

Lying and memory in forensic interviews: The influence of voluntary deception and repeated interviews on memory for the truth

by

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A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
DOCTOR OF PHILOSOPHY

Major: Psychology

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Iowa State University

Ames, Iowa

2020

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ACKNOWLEDGMENTS

First, I would like to thank my major professor, Dr. Christian Meissner, for all of the guidance, support, and advice throughout my time in graduate school. I am so grateful that I was able to complete my doctoral work under your supervision, and I could not have asked for a better advisor. I owe so much of who I am as a researcher, writer, and reviewer to you. Thank you for challenging me to think bigger. And of course, for encouraging me to find somewhere to publish a shrug emoji (even though it did not make it into the full text of this dissertation – 🙄).

I would also like to thank my committee members: Dr. Jason Chan, Dr. Shana Carpenter, Dr. Gary Wells, and Dr. Amie Zarling for all of your thoughtful comments and advice throughout this process. Your insights have strengthened the quality of my work, and I appreciate all of your time and effort spent meeting with me, providing feedback, and writing letters. Thank you to Dr. Jason Chan for welcoming me to your lab meetings, for sharing the secrets of poster design, and for your extreme patience while I write up our seven-experiment collaboration. I would also like to thank Dr. Jessica Swanner, the Psychology and Law group, and the Cognitive area faculty members as well. I have learned so much from all of you and am very thankful that I had the opportunity to do so.

I am also grateful to have met friends in graduate school who have become family. Krista and Sara, it goes without saying that your support and friendship mean the world to me. Thank you for all the coffee breaks, cross country road trips, sightseeing adventures, and Star Wars midnight premieres. I would also like to extend my gratitude to Alex, Mozhan, Kelly, Mallory, Brennan, Sam, and Kayla – your friendship has been invaluable. Finally, I want to thank my parents and sisters for being an unwavering source of encouragement and support, and especially

for coming to visit me even during Iowa winters. I would not be where I am today, personally or professionally, without any of you.

ABSTRACT

Repeated interviews are common during an investigation, and perceived consistency between multiple statements is associated with an interviewee's credibility. Furthermore, research has shown that the act of lying can affect a person's memory for what truthfully occurred. The current study assessed the influence of lying on memory during initial and repeated interviews, as well as how an interviewer's approach might affect between-statement consistency for true and false statements. In Experiment 1, participants performed actions, and then later lied or told the truth by describing these actions or by denying they had performed them. After each statement, participants provided judgments of learning for their lies and truths. One week later, participants were tested on their source memory. In Experiment 2, I adapted this procedure to manipulate whether participants were able to choose the items that they would lie and tell the truth about, as well as whether participants provided memory prediction ratings. In Experiments 1 and 2, people believed they would remember – and did actually remember – truthfully rehearsed actions better, especially when they described actions. However, in Experiment 2, there were no differences for people who were able to exert volition over their lies and truths with respect to source memory accuracy or statement consistency. In Experiment 3, participants performed a scavenger hunt at four different locations on campus and then were either dismissed or interviewed (with a reverse order instruction or a control interview) about their activities. Participants chose two of the locations to tell the truth about and then created a lie about activities in two other buildings that had not been visited. One week later, all participants provided a second free recall statement about their activities during the scavenger hunt, and then a final truthful description of both areas that were visited during the scavenger hunt. Truthfully rehearsed experiences were associated with more accurate recall of information learned during

the scavenger hunt as well as more consistent statements. The control interview led to initially more detailed statements, but more inconsistencies in the form of omissions.

CHAPTER 1. INTRODUCTION

The perception of inconsistency as an indicator of deception can have severe consequences for those implicated within the criminal justice system. During the course of an investigation, it is common for a suspect to be interviewed on multiple occasions – in one sample, investigators reported interviewing suspects an average of *three* separate times (Kassin, Leo, Meissner, Richman, Colwell, Leach, & La Fon, 2007). Importantly, a suspect who is repeatedly interviewed must be as consistent as possible to be perceived as credible (Fisher, Vrij, & Leins, 2013). For instance, inconsistency across statements led prosecutors to pursue allegations of repeated deception by Paul Manafort in the Mueller investigation (Hsu & Weiner, 2019). In addition to contradictions that arose between Manafort’s statements and the evidence obtained by the special counsel, Manafort was inconsistent across several interviews regarding the charge of conspiring with a Russian aide (Helderman, Weiner, & Hsu, 2018). After pleading guilty to the charge, Manafort retracted his plea in a subsequent interview, and then on a later occasion ultimately admitted that his initial plea was truthful. These discrepancies between both the acquired evidence and between Manafort’s own statements led Judge Amy Jackson to rule that this “deception” violated Manafort’s plea agreement. As a result, prosecutors were not compelled to recommend leniency and Manafort was sentenced more harshly, compared to if he had honored his plea agreement and fully cooperated with the investigation (LaFranier, 2019).

In the current dissertation, I explore the interaction between memory and inconsistency, particularly in the context of deception in repeated interviews. Across multiple interviews, guilty suspects must use these occasions to convince an interviewer that they are innocent. In contrast, innocent suspects have the chance to prove their innocence repeatedly. Alterations to one’s statement, regardless of the intention behind them, are often used to question the validity of a

witness (Brewer, Potter, Fisher, Bond, & Luszcz, 1999), as well as to identify a person who may be providing a false statement (e.g., Granhag & Strömwall, 2001). Repeated interviews therein pose a quandary for both innocent and guilty suspects. Innocent suspects are challenged with maintaining between-statement consistency, which can be difficult for truth-tellers who are strategically forthcoming (Hartwig & Granhag, 2008). Inconsistencies can appear, for instance, when a person offers new information that had not been provided in a previous statement (termed *reminiscence*), or when a person fails to recall information that had been provided in a previous statement (termed *oblivescence*; Erdelyi, 2010). Reminiscence and oblivescence thus reflect natural underlying cognitive processes that can arise as a result of repeated retrieval (Ballard, 1913). Should a truth-teller remember some information after an initial interview, providing those *reminiscent* details might lead an investigator to question their credibility.

Guilty suspects, on the other hand, will need to remember a previously provided false statement in order to maintain consistency across interviews. There are two types of false statements that a guilty suspect can provide: either a false description or a false denial of an event. In the case of the former, a suspect may describe an event or an experience differently than how it actually occurred or describe an event that never occurred. Lying, in this instance, requires the suspect to confabulate details to create a plausible account. Alternatively, the suspect may lie by falsely denying that an event occurred, despite the fact that the event did take place. Psychological research has shown that the type of false statement that is provided can carry implications for one's ability to remember that lie, and that the act of lying can change a person's memory for the truth (see Dianiska, Cash, Lane, & Meissner, 2019). As such, the manner in which a guilty suspect provides a false statement could influence not only their ability to appear

credible (i.e., consistent) on subsequent interviews, but also their memory for what truthfully occurred.

Regardless of guilt, the interaction between lying and memory has implications for a suspect's experience with the criminal justice system. For instance, whether guilty suspects are able to maintain their false narratives over time could have significant downstream consequences that lead to their conviction. On a subsequent interview, the ability to remember (and repeat; Granhag & Strömwall, 1999) what was said in an initial interview is extremely important given the common perception that inconsistency is associated with deception (Vredeveldt, van Koppen, & Granhag, 2014). Furthermore, the act of telling a lie itself might change a suspect's memory for their own experience. That is, suspects could come to believe their own lies as the truth, and falsely remember (or in an extreme case, falsely confess to; Kassin & Gudjonsson, 2004) something that did not occur.

Reliance upon consistency as an indicator of truth or deception can also negatively affect innocent suspects who seek to be cooperative with an interviewer. Truth-tellers' statements will be grounded in their memory for an event, and because memory is reconstructive, errors might be likely to appear (Bartlett, 1932). Should an innocent person provide an initially mistaken statement due to faulty memory and come to realize their error, any attempt to correct their statement by providing contradictory information might lead to suspicion as a result of that inconsistency (Crozier, Strange, & Luke, 2017). Therefore, unwarranted mistrust of an inconsistent (but innocent) alibi provider could potentially redirect the course of an investigation away from pursuing a different suspect. Herein, it is important that investigators consider the type of inconsistency and the role of memory inherent to the recall attempt. Despite advantages associated with the use of certain memory enhancing or strategic questioning strategies

(discussed below), the impact of such tactics have not yet been fully assessed with respect to possible misattributions of deception and guilt due to inconsistencies across statements.

In this dissertation I focus on the influence of lying on memory during initial and subsequent (i.e., repeated) interviews. Specifically, I explored the role of volitional deception and the manner in which a suspect is interviewed on interviewees' accuracy and consistency across multiple statements. I conducted three experiments that extended the current literature from the laboratory into more ecologically valid contexts. Below, I first review the basic psychological processes thought to be involved in the act of deception, as well as proposed theoretical accounts of when and how the act of deception affects memory. Next, I describe the primary paradigms used to examine the interaction between deception and memory, and discuss the potential role of volition as a moderator of that interaction. I then review research on consistency across repeated interviews for both truth-tellers and liars and discuss how conventional investigative interviewing techniques might increase or decrease inconsistencies.

Cognitive Processes Involved in Deception

Recent theoretical and empirical work has explored the basic processes involved in generating a lie (Sporer, 2016; Vrij 2015; Walczyk, Roper, Seeman, & Humphrey, 2003; Walczyk, Harris, Duck, & Mulay, 2014). Further, neural correlates and contributing brain regions implicated in deception have been identified (Abe, 2009; Christ, Van Essen, Watson, Brubaker, & McDermott, 2009; Lisofsky, Kazzer, Heekeren, Prehn, 2014). Cognitive theories of deception suggest that generating a lie requires more time to produce than telling the truth – a hypothesis that has been supported by numerous reaction-time deception paradigms (see Suchotzki et al., 2017).

