and 4 Truth questions that had previously been repeated.
during phase 3, thus answering each question 3 times in total (see Table 1). Participants were again instructed to answer consistently to be viewed as believable. As with immediate repetitions, no cues to the veracity of the question or previous responses were provided.

Two trained raters coded responses to repeated lie questions for consistency (defined as responses that retained the same gist) with disagreements resolved by a third rater. In this and subsequent experiments the results showed that participants were highly consistent in their repeated lies: Overall, participants responded consistently to all 3 repetitions of the lie questions 97% of the time. Because the results of the false memory measures do not differ when the data are restricted to consistent responses, the results reported below include all responses.¹

_Dissociative Experiences Scale._ Upon completion of the repeated questions, participants were next given the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986). The DES is a 28 item self-report measure of dissociative experiences. The DES was included as a measure of individual differences because it has previously been shown to be associated with false memories for lies (Polage, 2012). Participants rated how often they experienced dissociative events on a scale from 0 to 100 percent. Participants made their ratings using a slider with endpoints of 0 and 100 percent. Participants were then reminded to return for the third day and dismissed.

**Session 3**

_Phase 5: Assessment of memory for witnessed event._ Participants returned 28 to 35 days following day 1 participation (26 to 33 days following the second repeated questioning). Participants were informed that all responses provided at this point should be truthful and at no

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¹ Participants responded consistently 98% of the time in Experiment 2, and 96% of the time in Experiment 3. In neither experiment did restricting analyses to consistent responses change the results relative to any critical p-value, thus data for all responses are included in Experiments 2 and 3 as well.
point during this session should they continue to lie. See Figure 3 for the sequence of memory measures.

**Figure 3.** Session 3 (Day 28-35) sequence of memory measures employed in Experiments 1, 2 and 3.

*Free Recall Test of the Witnessed Event.* Participants were first asked to complete a free recall questionnaire. Participants were provided with a prompt to each of the 11 scenes in the video and were asked to recall everything that they had witnessed. Participants were instructed to be both detailed and accurate recalling everyone who was present, locations of events, what had occurred, and any additional details they recalled from the scene. Participants were not prompted about the specific events or details they had been asked to lie about. The measure of false memory was the spontaneous reporting of false details or events that were previously fabricated in response to the Lie questions. Freely provided reports of details or events the participant had previously fabricated were counted as false memories. Presuppositions that were
part of the questions they were asked that were also false (e.g., that Delaney was bleeding) were also counted as false memories. These presuppositions were included as participants were explicitly informed that the question asked about false details, and thus there was no suggestion that these details were true.

**Recognition Memory Test of the Witnessed Event.** Participants were then given a series of 24 yes/no recognition questions, of the form “When you watched the video, did you see (true or false detail)?”. For each question, participants were also given some information to orient them to the relevant scene (see appendix B for sample questionnaire). The 12 true details consisted of the participant’s responses to the 1x and 3x Truth questions, as well as the 4 true details that the participant had not been asked about. The 12 false details consisted of the 4 lies that participants had generated in the 1x condition, and the 4 lies that participant had generated in the 3x condition. The remaining 4 false details were novel items (control condition) that were generated by a yoked participant in response to the Lie questions the participant had never been asked. In this way, I was able to obtain a base rate of false assents to the lies that participants had actually generated. Assenting to a false detail by selecting “Yes” when presented with one of their lies served as the measure of false memory. False assents to the novel control items served as a measure of the base rate of false assents.

**Confidence Judgment.** After providing a response to each question, participants were asked to make a confidence judgment corresponding to their response. Confidence judgments were made using a slider on a scale with end points of “Not at all confident” and “Completely confident.” The center of the scale included a label “Moderately confident.”

**Recognition of Previous Responses Test.** I next assessed whether participants remembered providing the lie and truthful responses when they answered the original
questionnaire (see Appendix C). The Recognition of the Previous Responses test was constructed by modifying each of the Recognition of the Witnessed Event questions to replace “When you watched the video, did you see _____” with “When you answered the questions on day 1, did you say _____?” The remainder of the question was left identical unless a tense change was necessary to create a coherent question. As with the Recognition of the Witnessed Event test, the focus of the question was always on the details that were provided by the participant in the 1x and 3x conditions or a separate yoked partner in the Control condition.

Confidence Judgment. Participants also made a confidence judgment using the same scale used in the Recognition of the Witnessed Event test after each response.

2.2. Results

In all experiments, I report results of the inferential tests appropriate for evaluating the questions of interest only, rather than always reporting omnibus ANOVAs (for recommendations to conduct planned contrasts rather than omnibus tests see Rosenthal & Rosnow, 1985; Tabachnik & Fidell, 2001; Wilkinson, 1999). Additionally, as the primary focus of this dissertation is false memories for lies, data pertaining to the Lie items only will be reported.

Does repetition of lies affect false memory development?

False Recall of Having Witnessed the Lies. Two raters blind to condition coded free recall transcripts for clear, uncontroverted reports of the originally provided false lie detail or unwitnessed presuppositions. Inter-rater reliability was 99.6%. Discrepancies in scoring were resolved by a third blind rater. False details provided during recall that did not match the original lie were not included in the scoring. Because no lie had been provided by the participants for items in the Control condition, any false details provided that could potentially be related to the unasked Lie questions were scored as false recall.
Inspection of Figure 4 reveals that participants spontaneously incorporated their lies into their freely provided narrative accounts only rarely. Nevertheless, the results supported the hypothesis that lying can lead an individual to develop false memories for their own lies: the rate at which participants’ freely reported witnessing their lies exceeded the base rate and this was true both for lies that were provided once ($M’s = .03$ vs. $.00$ for the 1x and Control conditions, respectively, $t(110) = 3.05, p = .003, dz = .29$) as well as lies that were provided repeatedly ($M’s = .05$ vs. $.00$ for the 3x and Control conditions, respectively, $t(110) = 4.56, p < .001, dz = .43$). Although lies that were repeated 3x were falsely recalled more often than lies that had been provided once, this difference was not reliable, $t(110) = 1.57, p = .120$. Hence, there was no evidence that repeated lying influenced the magnitude of the false memory effect.

![Figure 4](image-url)

Figure 4. Mean proportion of Lie false details recalled as a function of Item Type (Control, 1x, 3x) on the Free Recall of the Witnessed Event test in Experiment 1. Error bars represent within-participants 95% confidence intervals (Loftus & Masson, 1994).

False Assents to Having Witnessed the Lies.
As illustrated in Figure 5, on the recognition measure, the results once again supported the hypothesis that lying can lead to false memories. Participants’ false assents to having witnessed their lies as part of the original event well exceeded the base rate, and this was true both for lies that were provided once (M’s = .36 vs. .09, for the 1x and control conditions, respectively, t(110) = 9.55, p < .001, dz = .91) as well for lies that were repeated (M’s = .22 vs. .09, for the 3x and control conditions, respectively, t(110) = 3.76, p < .001, dz = .38). However, in contrast to the pattern seen in free recall (see Figure 4), repeated lying decreased false memories, as lies that were repeated 3x were falsely assented to less often than those provided once (t(110) = 3.85, p < .001, dz = .37). Hence, on the recognition measure, lying repeatedly reduced false memory relative to lying once, but repeated lying did not eliminate the false memory effect.

**Figure 5.** Mean proportion of Lie items falsely assented to (“yes” in video) as a function of Item Type (Control, 1x, 3x) on the Recognition of the Witnessed Event test in Experiment 1. Error bars represent within-subjects 95% confidence intervals (Loftus & Masson, 1994).
To assess whether lying repeatedly affected the confidence with which these false assents were made, confidence judgments were scored by transforming the slider position into a score from 0 (“Not at all confident”) to 100 (“Completely confident”). As shown in Table 2, false assents to lies were made with significantly more confidence than false assents to novel items (in the control condition), and this was true for items lied about once ($t(11) = 1.12, p = .004, dz = 3.66$) as well as items lied about repeatedly ($t(11) = 3.58, p = .005, dz = .93$). However, repeatedly lying did not affect confidence relative to lying once, $t(11) = 1.18, p = .27$. Thus, despite falsely assenting to having seen lies that were repeated less often than those provided once, the confidence with which those false assents were made did not differ.

Table 2

Mean Confidence in False Assents to Lie Items as a Function of Item Type (Control, 1x, 3x) on the Recognition of the Witnessed Event Test in Experiment 1 (Standard Error in Parenthesis).

<table>
<thead>
<tr>
<th>Item Type</th>
<th>$M$ (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>51.0 (5.3)</td>
</tr>
<tr>
<td>Single</td>
<td>64.2 (2.4)</td>
</tr>
<tr>
<td>Repeat</td>
<td>69.1 (3.5)</td>
</tr>
</tbody>
</table>

The results suggest that the effects of lying repeatedly were dependent on how memory for the witnessed event was assessed: Relative to lying once, repeated lying increased false recall of lies (though not reliably so) but decreased the likelihood of falsely assenting to lies on tests of recognition. To assess whether the effects of repeated lying interacted with type of test, a

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2 Given that this is a conditional analysis, many participants did not falsely assent to one or more items in all three of the conditions. Accordingly, for all conditional analyses of confidence in false assents reported throughout this dissertation, the data were analyzed with item, rather than participant, as the random effect (i.e., the 12 critical lie items served as the random effect).
2 (Item Type: 1 vs. 3) x 2 (Test type: recall vs. recognition) repeated measures ANOVA was conducted on z-score transformed standardized scores. As expected, the interaction was reliable, $F(1,110) = 17.02, p < .001, \eta^2_p = .14$, thus confirming that the effects of repeated lying varied as a function of test.

**Does repetition of lies increase memory accuracy?**

The foregoing analyses assessed whether lying and doing so repeatedly would result in false memories of having witnessed events that had earlier been lied about. I next assessed whether repeated lying might improve accurate memory of having provided the lie response and memory for the content of the lies.

Participants completed the Recognition of Previous Responses test, where for each item on the test, participants were asked to indicate (yes or no) whether it was a response they had earlier provided in response to a question asked of them during the experimental session. The results showed that repeated lying improved memory for having provided their responses. Lies that were provided 3x ($M = .81$) were better recognized as having been provided than lies provided 1x ($M = .62$), $t(110) = 5.51, p < .001, dz = .52$. For analyses of the Confidence on the Recognition of Previous Responses test, see Appendix D.

What cannot be discerned from the data that has been presented thus far is how often participants who accurately remembered providing the lie response during the experiment nevertheless attributed their lies to the video. These data are presented in Table 3 which shows, for the lie test items, participants’ joint responses on the two source recognition measures (e.g., what proportion of their lies they attributed to the video but not the response, to providing a response but not the video, to both the video and the responses, or neither the video nor the response). It is clear from the table 3 that participants rarely attributed their lies to the video
without also accurately remembering having provided the response,\(^3\) instead when falsely
assenting to having seen the lies in the video, most of the time they also accurately remembered
having provided the response to questions they had been asked. Repeating lies reduced the
degree to which participants attributed the Lie items to only the video (Yes Video/No
Responses), \(t(110) = 3.35, p = .001, dz = .34\), said “yes” to the lie items being in both the video
and the responses (Yes Video/Yes Responses), \(t(110) = 2.22, p = .029, dz = .23\), and increased
the proportion of lies where participants were accurate on both tests by rejecting having seen it in
the video while also stated they provided the response (No Video/Yes Responses), \(t(110) = 7.08,\)
\(p < .001, dz = .72\).

Table 3

**Joint Proportion of “Yes” or “No” Response to Witnessing the Lie Items in the Video and For
Providing the Lie Items as Response as a Function of Item Type (1x vs. 3x) in Experiment 1
(Standard Error in Parenthesis).**

<table>
<thead>
<tr>
<th>Lie Repetition</th>
<th>Video</th>
<th>Responses</th>
<th>Video</th>
<th>Responses</th>
<th>Video</th>
<th>Responses</th>
<th>Video</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(M (SE))</td>
<td>(M (SE))</td>
<td>(M (SE))</td>
<td>(M (SE))</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1x</td>
<td>.09 (.02)</td>
<td>.34 (.03)</td>
<td>.28 (.02)</td>
<td>.30 (.03)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3x</td>
<td>.02 (.01)</td>
<td>.62 (.04)</td>
<td>.19 (.03)</td>
<td>.16 (.03)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Video No, Responses Yes is the correct pair of responses*

Another consequence of repeated lying that is evident from Table 3 is that repetition of
the lies reduced forgetting of the content of the lies, as indicated by a significant decline in the
proportion of lies that participants indicated were not in the video nor in their responses
following repeated lying (Note that indicating that the lie is from neither source signals that the

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\(^3\) For items in the Control condition, the proportion of Yes Video/No Responses was .06.
participant has forgotten the content of the lie altogether). The proportion of times participants endorsed not recognizing their lies as being from either experimental source went from .30 for lies provided once to .16 for lies repeated 3 times, $t(110) = 4.23$, $p < .001$, $dz = .43$. Put another way, memory for the content of lies (operationalized as recognizing the lie from at least one source) went from .70 in the 1x condition to .84 in the 3x condition.

**Individual differences in false memories for lies.** DES scores were calculated by taking the average of the 28 items. DES scores were not significantly correlated with either measures of false memory. DES scores were not correlated with total false assents ($r = .11$, $p = .27$), nor total false recall ($r = .07$, $p = .43$).

2.3. Discussion

Experiment 1 replicated the results of the preliminary studies showing that lying can lead to false memories. Participants recalled details they had earlier lied about having seen as part of the witnessed event despite explicit awareness that they were lying at the time of fabricating those details. Participants also falsely assented to having seen false details they had earlier lied about. Experiment 1 extended this finding to lies that were repeated which also resulted in false memories in both free recall and recognition: For repeated lies, both the rates of false recall and the rates of falsely assenting to having witnessed their lies exceeded the base rate of these errors. Finally, for both lies provided once or repeatedly, participants’ confidence in having witnessed their lies exceeded the confidence that accompanied their false assents to control (novel) items.

A second finding was that, with one exception, repeated lying improved memory accuracy. Relative to lying once, lying three times led to a significant decline in false assents to having witnessed lies, enhanced memory for having provided the lie response, and enhanced memory for the content of the lie. However, enhanced memory for having provided the response
cannot fully explain why repeated lying reduced false assents, as some participants misremembered witnessing their lies even when they remembered providing the response. As evidenced in Table 3, even for repeated lies, there were a substantial number of cases where participants both correctly identified their lies as a response they had provided to the questions and incorrectly claimed they had witnessed the lie in the video (see Yes Video/Yes Responses). Because participants are unlikely to claim they remember witnessing information they know to be a lie, it appears that some participants recognized the fabricated information as a response they had given, but forgot that the information was a lie they had fabricated. Hence, a likely reason why repeated lying reduced false assents is the possibility that repetition enhanced memory for having lied. In Experiment 2, I address this possibility directly by assessing participants’ memory for having lied.