Walczyk et al. (2003) proposed that three events precede a deceptive response to a question. First, semantic and episodic information that is related to the truth is activated. Next, a

respondent must decide to lie or tell the truth in order to further one's own self-interest. Finally, a plausible lie is constructed based on the related semantic and episodic information that has been retrieved from memory. This three-step process ultimately increases the response time required to generate a deceptive statement, when compared with the time required to generate a truthful statement (Activation-Decision-Construction Model; ADCM). Across three experiments, Walczyk and colleagues demonstrated that participants took longer to respond to questions that probed personal, factual information (e.g., "Do you believe in God?" or "What is your favorite alcoholic beverage?") when they were providing deceptive responses. This was especially pronounced when the questions probed potentially embarrassing information (about which people would be more likely to lie).

A more recent update to the ADCM model of deception incorporated additional contextual factors, such as motivational and emotional components, in order to model high-stakes deception (Activation-Decision-Construction-Action theory or ADCAT; Walczyk et al., 2014). The first step in this theory involves some aspect of the social context activating a truthful response, such as when a detective explicitly asks a question during an investigative interview. The decision component involves a calculated choice to provide a deceptive response over a truthful response. When making this choice, a respondent must consider the costs and benefits associated with lying (versus telling the truth) and decide if being deceptive will produce a more favorable outcome. Recent empirical tests of propositions made by ADCAT suggest that the decision to lie may be more related to a respondent's motivation and the expected value of telling the truth (Masip, Blandón-Gitlin, de la Riva, & Herrero, 2016), rather than the expected value of being deceptive (cf. Walczyk, Tcholakian, Newman, & Duck, 2016; Cassidy, Wyman, Talwar, & Akehurst, 2019).

After deciding to lie, the respondent then constructs the deceptive response. The way in which a respondent constructs the lie (e.g., by denying or by describing) will vary in the amount of cognitive load imposed by the construction process. During this stage, a liar will manipulate the information in order to strategically present a plausible lie to maximize its believability. Finally, the action component involves the respondent delivering the lie to the receiver. To do so effectively, the respondent will inhibit the automatically-activated truthful response (if it is required) and reduce extraneous load by engaging in self-regulatory behaviors (e.g., by breaking eye contact; Vrij, Mann, Fisher, Leal, Milne, & Bull, 2008).

Sporer (2016) has criticized the tendency in the field to prioritize manipulating cognitive load at the expense of studying the underlying cognitive processes involved in such manipulations. For instance, manipulating cognitive load by requiring an interviewee to recall an event in reverse-chronological order is not the same as investigating the processes that are induced when an event is recalled in reverse-chronological order. Consequently, Sporer introduced a working memory model of deception to explain differences in lie and truth generation based on these processes. From a working memory perspective (Baddeley, 2012), imposing cognitive load should make it more difficult for liars to engage in self-regulatory behaviors and control gestures that would indicate nervousness. Further, in line with other models of deception, liars will indeed take longer to respond than truth-tellers. According to Sporer, however, they will do so because truth-tellers are better able to capitalize on existing memory traces and are therefore *faster* to respond. Liars, in contrast, must either invent entirely new stories or rely on past experiences or existing scripts, which will be especially taxing when these experiences or scripts are absent from long-term memory.

Neurological Processes Involved in Deception

With respect to neurological findings, the prefrontal cortex and anterior cingulate cortex are commonly implicated in the production of a deceptive response (Abe, 2011; Christ et al., 2009). For instance, Abe and colleagues (2009) assessed performance on a yes/no memory task, during which participants lied or told the truth about having studied (or not studied) items presented by four unique actors. Specifically, participants were instructed to lie when prompted with one of the four actors, and to tell the truth when prompted with the other three actors. Patients with Parkinson's disease with frontal executive dysfunction demonstrated an impaired ability to tell a lie relative to healthy controls (Abe et al., 2009). That is, Parkinsonian patients provided fewer correct deceptive responses when prompted with the actor to whom they should have lied.

Further, there is considerable overlap between areas that are recruited for deception and areas that are recruited for executive control (Christ et al., 2009). Christ and colleagues (2009) used an activation likelihood estimate meta-analytic technique to produce maps of brain regions activated when a person is being deceptive. Regions consistently activated during deception included the ventrolateral prefrontal cortex, dorsolateral prefrontal cortex, and right anterior cingulate cortex. Additionally, meta-analytic maps of regions associated with three executive functions (working memory, inhibitory control, and task switching) were compared to the deception-related map to determine the extent of overlap between deception areas and executive control areas. The majority of the deception-related areas overlapped with areas associated with the executive functions that were examined. However, three areas – the right middle frontal gyrus, the right inferior parietal lobule, and the left middle frontal gyrus – shared unique activation on the deception map and the working memory map, but were not activated during

inhibitory control or task switching. These findings suggest that although inhibitory control and task switching may play a role in deception, deception may primarily rely on working memory.

Deception paradigms that involve a social component (e.g., providing lies to a real interaction partner) activate more regions than those involved in non-interactive deception (Lisofsky et al., 2014). Specifically, Lisofsky et al. (2014) examined whether deception that involves socio-cognitive processes, such as inferring an interaction partner's mental state, engages different neural correlates than deception that does not involve social interaction. Brain regions associated with deception generally, such as the anterior cingulate cortex, showed heightened activation during socially interactive deception paradigms. Further, brain regions associated with social cognition – including the temporo-parietal junction, which overlaps with the inferior parietal lobule (Igelström & Graziano, 2017) – were found to be more active during socially interactive deception paradigms rather than non-interactive paradigms. Thus, deception that involves more ecologically valid characteristics, such as the presence of an interaction partner, recruits brain regions in addition to those required for the deceptive narrative itself.

Providing a deceptive account may also be similar to episodic simulation or episodic future thought, which involves the imagination and generation of a mentally pre-experienced future event that draws on elements of past experiences (e.g., Schacter, Addis, & Buckner, 2008). Retrieval from episodic memory serves as the basis upon which episodic future thoughts are constructed, as suggested by neuroimaging studies that have shown distinct construction and elaboration phases when describing past and future events (e.g., Addis, Wong, & Schacter, 2007). During episodic future thought, people first engage in a construction phase in which one creates a future event. Subsequently, the future event is supplemented with additional details by either retrieving or imagining details during an elaboration phase.

Mental simulation of a future event could also be relevant to how people mentally create a false description of an event. One self-reported strategy that liars use is to provide a narrative that remains close to the truth (Strömwall & Willén, 2011). Episodic memory is thus not only important for remembering and recounting a truthful experience, but also for the mental simulation that is necessary to fabricate false events. The perceptual and contextual details generated during elaboration represent a potential negative corollary of such mental simulation. Specifically, the presence of these details could lead to source monitoring problems when a person attempts to discriminate a truthful experience from an invented experience (Johnson, Hashtroudi, & Lindsey, 1993).

When Does Lying Affect Memory?

Researchers have begun to examine the consequences of generating a deceptive statement on a liar's memory for what was said while lying as well as for what truthfully occurred. The act of deception could have an effect on memory due to the success (or failure) of a person's ability to monitor the source or origin of information – source monitoring (Johnson et al., 1993). As noted above, a person may provide a false statement in the form of a description or in the form of a denial. In the case of a descriptive lie, the lie involves a person describing an event that either never occurred or occurred differently in some respects. In contrast, false denials refer to lies that involve saying that an event did not occur.

False descriptions and false denials differ in the extent to which effortful, constructive mental processing is required. As a result, these two types of lies tend to differentially affect both accurate memory and false memory (Vieira & Lane, 2013). Lies that are told via false description are more likely to be correctly remembered due to the constructive processes involved in generating the descriptions. Providing a brief false denial, on the other hand, requires less effort to produce and is therefore more easily forgotten. However, memory for false denials

can improve when the denials are repeated (Vieira & Lane, 2013; Dianiska, Lane, Vieira, & Cash, in preparation). Due to these constructive processes, false descriptions can paradoxically be more likely to be *misremembered* as the truth, should the act of generating a description as a lie (rather than as a truth) be forgotten (Polage, 2004; Vieira & Lane, 2013). In this case, the content of the lie is retained, but the reason for its generation (e.g., to tell a lie) is not.

A Source-Monitoring Perspective

The dominant theoretical explanation for the effects of false description on memory is rooted in the source monitoring framework (Johnson et al., 1993). Source monitoring refers to a person's ability to differentiate between competing memory traces or sources of information. When making source decisions, people can capitalize on average differences in features that are associated with different sources. For instance, perceived or externally-derived events are more likely to be associated with perceptual and contextual (i.e., spatial and temporal) details, whereas imagined or internally-derived events often include more cognitive operations (i.e., evidence of mental processes invoked; Johnson et al., 1993).

Source monitoring errors are more likely to occur when sources are similar, when encoding is impaired, or when the cues that are available at retrieval are weak (see Lindsay, 2008). By providing a false description, liars generate a new memory trace (for the deceptive statement) that competes with the old trace (for what truthfully occurred). In order to appear convincing, a liar may provide a rich, detailed description of an event that includes fabricated perceptual and contextual details. Thus, generating a particularly elaborated false description involves effortful constructive processing that should increase the availability of cognitive operations. However, the fabricated details contained in that description would also have been present if the event had been truly experienced, increasing the likelihood that the presence of these details in memory could lead to confusion as to whether those perceptual details were

actually perceived in reality. As a result, the same processes that increase the likelihood of a liar remembering that she lied can also increase the probability of source monitoring failures and high-confident reporting of false information.

Source monitoring errors that arise when a liar generates a false description (in order to mislead another) are similar to errors that arise when a forced fabricator generates a description (as a guess in response to questions about unknown information; Ackil & Zaragoza, 1998). People might have difficulty in distinguishing forced fabrications from truthfully witnessed events due to the high degree of similarity between two sources, as would be suggested by source monitoring framework (Chrobak & Zaragoza, 2013; Johnson et al., 1993). An alternate mechanism could be a feeling of familiarity that occurs from self-generating the description (Chrobak & Zaragoza, 2013; Slamecka & Graf, 1978). However, false descriptions can differ from forced fabrications due to the *intentionality* associated with their production (DePaulo et al., 2003). Specifically, false descriptions are generated with an explicit attempt to mislead and be deceptive. Forced fabrications, on the other hand, are generated as a “best guess” in response to interrogative pressure.