Importantly, repeated lying did not improve memory accuracy in all cases. When participants were asked to provide a narrative account of the events they witnessed, there was no difference in the degree to which they incorporated their repeated lies relative to lies provided once and numerically, they were actually more likely to report lies that were repeated than those that were provided once (see Figure 4), and this pattern did reliably differ from that seen for false assents on the recognition measure providing evidence that the effect of repetition was dependent on the format of the test. Given that repeated lying improves long term retention of the content of the lie, it is possible that repeatedly lying increases the likelihood of false recall because it increases the likelihood that participants would retain and spontaneously retrieve the lie information over time. It should be noted, however, that the rate of false recall in Experiment 1 was quite low, and that the potential for floor effects limits the conclusions that I can draw from the false recall data. The low level of false recall is likely due to the fact that many of the items
participants were asked to lie about were isolated details that were not central to the narrative structure of the witnessed event (e.g., the type of hat Delaney wore, type of food the campers were eating). There is considerable evidence that free recall of narrative events is typically organized around the causal sequence of events (Gernsbacher, 1990), and as such some of the lie items were unlikely to be reported because they were peripheral to the narrative structure of the event. If more of the lies had been integral to the causal sequence of events, it is likely that the rates of false recall would have been higher than what was observed here. Although this finding must be considered with caution, it is nevertheless intriguing that repeated lying produced an inverse pattern of results on the two false memory measures. I return to the divergent pattern of performance on the two false memory measures in the Discussion of Experiment 2, where I propose a potential explanation for these findings, and test this explanation in Experiment 3.
III. Experiment 2

3.1. Introduction

Although Experiment 1 provided clear evidence that repeated lying reduced false assents to having witnessed fabricated details, a number of questions remain about the generality of these findings. In Experiment 1, I implemented the repeated lying manipulation by having participants lie twice in the first session and lie again in a second session two days later. Hence, what cannot be determined from the results of Experiment 1 is what effects, if any, the timing of these repeated lies might have on false memory development. For example, would having participants lie 3 times in the same session produce the same result? Similarly, would having participants lie 3 times spaced over different days produce the same results? Clearly, questions about the effects of repeated lying must also address the timing of the repeated lies, as it is well-documented in the memory literature that spacing of repetitions has wide reaching effects on memory (e.g., Dempster, 1987; Glover & Corkill, 1987; Hintzman, 1974; Janiszewski, Noel, & Sawyer, 2003; Melton, 1970; Rawson & Kintsch, 2005; see Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006; Donovan & Radosevich, 1999 for reviews). As a result, it is possible that the effects of repetition seen in Experiment 1 were driven by the delayed repetition. The goal of Experiment 2, therefore, was to assess the effects of the timing of repeated lies on false memory development.

To this end, Experiment 2 separately assessed the effects of two different types of repetitions, repetitions which immediately followed the original lie manipulation (immediate) and repetitions that occur following a longer delay. Experiment 2 expanded upon the 1x and 3x
repetition conditions employed in Experiment 1 with the addition of two conditions that used a single repetition (2x): The 2x-Immediate condition used a single repetition shortly following the original lie, while the 2x-Delayed condition used a single repetition 2-days after the original lie (see table 4). In this manner, the effect of a single immediate and single delayed repetition can be directly compared while controlling for number of repetitions. In addition, in an attempt to replicate the results from Experiment 1, the two conditions from Experiment 1: The 1x lie condition and 3x lie condition, were also implemented with the same timing as Experiment 1. This design also allows me to determine the effect of the number of repetitions by comparing 1, 2, and 3 total lies (although number of repetitions is confounded with type of repetition).

An additional recognition measure was also added to Experiment 2, a Memory for Lying test, to assess memory for having lied. It used a similar recognition format, but specifically asked participants if they had provided that lie previously. Additionally, to assess potential individual differences in false memory susceptibility, two additional measures that have been shown to be associated with false memories for lies, self-reported lie frequency and comfort experienced while lying in the study (Polage, 2012) were added to Experiment 2.

Table 4

*Experiment 2 Lie Manipulation*

<table>
<thead>
<tr>
<th>Item Type</th>
<th>Session 1</th>
<th>Session 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 1</td>
<td>Day 3</td>
</tr>
<tr>
<td>1x</td>
<td>Lie</td>
<td></td>
</tr>
<tr>
<td>2x-Immediate</td>
<td>Lie 2x</td>
<td></td>
</tr>
<tr>
<td>2x-Delayed</td>
<td>Lie</td>
<td>Lie 2x</td>
</tr>
<tr>
<td>3x</td>
<td>Lie 2x</td>
<td>Lie 3x</td>
</tr>
</tbody>
</table>
3.2. Method

Participants and design. A total of 99 participants (83 female) completed the experiment in partial fulfillment of an introductory psychology course requirement. Sample size was based on an a-priori power analysis (G* Power 3; Faul, Erdfelder, Lang, & Buchner, 2007) to detect an effect size $d_z = .26$ (an estimate of an intermediate 2x condition based on the 1x and 3x recognition data from Experiment 1) at $\alpha = .05$, $1-\beta = .80$ indicating a necessary sample of 93 participants. Repetition of lies was manipulated within-participants (1x, 2x-Immediate, 2x-Delayed, and 3x Lie conditions).

Materials and procedure. The materials and procedures were identical to Experiment 1 except for the following changes.

Session 1

Phase 2: Lie manipulation. Participants were now asked all 24 questions (12 Truth, 12 Lie) about the video used in Experiment 1 (see Appendix A). For every participant, there were 3 Lie questions and 3 Truth questions in each of the repetition conditions (1x, 2x-Immediate, 2x-Delayed, 3x; see table 4). The questions were counterbalanced such that across the experiment, every Lie question served equally often in the four repetition conditions.

Phase 3: Immediate repetition. Upon completing the phase 2 lie manipulation, participants were again asked to repeat questions. At this point they repeated the 3 Lie questions in the 2x Immediate condition and the 3 Lie questions that served in the 3x condition only (see Table 4). Similarly, participants repeated the 3 Truth questions in the Immediate condition and the 3 Truth questions that served in the 3x condition.


Comfort During Lying and Lie Frequency Measures. Anxiety while lying and frequency of lying are two additional measures that have been shown to be related to false memory rates for lies (Polage, 2012). These measures were added to Experiment 2. After completing the immediate repetition, participants were then asked a pair of questions about their experience lying. Participants were first asked to rate their comfort while lying during the experiment. They were asked to provide a rating between “Very uncomfortable” to “Very comfortable” using a slider. No additional anchor points were provided between the endpoints. Participants were then given a question to assess the frequency with which they lie. Participants were asked to estimate the average number of times they lie during a week. Participants were instructed that lying included any time they provided false information to deceive someone else and that this includes instances such as little white lies or stretching the truth. Participants were reminded to return for day 2 and were then dismissed.

Session 2

Phase 4: Delayed repetition. Participants returned 2 days later and were asked to answer for the second time the 3 Lie questions in the 2x-Delayed condition, and for the third time the 3 Lie questions in the 3x condition (see Table 4). Similarly, they were asked to answer the 3 Truth questions in the 2x-Delayed condition and the 3 Truth questions in the 3x condition.

Session 3

Phase 5: Memory assessments. See Figure 3 for the sequence of the memory measures. The Recognition of the Witnessed Event and Recognition of Previous Responses tests were identical in format to Experiment 1 except that the total number of items was expanded to 36. Of these, as in Experiment 1, 24 items corresponded to questions that were asked during day 1. The change to the format of the test was the addition of 12 items that were not previously asked about
during day 1 (see Appendix E). As these 12 items were not included during the lie manipulation, and are not counterbalanced across conditions, these items only serve as not asked fillers on the final tests. Of these items, 6 were about true events that were witnessed, and the remaining 6 were about details that were not witnessed and not previously fabricated.

Memory for Lying Test. After completing all other measures, one additional test was used to assess participants’ memory for having lied about specific items. Participants were asked to identify which lies they had previously provided during day 1 (see Appendix F). The test used the same 36 question format and items as the other two recognition tests. The question wording was changed to ask, “When you answered the questions during day 1, did you lie by saying ______.” Accurate identification of prior lies served as the dependent measure of interest. As with the other recognition measures, after each response participants also made a confidence judgment using the same slider scale.

3.3. Results

Does repetition of lies, and the timing of those repetitions, affect false memory development?

False Recall of Having Witnessed the Lies. Two raters blind to condition coded free recall transcripts for clear, uncontroverted reports of the originally provided false lie detail or false presuppositions. Inter-rater reliability was 98.8%. Discrepancies in scoring were resolved by a third blind rater.

The proportion of times participants freely incorporated their lies into their narrative accounts of the witnessed event is illustrated in Figure 6. Contrary to expectations, timing of repeated lies had no effect, as false recall of lies in the 2x-Immediate (M = .04) and 2x-delayed
(\(M = .05\)) conditions did not differ, \(t(98) = .942, p = .348\). Accordingly, for purposes of assessing the effect of number of repetitions, I collapsed across the timing conditions.

![Figure 6](image.png)

**Figure 6.** Mean proportion of lie false details recalled as a function of item type (1x, 2x, 3x) on the Free Recall of the Witnessed Event test in Experiment 2. Error bars represent within-participants 95% confidence intervals (Loftus & Masson, 1994).

Although false recall in the repeated lie conditions (i.e., 2x and 3x) was numerically higher than in the single lie condition, these differences were not reliable, with the 1x (\(M = .02\)), 2x (\(M = .04\)), and 3x (\(M = .04\)) conditions evidencing no significant differences in the rates of false recall (1x vs. 2x: \(t(98) = 1.557, p = .123\); 1x vs. 3x: \(t(98) = 1.149, p = .253\); 2x vs. 3x: \(t(98) = .244, p = .808\).

**False Assents to Having Witnessed the Lies.** Consistent with the findings obtained with the free recall measure, the timing of the repetitions had no reliable effects on participants’ false assents to having witnessed their lies (see Figure 7): False assents in the 2x-Immediate (\(M = .24\)) and 2x-Delayed (\(M = .21\)) conditions did not differ, \(t(98) = .84, p = .402\). Accordingly, the data were collapsed across the timing variable.
The results replicated the finding in Experiment 1 that repeated lying served to reduce false assents. False assents in the 2x ($M = .22$) and 3x ($M = .18$) conditions were significantly lower than false assents in the 1x condition ($M = .29$) where participants lied only once (1x vs. 2x: $t(98) = 2.27, p = .026, dz = .22$; 1x vs. 3x: $t(98) = 3.45, p = .001, dz = .36$). Although false assents in the 3x condition were lower than in the 2x condition, this difference did not reach statistical significance ($t(98) = 1.76, p = .082, dz = .20$).

Although the foregoing results showed that timing of repetitions did not have a reliable effect on the incidence of false memories, the data provided in Table 5 shows that timing of repetitions did have an effect on the confidence with which participants endorsed having witnessed their lies, such that delayed repetitions resulted in higher confidence false assents than immediate repetitions. In the 2-Delayed condition, confidence in false assents exceeded that of both the 2-Immediate condition ($t(11) = 2.79, p = .018, dz = .84$) and 1x condition ($t(11) = 3.17,$
\( p = .009, dz = .92 \), which did not differ from each other \((t(11) = .43, p = .677)\). False assents in the 2-Delayed and 3x condition did not differ reliably in confidence \((t(11) = 1.72, p = .114)\), nor did confidence in the 3x condition differ reliably from either the 1x condition \((t(11) = 1.39, p = .194)\) or 2x-Immediate condition \((t(11) = .81, p = .434)\). Hence, there was no clear evidence that number of repetitions had an effect on the confidence with which participants endorsed having witnessed their lies.

Table 5

*Mean Confidence in Lie Item Responses on the Recognition of the Witnessed Event Test as a Function of Item Type (1x, 2x, 3x) and Accuracy of the Response in Experiment 2 (Standard Error in Parenthesis)*

<table>
<thead>
<tr>
<th>Item type</th>
<th>Falsely Assent to having seen</th>
<th>( M ) (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1x</td>
<td></td>
<td>63.6 (2.8)</td>
</tr>
<tr>
<td>2x-Immediate</td>
<td></td>
<td>65.0 (2.0)</td>
</tr>
<tr>
<td>2x-Delayed</td>
<td></td>
<td>75.8 (4.0)</td>
</tr>
<tr>
<td>3x</td>
<td></td>
<td>67.7 (3.3)</td>
</tr>
</tbody>
</table>

As in Experiment 1, the results suggest that the effects of lying repeatedly were dependent on how memory for the witnessed event was assessed. Relative to lying once, repeated lying increased false recall of lies (though not reliably so) but decreased the likelihood of falsely assenting to lies on tests of recognition. A 2 (Item Type: 1 vs. 3) x 2 (Test type: recall vs. recognition) repeated measures ANOVA conducted on z-score transformed standardized
scores revealed that the interaction was reliable, $F(1,98) = 9.21, p = .003, \eta^2 = .09$, thus confirming that the effects of repeated lying varied as a function of test.

**Does repetition of lies, and the timing of those repetitions, affect memory accuracy?**

With regard to timing of a repetition, relative to an immediate repetition (2x-Immediate), a delayed repetition (2x-Delayed) improved memory for having provided a response, and improved memory for lying (although in some cases the effects of delayed repetition were only marginally significant). On most accuracy measures, performance in the 2x-Delayed condition was virtually identical to performance in the 3x condition. A second finding was that relative to lying once, repeated lying improved memory for having provided a response, improved memory for the content of the lie, and improved memory for lying. The statistical analyses supporting these claims are provided below.

With regard to memory for having provided a response, delayed repetitions (2x-Delayed, $M = .81$) led to better memory than immediate repetitions (2x-Immediate, $M = .71$) but this difference did not reach statistical significance, $t(97) = 1.97, p = .052$, $d_z = .20$. In addition, overall, repetition improved memory for having provided the lie response: Collapsing across immediate and delayed conditions, performance in both the 2x ($M = .78$) and 3x ($M = .82$) conditions exceeded that of the 1x condition ($M = .63$), (1x vs. 2x: $t(97) = 4.53, p < .001$, $d_z = .46$; 1x vs. 3x: $t(97) = 5.52, p < .001$, $d_z = .56$). The difference between performance in the 2x and 3x did not reach statistical significance, $t(97) = 1.98, p = .051$, $d_z = .20$. For analyses of confidence on the Recognition of Providing Responses test, see Appendix D.

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4 Due to a computer error one participant did not complete the Recognition of Previous Responses and Memory for Lying tests, resulting in a sample of 98 participants on these measures. Excluding this participant from all prior analyses does not change the effects reported relative to any critical $p$-value cutoffs.
Table 6 shows participants’ responses to Lie items on the Recognition of the Witnessed Event and Recognition of Providing Response measures jointly. As in Experiment 1, the majority of times that participants falsely assented to having seen their lies, they also remembered providing the response. Timing of repeating the lie had no effect on the degree to which participants attributed the Lie items to only the video (Yes Video/No Responses), \( t(97) = .53, p = .596 \), whereas repetition decreased these attributions, but only for lies that were provided 3x relative to those provided 1x (1x vs. 3x: \( t(97) = 2.41, p = .018, dz = .24 \); 1x vs. 2x: \( t(97) = 1.49, p = .141 \); 2x vs. 3x: \( t(97) = 1.85, p = .067 \)). Likewise, timing of repeating the lie had no effect on the degree to which participants attributed the Lie items to the video and their responses (Yes Video/Yes Responses), \( t(97) = .87, p = .388 \), whereas repetition decreased these attributions, but only for lies that were provided 3x relative to those provided 1x (1x vs. 3x: \( t(97) = 2.445, p = .016, dz = .23 \); 1x vs. 2x: \( t(97) = 1.58, p = .118 \); 2x vs. 3x: \( t(97) = 1.45, p = .149 \)).

Delaying the repetition relative to an immediate repetition did increase the proportion of lies where participants were accurate on both tests by rejecting having seen the lies in the video while also having provided the response (No Video/Yes Responses), \( t(97) = 2.29, p = .024, dz = .24 \). Repetition also improved accurate performance with the 2x-Immediate, 2x-Delayed, and 3x conditions correctly responding on both measures more often than participants in the 1x condition (1x vs. 2x-Immediate: \( t(97) = 3.92, p < .001, dz = .38 \); 1x vs. 2x-Delayed: \( t(97) = 5.66, p < .001, dz = .56 \); 1x vs. 3x: \( t(97) = 2.45, p = .016, dz = .24 \)). Providing the lie three times only improved accuracy relative to lies with a single immediate repetition, (2x-Immediate vs. 3x: \( t(97) = 3.46, p < .001, dz = .36 \)), but not relative to a single delayed repetition, (2x-Delayed vs. 3x: \( t(97) = 1.22, p = .227 \)).
Table 6

Joint Proportion of “Yes” or “No” Response to Witnessing in the Video and For Providing a Response as a Function of Item Type (1x, 2x-Immediate, 2x-Delayed, 3x) in Experiment 2 (Standard Error in Parenthesis).

<table>
<thead>
<tr>
<th>Lie Repetition</th>
<th>M (SE)</th>
<th>M (SE)</th>
<th>M (SE)</th>
<th>M (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1x</td>
<td>.06 (.01)</td>
<td>.39 (.04)</td>
<td>.24 (.03)</td>
<td>.31 (.03)</td>
</tr>
<tr>
<td>2x-IMM</td>
<td>.04 (.01)</td>
<td>.55 (.04)</td>
<td>.20 (.03)</td>
<td>.21 (.03)</td>
</tr>
<tr>
<td>2x-DEL</td>
<td>.03 (.01)</td>
<td>.63 (.04)</td>
<td>.18 (.03)</td>
<td>.16 (.03)</td>
</tr>
<tr>
<td>3x</td>
<td>.02 (.01)</td>
<td>.66 (.04)</td>
<td>.16 (.03)</td>
<td>.16 (.03)</td>
</tr>
</tbody>
</table>

Note: Video No, Responses Yes is the correct pair of responses

Another consequence of repeated lying, replicating Experiment 1, is that repeated lying reduced forgetting of the content of the lies, as indicated by a significant decline in proportion of lies that participants indicated were not in video and were not provided as response in the repeated lie conditions (see rightmost column of Table 6). These are lies that participants failed to recognize as being from any experimental source (i.e., and hence have forgotten). Collapsing across the 2x Immediate and 2x Delayed repetition conditions (which did not differ reliably from each other, $t(97) = 1.86, p = .066, dz = .27$), forgetting of the lies was greater in the 1x condition relative to the 2x conditions ($t(97) = 3.04, p = .003, dz = .50$) and the 3x conditions ($t(97) = 3.34, p = .001, dz = .57$). The 2x and 3x conditions did not differ significantly from each other ($t(97) = 1.19, p = .24$). Put another way, repeated lying enhanced retention of the content of the lies.

Participants’ memory for having lied is provided in Table 7 as a function of repetition condition. For the 2x lies, delaying the repetition improved memory for having lied compared to immediate repetition, $t(97) = 2.60, p = .011, dz = .27$. In addition, repeated lying significantly
improved memory for having lied: memory for having lied was lower in the 1x condition than in every other repeated lie condition (1x vs. 2x -Immediate: \( t(97) = 3.67, p < .001, dz = .37 \); 1x vs. 2x-Delayed: \( t(97) = 5.47, p < .001, dz = .57 \); 1x vs. 3x = \( t(97) = 5.60, p < .001, dz = .57 \)). Lying three times (3x) improved memory for having lied relative to the 2x-Immediate condition (\( t(97) = 2.36, p = .02, dz = .24 \)) but not the 2x-Delayed condition (\( t(97) = 0, p = 1 \)). For analyses of confidence on the Memory for Lying test, see Appendix D.

Table 7

The Proportion of Items Participants Accurately Identified as Having Previously Fabricated as a Function of Item Type in Experiment 2 (Standard Error in Parenthesis).

<table>
<thead>
<tr>
<th>Item Type</th>
<th>Memory for Lying M (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1x</td>
<td>.64 (.03)</td>
</tr>
<tr>
<td>2x-Immediate</td>
<td>.79 (.03)</td>
</tr>
<tr>
<td>2x-Delayed</td>
<td>.86 (.02)</td>
</tr>
<tr>
<td>3x</td>
<td>.86 (.03)</td>
</tr>
</tbody>
</table>

Individual differences in false memories for lies. As previously seen in Experiment 1, DES scores were not correlated with either measure of false memories. There was no statistically significant correlation with either total false assents (\( r = .11, p = .27 \)), nor with total false recall (\( r = .03, p = .78 \)). Comfort scores were calculated by transforming the slider position into a score from 0 (“Very uncomfortable”) to 100 (“Very comfortable”). As with DES, comfort scores were not correlated with either total false assents (\( r = -.13, p = .21 \)), nor total false recall (\( r = -.12, p = .25 \)). There was, however, a significant correlation between total false assents and
self-reported lies per week ($r = -.21, p = .04$). Those that lied more often evidenced fewer false assents. In contrast to the recognition measure, there was no significant relationship between lies per week and total false recall ($r = -.16, p = .12$).

3.4. Discussion

Experiment 2 sought to assess whether the timing of repeated lies (whether immediate or delayed) would influence the extent to which participants developed false memories for their lies. Although, relative to immediate repetitions, delaying the repetition of the lie appeared to enhance the repeated lying effect (increasing false recall and reducing false assents on the yes/no recognition test) these effects were not statistically reliable. Importantly, however, although delayed repetition did not affect the number of false memory errors it did result in increased confidence in false memory errors. Given that people are more likely to act on false memories that are held with high confidence, this finding suggests that repeated lies that are spaced in time may result in false memories and beliefs that are more firmly held. Obviously, this finding will need to be replicated before firm conclusions can be drawn about the effects of timing on confidence. In contrast, delayed repetitions also improved accurate memory for having lied, a finding consistent with the broader literature showing that distributed practice is more effective than massed practice (e.g., Hintzman & Rogers, 1973; Melton, 1970). This latter finding suggests that there is the potential for repeated lies that are spaced to reduce false assents relative to those that are not (even if the false assents are made with higher confidence).

That the timing of repeated lies had such modest effects in Experiment 2 may be due in part to the implementation of the immediate repetition condition. In the immediate condition, participants completed the entire lie questionnaire before returning to the repeated questions. As a result, each individual lie item was separated, and thus spaced, in time even in the immediate
condition (see Cepeda et al., 2006 for discussion on spacing versus lag effects). If the immediate repetition had been massed such that the participant lied twice in immediate succession, the delayed repetition would likely have been more effective than a massed condition (see Cepeda et al., 2006; Delaney, Verkoeijen, & Spirgel, 2010; Donovan & Radosevich, 1999 for reviews). Additionally, the 2-day interval between lie repetitions is relatively short in comparison to the retention interval between the final repetition and the memory tests (which was approximately 4 weeks). The most effective interval between repetitions has been found to be approximately 10-20% of the retention interval (Cepeda et al., 2008), which is longer than the 2-day interval used here. It should also be noted that the immediate and delayed repetition conditions used in this experiment were a single repetition and used a single delay timing. It may well be the case that using multiple repetitions that are spaced over multiple days may have larger effects relative to multiple repetitions that occur in a massed manner. Clearly, many questions remain regarding how the timing of repeated lies might influence false memory development.

Experiment 2 also replicated the effects of repeated lies documented in Experiment 1, and extended them by including a 2x condition. The results showed that, on most of the measures employed here, the effects of repeating a lie 2x did not differ from repeating the lie 3x; rather, the critical variable turned out to be whether or not the lie was repeated. As documented in Experiment 1, with one exception (the free recall measure), repeated lying improved memory accuracy. Relative to lying once, repeated lying led to a significant decline in false assents to having witnessed lies, enhanced memory for having provided the lie response, and enhanced memory for the content of the lie. A novel finding was that repeating lies (relative to lying once) significantly enhanced memory for having lied. As in Experiment 1, repeating lies did not
reduce false recall; to the contrary, there was a nonsignificant increase in false reporting of repeated lies relative to those provided once.

Why might repeated lying reduce false assents to having witnessed the lies on a recognition test, yet lead to an opposite pattern on a recall test? The disparity in these findings may have to do with the two distinct consequences of repeated lies. On the one hand, repeated lying results in better memory for the content of the lies (and presumably increases their familiarity), potentially explaining why participants were somewhat more likely to report their lies when they had been repeated. On the other hand, it was also the case that repeated lying enhanced participants’ ability to recognize their lies as “lies”. The latter may have contributed to participants’ improved ability to correctly reject their lies as not witnessed on the recognition test when they had been repeated relative to when they had not.

I propose that whether or not repeated lying will lead to greater false memory than lying once will depend on the sensitivity of the test context to these two distinct consequences of repeated lying, which work in opposition to each other. Research on the illusory truth effect (Begg et al., 1992; Mitchell et al., 2005) demonstrates that repetition produces the illusion of truth, because – in the absence of information to the contrary – highly familiar information is judged to be true. However, as evidenced by the results of Experiment 2, another consequence of repeated lying is enhanced memory that the lie “is a lie.” Even highly familiar information will be judged by a person as untrue, if that person remembers that the familiar information is a fabricated lie. I propose that repeated lying reduced false recognition yet increased (or had no effect) on false recall, because the recognition test facilitated memory for having lied and the recall test did not. On the recognition test, participants were explicitly asked “when you watched the video, did you see ____?” Because this prompt explicitly asks participants whether they
witnessed the lie in the video, it directs participants to search extensively for source specifying information (What is the evidence that I witnessed this? What is the evidence that the information came from another source?) hence increasing the likelihood that participants will retrieve that the information was a lie they had fabricated. Consistent with this hypothesis, when misled participants in eyewitness suggestibility experiments are given a source-monitoring test, relative to a recognition test, the rates of false memories are reduced (Zaragoza & Lane, 1994) or can be eliminated (Lindsay & Johnson, 1989; Zaragoza & Koshmider, 1989). Given that repeated lying improved memory for having lied, when using the recognition measure, repeated lying can result in fewer false assents than lying once, because participants are better able to remember having lied when they had done so repeatedly. Even if repeated lies are more familiar than single lies, remembering that the highly familiar information is a lie will prevent false memories.

The retrieval demands of a free recall test contrast considerably with those of a recognition test. Relative to a recognition test, free recall is more cognitively demanding (Cabeza et al., 1997). On a recognition test, the participant is presented with the target information and has to make a judgment about the source of that information. Hence, on the recognition test, participants do not have to retrieve their lie, but rather can use all available cognitive resources to retrieve source specifying information and monitor the source of their lie. In contrast, on a test of free recall, participants must retrieve the elements of the witnessed event, construct a narrative account, determine what to report or withhold, determine the wording to be used, and formulate and produce a response. As a result, given the resource demands of retrieving and constructing a freely provided narrative account, there are fewer cognitive resources available to monitor the source of the information that comes to mind. Moreover,
there is no cue directing the participant to discriminate the source of the information they recall. Despite participants being instructed to report only what they saw in the video and to respond truthfully, this prompt was only provided at the start of their recall. As a result, when providing a narrative report of the witnessed event, participants may be less likely to spontaneously retrieve that the information that comes to mind was in fact something they fabricated. Because fabrications that were repeated are more likely to come to mind during free recall than those that were not, failure to also remember that this information was a lie would result in increased false recall for lies that were repeated relative to lies provided once.

If the foregoing account is correct, the finding in Experiments 1 and 2 that repeated lying reduced false assents was a consequence of participants having sufficient cognitive resources to support memory for having lied when taking the recognition test. By this account, repeated lying would not be expected to reduce false memory on a recognition test if cognitive resources were severely restricted (e.g., because of competing demands, severe anxiety, etc.) because memory for having lied should be selectively impaired under such circumstances. Experiment 3 was designed to test this prediction.
IV. Experiment 3

4.1. Introduction

The purpose of Experiment 3 was to test the proposal that the effects of repeated lying on false memory development depend on the cognitive resources available to monitor source at the time of test. As in Experiments 1 and 2, participants provided some lies once and other lies three times, and 4 weeks later received a yes/no recognition test as in Experiments 1 and 2. The innovation introduced in Experiment 3 was that I manipulated the cognitive demands placed upon the participants when making their recognition decision. Whereas participants in the Standard group were treated comparably to participants in Experiments 1 and 2, participants in the Dual-task group completed the Recognition of the Witnessed Event under conditions that were designed to severely restrict the cognitive resources available for completing the recognition task. I attempted to restrict cognitive resources in two ways. First, participants in the Dual-task group had to perform a secondary task (a shape matching task) at the same time as they were completing the recognition task, thus forcing them to divide their attention between the two tasks. In contrast, participants in the Standard group were able to complete the recognition task at their own pace and under conditions of full attention. Prior research has established that dividing attention selectively impairs access to source specifying information while sparing access to familiarity (Anderson, Craik, & Naveh-Benjamin, 1998; Craik, Govoni, Naveh-Benjamin, & Anderson, 1996; Dodson & Johnson, 1996; Troyer, Winocur, Craik, & Moscovitch, 1999; see also Yonelinas, 2002 for review).
The second manipulation was that participants in the Dual-task group were given a very limited time window (only 500 ms) to provide their recognition responses, whereas participants in the Standard group were permitted to take as much time as they needed. Studies have shown that forcing participants to make recognition decisions in this limited time window can impair their ability to retrieve source specifying information, while leaving their access to familiarity intact (Hintzman & Caulton, 1997; Gronlund, Edwards, & Ohrt, 1997; Johnson et al., 1994).