A (Directed) Forgetting Perspective

Several studies have shown that false denials can lead to memory impairments for denied items (Vieira & Lane, 2013) as well as for the act of denial itself (Otgaar, Howe, Memon, & Wang, 2014; Otgaar, Howe, Smeets, & Wang, 2016; Romeo, Otgaar, Smeets, Landstrom, Boerboom, 2018). A recent theoretical framework proposed by Otgaar and Baker (2018) suggests that the mechanism responsible for this impairment could be a lack of rehearsal. Specifically, when people *deny* that an event truthfully occurred, they forgo rehearsing information and details that were present during the original event. Denials also do not require the liar to fabricate new details, and thus require less effort (i.e., fewer cognitive operations) to

produce than a description. As an alternative explanation, participants may spontaneously engage in a retrieval inhibition strategy akin to what occurs in the directed forgetting phenomenon. In directed forgetting experiments, participants are instructed to “remember” or “forget” randomly interspersed items in a list of words (item-method) or to “forget” an entire list (list-method) prior to a subsequent memory test. The attentional inhibition hypothesis suggests that the instruction to “forget” an item engages a suppression mechanism of “forget” words at encoding, resulting in those items being removed from working memory and preventing their future access at retrieval (a cost). This suppression thus frees resources to process and encode the to-be-remembered items that receive a “remember” instruction (a benefit, Zacks, Radvansky, & Hasher, 1996; Fawcett & Taylor, 2008). Although people who provide false denials are not explicitly instructed to “forget,” they may nevertheless use an inhibition strategy unprompted (in order to not think about items that were witnessed) to facilitate the generation and delivery of their deceptive statements.

Contemporary Paradigms for Studying the Impact of Lying on Memory

Table 1

Summary of Paradigms Used to Study Deception and Memory

| Research Lab | Paradigm Derivation | Stimulus | Outcome Measure |
|---------------------|----------------------------|---------------------------------------|--|
| Polage | Imagination Inflation | Life events | Belief in occurrence of event |
| Lane | List-Learning | Studied objects; Performed actions | Source memory accuracy Accurate and false recognition |
| Otgaar | Forced Fabrication | Video witnessed event | Source memory for “person” and “video” details |

To date, researchers examining the impact of lying on memory have employed a variety of approaches and paradigms, yielding a slightly incongruous picture. Table 1 presents a summary and overview of the typical paradigms used to assess the interface of lying and memory. Though some researchers have employed paradigms that prioritize ecological validity over the creation and elaboration of rich false narratives (e.g., unexperienced childhood events, Polage 2004; 2012), much of the extant research has relied upon stimulus materials that can be objectively verified as true or false (e.g., studied pictures of objects, Vieira & Lane, 2013; mock crime video, Otgaar, Howe, Smeets, & Wang, 2016). Further, the most commonly used paradigms experimentally control when and about what participants lie versus tell the truth (cf. Hudson, Vrij, Akehurst, & Hope, 2019; Romeo, Otgaar, Smeets, Landstrom, & Boerboom, 2018).

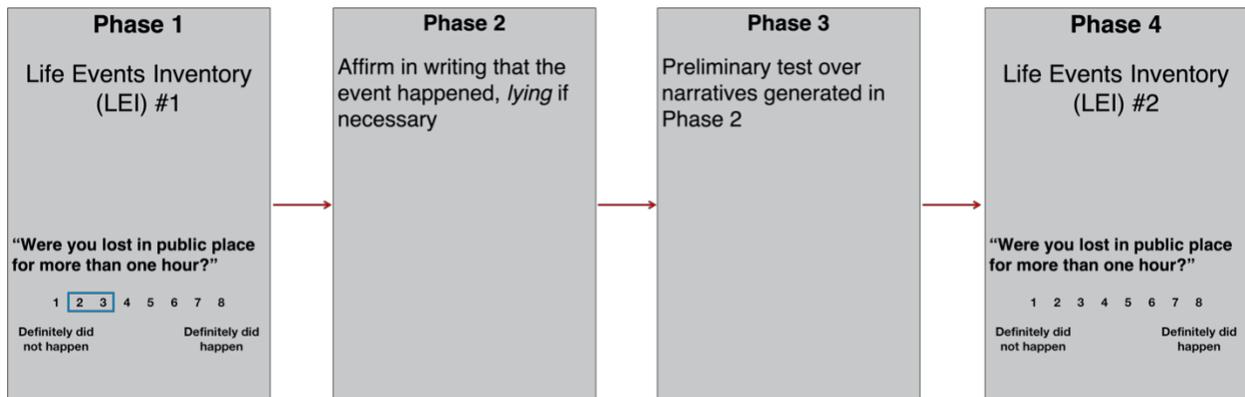


Figure 1. Depiction of the autobiographical events paradigm used by Polage (2004) and Polage (2012)

Polage (2004; 2012) examined source monitoring performance in the context of true and false autobiographical events by employing an adaption of the imagination inflation paradigm (Garry, Manning, Loftus, & Sherman, 1996). Participants completed a Life Events Inventory, a checklist of childhood events (e.g., “Were you caught sneaking out of the house?”) on which they rated the likelihood that the events occurred before they were 10 years old (see Figure 1).

Across two subsequent interviews, participants created believable narratives affirming that a set of childhood events (which included experienced events as well as a target *lied-about* event) had happened to them and were instructed to do so by lying if necessary. After constructing these detailed narratives, some participants altered their ratings of whether they believed the event occurred to them. However, the direction of the change in belief ratings depended on the source monitoring capability afforded by the paradigm.

Polage (2004) found a “deflation” effect on memory, whereby participants rated the lied-about events as *less* believable than truthfully-described target events, when the time between lie generation and test was relatively short. Therefore, the act of fabricating a rich narrative account of an unexperienced event likely produced memories of the cognitive operations involved in generating those narratives. Participants were then able to use these as cues to determine that the memory had not been experienced. In contrast, Polage (2012) later observed an “inflation” effect when source monitoring ability was poor or disrupted. Here, the lying event was temporally separated from the memory test. Presumably, people were more likely to believe that their self-generated false narratives were truthfully experienced because information about cognitive operations was less available. Unfortunately, this paradigm prevents an assessment of accuracy given that it is impossible to establish ground truth for participants’ false narratives. Further, only one type of lie (false descriptions) were assessed with respect to source memory.

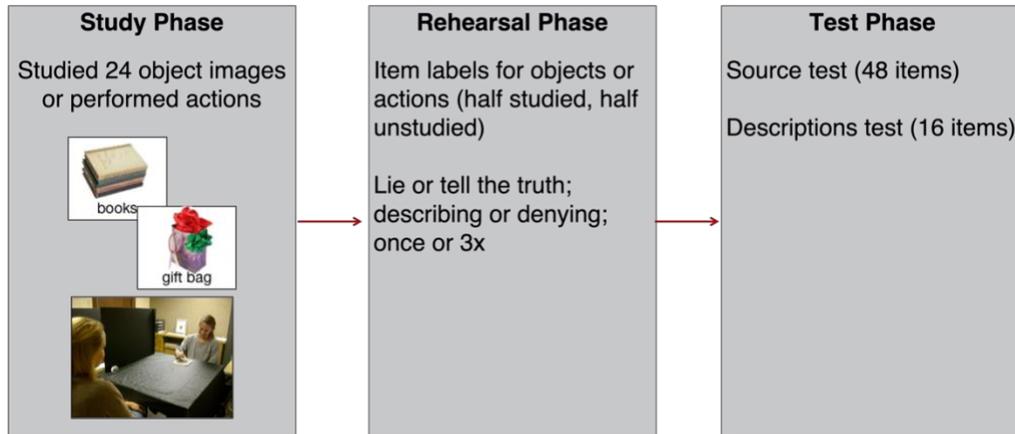


Figure 2. Depiction of the general object paradigm used by Dianiska, Lane, et al. (in prep) and Vieira and Lane (2013).

Lane and colleagues (Dianiska, Lane, et al., in preparation; Vieira & Lane, 2013) have extended this previous work by examining a broader set of variables that reflect myriad ways in which lies are told (e.g., different types of lies, how many times a lie is repeated, whether the lie content is self-relevant). In these studies, participants first study a series of object images (Vieira & Lane) or perform a set of simple interactions with objects (Dianiska, Lane et al.; see Figure 2). Subsequently, participants are prompted by the computer with the name of the object (or action) and asked to truthfully or deceptively describe the item (or action) that they had seen (performed), or to deny that they had done so. Participants then either lie or tell the truth regarding these items to a video camera. Half of the lies and truths are rehearsed once, and half are rehearsed three times. Another set of items seen at encoding, but not discussed on camera, serve as control items on the final test. After a delay (48 hours in Vieira & Lane, 2013; 1 week in Dianiska, Lane, et al., in prep), participants are asked to indicate for each item (action) whether they had seen it (performed the action), whether they had lied or told the truth about it, and if so, whether they had done so by describing it or denying it. Another study further examined source memory performance by assessing the phenomenological basis on which source decisions were

made (Dianiska, Lane, et al., in prep). For each action that participants indicated they had performed, they were asked whether that decision was based on recollection or familiarity (or if it was simply a guess). In this context, a “recollect” response was provided if one could remember a contextual detail about seeing an object or having performed the action. If this information was absent but the object felt familiar, a “familiar” response would be provided (see Jacoby, 1991; Yonelinas & Jacoby, 1995).

Across both studies (Dianiska, Lane, et al., in prep; Vieira & Lane, 2013), participants were less likely to remember their denials compared to their descriptions. Furthermore, repetition of an item (regardless of veracity) increased source accuracy. With respect to memory errors, or the false recognition of unstudied items as having been seen or performed in a prior session, there were two primary findings. First, *repeated truthful denials* increased the likelihood of false memory. Repeatedly denying that one had seen an item that, in reality, had not actually been seen (e.g., saying “I did not see the book,” when they actually had not studied a book), led participants to falsely remember having seen that item on a delayed memory test, relative to unrehearsed control items. This type of error tended to be based on feelings of familiarity and increased guessing, rather than recollection (Dianiska, Lane, et al., in prep). Second, false memory was more likely following *false descriptions*, particularly at the longer delay. Furthermore, these errors were more likely to be based on the false recollection of details rather than familiarity. Interestingly, repetition did not increase false description errors, likely due to participants’ remembering that they had generated the description and using this information to correctly attribute it to having been fabricated.