The expectation was that, as a consequence of the divided attention and deadline procedure manipulations, access to memory for having lied would be impaired (and familiarity spared) for participants in the Dual-task group when compared to those in the Standard group. Hence, I predicted that, consistent with the results of the foregoing experiments, repeated lying (relative to lying once) would reduce false assents in the Standard Group, but would not reduce false assents in the Dual-task group. This is because under conditions of divided attention, participants in the Dual-task group should no longer be able to benefit from the enhanced memory of having lied that repeated lying typically confers.

4.2. Method

Participants and design. A total of 85 participants (50 Dual-task – 38 female, 35 Standard – 27 female) completed the experiment in partial fulfillment of an introductory psychology course requirement. Five participants in the Dual-task group did not follow instructions and were excluded from all analyses, resulting in a final sample of 45 participants in the Dual-task group. Sample size was based on an a-priori power analysis (G* Power 3; Faul, Erdfelder, Lang, & Buchner, 2007) to detect a small to medium effect size $f = .25$ at $\alpha = .05$, $1-\beta = .80$, $r = .10$, indicating a necessary sample of 60 participants. Analyses in the Dual-task group require that participants adequately performed both tasks simultaneously, thus the Dual-task
group was oversampled to ensure adequate power when accounting for analyses conditional on accurate secondary-task performance. The study used a 2 (Response Task: Dual-task vs. Standard) x 2 (Repetition: 1x vs. 3x) mixed factorial design with Response Task manipulated between participants and Repetition manipulated within participants.

**Materials and procedure.** The method follows that of the 1x and 3x conditions in Experiment 2 with the following changes.

**Session 1**

**Phase 2: Lie manipulation.** As in Experiment 2, participants were again asked all 24 questions (12 Truth, 12 Lie) about the video. For every participant, there were 6 Lie questions and 6 Truth questions in each of the repetition conditions (1x, 3x). The questions were counterbalanced such that across the experiment, every Lie question served equally often in the two repetition conditions.

**Phase 3: Immediate repetition.** Upon completing the phase 2 lie manipulation, participants were again asked to repeat questions. At this point they repeated 6 Lie questions in the 3x condition. Similarly, participants repeated 6 Truth questions in the 3x condition.

**Session 2**

**Phase 4: Delayed repetition.** Participants returned 2 days later and were asked to answer for the third time the 6 Lie questions in the 3x condition. Similarly, they were asked to answer for the third time the 6 Truth questions in the 3x condition.

**Session 3**

**Phase 5: Memory assessment.** Participants returned to the lab 28-35 days after completing day 1. During Session 3, participants were separated into the Standard and Dual-task groups. These groups were treated identically except for the conditions under which they took
the Recognition of the Witnessed Event test (described below). Session 3 was identical to Experiment 2 with the exception of the following changes (see Figure 3 for complete sequence of day 3 measures).

1-Back Filler/Practice Task. After completing the Recall of the Witnessed event test, all participants were next given a visual 1-back task (see Figure 8 for illustration of the task). For participants in the Dual-task group, this served as practice for the secondary task they would have to perform during the Recognition of the Witnessed Event test. For participants in the Standard group, this was a filler task.

Participants were first shown samples of the test stimuli (triangle, circle, and square) and instructed to respond as quickly and accurately as possible whether each shape matched the shape that immediately preceded it. For example, accurate responses for the sample stimuli in Figure 8 would be, “Same,” because the first two shapes matched, “Different,” because the second and third shapes did not match, followed by “Different,” “Different.” Participants made a response using their left hand with the “F” key to indicate the shapes were the “Same” and the “D” key to indicate the shapes were “Different.” Participants completed 6 self-paced practice trials with feedback following each response. Participants were then given a sequence of 24 continuous trials. Each trial consisted of presenting the shape on the screen for 1,500 ms, followed by a blank screen for 1,500 ms before the next shape was presented. During these trials, each shape appeared 8 times and there were 8 targets (1/3 of trials, “Same”) and 16 foils (2/3 of trials, “Different”). Participants in the Dual-task group that did not answer 75% or more trials correctly were required to speak to an experimenter to better understand the task before advancing. No additional practice trials were provided.
Recognition of the witnessed event – Standard group. At this point, participants were separated into the Dual-task and Standard groups. For participants in the Standard group, this test was identical to Experiment 2 except for the following changes. First, participants were presented the 36 recognition questions in an audio format rather than on the screen. Second, the 36 recognition questions were reworded from Experiment 2 to as best as possible ensure that participants could not answer the question until after hearing the final word (e.g., “When you watched the video, did you see Delaney’s elbow bleeding?”). A transcript of a sample questionnaire is provided in Appendix F. Third, for each question, participants made a response by pressing the “J” key for a “Yes” response and the “K” key for a “No” response. Prompts were provided on screen to remind participants which keys corresponded to a “Yes” and “No” response. Fourth, participants were given 6 practice questions to orient to the audio format and the keyboard responses. These 6 questions were filler questions (3 True, 3 Novel) that participants had not previously answered and no feedback was provided. Responding during practice and the critical trials was self-paced. Finally, no confidence judgments were provided for each response during the test.
Recognition of the witnessed event - Dual-task group. The Dual-task group was identical to the Standard group except that participants in the Dual-task group had to perform the visual 1-back task at the same time, and in addition to, answering the recognition questions which were presented via audio recording and (2) participants in the Dual-task group had only 500 ms to provide their recognition responses whereas participants in the Standard group had no time limit. A 1-back task was used as the secondary task because previous research has utilized it as a secondary task in divided attention studies where it was shown to impair performance on the primary task (Asloun et al., 2008; Finley, Benjamin, & McCarley, 2014; Lozito & Mulligan, 2006).

The secondary 1-back task (see Figure 8) was created using a random sequence of the three shapes (resulting in approximately 1/3 target trials and 2/3 foil trials) and with shapes presented on screen for 1,500 ms followed by a 1,500 ms blank screen. The number of 1-back task trials completed varied by participant based on the length of their audio recordings ($M = 136$ 1-back trials per participant). On screen prompts indicating the keys for the four different responses for the two tasks (“Same,” “Different,” “Yes,” “No”) were also provided for participants.

Pilot testing ($N = 12$) was conducted to determine the speed of the 1-back task during the dual-task manipulation. Participants viewed the eyewitness event, received practice on the 1-back task, and then completed the Dual-task version of the Recognition of the Witnessed Event test. Half of the participant attempted the test with shape stimuli presented on screen for 1,000 ms followed by a blank screen for 1,000 ms between stimuli whereas the other half of participants were given the test with 1,500 ms intervals. Afterward participants rated how difficult it was to perform both tasks on a slider scale from “Easy” (0) to “Impossible” (100) with
a midpoint of “Challenging” (50). Participants rated the 1,000 ms interval near the maximum “Impossible” on a slider scale ($M = 88$), whereas the 1,500 ms interval was rated between “Challenging” and “Impossible” ($M = 72$). Written feedback from participants using the 1,500 ms intervals also characterized the task as very difficult but still feasible. As a result, the 1,500 ms interval was used to avoid excessive data loss due to an inability to complete both tasks.

In addition to the secondary task, a deadline procedure was also implemented for participants in the Dual-task group. At the completion of each audio question, a brief tone played indicating that participants would only be given 500 ms to provide their response. This response speed was selected as it has been shown to significantly limit access to source specifying information without impairing access to familiarity (Johnson et al., 1994). Responses made after the deadline were excluded from data analyses. Whereas for participants in the Standard group the audio questions were self-paced (participants did not hear the next question until they had answered the prior one), for participants in the Dual-task group the questions were not self-paced, and there was a 1,000 ms interval between questions.

Participants in the Dual-task group were given the same 6 practice questions given to the Standard group but completed these trials with the deadline procedure and secondary task to give them practice responding on the recognition test under these conditions. As with the Standard group, no confidence judgments were provided for this measure.

4.3. Results

Given that the divided attention manipulation only occurred during the Recognition of the Witnessed Event test (see Figure 3), it was predicted that there would be no differences between the Standard and Dual-task groups on Recall of the Witnessed Event, memory for the content of the lie, or Memory for Lying, and that group would not interact with repetition. To test this
prediction, each of these measures was submitted to separate 2 (Response Task: Dual-task vs. Standard) x 2 (Item Type: 1x vs. 3x) mixed factorial ANOVAs with Response task manipulated between participants and Item Type manipulated within participants. Consistent with the prediction, there was no main effect of Response task (all $F$’s < .736, $p$’s > .394), nor an interaction between Response task and Item Type (all $F$’s < 1.036, $p$’s > .312) on any of these measures. As a result, for all reported analyses of these measures, I will collapse the Dual-task and Standard groups and only report the effect of repetition.

Contrary to expectations, and in spite of the divided attention and deadline procedure manipulations, false assents to having witnessed lies in the Dual-task group did not differ from false assents in the Standard group on the Recognition of the Witnessed Event measure. For this measure, I report performance in the two groups separately, because this was the primary experimental manipulation.

Does repetition of lies affect false memory recall?

False Recall of Having Witnessed the Lies. Two raters blind to condition coded free recall transcripts for clear, uncontroverted reports of the originally provided false lie detail or false presuppositions. Inter-rater reliability was 98.7%. Discrepancies in scoring were resolved by a third blind rater.

As seen in Figure 9, the pattern of results obtained in Experiments 1 and 2 was replicated: Lies that were repeated were more likely to be falsely recalled as part of the witnessed event than lies that were provided once, ($M$’s = .06 vs. .02 for the 3x vs. 1x condition, respectively, $t(79) = 2.55, p = .013, dz = .29$).
Figure 9. Mean proportion of Lie false details recalled as a function of Item Type (1x vs. 3x) on the Free Recall of the Witnessed Event test in Experiment 3. Error bars represent within-participants 95% confidence intervals (Loftus & Masson, 1994).

Does dividing attention affect false assents to repeated lies?

False Assents to Having Witnessed the Lies. Participants in the Dual-task group correctly answered the secondary 1-back task on 73.2% of trials. The primary predictions were that, for participants in the Standard group, repeated lying would reduce false assents but for participants in the Dual-task condition, repeated lying would not reduce these errors. As seen in Figure 10, this prediction was not confirmed, as participants in the Dual-Task group did not differ from the Standard group on any of the false memory measures. A 2 (Response Task: Dual-task vs. Standard) x 2 (Item Type: 1x vs. 3x) mixed factorial ANOVA conducted on the mean proportion of false assents to having witnessed their lies revealed neither a main effect of Response Task, $F(1,78) = 2.19, p = .143$ nor a significant interaction between Response Task and Item Type, $F(1,78) = .442, p = .508$. Consistent with Experiments 1 and 2, lies that were
repeated were falsely assented to less often than lies that were provided once, as evidenced by a main effect of Item Type, $F(1,78) = 32.52, p < .001, \eta^2_p = .29.$

![Figure 10](image-url)

Figure 10. Mean proportion of Lie items falsely assented to (“yes” in video) as a function of Item Type (1x vs. 3x) and Response Task (Standard vs. Dual-task) on the Recognition of the Witnessed Event test in Experiment 3. Error bars represent between-subjects 95% confidence intervals.

The foregoing analyses were conducted with all participants, including those that did not perform accurately on the secondary task. It is possible that participants who did not perform well on the visual 1-back task were not performing both tasks simultaneously as instructed, but rather just focused on doing the recognition task. If so, their attention was not divided while taking the recognition test.

To control for this possibility, I next analyzed the subset of data where there was evidence that participants were performing both tasks simultaneously. Specifically, I restricted the analysis to recognition responses that were both preceded by two accurate responses on the 1-back task and followed by one accurate response on the 1-back task. Additionally, the data were further
restricted to yes/no recognition responses that occurred within the 500 ms deadline window. In total, 46% of trials met these criteria, resulting in 29 participants in the Dual-task group with responses meeting these criterion in both the 1x and 3x conditions.

The results are provided in Table 8. Restricting the analyses to cases where there was accurate secondary task performance did not change the pattern of results: the prediction that false assents to repeated lies would increase under conditions of divided attention was not supported: A 2 (Response Task: Dual-task vs. Standard) x 2 (Item Type: 1x vs. 3x) mixed factorial ANOVA conducted on the mean proportion of false assents revealed that the predicted Response task x Item type interaction was not reliable, $F(1,63) = 2.74, p = .103$. Consistent with the findings from Experiments 1 and 2, there remained a significant effect of Item Type, with fewer false assents to lies that were repeated than lies that were only provided once, $F(1,63) = 4.74, p = .033, \eta_p^2 = .07$. Contrary to predictions, the Dual-task group actually evidenced fewer false assents relative to the Standard group as evidenced by a significant main effect of Response Task, $F(1,63) = 4.69, p = .034, \eta_p^2 = .07$.

Table 8

<table>
<thead>
<tr>
<th>Item type</th>
<th>Dual-task M (SE)</th>
<th>Standard M (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1x</td>
<td>.29 (.06)</td>
<td>.37 (.04)</td>
</tr>
<tr>
<td>3x</td>
<td>.10 (.04)</td>
<td>.21 (.05)</td>
</tr>
</tbody>
</table>
The finding that restricting the analysis to cases where participants performed accurately on the secondary task actually led to improvements in performance raises the possibility that this conditional analysis selected for participants with superior working memory capacity (see Discussion of Experiment 3 for additional discussion of this point).

**Does repetition differentially affect false recognition and recall?** As in Experiments 1 and 2, the effects of lying repeatedly were dependent on how memory for the witnessed event was assessed: Relative to lying once, repeated lying increased false recall of lies but decreased the likelihood of falsely assenting to lies on tests of recognition. A 2 (Item Type: 1x vs. 3x) x 2 (Test Type: Recall vs. Recognition) repeated measures ANOVA conducted on the z-score transformed data confirmed that the interaction was significant \( F(1,78) = 36.14, p < .001, \eta^2_p = .31 \) once again confirming that repeated lying had differing effects on the recall and recognition measures.

**Does repeated lying improve memory accuracy?** Consistent with the foregoing experiments, relative to lying once, repeated lying improved memory for having provided a response, improved memory for the content of the lie, and improved memory for lying.

With regard to memory for having provided a response, consistent with Experiments 1 and 2, participants remembered providing lies that were repeated more often than lies that were provided once: performance in the 3x condition (M = .88) exceeded that of the 1x condition (M = .60), \( t(84) = 10.07, p < .001, dz = 1.16 \). For analyses of the confidence data this measure, see Appendix D.