Limitations with this paradigm include the constrained nature of the experimental task and the potential lack of detail present in the descriptions. In the case of the former, the paradigm

used by Lane and colleagues allows for manipulation of important ecological variables, but participants are still instructed to lie by an experimenter. With regard to the latter, when people provide a false description about an image or a performed action, the amount of elaboration and level of detail for these types of descriptions might be more concise than the descriptions that, for instance, a guilty suspect would provide as a false alibi.

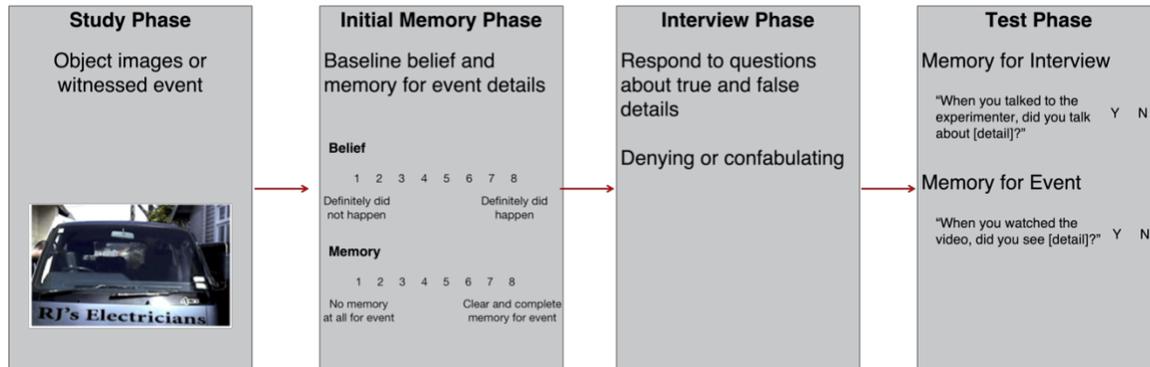


Figure 3. Depiction of the witnessed event paradigm used by Romeo et al. (2018), Otgaar et al. (2014) and Otgaar et al. (2016).

Finally, Otgaar and colleagues (Otgaar, Howe, Memon, & Wang, 2014; Otgaar, Howe, Smeets, & Wang, 2016) have examined the influence of both false descriptions and false denials on later memory using an adaptation of the forced fabrication paradigm (Ackil & Zaragoza, 1998). In these studies, participants view a series of pictures (Otgaar et al. 2016) or a brief witnessed event (Otgaar et al., 2014; 2016) and are asked to complete a baseline memory test (see Figure 3). On this memory test, participants rate details present in the video in terms of their belief in occurrence and the quality of their memory for the detail. During a subsequent interview phase, participants are then randomly assigned to respond to only questions that they are sure about (*cued recall* group), to respond to all questions and to guess if they are not sure (*forced confabulation* group), or to deny in response to each question (*false denial* group). The questions in the interview phase corresponded to either details that were present in the video (*true-event*

questions) or not present in the video (*false-event* questions). Across multiple experiments, Otgaar and colleagues have found that when participants are forced to falsely deny details during an initial interview, they demonstrate impaired memory for discussing a denied item with an interviewer, but not in memory for seeing the item itself (i.e., *denial-induced forgetting*; cf. Romeo, Otgaar, Smeets, Landström, & Boerboom, 2018).

Recent work by Otgaar and colleagues (Romeo et al., 2018) has also found a denial-induced forgetting effect for both participants' memory for the interview and their memory for the event details. Specifically, Romeo et al. (2018) presented participants with a traumatic virtual reality event (an airplane crash site) and then assessed their baseline memory for the event. Participants were then instructed to choose a strategy (i.e., tell the truth, falsely deny, or fabricate) for a subsequent structured interview comprised of 12 yes/no questions. Depending on the strategy, participants either (i) responded honestly, (ii) denied having seen each item, or (iii) affirmed and added an additional detail. On a final source memory test, participants in the false denial condition demonstrated a “denial-induced forgetting effect” (i.e., poorer memory for having discussed a detail during a prior memory task) relative to truth-tellers. Further, they also found that denial impaired memory for details present in the witnessed event. Given inconsistencies across studies conducted by Otgaar and colleagues, whether denials affect memory for the interview as well as memory for the event requires further assessment.

Taken together, the extant research on descriptions and denials by liars and truth tellers has focused on determining the mechanisms that underlie the relationship between deception and memory. However, one (potential) hindrance to the applicability of these findings is that participants in such studies are often *instructed* to lie at the behest of an experimenter, whereas deception in the real world is characterized by some degree of volition or intentionality (DePaulo

et al., 2003). Further, interviewees almost never wholly lie or tell the truth in a forensic interview. Both researchers and practitioners aim to capitalize on this within-subject or within-interviewee variability in providing lies and truths, for example by establishing a verbal “baseline,” deviations from which can be used to facilitate lie detection (Vrij, 2016). Finally, deception studies rarely assess statements provided across multiple interviews (cf. Granhag & Strömwall, 2001). Two aims of this dissertation are thus (i) to assess the extent to which allowing individuals to *voluntarily* engage in deception may influence the effects of lying on memory, and (ii) to assess the extent to which statement inconsistencies become apparent and are reliable indicators of deception when repeated interviews are conducted using evidence-based interviewing techniques.

Volitional Deception and Memory

Lying is defined by the intentionality to mislead another person (DePaulo et al., 2003), yet the current field of research on the relationship between lying and memory has largely failed to assess the notion of deception as a *volitional* act. Participants may be asked to lie about a number of items in a given experiment, but what separates providing a “lie” from providing an objectively false statement (e.g., as a result a false memory) is an *intent* to deceive a conversation partner. Further, meta-analytic assessments of neuroimaging studies have shown differential activation for deception that involves volitional rather than instructed lies (Lisofsky et al., 2014). Participants who were allowed to choose whether and when to deceive an interaction partner showed greater activation in the bilateral inferior parietal lobule relative to participants who engaged in paradigms that involved experimenter-instructed deception. The inferior parietal lobule has been implicated in higher-order functions such as memory retrieval (e.g., the maintenance of retrieved information; Villberg & Rugg, 2008) and social cognition (Igelström & Graziano, 2008), and there is preliminary evidence of its role in functions such as intentional

movement (e.g., Jahanshahi et al., 1995; Kühn, Haggard, & Brass, 2009) and a sense of agency (Tsakiris, Longo, & Haggard, 2010). However, because studies included in this meta-analysis were conducted primarily to examine differences in neurological activation, whether differences in volitional versus instructed deception would influence memory performance remains unexamined. Though a reliance on experimenter-instructed lies has allowed for experimental control over the falsehoods that are generated, the underlying processes involved in deception might differ depending on whether deception is intentional or instructed. Thus, the extant experimental findings on how lying affects memory may only be applicable to situations in which motivation to lie is absent or low.

Of note, Romeo et al. (2018) attempted to manipulate the intentionality associated with deception by allowing participants to self-select a strategy for an interview. Although participants were allowed to choose what strategy they would like to use during an interview (either tell the truth, falsely deny, or fabricate), only 14% chose to be deceptive. As a result, Romeo et al. excluded those 14% and only included truth-tellers and a subset of participants who initially chose to tell the truth but were later instructed to falsely deny. Further, Hudson et al. (2019) allowed participants to choose from one of two tasks: stealing a flash drive (and lying about it during a subsequent interview) or watching a short documentary (and telling the truth about it during a subsequent interview). In addition to self-selected liars and truth-tellers, a separate group of participants were instructed to complete the deceptive tasks to equate the size of the groups. There was a marginally significant difference between volitional liars and instructed liars in the amount of detail provided during a subsequent interview ($d = 0.44, p = .05$); nevertheless, analyses were collapsed across the volitional manipulation for the primary analyses. Thus, whether volition has an impact on memory cannot be determined from these

studies because too few participants chose to deny or fabricate, or because volitional liars were combined with instructed liars in final analyses. Manipulating volition for some items (rather than some participants) in the current dissertation allowed for an examination of the relationship between deception and memory when intentionality is involved.

Could volition have an effect on a person's memory? Prior research suggests that individuals who choose which items to study perform better than those who are assigned study items by an experimenter (Perlmutter, Monty, & Kimble, 1971). Perlmutter and colleagues (1971) examined whether choosing responses prior to learning a list of words would affect memory performance. Participants were asked to remember pairs of words. For each pair, they were presented with a stimulus word and shown five possible response options to be associated with the stimulus. Some participants selected a response to be paired with the stimulus word on a subsequent paired-associates learning task (*choice* group), while other participants were assigned the stimulus-response word selected by participants in the choice group (*forced* group). When participants were allowed to choose the response for the word pairs, they recalled more correct responses on a subsequent cued-recall task. This effect was originally thought to be the result of the choice group's enhanced ability to form stimulus-response associations. Later research, however, suggests this "self-choice" effect might be due to the activation of multiple response candidates when choosing (Watanabe, 2001).

In the education domain, the effects of volition on memory are also well-known with respect to selecting items that receive further study. Memory tends to be enhanced when individuals are able to exert control over their learning environment, including *what* information is encoded (e.g., Kornell & Metcalfe, 2006). Across three experiments, Kornell and Metcalfe (2006) assessed the relationship between metacognitively guided study and performance on a

subsequent memory task. Compared to conditions that did not honor a participant's study choices, people who were allowed to choose selected easier items, which ultimately benefited them on a later memory test. As such, the potential role of choosing which aspects of an event receive further rehearsal (either deceptively or truthfully) could be an important moderator on the relationship between lying and memory.

Kornell and Metcalfe (2006) suggest that the benefit to chosen versus unchosen items is associated with improved metacognition that accompanies the act of choosing. A similar mechanism could account for any such benefit to memory following volitional deception. Recently, Besken (2018) examined the relationship between deception and memory while also assessing the *metamemory* of liars and truth-tellers. Participants provided correct (truthful) or incorrect (deceptive) answers to a series of general knowledge questions, and subsequently rated their confidence that they would remember their response on a later memory test (a "judgment of learning"). Following a brief distraction phrase, participants freely recalled their responses to the general knowledge questions from the prior phase of the experiment. Besken (2018) found evidence of a "metacognitive illusion" of lying, such that people were more confident that they would accurately remember their truthful responses on a subsequent memory test, but in actuality they recalled more of their deceptive responses.

As reviewed above, the *type* of lie that is told tends to differentially affect memory performance and so may also affect metamemory performance. What liars believe about their own ability to remember different types of lies could inform how guilty suspects approach investigative interviews. Liars will often invoke an avoidant strategy (i.e., providing little information in their statement) or an escape strategy (i.e., denying their involvement in response to an interviewer's direct questioning; Granhag & Hartwig, 2008). Therefore, whether a liar

believes they will be able to remember a denial might affect the likelihood that she will use an escape strategy. The optimal strategy will likely vary based on a suspect's perception of the evidence against him (Granhag & Hartwig, 2014); however, the choice of strategy might *also* depend on a suspect's belief about whether she can remember and maintain that falsehood over time.

Metacognitive judgments of learning have been used in the context of fluency effects and in the field of education (see Rhodes, 2016). Asking for judgments of learning requires that participants rate their confidence that they will remember an item on a subsequent memory test. Given differences in how deception is conceptualized across paradigms, the first and second experiments of this dissertation employ a paradigm that balances experimental control and ecological validity while also allowing for an assessment of differences in metacognitive predictions and memory performance. In line with Besken (2018), the first two experiments of this dissertation assess differences in memory predictions based on the way in which participants provide deceptive responses, as well as whether volition is involved in deception (Experiment 2 only). I use a performed-actions adaptation of the object paradigm developed by Vieira and Lane (2013) to assess the effect of volitional deception on subsequent memory. This paradigm supports the need for both internal validity, by allowing for experimental control over the types of lies told, and external validity, by asking participants to lie and tell the truth about actions for which she has performed (more similar to the position of a perpetrator in the real world). In general, I predicted that participants would provide higher judgments of learning when they provide truthful responses (compared to when they provide deceptive responses) and when they were allowed to choose items about which to lie or tell the truth (compared to when they are instructed when to do so by an experimenter). Further, I expected that when participant liars are

able to exert control over the items about which they lie or tell the truth, they will better remember their lies (e.g., Murty, DuBrow, & Davachi, 2015), compared to when lies and truths are selected by an experimenter.

Consistency Across Repeated Interviews

Inconsistencies are often treated by laypeople and professionals as indicators of deception. However, research suggests that the type of inconsistency is a more important indicator of deception than inconsistency itself (Fisher, Vrij, & Leins, 2013; Vredevelt, van Koppen, & Granhag, 2014). Assessing between-statement consistency allows for separation of different types of inconsistencies that can arise between two interviews. Inconsistencies can be *contradictory* in nature, such as when a witness initially recalls the perpetrator to be blonde and on a later interview reports that the perpetrator had black hair. Two statements can also be inconsistent if information is added during a second interview that was not present during an initial interview statement (i.e., *reminiscent*), as when a witness fails to remember that a perpetrator wore a black baseball cap until she is brought in for a follow-up interview. Lastly, inconsistencies can arise when information that is provided initially is left out of a second statement (i.e., *omitted*). In this case, a witness could fail to repeat that a perpetrator was bearded when interviewed a second time, after providing that detail in an initial statement.

Effects of Repeated Recall for Truth-tellers

There is robust evidence for the beneficial effects of retrieval on the learning of old and new material (Roediger & Karpicke, 2006; Chan, Meissner, & Davis, 2018). Additionally, paradigms that involve repeated retrieval have been used to assess differences (or inconsistencies) in memory reports that occur as a result of forgetting and reminiscence (for review, see Roediger, Wheeler, & Rajaram, 1993). Hypermnnesia refers to an overall increase in memory recall across two tests (Erdelyi & Becker, 1974), whereas reminiscence specifically

refers to the additional recall of information on a later test that was not recalled on an earlier test (Ballard, 1913). Thus, reminiscence must occur in order to observe hypermnesia on a second test. Reminiscence, however, can also occur in the absence of hypermnesia. If the amount of forgetting observed is greater than or equal to the amount of information added on a subsequent test (i.e., reminiscence), there will be no increase in the overall amount of information provided.

Research suggests that engaging in *varied retrieval* can contribute to reminiscence (Gilbert & Fisher, 2006). According to the principle of varied retrieval, if a retrieval cue at an initial test differs from a retrieval cue at a subsequent test, witnesses should recall different information on each test. Gilbert and Fisher assessed this by asking participants to describe a witnessed event without instruction (free recall), or cuing participants to recall the event with a type of temporal cue (chronological or reverse order recall), or with a type of spatial cue (robber's perspective or police officer's perspective). After a two-day delay, participants provided another statement about the event. On this subsequent recall attempt, participants were cued to recall the event either using the same cue as in the initial interview or using a different temporal or spatial cue than in the initial interview.

Gilbert and Fisher coded event statements for the amount of information provided and whether it was consistent or inconsistent across statements. *Consistent* information was present in both event statements. *Inconsistent-contradictory* items were described differently on an initial statement than how they were described on a subsequent statement. *Inconsistent-forgotten* information was provided in an initial statement but not recalled on a subsequent statement. Lastly, *inconsistent-reminiscent* information was provided on a subsequent statement but was not present in an initial statement.

Inconsistencies from participants cued with varied retrieval cues (e.g., asking for an initial statement in reverse chronological order and a subsequent statement in chronological order) were compared to those from participants cued without a specific retrieval cue (i.e., a free recall prompt). Gilbert and Fisher found that varying the retrieval cues between two event recall opportunities increased the amount of reminiscent information reported and decreased the number of items that were forgotten on the second event recall. The amount of consistent and contradictory items that were recalled were similar.

Gilbert and Fisher also examined the accuracy of each consistent and inconsistent item type. The accuracy of inconsistent-reminiscent and inconsistent-forgotten details was fairly high (0.87 and 0.93, respectively). Consistent details, however, were still associated with the highest accuracy (0.95). Few contradictory details were reported overall, but when they were reported, they were associated with low accuracy (0.49). Thus, inconsistencies that do not contradict a prior statement, including items that are added or omitted between two statements, are more likely to be accurate than inconsistencies that directly contradict a prior statement.

Effects of Repeated Recall for Liars

For guilty suspects, there are a number of different types of (in)consistency that can induce suspicion, including the perceived consistency within a suspect's statement and across multiple statements. Inconsistencies can also arise between statements elicited from multiple suspects, or between a suspect's statement and the available evidence. Interviewers can use strategic questioning approaches to encourage the production of some inconsistencies to facilitate credibility assessment. For instance, the Strategic Use of Evidence (SUE) technique can be used to elicit statement-evidence inconsistencies that improve an observer's ability to detect deception (Hartwig, Granhag, & Luke, 2014).

The diagnostic value of between-statement consistency (i.e., between multiple recall opportunities from a single suspect) is considered in this dissertation. Consistency across statements has been suggested to be indicative of liars who have rehearsed their statement (Vrij et al., 2009; Masip, Martinez, Blandon-Gitlin, Sanchez, Herrero, & Ibabe, 2018), liars who underestimate the extent to which forgetting occurs (i.e., stability bias; Kornell & Bjork, 2009; Harvey, Vrij, Hope, Leal, & Mann, 2017), and/or liars who deliberately repeat the same statement given previously to avoid being exposed (Granhag & Strömwall, 1999). However, manipulating the way in which a suspect provides a statement can prevent a liar from using a “repeat” strategy to appear consistent.

Liars are likely to be *inconsistent* when faced with varied retrieval, such as when they must report an event differently between multiple interviews (Leins, Fisher, & Vrij, 2012). During an initial interview, Leins et al. (2012) asked liars and truth-tellers to describe their activities in a prior phase either *verbally*, by providing an initial free recall and then answering specific questions from an interview, or *pictorially*, by producing a sketch drawing of the task room and the location of as many items as possible. After a ten-minute delay, participants provided the interviewer with an additional statement about their activities in the same or different reporting method. Truth-tellers were more consistent than liars (when only items that were *contradictory* were compared to items that were consistent); however, liars were even less consistent when the retrieval method differed between interviews.

Evidence-Based Interviewing Techniques and Consistency

When suspects are repeatedly interviewed, techniques that are employed by an interviewer on one occasion might inadvertently increase the likelihood of between-statement inconsistencies. Specifically, these techniques are often intended to increase the volume of information obtained from an interview (e.g., the Cognitive Interview; Fisher & Geiselman,

1992). If more information is provided on one occasion (regardless of its veracity), there is then more information to be forgotten (i.e., not repeatedly provided by a suspect) on a subsequent occasion. Nevertheless, proponents of a cognitive lie detection approach encourage interviewers to use such techniques to increase the length and verbal content of interviewees' statements (Vrij, 2015), given that the most successful training protocols for lie detection and credibility assessment focus on such verbal content (see Hauch, Sporer, Michael, & Meissner, 2016).

One technique that supports memory retrieval, reverse-order recall, has been shown to induce inconsistencies in both liars and truth-tellers (Gilbert & Fisher, 2006; Hudson et al., 2019). Hudson and colleagues examined consistency between two statements provided in close succession to each other (approximately 3 minutes following the conclusion of an initial interview). When a reverse-order recall instruction was administered, both liars and truth-tellers provided more omissions and fewer repetitions. Overall, truth-tellers provided more details across the two interviews, and specifically more reminiscent details during a second interview than did liars. Liars, in contrast, made significantly more omissions when a reverse-order recall instruction was administered during an interview, compared to when a chronological order recall instruction was administered.