Table 9 shows participants’ responses to Lie items on the Recognition of the Witnessed Event and Recognition of Providing Response measures jointly. As in Experiments 1 and 2, most of the time that participants falsely assented to having seen their lies, they also remembered
providing the responses. Repeating lies reduced the degree to which participants attributed the Lie items to only the video (Yes Video/No Responses), \( t(79) = 6.27, p < .001, dz = .70, \) and numerically the reduced the rate of yes responses to both the video and the responses (Yes Video/Yes Responses), although not reliably so, \( t(79) = 1.53, p = .130. \) Repetition also increased the proportion of lies where participants were accurate on both tests by rejecting having seen the lies in the video while also correctly stating they provided the response (No Video/Yes Responses), \( t(79) = 11.05, p < .001, dz = 1.23. \)

Finally, repetition improved memory for both the content of the lies as well as having lied. As indicated in the rightmost column of Table 9, repeated lies were less likely to be forgotten than those once provided lies, \( t(79) = 7.11, p < .001, dz = .79. \) In addition, repeated lying improved memory for having lied: Lies in the 3x condition (\( M = .89 \)) were more often identified as “lies” than lies in the 1x condition (\( M = .61 \)), \( t(79) = 10.08, p < .001, dz = 1.13. \) For analyses of confidence on the Memory for Lying test, see Appendix D.

Table 9

<table>
<thead>
<tr>
<th>Lie Repetition</th>
<th>Video</th>
<th>Responses</th>
<th>Video</th>
<th>Responses</th>
<th>Video</th>
<th>Responses</th>
<th>Video</th>
<th>Responses</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>1x</td>
<td>.13 (.02)</td>
<td>.38 (.03)</td>
<td>.23 (.02)</td>
<td>.27 (.03)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3x</td>
<td>.02 (.01)</td>
<td>.68 (.03)</td>
<td>.19 (.02)</td>
<td>.11 (.02)</td>
<td></td>
<td></td>
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</tbody>
</table>

Note: Video No, Responses Yes is the correct pair of responses
**Individual differences in false memories for lies.** Unlike Experiment 2, there were no significant correlations any of the individual difference measures (DES, Comfort, or Lies per week) with either of the total false memory measures. DES scores were not correlated with total false assents \(r = .18, p = .15\), nor with total false recall \(r = -.07, p = .58\). Comfort while lying was also not correlated with total false assents \(r = -.09, p = .49\) nor total false recall \(r = -.106, p = .41\). Finally, lies per week was also not correlated with total false assents \(r = -.05, p = .70\), nor with total false recall \(r = -.03, p = .79\).

**4.4. Discussion**

The results of Experiment 3 suggest that the divided attention manipulation was not successful in impairing access to source specifying information as was intended. When all the data were considered, false assents in the Dual-task group did not differ from that of the Standard group, and when the analysis was restricted to cases where the participant accurately responded on the secondary task (thus assuring that they were fully engaging in both tasks simultaneously), the Dual-task group actually falsely assented *less often* than the Standard group. If, as intended, limiting cognitive resources impairs access to source specifying information, Dual-task participants should have had been impaired, relative to their full attention counterparts, in their ability to recognize the test items as fabricated lies. An impaired ability to recognize their lies as “lies” should have predisposed participants in the Dual-task group to greater false memory than participants in the Standard group. To the contrary, there was some evidence that participants in the Dual-task group evidenced lower false memory than those in the Standard group. Clearly, the divided attention and deadline manipulations employed in Experiment 3 did not impair Dual-task participants’ access to having previously fabricated their lies.
There are a number of reasons why the divided attention manipulation may not have produced the predicted results. One potential explanation is that the difficulty of having to perform two tasks concurrently may have increased participants engagement and attention. In other words, the challenge of having two perform two tasks simultaneously may have motivated participants to try harder. However, other aspects of my data argue against this interpretation. Increased attention should result in both a decrease in false assents as well as an increase in accurate identification of witnessed events, but that was not the case: participants in the Dual-task group correctly identified numerically fewer witnessed events (M = .87) relative to the Standard group (M = .89).

Another possibility is that the difficulty of having to perform two tasks simultaneously may have led participants to adopt a more conservative response criterion, biasing them to respond “no” more often on the recognition test. A more conservative response criterion would result in both a decrease in false assents, as well as fewer accurate identifications of witnessed details. To test this hypothesis, I analyzed the proportion of “no” responses across all 36 Recognition of the Witnessed Event test items (which included true, lie, and novel items) as a function of group. The results were consistent with the conservative bias hypothesis: collapsing across true and false responses, participants in the Dual-task group were more likely to say “no” (M = .45) than those in the Standard group (M = .41), t(78) = 2.12, p = .037, d = .45. Thus, this bias towards saying “no” may explain part of why the Dual-task group had numerically fewer false assents overall than in the Standard group.

Another potential explanation is that participants in the Dual-task group prioritized the recognition task over the 1-back task, and hence their attention was not divided when performing the recognition task. To address this possibility, I conducted an analysis on the subset of cases
where participants were fully engaged in both tasks as evidenced by accurate performance of the secondary task. However, this conditional analysis disproportionately selects participants and items that may be more accurate. That is, participants who can perform concurrent tasks successfully are likely to be higher in working memory, a factor that is negatively correlated with suggestibility (Jaschinski & Wentura, 2002; Peters, Jelicic, Verbeek, & Merckelbach, 2007), resulting in a sample that may be less likely to evidence false memories. Similarly, such an analysis is more likely to include “easy” recognition test items than “hard” ones, because difficult test items are likely to require more attention, causing performance on the secondary task to suffer. Hence, although the intent was to restrict the analysis to cases where attention was divided, conditionalizing on accurate secondary task performance may have had the unintended consequence of selecting for participants that were less error prone and lie items that were less likely to be misattributed.

Of course, even if the divided attention task was ineffective, it was also the case that participants had to respond under a deadline procedure. It is well established that a 500 ms deadline procedure, like the one employed here, selectively impairs memory for source (e.g., Hintzman & Caulton, 1997; Johnson et al., 1994). However, it is important to note that prior studies that have implemented deadline procedures (e.g., Johnson et al., 1994) and dual-task manipulations (e.g., Anderson et al., 1998; Craik et al., 1996) have typically had participants study lists of unrelated words, and then given them a test consisting of single words (presented under deadline or divided attention conditions). In contrast, in Experiment 3, the test probes consisted of complex, multi-sentence questions about events participants had been queried about several times before. I propose that the likely reason why the deadline procedure did not impair source memory in Experiment 3 was that participants were able to anticipate and predict what
the critical test item would be, even before reaching the end of the sentence. As a result, even if recollecting source takes longer than the 500 ms response window provided, participants may have gotten a head start on this judgment, because they were able to predict what the lie item was going to be, well before they reached the end of the sentence.

Despite the ineffectiveness of the divided attention deadline procedure manipulation, one contribution of Experiment 3 is that it replicated the effects of repeated lying obtained in Experiments 1 and 2. Lies that were provided three times were falsely assented to less often than lies provided once, but the opposite pattern was seen in free recall, with more false recall for lies provided three times relative to lies provided once. In addition, repetition also improved memory for the content of lies provided three times compared to lies provided once. Likewise, repetition also improved memory for having previously lied with lies provided three times better recognized as lies than lies provided once. Thus, the effects of repetition were consistent across all three experiments.
V. General Discussion

5.1. Main Findings

Can people come to develop false memories for their own lies? The experiments reported in this dissertation, in combination with the preliminary studies, provide clear evidence that the answer is “yes”. Despite having full awareness that the information they were lying about was a complete fabrication, participants falsely assented to having witnessed those very same lies when tested approximately one month later. In four experiments, participants falsely assented to witnessing lies they had provided once approximately 30% of the time (as compared to a base rate of false assents that was less than 10%). The magnitude of the false memory effects documented here are more robust than those that have been reported previously in the literature, as prior studies have either failed to find evidence that people develop false memories for their fabricated lies (Bylin & Christianson, 2002; Vieira & Lane, 2013) or have obtained false memory effects that are small or ambiguous (Pickel, 2004; Polage, 2004; 2012). It is likely that previous studies failed to find evidence that lying led to false memories because they used retention intervals (e.g., 2 days, 1 week) that were much shorter than the month-long retention interval employed here.\(^5\) As documented in the preliminary studies, when participants engaged in the very same lie manipulation but were tested after a 1-week retention interval, they were not susceptible to developing false memories for their lies. Lying is memorable. To the extent that

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\(^5\) Experiment 2 of Polage (2012) manipulated retention interval with a 3-week and 1-week group but failed to find an effect of retention interval. However, given that an effect was found after 1 week and these experiments involved lying about childhood events, the time course for these false memory effects may differ.
people can identify their lies as “lies” they will be resistant to developing false memories for their lies, because information cannot simultaneously be both true and lie. However, there is considerable evidence that the source of our memories tends to be forgotten over time (e.g., Chrobak & Zaragoza, 2008; Jacoby et al., 1989; Hovland & Weiss, 1951; Cook & Flay, 1978). As a result, people can forget having lied and mistake the familiarity of their fabrications for evidence that the fabricated event happened. Additionally, lying can result in an increased confidence with which these false memories are held as there was greater confidence when falsely assenting to previously fabricated information than to other unseen details, and this confidence can have negative consequences because false memories held with greater confidence are more likely to be believed and acted upon (Sauer et al., 2010, Wells et al., 1981).

The second goal of the current studies was to assess the effects of repeated lying, relative to lying once, on false memory development. A consistent finding across all studies reported here was that, in most cases, repeated lying served to improve memory accuracy: repeated lying reduced false assents, enhanced memory for the content of the lie, and enhanced participants’ ability to remember their lies as “lies”. Timing of the repeated lies (whether immediate or delayed) had little impact on false memory development (Experiment 2), though there was evidence that spaced repetitions might lead to false memories that are held with higher confidence. It should be noted that Experiment 2 only compared two timings of a single repetition. Thus, it is possible that variations in the timing and number of repetitions may result in significant effects on the rate of false memory development (see also Cepeda et al., 2008).

Understanding how spacing of repeated lies might impact false memory development remains an important question for future research.
The current studies also showed that the effects of repeated lying depended on the type of test. Although repeated lying reduced false memory on recognition tests, repeated lying did not confer the same accuracy advantage on tests of free recall. In fact, the opposite pattern was observed, in that participants were somewhat more prone to incorporating their fabricated lies into their narrative accounts of the witnessed event when they had been repeated than when they had not. Although false recall was very low, and hence the results need to be interpreted with caution, this pattern was replicated across all three experiments\(^6\), and is consistent with the finding in studies of the “illusory truth effect” (Begg et al., 1992; Hasher et al., 1977) that repetition produces the illusion of truth. As discussed earlier, a likely explanation for this finding is that the content of repeated lies is better remembered than that of lies provided only once, and hence the content of repeated lies is more likely to come to mind, when attempting to recall a witnessed event. Although repeating lies serves to improve memory for having lied, the cognitive demands of the free recall task were such that they likely interfered with participants’ ability to retrieve that the fabricated information was in fact a “lie”. In contrast, on tests of recognition, where the lie is provided to the participants, repeated lies were much less likely to be mistaken for something participants had witnessed, because participants were better able to remember that the repeated lies were “lies”.

Consistent with the contention that participants may not have had the resources to accurately monitor the source of their lies during free recall, in those cases where participants freely recalled their lies as part of the witnessed event, they subsequently falsely assented to having witnessed those same details on the recognition test just over half of the time ($M = .53$, data collapsed across the three experiments). That is, despite freely reporting their lie as part of

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\(^6\) Collapsing the 1x and 3x conditions from all 3 experiments demonstrated that lying repeatedly lead to more false recall relative to lying once, $t(295) = 2.97, p = .003, dz = .18$. 

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the witnessed event, when later presented with their lie on the recognition test, and asked directly whether they remembered witnessing it in the video, they were able to accurately reject the lie a significant proportion of the time. The latter finding is consistent with the conclusion that recognizing a lie “as a lie” is dependent on the cognitive resources available at the time of test. Experiment 3 sought to test the role of cognitive resource availability in false memory development by manipulating the cognitive resources available at the time of test, but unfortunately, the manipulation was ineffective.

Finally, a secondary goal of the present study was to assess potential individual differences in susceptibility to developing false memories for lies. Unfortunately, I largely failed to find individual differences in susceptibility to false memories. Across several experiments, I failed to find a relationship between dissociative experiences and false memories, as well as no relationship between comfort lying and false memories. The only significant relationship found was a negative correlation between total false assents and the number of times an individual reported lying per week in Experiment 2. It is possible that individuals that lie less often may be less experienced with differentiating the truth from their lies and as a result are more susceptible to false memories. However, this finding was not replicated in Experiment 3 and is in the opposite direction to the relationship reported in Polage (2012) where there was a positive relationship between frequency of lying and fabrication inflation (a measure of false memory). The general failure to replicate these previously demonstrated individual differences (Polage, 2012) may reflect many of the differences between these methodologies. In Polage (2012), the measure of false memories was changes in believability ratings for having experienced childhood events. This measure may capture small changes in belief that are produced by lying. In contrast, the measures I used reflect multiple dichotomous outcomes. For instance, it may be the
case that lying can produce small shifts in belief that would not be sufficient to produce a false assent based on the individual participant’s decision criteria. The nature of the fabricated details also differed considerably, with Polage (2012) fabricating about a fictitious childhood event and also doing so in a face to face interview. This may result in differing levels of engagement where individual variability in experiencing dissociative episodes or comfort while lying may impact the rate of false memory. It is also the case that in the current study, counterbalancing of lies results in large variability in false assents due to variations in the assignment of individual items to the different conditions across participants. This additional source of variability can make it difficult to observe individual differences in false memory.

It is interesting to note that there is a dearth of studies on individual differences in source monitoring ability, and most work on this topic has focused on the individual difference variable of age. Relative to adults, both children (Foley & Johnson, 1985; Foley & Ratner, 1998; Foley, Johnson, & Raye, 1983; Lindsay, Johnson, & Kwon, 1991) and older adults (Henkel, Johnson, & De Leonards, 1998; Lyle, Bloise, & Johnson, 2006) evidence deficits in source monitoring (for other individual differences see Heaps & Nash, 1999; Hyman & Billings, 1998; Zhu et al., 2010; see Gallo, 2013 for review). Clearly, identifying individual differences in susceptibility to false memories for lies remains an important question for future research.