The current dissertation examines whether interview approaches that enhance the frequency of diagnostic cues to deception, such as differences in verbal content, might yield a corollary negative effect in diminishing the frequency of (or reducing the efficacy of) memory-based cues to deception in truth-tellers' accounts. For example, when being questioned about an event that occurred long ago, truth-tellers may not have access to an event memory due to forgetting, leading them to offer narratives that lack content cues to credibility. Liars, on the other hand, often fail to consider the effects of delay (i.e., forgetting) in the information that they

report and do not appropriately monitor their output to mimic honest forgetting. Truth-tellers interviewed following a three-week delay provided fewer details about an experienced event, compared to truth-tellers interviewed immediately after the event (Harvey et al., 2017). In contrast, liars produced equivalent amounts of detail when interviewed initially and after a delay. In fact, on the delayed interview, liars and truth-tellers did not differ in the amount of information that they provided. Thus, although truth-tellers might simply be unable to retrieve more information following a delay, liars might strategically provide less information in order to facilitate consistency across repeated interviews (i.e., to decrease the amount of information necessary to remember from one interview to another).

Researchers and practitioners have advocated for the use of evidence-based interviewing techniques to increase cooperation and disclosure of information in investigative interviewing (Brandon, Wells, & Seale, 2018; Meissner, Surmon-Böhr, Oleszkiewicz, & Alison, 2017; Vrij & Granhag, 2014; Vrij, Hope, & Fisher, 2014). Such interviewing tactics have been assessed as both tools to improve the quality of an interviewee's memory report as well as tools to magnify differences between liars and truth-tellers that aid lie detection. Examples include eye closure instructions (Perfect et al., 2008), mental context reinstatement (Smith & Vela, 2001), recalling an event in reverse temporal order (Vrij, Mann, Fisher, Leal, Milne, & Bull, 2008), and providing subjects with a "model" statement (Leal, Vrij, Warmelink, Vernham, & Fisher, 2015).

The primary goal of these techniques is to increase the amount of information obtained from an interview without a commensurate decrease in accuracy; however, techniques that encourage a speaker to elaborate can, in some cases, lead an interviewee to provide information that may not be true (or information that they might be unsure of; Koriat & Goldsmith, 1996). Erroneous information that is provided to an interviewer as a result of such techniques could be

due to an interviewee reporting incorrect information (i.e., errors in describing a witnessed detail) or due to confabulation (i.e., errors in describing unwitnessed details). Should an interviewee fail to report that erroneous information on a subsequent interview (or amend that statement to correct an error), an interviewer could note a difference between the two statements and perceive the interviewee's between-statement consistency negatively. However, an error that persists could become incorporated into one's memory for what truthfully occurred (e.g., self-generated misinformation; Pickel, 2004), irreparably affecting one's credibility if that information is revealed to be inaccurate.

In Experiment 3, I examine the potential for evidence-based interviewing tactics to foster the generation of inconsistencies across multiple interviews, as well as the potential detrimental influence of providing a false statement on memory for the truth. Two interviewing techniques (a memory-enhancing technique, reverse-order recall and a standard control interview, a structured interview) were compared to examine their influence on the production of inconsistencies across repeated interviews. Truth-tellers may be more inconsistent than liars because they are able to draw from a true memory and should thus be able to report more information than liars who will be fabricating or inventing an account. Liars, in contrast, may strategically aim to be consistent across their multiple reports and thus fail to consider (i) that evidence-based interviewing tactics are designed to enhance memory and facilitate information gain, and (ii) that truth-tellers' reports will be affected by forgetting. As noted previously, conventional interviewing techniques were designed with the intent to exploit the different strategies used and misconceptions held by liars and truth-tellers to magnify observable differences between the two. However, of interest here is whether the current literature might underestimate the potential vulnerability of truth-tellers to be misattributed as liars when these techniques are used.

Reverse-Order Recall

One tactic that has been evaluated as a credibility assessment tool is a *reverse-order recall* instruction (Evans, Michael, Meissner, & Brandon, 2013; Vrij et al., 2008). After an interviewee has provided an initial free narrative, they are asked to recall the event once more in reverse chronological order. Recalling an event from multiple retrieval perspectives, in particular one that is counter to an initial schema-guided retrieval attempt (Geiselman & Callot, 1990), can allow for a previously inaccessible memory trace to be accessed (Milne & Bull, 1999) and therein increase the amount of information reported. Asking for an event description in reverse-order increases cognitive load more so for liars than truth-tellers, thereby magnifying discriminable verbal and nonverbal behaviors between the two (Evans et al., 2013; Vrij et al., 2008). However, when compared with a request for an open-ended narrative, recalling an event in reverse-order can sometimes increase confabulations and decrease overall statement accuracy (Dando, Ormerod, Wilcock, & Milne, 2011). Errors that are produced as a result of compliance with a reverse-order instruction could persist across repeated interviews, leading to further consequences for interviewees with respect to perceived inconsistency (Fisher et al., 2013).

Structured Interview

Experimental work manipulating interviewing techniques often uses a *structured interview* as an evidence-based control (see Memon, Meissner, & Fraser, 2010). The Structured Interview is comprised of two interview phases: an open-ended initial free recall, and a supplemental questioning phase (Memon, Wark, Holley, Bull, & Koehnken, 1997). Interviewees are first asked to freely report their narrative account, and interviewers then use the information from this narrative to generate follow-up questions (e.g., “tell me more about...”). The use of a Structured Interview standardizes the requests for an initial narrative as well as the subsequent

probing phase, separate from those techniques that are employed to address potential credibility assessment.

Experiment 3 was designed to capture several ecologically relevant aspects with respect to lying in forensic interviews. Participants completed two distinct events (a scavenger hunt in two “areas” of campus) and then had the opportunity to choose which event they would rehearse truthfully (rather than be exclusively a “liar” or a “truth-teller”; Vrij, 2016). Following the event, they completed an initial interview with either a structured interview, a reverse-order recall instruction, or they were dismissed until the next session (no initial recall). Participants returned one week later to provide another free recall statement about the event. Finally, to assess the influence of lying on memory, participants were asked to truthfully recall the Encoding Phase events as they actually occurred in the first experiment session. I predicted that when interviewed with a reverse order technique, interviewees would provide more information during an initial interview relative to a structured interview. Relatedly, I predicted that the reverse order technique would also lead to more inconsistencies in the form of omissions (i.e., details present in an initial statement that are not repeated during a subsequent interview) for both deceptively described and truthfully described events. Specifically, the increase in information associated with the mnemonic technique presents the possibility that more information will be forgotten on a delayed second interview (e.g., Wixted & Ebbesen, 1991), when compared with a structured interview that does not employ such techniques.

Overview of the Current Study

There were two primary aims to this dissertation. First, to assess whether intentional deception (and truth-telling) affects the relationship between lying and memory for the truth. Second, to examine differences in between-statement consistency (and inconsistency) when people lie versus tell the truth. Experiments 1 and 2 offer a more experimentally controlled

paradigm to examine how lying affects memory, and Experiment 3 extends this research to a more ecologically valid context. Further, Experiments 1 and 2 allow for an assessment of people's metacognitive abilities when lying and telling the truth, and specifically in Experiment 2 the effect of volition or intentionality is examined. Volitional truth-telling is required by participants in Experiment 3, but it is not manipulated. Experiment 3 in particular allows for an assessment of how an interviewer's approach might lead to the production of inconsistencies. In each experiment, memory accuracy is assessed with respect to what material was encoded—simple performed actions in Experiment 1 and 2; key facts acquired during a scavenger hunt in Experiment 3. Further, the consistency of true and false statements provided one week apart are assessed.

CHAPTER 2. EXPERIMENT 1

Previous research has shown that there is a disparity between what people think they will remember when lying and telling the truth, compared to what they actually remember (i.e., a “metacognitive illusion”). That is, people predict they will remember the truth better, but on a subsequent memory test recall more of their lies (Besken, 2018). However, prior work has also shown that different types of lies differentially affect memory (Dianiska, Lane, et al., in prep). In this experiment, I explored the relationship between memory and metamemory for different types of lies (and truths) to assess whether a “metacognitive illusion” persists for different types of lies. I hypothesized to replicate the effect of veracity on memory for the truth demonstrated in prior work (Dianiska, Lane, et al., in prep), wherein people will show better memory for truthfully rehearsed items. Further, I hypothesized that participants would be more consistent across two experimental sessions when describing actions truthfully than when describing them deceptively.

Method

Participants

Thirty-six participants (26 female) from Iowa State University participated for partial course credit. Normal or corrected to normal vision was required. The ages of participants varied between 18 and 22 years of age ($M = 18.83$, $SD = 1.11$). This sample size was based on prior work using this paradigm (Dianiska, Lane, et al., in prep).

Materials and Design

Stimuli were a set of 48 simple objects (e.g., a marble). Participants performed actions with these simple objects, which were modified from the actions used in Goff and Roediger’s (1998) imagination inflation study (see Materials on OSF). A video camera was used to record

participants' verbal responses during the Rehearsal Phase in Session 1. A 2 (*Veracity*: Lie, Truth) x 2 (*Rehearsal Type*: Deny, Describe) x 2 (*Repetition*: Once, Thrice) within-subjects design was used.

Procedure

Using a paradigm adapted from Vieira and Lane (2013) and Dianiska, Lane, et al. (in preparation), participants completed a two-session experiment. Session 1 comprised the Action Phase and Rehearsal Phase, and three days later participants returned for Session 2 which comprised the Test Phase (see Figure 4).

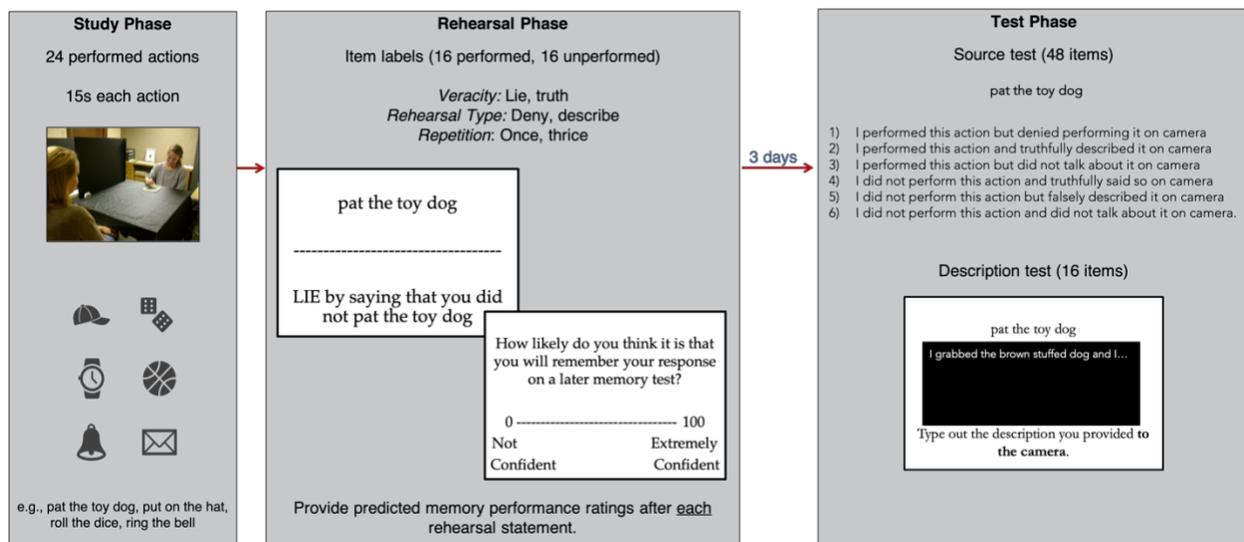


Figure 4. Depiction of procedure used in Experiment 1.

Session 1

During the Action Phase, participants sat across a table from the experimenter. For each action, the experimenter set an object (e.g., a toy dog) on the table in front of the participant, read an action statement (e.g., “pat the toy dog”), and then began a timer. Each action was carried out for 15 seconds; participants were instructed to repeat performing the action for the full time.

After the 15 seconds had passed, the experimenter stopped the timer, removed the object from

the table and replaced it with another object, and proceeded to the next action statement. This continued for a total of 24 actions in a predetermined random order.

Participants then began the Rehearsal Phase (see Figure 5 for rehearsed item types). For each trial, participants were presented with an action statement on the screen (e.g., pat the toy dog). Some of these action statements corresponded to actions that were studied during the Action Phase (i.e., performed items) while others referred to actions that were not studied during the Action Phase (i.e., unperformed items). Below each action statement were instructions to either truthfully or deceptively deny having performed the action (e.g., “I did not pat the toy dog”) or to truthfully or deceptively describe performing the action (e.g., “There was a stuffed animal dog, it was white and brown, it looked like a bulldog and with my left hand I kept patting it on its head”).

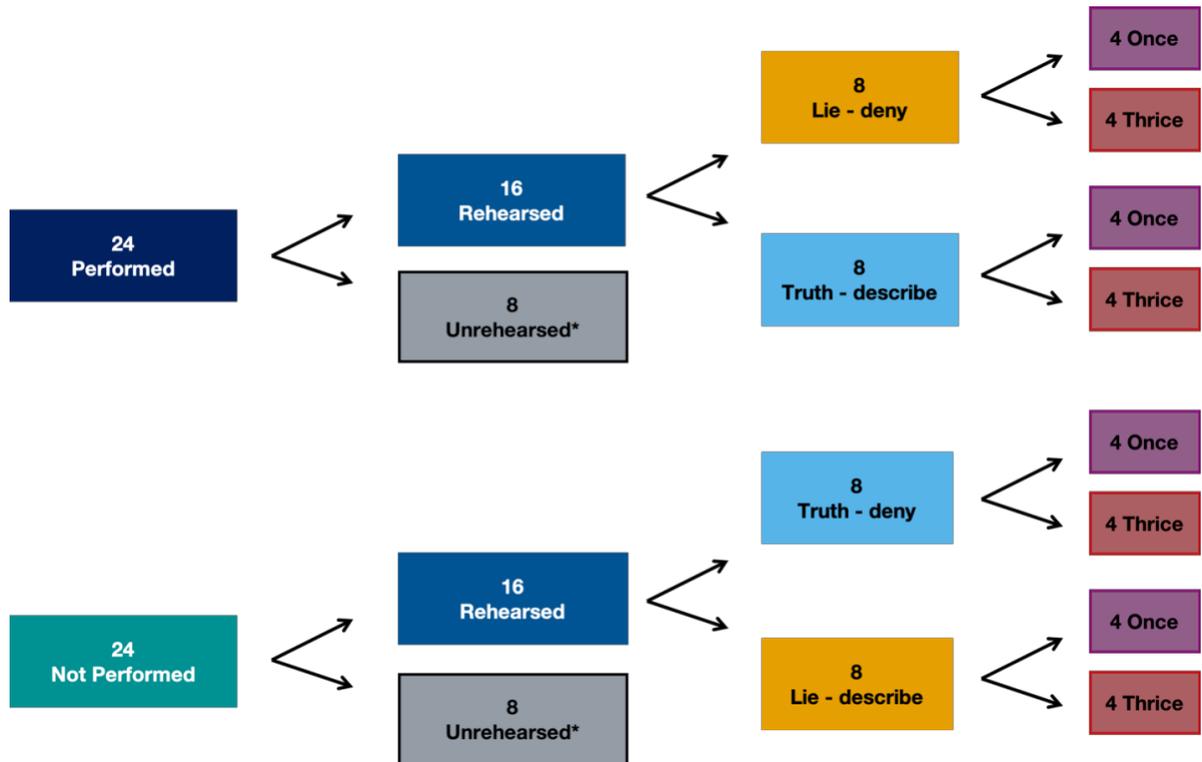


Figure 5. Item types presented in the Rehearsal Phase in Experiment 1. Items with an asterisk represent control items on the final test that were not rehearsed.

For actions that had been performed during the Action phase, participants either truthfully described the action as they performed it (performed truth-describe items) or lied by denying that they had performed that action (performed lie-deny items). For actions that had not been performed during the first phase, participants either truthfully denied that they performed the action during the first phase (unperformed truth-deny items) or lied by providing a false description of how they supposedly performed the action (unperformed lie-describe items). For each trial, participants read an action statement on the computer, turned to the camera to give their response, and then turned back to the computer for the next action statement. Half of these statements were rehearsed once during the Rehearsal Phase, while the other half appeared three times. Participants were instructed to keep their responses consistent for these thrice-repeated items. After each statement, participants provided judgments of learning (JOLs) by rating the likelihood that they would remember their responses on a later memory test.

Additionally, two control item types were included in the subsequent Test Phase. These items had not been presented during the Rehearsal Phase: *performed no-rehearsal items* (actions that were performed during the Action Phase, but not truthfully or deceptively rehearsed in the Rehearsal Phase), and *unperformed no-rehearsal items* (actions that were neither performed nor rehearsed in Session 1). These items were used to assess the extent to which rehearsal affects correct and false recognition of actions as having been performed.

After providing all of the rehearsal statements on camera, participants provided demographic information (age, sex, ethnicity) and responded to several post-experiment questions regarding the frequency with which they lie in everyday life (white lies, serious lies), how difficult they found it to provide the different types of rehearsal statements (truthful

descriptions, false descriptions, truthful denials, false denials), and how believable they think they are when lying (in the experiment, in everyday life).

Session 2

Three days later, participants returned to complete the third and final phase of the experiment, the Test Phase. Participants' memory for the performed actions was first assessed via a 48-item source memory test. A series of action statements appeared on the computer screen, and participants indicated whether and how they encountered the action in Session 1. For each action, participants selected from response options that represented whether an action was performed, whether it was rehearsed, and if so, if it was rehearsed truthfully or deceptively. Participants made their source test decision from one of six possible options: 1) I performed this action but denied performing it on camera, 2) I performed this action and truthfully described it on camera, 3) I performed this action but did not talk about it on camera, 4) I did not perform this action and truthfully said so on camera, 5) I did not perform this action but falsely described it on camera, and 6) I did not perform this action and did not talk about it on camera.

Following the source test, participants completed a test regarding the *descriptions* they provided in the first session. For each described item, participants were asked to type the exact description that they provided to the camera during the Rehearsal Phase. Participants' videotaped responses to each *described* action statement during the Rehearsal Phase were transcribed and coded for the presence of action and object features, as well as the correspondence between the transcribed descriptions and the descriptions provided one week later. Participants were then debriefed and dismissed from the experiment.

Coding of Description Statements

Participant responses from the Rehearsal Phase were videotaped and transcribed. Based on the transcripts of these rehearsal recordings, two coders counted the number of features

participants used to describe each action performed in the Action Phase. Features were counted if they described what the object looked like (e.g., color, size, type of material) as well as how the participant completed the action (e.g., which hand was used, movement, number of times).

Features that were a part of the action statement were not counted. For example, for the action statement, “bounce the ball,” a participant’s response of, “I held the blue ball in my right hand and bounced it on the table” would have four features: “held,” “blue,” “in my right hand,” and “on the table.”

Descriptions provided during the Rehearsal Phase were next compared to the typed-out responses that participants provided during the descriptions test. The features present in the descriptions test were coded similarly, and further classified as i) repeated between the Rehearsal Phase and the descriptions test (*consistent* details); ii) contradictory to features present in the Rehearsal Phase statement (*contradictory* details); iii) new details that were not previously mentioned during the Rehearsal Phase (*new* details); and iv) features from Rehearsal Phase statements that were not said during the descriptions test (*omitted* details). The primary dependent variable was the number of consistent features that were remembered and provided on the descriptions test.

Results

All materials and data necessary to produce the statistical results are hosted on OSF (https://osf.io/u875g/?view_only=88e413644c114d90a7969e4429f8bd43). Descriptive statistics can be found in Tables 2 and 3. In the following sections I begin by assessing the effects of the type and veracity of rehearsal, as well as whether rehearsal was repeated, on participants’ predicted memory performance (JOLs) and then move on to assess these same effects on actual memory performance on the source memory test. Next, I examine differences in the consistency of described action statements based on veracity and repetition. I then examine the effect of

rehearsed item types on accurate and false memory for having performed an action. Finally, I explore the effect of the type and veracity of rehearsal on the relationship between memory predictions and actual performance with Goodman-Kruskal gamma correlations.