5.2. Mechanisms of False Memory Development: A Source Monitoring Account

The Source Monitoring Framework (Johnson et al., 1993; Lindsay, 2008) provides a theoretical framework for understanding why lies develop into false memories. According to the source monitoring framework, source is not an explicit tag in memory, but is instead an attribution based on the quantity and quality of characteristics of the memory such as the perceptual, semantic, and contextual information as well as the cognitive operations associated
with formation of the memory. By this account, attributing a memory to a source is based on comparing the characteristics of the retrieved memory to those typical of a source. In the studies reported here, participants had to discriminate between lies they generated and the eyewitness event. The characteristics of memories that were specific to lying - such as the cognitive operations involved in deciding how to lie and how to do so believably, or the discomfort experienced while lying (Colwell et al., 2011; Ekman, 1993) – all served as cues participants could use to discriminate between the lies and the witnessed event. On the other hand, there were other aspects of participants’ memories for their lies that likely rendered their lies similar, and hence confusable, with the witnessed event. For example, participants attempted to create believable fabrications that overlapped considerably with the witnessed event, thus rendering the two sources especially confusable (see also Mitchell & Zaragoza, 1996). Additionally, when lying, participants may have visualized their fabrications, and in doing so created more vivid memories that were likely to be misattributed to a witnessed event (Dobson & Markham, 1993; Hyman & Pentland, 1996, see also Gonsalves et al., 2004; Leynes, Grey, & Crawford, 2006 for fMRI and ERP evidence consistent with greater visualization resulting in increased source monitoring errors).

When there is uncertainty as to the source of a memory, that memory is likely to be attributed to the source that has characteristics that most resemble the memory (Bink, Marsh, & Hicks, 1999; Hoffman, 1997). In this case, the overlap in content, and the semantic and perceptual detail that lies produce may cause the lies to more closely resemble memories for the original event. Additionally, as demonstrated by the “it-had-to-be-you” effect (Johnson, Raye, Foley, & Foley, 1981) individuals can be biased to attributing a memory to an external source in the absence of memory for having generated the memory. It is also the case that memories that
are retrieved are assumed to be true (Brewer, 1996) and the nature of the task orients to the witnessed event as the source of participant’s memories. Thus, in the absence of memory of having fabricated the lie, participants in these experiments were likely prone to misattributing their lies to the witnessed event.

Another factor that increases the likelihood of source misattributions is the passage of time (Chrobak & Zaragoza, 2008; Jacoby et al., 1989). As memory decays, the features of the memory that reflect the circumstances under which the memory was acquired become weaker. As a result, making an attribution based on these weaker memory traces becomes more difficult. For example, as seen in Preliminary Study 1, false memories were not evidenced when using a 1-week retention interval because the characteristics of memory that reflected having lied were still well remembered. In contrast, when using the 4-week retention interval, as the source specifying aspects of the memory started to decay, the line between truth and lies became blurrier, thus resulting in false memories.

The broader literature on source monitoring can also explain the decrease in false assents that resulted when lies were repeated. Participants were required to repeat a previously provided lie in a manner that was consistent across multiple retellings. When repeating a lie, participants specifically had to retrieve from memory the lie they had previously provided. This retrieval process leaves a memory trace, which can itself serve as an additional cue to having lied. The retrieval cues in the recognition test were likely to revive memories of having originally lied as well as episodes of repeating the lies during subsequent repetitions (Lane, Mather, Villa, & Moriata, 2001). The lies that were repeated were also likely easier to distinguish as lies because they occurred up to 2 days following the witnessed event and were thus more temporally distinct relative to lies that were provided once which were provided within minutes of watching the
video. As a result, this temporal difference can better separate the episodes and aid source discrimination (Lindsay, 1991). Thus, for lies that were repeated, there was additional cues to the source, namely having lied, increasing the likelihood of remembering having lied, thus producing the observed effects of decreased false memories and enhanced memory for lying.

5.3. Are these genuine false memories?

One might question whether the effects of lying reported here represent genuine false memories. One possible alternative explanation is that participants assented to their lies, not because they believed they remembered witnessing them, but because they failed to heed instructions to discontinue lying during the final test. This seems unlikely for several reasons. First, participants were explicitly instructed not to continue lying during the final test. Second, if participants were simply failing to follow instructions, they should have reported their lies on the final test in all experiments. This is not what I found. In Preliminary Study 2, when participants were tested after one week, there was no evidence that lying led to false memories. Thus, it is evident that these false memories are developing over time.

Of particular relevance to the question of whether these are genuine memories is the confidence with which these false memories were held. In Experiment 1, participants endorsed significantly higher confidence when falsely assenting to their own lies than when falsely assenting to unseen details they had not earlier fabricated. Thus, for some participants, there is evidence suggesting these memories were genuine. This is especially concerning given that false reports that are provided with high confidence are more likely to be believed by others (Wells et al., 1981; Brewer & Burke, 2002).

A question that cannot be answered based on the data presented here is whether these false memories reflect false recollections or instead reflect false beliefs (the absence of conscious
recollective experience of having witnessed the fabricated information). One way to
differentiate between false beliefs and false memories is to use a measure of phenomenological
experience (e.g., Frost, LaCroix, & Sanborn, 2003; Rajaram, 1993; Rindal, Chrobak, Zaragoza,
& Weiheing, 2017; Tulving, 1985; Zaragoza & Mitchell, 1996), but this remains an open question
for future research. Further, it remains to be seen to what extent people internalize false
memories for having lied and are willing to act on them. Future research is needed to determine
whether lies that develop into false memories may impact the individual in ways that go beyond
simply endorsing the lie as truth.

5.4. Implications of Current Findings for Real World Lies

To investigate the effect of lying on false memories in a controlled manner, I asked
participants in these experiments to fabricate specific details and events regarding the same
experimenter-provided event. Thus, a legitimate question is whether the results obtained in this
controlled laboratory setting would generalize to the variety of naturally occurring lies outside of
the lab. For instance, in these studies participants did not lie to another person in a direct face-to-
face manner, but rather typed their lies in response to questions read on a computer.
Undoubtedly, lying face to face is more cognitively demanding than lying in the manner used in
this experiment as it requires simultaneous formulating, providing, and monitoring the success of
the lie (DePaulo et al., 2003; Gombos, 2006; Vrij, et al., 2008) and does not allow for the
deliberation and editing prior to providing the lie that the current paradigm allowed. It is
possible that this added cognitive demand while lying may result in poorer memory for the
source of the lies that were provided, and thus increase false memories. Alternatively, this effort
and anxiety associated with lying in a face-to-face manner may serve as a cue to having
previously fabricated, resulting in fewer false memories.
The paradigm employed here also differs considerably from most lie situations with regard to both the motivation of the liar and consequences for the liar. When an individual chooses to lie, they are typically motivated by some type of self-gain or self-preservation, and they make a conscious decision to lie for that reason. By comparison, participants in these experiments had little to gain by lying and lied only because they were asked to do so by the experimenter. It is possible that a motivation to lie could encourage false memory development because an individual that lies is motivated to forget the truth. This may result in a form of directed forgetting of the truth (Brown, 1954; Muther, 1965; see MacLeod, 1998 for review). Additionally, research has demonstrated that a person’s current attitudes and behaviors can lead to forgetting having previously held a different attitude or having engaged in discrepant behaviors (Conway & Pleydell-Pearce, 2000; Newman & Lindsay, 2009, see also Gordon et al., 2005; Henkel & Mather, 2007). Thus, an individual may likewise forget the truth because it is discrepant with their current motivations. The motivation to deceive is also likely to result in an even greater attempt to create believable lies, which would render the lies more confusable with the truthful event as well.

The experimental paradigm employed here also restricted lies to information that was witnessed, rather than having participants lie about their own personal behaviors. Thus, future studies should increase personal relevance of the lies to gain a better understanding of lying about one’s own behavior (see also Sharman & Calacouris, 2010). Another potentially important way in which the current paradigm differed from many real-world situations involving lies is that there were no consequences for a failure to deceive. In the presence of consequences, an individual that lies will be highly motivated to be consistent and believable in their lies, and is likely to rehearse their lies. As demonstrated here, such rehearsal can decrease false memory
development. The potential for negative consequences may also decrease the likelihood of false memory development, but it would not necessarily eliminate the potential for false memories. Research on false confessions (e.g., Kassin & Kiechel, 1996, Redlich & Goodman, 2003; see Kassin, 2015; Meissner, et al., 2014 for reviews) has demonstrated that even when there are negative consequences to endorsing a false memory, individuals nevertheless sometimes internalize their false confessions. Of course, it is also possible that repetition may facilitate false memory development as was seen with the free recall measure. Given that participants in this study lied at most three times over the course of 2 days, it is entirely possible that if an individual lies often enough in multiple contexts, this preferential rehearsal of the lie may increase false memories, even under circumstances that encourage careful deliberate source monitoring such as those used here. Understanding how the motivation to lie, and the consequentiality of lies might impact false memory development remain critically important issues for future research.

Despite these limitations, the current findings provide clear evidence that there are circumstances under which lying can lead to false memories, a finding that has both practical and theoretical implications. For example, the present research demonstrates that a suggestive influence is not a prerequisite for false memory development, rather, in these studies, people came to develop false memories for information that was known to be false. Given that most research on false memories comes from studies where misinformation is presented as truth (e.g., the misinformation effect; Loftus et al., 1978), the finding here that people can forget having lied is a novel contribution.

From a practical perspective, the demonstration that lies can result in false memories also raises questions about the accuracy of reports provided by people who have previously lied. For
instance, a witness who has been deceptive may be offered a plea deal. It is possible that this individual may come to believe that elements of their previous lies are true. Hence even if the individual attempts to be truthful, their accuracy may be compromised. The potential for lies to become false memories is also relevant to deception detection. An underlying assumption of the deception detection techniques such as polygraph tests (e.g., Lykken, 1959; Reid, 1947; see also Ben-Shakhar, 2002; 2012; MacLaren, 2001) and content analysis (e.g., Statement Validity Assessment; see Vrij, 2005) is that the suspect has accurate memory for crime related details even after long delays and repeated questioning. Validation studies exploring the effectiveness of polygraphs typically have ignored the quality of memory being evaluated (see Ben-Shakhar, 2012; Ioannou & Hammond, 2014 for discussion). It is possible that as a result of long delays and questioning that may have resulted in lies, false memories may result. These false memories in combination with generally poorer memory following a delay may give rise to the higher rates of false negatives (failure to detect the liar) in field studies than in laboratory studies (Ben-Shakhar, 2012). Finally, the most important relevance of the present findings is for the veracity of everyone’s memory. People lie for different reasons, with different frequencies, and in different ways, but everyone does it. This research shows that lying can have consequences, and it is likely that some of the memories that people believe to be true, began as lies.
APPENDICES

A. LIE MANIPULATION QUESTIONNAIRE

Lie items have been highlighted in yellow, as they are for participants.

1. In the beginning of the video some ladies arrived at the camp. Describe what the weather was like when they arrived.

2. While giving a speech at the beginning of the video, the head of the camp was interrupted. What caused the interruption?

3. One of the boys was giving a demonstration with a snake. Describe everything that happened during that scene.

4. After being bitten by the snake the counselor was given the anti-venom by the nurse. Where did she inject him with the anti-venom?

5. Then, all the ladies and the boys were in the dining hall having lunch. The cook brought out a cake because it was one of the boys' birthday. Before he brought out the cake, what were they having for lunch?

6. It got really noisy in the dining hall. In order to get the boys' attention, Delaney stood on a chair at the front of the room. What happened after he stood on the chair?

7. It got really noisy in the dining hall. In order to get the boys' attention, Delaney stood on a chair at the front of the room. As a practical joke, Ratface pulled a prank on Delaney causing him to fall on the floor. What did Ratface do that caused Delaney to fall to the floor?

8. After he fell, Delaney was bleeding. Where was he bleeding from?

9. In the next part, everyone was outside walking down a dirt path, and some of the ladies had a hard time walking in their high heels. Where was everyone going?

10. Then the ladies took a ride around the lake in the boats while Delaney talked about Indian folklore. What kind of hat was Delaney wearing?

11. Then the ladies took a ride around the lake in the boats. While Delaney was talking about Indian folklore the ladies screamed. What was it that scared the ladies?

12. Then the ladies swam toward the other boat in their clothes. After climbing into the boat, what did one of the ladies say she had lost?

13. After killing the snake, Delaney suggested a way to improve the camp. What did Delaney think the camp should be teaching the boys?

14. In the next part, Sullivan and some other boys were fighting by the water. They were arguing and one of the boys was really angry with Sullivan. Then the boys did something very mean to Sullivan. What did they do to Sullivan?
15. Later, Sullivan and some other boys were by the water fighting. They were arguing and Ratface was really angry with Sullivan. What did Ratface say Sullivan had stolen?

16. Then Delaney came running down to the lake to break up the fight. Delaney yelled at the boys to “scram”. What did he tell them they had to do as punishment for bullying Sullivan?

17. Delaney came running down to the lake to break up the fight. He helped Sullivan out of the water, and gave him something to help him keep warm. What was it?

18. Next, the young boys were practicing wrestling. What did Delaney request the other counselor do?

19. While wrestling one of the boys got injured. Describe the injury the boy suffered.

20. Towards the end of the movie, two of the counselors stole a canoe. Describe where they steal the canoe from.

21. Later, at night, two of the counselors stole a canoe. Where did they go and what did they do that caused them to get in so much trouble?

22. The next day, the Chief was very upset with Delaney. He had always doubted the decision to let him work there because of his past. What in Delaney's past had made the Chief worried?

23. After getting scolded by the Chief, Delaney was talking to another counselor named Moe who had a medical issue. What was his medical issue?

24. Delaney was upset by the water. Sullivan came to comfort his brother. Why was Delaney upset?
B. RECOGNITION OF THE WITNESSED EVENT TEST

Lie questions have been bolded and italicized. The details provided in each question depend on the answers provided by the participant.

1. In the beginning of the video some ladies arrived at the camp. When you watched the video, did you see sunny weather when they arrived?

2. The head of the camp was giving a speech. When you watched the video, did you see two boys bullying another boy?

3. A counselor was giving a demonstration with a snake. When you watched the video, did you see the counselor get bitten by the snake?

4. A counselor was bitten by a snake. When you watched the video, did you see the nurse give him the anti-venom in his leg just above the bite?

5. All the ladies and the boys were in the dining hall having lunch. The cook brought out a cake because it was one of the boys’ birthday. When you watched the video, did you see the boys eating chicken and vegetables with bread?

6. After that, it got really noisy in the dining hall. In order to get the boys' attention, Delaney stood on a chair at the front of the room. When you watched the video, did you see him fall?

7. Delaney stood on a chair in the dining hall and fell. When you watched the video, did you see Ratface push out the chair from underneath Delaney?

8. After Delaney fell, when you watched the video, did you see Delaney bleeding from his head?

9. In the next part, everyone was outside walking down a dirt path, and some of the ladies had a hard time walking in their high heels. When you watched the video, did you see they were all going down to the lake?

10. Then the ladies took a ride around the lake in the boats while Delaney talked about Indian folklore. When you watched the video, did you see Delaney wearing a Native American head dress?

11. Then the ladies took a ride around the lake in the boats. While Delaney was talking about Indian folklore, the ladies screamed. When you watched the video, did you see the ladies scream because there was a snake in the boat?

12. Then the ladies swam toward the other boat in their clothes. When you watched the video, did you see one of the ladies lose her hat in the lake?

13. After killing the snake, Delaney suggested a way to improve the camp. When you watched the video, did you see Delaney suggest they teach the boys wrestling?

14. The boys were arguing by the lake. When you watched the video, did you see Sullivan get pushed into the lake?
15. Then in the next part, Sullivan and some other boys were by the water fighting. They were arguing and Ratface was really angry with Sullivan. When you watched the video, did you see Ratface claim Sullivan had stolen his pocket knife?

16. Then Delaney came running down to the lake to break up the fight. Delaney yelled at the boys to scram. When you watched the video, did you see Delaney say they had to sprint back to the campsite as punishment?

17. Delaney helped Sullivan out of the water. When you watched the video, did you see Delaney give Sullivan his jacket to keep warm?

18. Next, the young boys were wrestling. When you watched the video, did you see Delaney ask a fellow counselor to look out for Sullivan?

19. The young boys were wrestling. When you watched the video, did you see a short, skinny boy with blonde hair get injured while wrestling?

20. Towards the end of the movie, two of the counselors stole a canoe. When you watched the video, did you see the counselors steal the canoe from behind the boathouse?

21. After the two counselors stole a canoe. When you watched the video, did you see the counselors go across the lake to the girls camp?

22. The next morning the Chief was very upset. When you watched the video, did you see the Chief say Delaney had used to cause trouble, steal and fight when he used to go to the camp?

23. Delaney was talking to another counselor about getting in trouble. When you watched the video, did you see the other counselor have a bad case of poison ivy?

24. Near the end of the film, Delaney is upset by the water. Sullivan tries to comfort him. When you watched the video, did you see Delaney get upset because he lost his scholarship?
C. RECOGNITION OF PRIOR RESPONSES TEST

1. In the beginning of the video some ladies arrived at the camp. When you answered the questions during day 1, did you say there was sunny weather when they arrived?

2. The head of the camp was giving a speech. When you answered the questions during day 1, did you say two boys were bullying another boy?

3. A counselor was giving a demonstration with a snake. When you answered the questions during day 1, did you say the counselor got bitten by the snake?

4. A counselor was bitten by a snake. When you answered the questions during day 1, did you say the nurse gave him the anti-venom in his leg just above the bite?

5. All the ladies and the boys were in the dining hall having lunch. The cook brought out a cake because it was one of the boys’ birthday. When you answered the questions during day 1, did you say the boys were eating chicken and vegetables with bread?

6. After that, it got really noisy in the dining hall. In order to get the boys' attention, Delaney stood on a chair at the front of the room. When you answered the questions during day 1, did you say he fell?

7. Delaney stood on a chair in the dining hall and fell. When you answered the questions during day 1, did you say Ratface pushed out the chair from underneath Delaney?

8. After Delaney fell, when you answered the questions during day 1, did you say Delaney was bleeding from his head?

9. In the next part, everyone was outside walking down a dirt path, and some of the ladies had a hard time walking in their high heels. When you answered the questions during day 1, did you say they were all going down to the lake?

10. Then the ladies took a ride around the lake in the boats while Delaney talked about Indian folklore. When you answered the questions during day 1, did you say Delaney was wearing a Native American head dress?

11. Then the ladies took a ride around the lake in the boats. While Delaney was talking about Indian folklore, the ladies screamed. When you answered the questions during day 1, did you say the ladies screamed because there was a snake in the boat?

12. Then the ladies swam toward the other boat in their clothes. When you answered the questions during day 1, did you say one of the ladies lost her hat in the lake?

13. After killing the snake, Delaney suggested a way to improve the camp. When you answered the questions during day 1, did you say Delaney suggested they teach the boys wrestling?

14. The boys were arguing by the lake. When you answered the questions during day 1, did you say Sullivan got pushed into the lake?
15. Then in the next part, Sullivan and some other boys were by the water fighting. They were arguing and Ratface was really angry with Sullivan. When you answered the questions during day 1, did you say Ratface claimed Sullivan had stolen his pocket knife?

16. Then Delaney came running down to the lake to break up the fight. Delaney yelled at the boys to scram. When you answered the questions during day 1, did you say Delaney said they had to sprint back to the campsite as punishment?

17. Delaney helped Sullivan out of the water. When you answered the questions during day 1, did you say Delaney gave Sullivan his jacket to keep warm?

18. Next, the young boys were wrestling. When you answered the questions during day 1, did you say Delaney asked a fellow counselor to look out for Sullivan?

19. The young boys were wrestling. When you answered the questions during day 1, did you say a short, skinny boy with blonde hair got injured while wrestling?

20. Towards the end of the movie, two of the counselors stole a canoe. When you answered the questions during day 1, did you say the counselors stole the canoe behind the boathouse?

21. After the two counselors stole a canoe. When you answered the questions during day 1, did you say the counselors went across the lake to the girls camp?

22. The next morning the Chief was very upset. When you answered the questions during day 1, did you say the Chief said Delaney had used to cause trouble, steal and fight when he used to go to the camp?

23. Delaney was talking to another counselor about getting in trouble. When you answered the questions during day 1, did you say the other counselor had a bad case of poison ivy?

24. Near the end of the film, Delaney is upset by the water. Sullivan tries to comfort him. When you answered the questions during day 1, did you say Delaney got upset because he lost his scholarship?
D. ADDITIONAL ANALYSES

Experiment 1

Confidence in Recognition of Previous Responses. Confidence judgments were scored by transforming the slider position into a score from 0 (“Not at all confident”) to 100 (“Completely confident”). Confidence in providing a response were categorized based on accuracy of a response (correctly accept having provided a response vs. incorrectly reject having provided a response). Repetition increased the confidence with which participants correctly identified their prior responses. Lies in the 3x condition were correctly identified with greater confidence (M = 87.2) than in the 1x condition (M = 75.9), t(92) = 5.96, p < .001, dz = .67.\(^7\) However, there was no significant effect of repetition on confidence when incorrectly rejecting having provided a prior response, as confidence when rejecting having provided responses to items in the 1x condition (M = 65.4) did not differ from the 3x condition (M = 70.1), t(11) = 1.07, p = .306.\(^8\)

Experiment 2

Confidence in Recognition of Previous Responses. As seen in the left column of Table 10, timing of the repetition did not affect the confidence with which participants accurately remembered having provided a response, as items in the 2x-Immediate and 2x-Delayed conditions did not differ, t(88) = .643, p = .522. Accordingly, for purposes of assessing the effects of number of repetitions, I collapsed across the timing conditions. There was an effect of repetition with lies that were repeated resulting in greater confidence for having provided the

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\(^7\) Analyzing confidence conditional on accuracy results in some participants not having an observation in every condition. Thus, analyses for accurate confidence are conducted only with those providing a confidence judgment for every item type. This is true for all confidence judgments in this appendix. The number of participants in each analysis is available through the degrees of freedom.
\(^8\) Given that this is a conditional analysis, and participants had low rates of errors, the majority of participants did not make errors in all of the varying Item Type conditions. Accordingly, throughout this appendix, all analyses of confidence when incorrect use the 12 critical Lie items as the random effect rather than participant.
response: Confidence in responses in the 1x condition was lower than both the 2x condition, \( t(88) = 3.964, p < .001, dz = .46 \), and 3x conditions, \( t(88) = 4.47, p < .001, dz = .46 \). There was also a trend towards more confidence when remembering providing responses 3x relative to 2x, but this difference was not reliable, \( t(88) = 1.89, p = .063, dz = .20 \).

Table 10

Confidence in Memory for Providing a Response as a Function of Accuracy of Response (Remember Providing vs. Incorrectly Reject Providing) and Item Type (1x, 2x, 3x, 2x-Immediate, 2x-Delayed) in Experiment 2 (Standard Error in Parenthesis).

<table>
<thead>
<tr>
<th>Item type</th>
<th>Remember Providing</th>
<th>Reject Providing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M ) (SE)</td>
<td>( M ) (SE)</td>
</tr>
<tr>
<td>2x-Immediate</td>
<td>81.2 (2.2)</td>
<td>64.5 (3.3)</td>
</tr>
<tr>
<td>2x-Delayed</td>
<td>82.3 (2.1)</td>
<td>67.0 (3.4)</td>
</tr>
<tr>
<td>1x</td>
<td>71.0 (2.8)</td>
<td>60.1 (2.4)</td>
</tr>
<tr>
<td>2x</td>
<td>81.1 (1.9)</td>
<td>65.7 (1.6)</td>
</tr>
<tr>
<td>3x</td>
<td>84.3 (2.1)</td>
<td>70.0 (4.0)</td>
</tr>
</tbody>
</table>

As seen in the right column of Table 10, timing of the repetition did not have a significant effect on the confidence with which participants incorrectly rejected providing a response, as the 2x-Immediate and 2x-Delayed conditions did not reliably differ, \( t(11) = .45, p = .665 \).

Accordingly, for purposes of assessing the effects of number of repetitions, I collapsed across the timing conditions. There was an effect of repetition as lies that were repeated were incorrectly rejected as having been provided with more confidence than those provided once, as the 1x condition evidenced lower confidence relative to both the 2x condition, \( t(11) = 2.73, p = .020, dz \)
= .79, and the 3x condition, \( t(11) = 2.27, p = .044, dz = .65 \). The 2x and 3x conditions did not reliably differ, \( t(11) = 1.01, p = .333 \).

**Confidence in Memory for Lying.** As seen in the left column of Table 11, timing of the repetition did affect the confidence with which participants accurately remembered lying, as participants were more confident when remembering having lied for lies that were repeated after a delay than those repeated immediately, \( t(82) = 2.35, p = .021, dz = .26 \). Repetition increased the confidence with which participants corrected remembered lying: The 1x condition was corrected identified with lower confidence than the 2x-Immediate \( (t(82) = 2.23, p = .028, dz = .24) \), 2x-Delayed \( (t(82) = 3.60, p < .001, dz = .39) \), and 3x conditions \( (t(82) = 4.59, p < .001, dz = .50) \). Providing the lie for a third time also increased the confidence for correctly remembering having lied, but only relative to the 2x-Immediate condition (2x-Immediate vs. 3x: \( t(82) = 2.73, p = .008, dz = .30 \); 2x-Delayed vs. 3x: \( t(82) = .76, p = .45 \)).

As seen in the right column of Table 11, timing of the repetition did not have a significant effect on the confidence with which participants falsely rejected having provided a lie. Confidence when rejecting having lied did not differ in the 2x-Immediate and 2x-Delayed conditions, \( t(11) = .09, p = .931 \). Accordingly, for purposes of assessing the effects of number of repetitions, I collapsed across the timing conditions. Likewise, neither repetition nor number of repetitions had an effect as the 1x, 2x, and 3x conditions did not reliably differ from each other (1x vs. 2x, \( t(11) = .09, p = .932 \); 1x vs. 3x, \( t(11) = 1.48, p = .166 \); 2x vs. 3x, \( t(11) = 1.37, p = .199 \)).
Table 11

Confidence in Memory for Lying as a Function of Accuracy of Response (Remember Lying vs. Incorrectly Reject Lying) and Item Type (1x, 2x, 3x, 2x-Immediate, 2x-Delayed) in Experiment 2 (Standard Error in Parenthesis).

<table>
<thead>
<tr>
<th>Item type</th>
<th>Remember Lying</th>
<th>Reject Lying</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SE)</td>
<td>M (SE)</td>
</tr>
<tr>
<td>2x-Immediate</td>
<td>79.9 (2.4)</td>
<td>58.9 (4.5)</td>
</tr>
<tr>
<td>2x-Delayed</td>
<td>83.4 (2.0)</td>
<td>58.5 (2.5)</td>
</tr>
<tr>
<td>1x</td>
<td>74.9 (2.5)</td>
<td>59.0 (3.6)</td>
</tr>
<tr>
<td>2x</td>
<td>81.7 (2.0)</td>
<td>58.7 (2.7)</td>
</tr>
<tr>
<td>3x</td>
<td>84.3 (2.1)</td>
<td>67.0 (4.5)</td>
</tr>
</tbody>
</table>

Experiment 3

Confidence in Recognition of Previous Responses. As seen in left column of Table 12, repetition increased the confidence with which participants correctly identified their prior responses. Lies in the 3x condition were correctly identified as having been provided with greater confidence than in the 1x condition, $t(77) = 5.86, p < .001, dz = .68$. While numerically, rejecting items that were lied about repeatedly was done with greater confidence than items that were lied about once, this difference was not reliable, $t(11) = 1.78, p = .103$. 
Table 12

Confidence in Memory for Providing a Response as a Function of Accuracy of Response
(Remember Providing vs. Incorrectly Reject Providing) and Item Type (1x vs. 3x) in Experiment 3 (Standard Error in Parenthesis).

<table>
<thead>
<tr>
<th>Item type</th>
<th>Remember Providing</th>
<th>Reject Providing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SE)</td>
<td>M (SE)</td>
</tr>
<tr>
<td>1x</td>
<td>73.3 (2.2)</td>
<td>61.2 (2.0)</td>
</tr>
<tr>
<td>3x</td>
<td>88.0 (1.7)</td>
<td>70.7 (3.8)</td>
</tr>
</tbody>
</table>

Confidence in Memory for Lying. As seen in Table 13, confidence in memory for lying was categorized based on accuracy of a response (correctly remember lying versus incorrectly reject having lied). Repetition increased the confidence with which participants correctly identified having lied. Lies in the 3x condition were correctly identified as lies with more confidence than in the 1x condition, $t(77) = 6.15, p < .001, dz = .70$. However, repetition did not increase the confidence with which participants mistakenly rejected having lied, $t(11) = 1.37, p = .198$. 
Table 13

*Confidence in Memory for Lying as a Function of Accuracy of Response (Remember Lying vs. Incorrectly Reject Lying) and Item Type (1x vs. 3x) in Experiment 3 (Standard Error in Parenthesis).*

<table>
<thead>
<tr>
<th>Item type</th>
<th>Remember Lying</th>
<th>Reject Lying</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$ (SE)</td>
<td>$M$ (SE)</td>
</tr>
<tr>
<td>1x</td>
<td>73.0 (2.4)</td>
<td>61.3 (2.6)</td>
</tr>
<tr>
<td>3x</td>
<td>87.4 (2.0)</td>
<td>68.2 (4.0)</td>
</tr>
</tbody>
</table>
E. EXPERIMENT 2 RECOGNITION OF THE WITNESSED EVENT TEST

12 additional not asked control items bolded. These items do not vary by participant.

1. In the beginning of the video, the boys are gathered outside. When you watched the video, did you see Miss Gibson give a speech to the campers?

2. The Chief and Miss Gibson were giving a speech to all of the campers. When you watched the video, did you see someone throw something at Miss Gibson?

3. In the beginning of the video some ladies arrived at the camp. When you watched the video, did you see beautiful sunny weather when they arrived?

4. The head of the camp was giving a speech. When you watched the video, did you see Rateface bullying another boy?

5. A counselor was giving a demonstration with a snake. When you watched the video, did you see a counselor get bitten by a snake?

6. A counselor was bitten by a snake. When you watched the video, did you see the nurse give him the anti-venom in his lower leg?

7. All the ladies and the boys were in the dining hall having lunch. The cook brought out a cake because it was one of the boys’ birthday. When you watched the video, did you see the boys eating chicken nuggets and french fries?

8. After that, it got really noisy in the dining hall. In order to get the boys’ attention, Delaney stood on a chair at the front of the room. When you watched the video, did you see Delaney fall off the chair onto the table and knock the food off onto the floor?

9. Delaney stood on a chair in the dining hall and fell. When you watched the video, did you see Ratface and Delaney yelling at each other about what had happened?

10. After Delaney fell, when you watched the video, did you see Delaney bleeding from his nose and mouth?

11. After Delaney fell off the chair, when you watched the video, did you see Miss Gibson reprimand Delaney for falling?

12. In the next part, everyone was outside walking down a dirt path, and some of the ladies had a hard time walking in their high heels. When you watched the video, did you see everyone walking down to the lake?

13. Everyone was walking to the boats. When you watched the video, did you see a bear in the woods by the path?

14. The ladies and counselors are getting into the boats by the lake while the campers watched. When you watched the video, did you see a camper fall into water and almost drown?
15. Then the ladies took a ride around the lake in the boats while Delaney talked about Indian folklore. When you watched the video, did you see Delaney wearing a scout hat?

16. Then the ladies took a ride around the lake in the boats. While Delaney was talking about Indian folklore, the ladies screamed. When you watched the video, did you see the ladies scream when they saw a snake in the boat?

17. Then the ladies swam toward the other boat in their clothes. When you watched the video, did you see one of the ladies lose her pearl bracelet in the lake?

18. After the ladies jumped out of the boat, when you watched the video, did you see Delaney kill the snake that was in the boat?

19. After killing the snake, Delaney suggested a way to improve the camp. When you watched the video, did you see Delaney suggest they teach the boys wrestling?

20. The Chief congratulates Delaney for his bravery. When you watched the video, did you see Delaney accidentally knock the Chief into the water?

21. The boys were arguing by the lake. When you watched the video, did you see Ratface push Sullivan into the water and then ducking his head under?

22. Then in the next part, Sullivan and some other boys were by the water fighting. They were arguing and Ratface was really angry with Sullivan. When you watched the video, did you see Ratface claim Sullivan had stolen his Superman comic?

23. Then Delaney came running down to the lake to break up the fight. Delaney yelled at the boys to scram. When you watched the video, did you see Delaney tell the boys to run laps around camp as punishment?

24. Delaney helped Sullivan out of the water. When you watched the video, did you see Delaney give Sullivan his shirt to keep warm?

25. Delaney was talking to Sullivan after he got him out of the water. When you watched the video, did you see Sullivan say he had no friends?

26. Next, the young boys were wrestling. When you watched the video, did you see Delaney ask a fellow counselor to give Sullivan special attention?

27. The young boys were wrestling. When you watched the video, did you see a boy injure his nose while wrestling?

28. The counselors were in the cabins. When you watched the video, did you see the counselors playing chess?

29. Towards the end of the movie, two of the counselors stole a canoe. When you watched the video, did you see the counselors steal the canoe from a boat storage building?

30. The two counselors were stealing the canoe. When you watched the video, did you see someone listening to baseball in the boathouse?
31. After the two counselors stole a canoe. When you watched the video, did you see the counselors take the canoe to the girls' camp?

32. The next morning the Chief was very upset. When you watched the video, did you see the Chief say Delaney had struggled with substance abuse in his past?

33. Delaney was talking to another counselor about getting in trouble. When you watched the video, did you see the other counselor have a case of poison ivy?

**34. Delaney was talking to another counselor about getting in trouble. When you watched the video, did you see the other counselor accuse Delaney of ratting him out to the Chief?**

35. Near the end of the film, Sullivan comes to talk to Delaney by the water. When you watched the video, did you see Sullivan say he had passed his tadpole swimming test?

36. Near the end of the film, Delaney is upset by the water. Sullivan tries to comfort him. When you watched the video, did you see Delaney say that he was no longer receiving his scholarship?
F. MEMORY FOR LYING TEST

1. In the beginning of the video, the boys are gathered outside. When you answered the questions on day 1, did you lie by saying Miss Gibson gave a speech to the campers?

2. The Chief and Miss Gibson were giving a speech to all of the campers. When you answered the questions on day 1, did you lie by saying someone threw something at Miss Gibson?

3. In the beginning of the video some ladies arrived at the camp. When you answered the questions on day 1, did you lie by saying there was beautiful sunny weather when they arrived?

4. The head of the camp was giving a speech. When you answered the questions on day 1, did you lie by saying Rateface was bullying another boy?

5. A counselor was giving a demonstration with a snake. When you answered the questions on day 1, did you lie by saying a counselor got bitten by a snake?

6. A counselor was bitten by a snake. When you answered the questions on day 1, did you lie by saying the nurse gave him the anti-venom in his lower leg?

7. All the ladies and the boys were in the dining hall having lunch. The cook brought out a cake because it was one of the boys’ birthday. When you answered the questions on day 1, did you lie by saying the boys were eating chicken nuggets and french fries?

8. After that, it got really noisy in the dining hall. In order to get the boys’ attention, Delaney stood on a chair at the front of the room. When you answered the questions on day 1, did you lie by saying Delaney fell off the chair onto the table and knocked the food off onto the floor?

9. Delaney stood on a chair in the dining hall and fell. When you answered the questions on day 1, did you lie by saying Ratface and Delaney were yelling at each other about what had happened?

10. After Delaney fell, when you answered the questions on day 1, did you lie by saying Delaney was bleeding from his nose and mouth?

11. After Delaney fell off the chair, when you answered the questions on day 1, did you lie by saying Miss Gibson reprimanded Delaney for falling?

12. In the next part, everyone was outside walking down a dirt path, and some of the ladies had a hard time walking in their high heels. When you answered the questions on day 1, did you lie by saying everyone was walking down to the lake?

13. Everyone was walking to the boats. When you answered the questions on day 1, did you lie by saying a bear was in the woods by the path?

14. The ladies and counselors are getting into the boats by the lake while the campers watched. When you answered the questions on day 1, did you lie by saying a camper fell into water and almost drowned?
15. Then the ladies took a ride around the lake in the boats while Delaney talked about Indian folklore. When you answered the questions on day 1, did you lie by saying Delaney was wearing a scout hat?

16. Then the ladies took a ride around the lake in the boats. While Delaney was talking about Indian folklore, the ladies screamed. When you answered the questions on day 1, did you lie by saying the ladies screamed when they saw a snake in the boat?

17. Then the ladies swam toward the other boat in their clothes. When you answered the questions on day 1, did you lie by saying one of the ladies lost her pearl bracelet in the lake?

18. After the ladies jumped out of the boat, when you answered the questions on day 1, did you lie by saying Delaney killed the snake that was in the boat?

19. After killing the snake, Delaney suggested a way to improve the camp. When you answered the questions on day 1, did you lie by saying Delaney suggested they teach the boys wrestling?

20. The Chief congratulates Delaney for his bravery. When you answered the questions on day 1, did you lie by saying Delaney accidentally knocked the Chief into the water?

21. The boys were arguing by the lake. When you answered the questions on day 1, did you lie by saying Ratface pushed Sullivan into the water and then ducked his head under?

22. Then in the next part, Sullivan and some other boys were by the water fighting. They were arguing and Ratface was really angry with Sullivan. When you answered the questions on day 1, did you lie by saying Ratface claimed Sullivan had stolen his Superman comic?

23. Then Delaney came running down to the lake to break up the fight. Delaney yelled at the boys to scram. When you answered the questions on day 1, did you lie by saying Delaney told the boys to run laps around camp as punishment?

24. Delaney helped Sullivan out of the water. When you answered the questions on day 1, did you lie by saying Delaney gave Sullivan his shirt to keep warm?

25. Delaney was talking to Sullivan after he got him out of the water. When you answered the questions on day 1, did you lie by saying Sullivan said he had no friends?

26. Next, the young boys were wrestling. When you answered the questions on day 1, did you lie by saying Delaney asked a fellow counselor to give Sullivan special attention?

27. The young boys were wrestling. When you answered the questions on day 1, did you lie by saying a boy injured his nose while wrestling?

28. The counselors were in the cabins. When you answered the questions on day 1, did you lie by saying the counselors were playing chess?

29. Towards the end of the movie, two of the counselors stole a canoe. When you answered the questions on day 1, did you lie by saying the counselors stole the canoe from a boat storage building?
30. The two counselors were stealing the canoe. When you answered the questions on day 1, did you lie by saying someone was listening to baseball in the boathouse?

31. After the two counselors stole a canoe. When you answered the questions on day 1, did you lie by saying the counselors took the canoe to the girls’ camp?

32. The next morning the Chief was very upset. When you answered the questions on day 1, did you lie by saying the Chief said Delaney had struggled with substance abuse in his past?

33. Delaney was talking to another counselor about getting in trouble. When you answered the questions on day 1, did you lie by saying the other counselor had a case of poison ivy?

34. Delaney was talking to another counselor about getting in trouble. When you answered the questions on day 1, did you lie by saying the other counselor accused Delaney of ratting him out to the Chief?

35. Near the end of the film, Sullivan comes to talk to Delaney by the water. When you answered the questions on day 1, did you lie by saying Sullivan said he had passed his tadpole swimming test?

36. Near the end of the film, Delaney is upset by the water. Sullivan tries to comfort him. When you answered the questions on day 1, did you lie by saying Delaney said that he was no longer receiving his scholarship?
G. EXPERIMENT 3 RECOGNITION OF THE WITNESSED EVENT TEST

1. In the beginning of the video, the boys are gathered outside. When you watched the video, did you see Miss Gibson give a speech?

2. The Chief and Miss Gibson were giving a speech to all of the campers. When you watched the video, did you see someone throw something?

3. In the beginning of the video some ladies arrived at the camp. When they arrived, when you watched the video, did you see sunny weather?

4. The head of the camp was giving a speech. When you watched the video, did you see boys picking on another boy?

5. A counselor was giving a demonstration with a snake. When you watched the video, did you see the counselor get bitten?

6. A counselor was bitten by a snake. When you watched the video, did you see the nurse give him the anti-venom in his leg?

7. All the ladies and the boys were in the dining hall having lunch. The cook brought out a cake because it was one of the boys’ birthday. When you watched the video, did you see the boys eating pizza?

8. After that, it got really noisy in the dining hall. In order to get the boys’ attention, Delaney stood on a chair at the front of the room. When you watched the video, did you see Delaney fall?

9. Delaney stood on a chair in the dining hall and fell. When you watched the video, did you see Delaney fall because Ratface pull his chair?

10. After Delaney fell, when you watched the video, did you see Delaney’s arm bleeding?

11. After Delaney fell off the chair, when you watched the video, did you see Miss Gibson reprimand Delaney?

12. In the next part, everyone was outside walking down a dirt path, and some of the ladies had a hard time walking in their high heels. When you watched the video, did you see them going to the boats?

13. Everyone was walking to the boats. When you watched the video, did you see a bear?

14. The ladies and counselors are getting into the boats by the lake while the campers watched. When you watched the video, did you see a camper fall into water?

15. Then the ladies took a ride around the lake in the boats while Delaney talked about Indian folklore. When you watched the video, did you see Delaney wearing a cowboy hat?
16. Then the ladies took a ride around the lake in the boats. While Delaney was talking about Indian folklore, the ladies screamed. When you watched the video, did you see the ladies scream because of a snake?

17. Then the ladies swam toward the other boat in their clothes. When you watched the video, did you see one of the ladies lose her watch?

18. After the ladies jumped out of the boat, when you watched the video, did you see Delaney kill the snake?

19. After killing the snake, Delaney suggested a way to improve the camp. When you watched the video, did you see Delaney suggest they teach the boys wrestling?

20. The Chief congratulates Delaney for his bravery. When you watched the video, did you see Delaney accidentally knock over the Chief?

21. The boys were arguing by the lake. When you watched the video, did you see Ratface pushing Sullivan?

22. Then in the next part, Sullivan and some other boys were by the water fighting. They were arguing and Ratface was really angry with Sullivan. When you watched the video, did you see Ratface claim Sullivan had stolen his watch?

23. Then Delaney came running down to the lake to break up the fight. Delaney yelled at the boys to scram. When you watched the video, did you see Delaney say they had to clean the cabins?

24. Delaney helped Sullivan out of the water. When you watched the video, did you see Delaney give Sullivan a blanket?

25. Delaney was talking to Sullivan after he got him out of the water. When you watched the video, did you see Sullivan say he had no friends?

26. Next, the young boys were wrestling. When you watched the video, did you see Delaney ask a fellow counselor to keep an eye on Sullivan?

27. The young boys were wrestling. When you watched the video, did you see a boy injure his arm?

28. The counselors were in the cabins. When you watched the video, did you see the counselors playing chess?

29. Towards the end of the movie, two of the counselors stole a canoe. When you watched the video, did you see the counselors steal the boat from outside the boathouse?

30. The two counselors were stealing the canoe. When you watched the video, did you see someone in the boathouse listening to baseball?
31. After the two counselors stole a canoe. When you watched the video, did you see the counselors go to the girls' camp?

32. The next morning the Chief was very upset. When you watched the video, did you see the Chief say Delaney had a history of fighting?

33. Delaney was talking to another counselor about getting in trouble. When you watched the video, did you see the other counselor have a case of poison ivy?

34. Delaney was talking to another counselor about getting in trouble. When you watched the video, did you see the other counselor accuse Delaney of ratting him out?

35. Near the end of the film, Sullivan comes to talk to Delaney by the water. When you watched the video, did you see Sullivan say he had passed his swimming test?

36. Near the end of the film, Delaney is upset by the water. Sullivan tries to comfort him. When you watched the video, did you see Delaney say he lost his scholarship?
REFERENCES


Meissner, C. A., Redlich, A. D., Michael, S. W., Evans, J. R., Camilletti, C. R., Bhatt, S., & Brandon, S. (2014). Accusatorial and information-gathering interrogation methods and
their effects on true and false confessions: A meta-analytic review. *Journal of Experimental Criminology, 10*(4), 459-486.