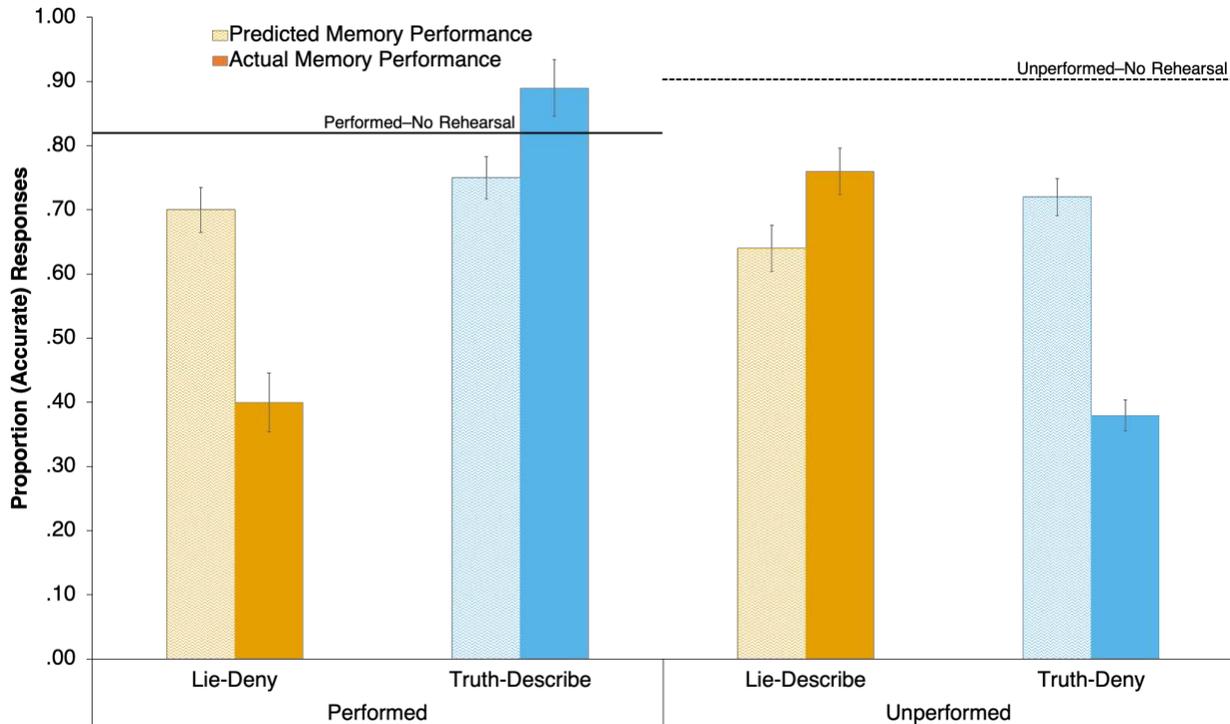


Figure 6. Predicted memory performance (JOLs) and actual memory performance (source test accuracy) per item type, Experiment 1. Errors bars represent standard errors. Bars in this graph are collapsed across the Repetition variable.

Predicted Memory Performance

Predicted memory performance and actual memory performance were assessed as proportions (see Figure 6, lighter bars). A 2 (*Veracity*: Lie, Truth) x 2 (*Rehearsal Type*: Deny, Describe) x 2 (*Repetition*: Once, Thrice) within-subjects ANOVA was conducted on the average ratings of predicted memory performance for each item type. For items that were repeated three times, I used the mean of the three JOL ratings. The pattern of results remains the same whether the first rating, third rating, or mean of all three ratings are used.

There were significant main effects of Repetition ($F(1, 35) = 4.14, p = .049, d = 0.34$ [0.00, 0.67]) and Veracity ($F(1, 35) = 14.96, p < .01, d = 0.65$ [0.28, 1.00]). People predicted they would remember items that were rehearsed multiple times ($M = .71, SE = .03$) better than items that were rehearsed only once ($M = .69, SE = .32$). Further, in line with Besken (2018), people predicted that they would remember items that they rehearsed truthfully ($M = .73, SE = .03$) better than items that they lied about ($M = .67, SE = .04$). This main effect of Veracity was qualified by a significant interaction between Veracity and Rehearsal Type ($F(1, 35) = 11.61, p = .002, \eta_p^2 = 0.25$). For items that participants described, people predicted they would remember their truthful descriptions ($M = .75, SE = .03$) better than false descriptions ($M = .64, SE = .04$), $t(35) = 4.25, p < .001, d = 0.71$ [0.34, 1.07]. However, there was no difference in predicted memory performance for false denials ($M = .70, SE = .04$) compared to truthful denials ($M = .72, SE = .03$), $t(35) = 1.01, p = .32, d = 0.17$ [-0.16, 0.50]. All other effects were not statistically significant, F 's $< 3.65, p$'s $> .07$.

Actual Memory Performance

Source test responses were considered accurate if the participant correctly categorized what happened with that action in both the Action Phase and Rehearsal Phase (e.g., a participant correctly associating an item that was performed and truthfully described once with response option 2, "I performed this action and truthfully described it on camera"). To compare source test accuracy for the different item types, a 2 (*Veracity*: Lie, Truth) x 2 (*Rehearsal Type*: Deny, Describe) x 2 (*Repetition*: Once, Thrice) repeated measures ANOVA was conducted on the mean proportion of accurate source test responses for all item types that were rehearsed (Figure 6, darker bars). See Table 2 for the full breakdown of response selections.

Overall, participants were more accurate on the source test for items that were described ($M = .82, SE = .02$) than denied ($M = .39, SE = .04$), $F(1, 35) = 115.99, p < .001, d = 1.80$ [1.26,

2.32], as well as for items that were rehearsed three times ($M = .70$, $SE = .03$) than one time ($M = .51$, $SE = .03$), $F(1, 35) = 32.14$, $p < .001$, $d = 0.95$ [0.55, 1.33]. As in prior work (Dianiska, Lane, et al., in prep; Vieira & Lane, 2013), there was a significant interaction between Veracity and Rehearsal Type ($F(1, 35) = 5.51$, $p = .025$, $\eta_p^2 = 0.14$). For items that were described, source accuracy was greater for truthful descriptions ($M = .89$, $SE = .02$) than false descriptions ($M = .76$, $SE = .04$), $p = .002$, $t(35) = 3.42$, $p = .002$, $d = 0.57$ [0.21, 0.92]. There was no difference in memory accuracy, however, for truthful denials ($M = .38$, $SE = .05$) compared to false denials ($M = .40$, $SE = .04$), $t(35) = 0.29$, $p = .78$, $d = 0.05$ [-0.28, 0.37]. All other effects were not statistically significant, F 's < 3.65 , p 's $> .06$.

Consistency

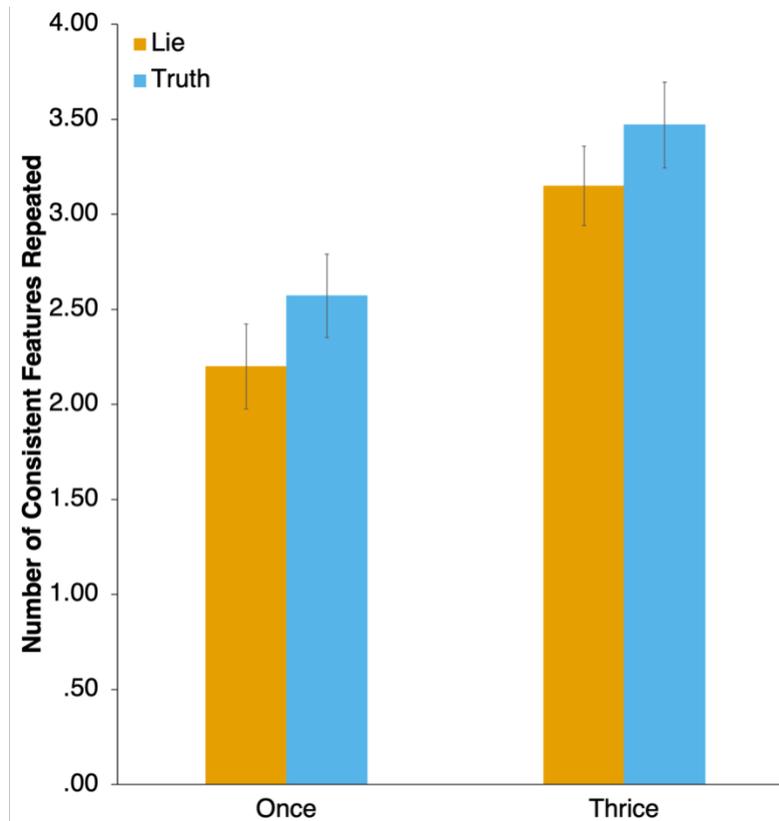


Figure 7. Number of consistent features from Rehearsal Phase provided on the Descriptions test based on description type, Experiment 1. Errors bars represent standard errors..

Consistency data from three participants could not be assessed due to camera errors that prevented recording of Rehearsal Phase ($n = 2$) or due to incorrect completion of the descriptions test ($n = 1$). A 2 (*Veracity*: Lie, Truth) x 2 (*Repetition*: Once, Thrice) repeated measures ANOVA was conducted on the number of features consistently remembered on the descriptions test (see Figure 7).

There were significant main effects of Veracity ($F(1, 32) = 7.22, p = .01, d = 0.50 [0.14, 0.85]$), and Repetition ($F(1, 32) = 70.78, p < .001, d = 1.47 [0.97, 1.95]$). On the descriptions test, people remembered more consistent features for actions that had been rehearsed truthfully ($M = 3.02, SE = .20$) rather than lied about ($M = 2.67, SE = .21$), as well as for actions that had been rehearsed repeatedly ($M = 3.31, SE = .20$) rather than once ($M = 2.39, SE = .20$). The interaction between Veracity and Repetition was not significant, $F(1, 32) = 0.04, p = .85$.

Accurate and False Memory for Performing Actions

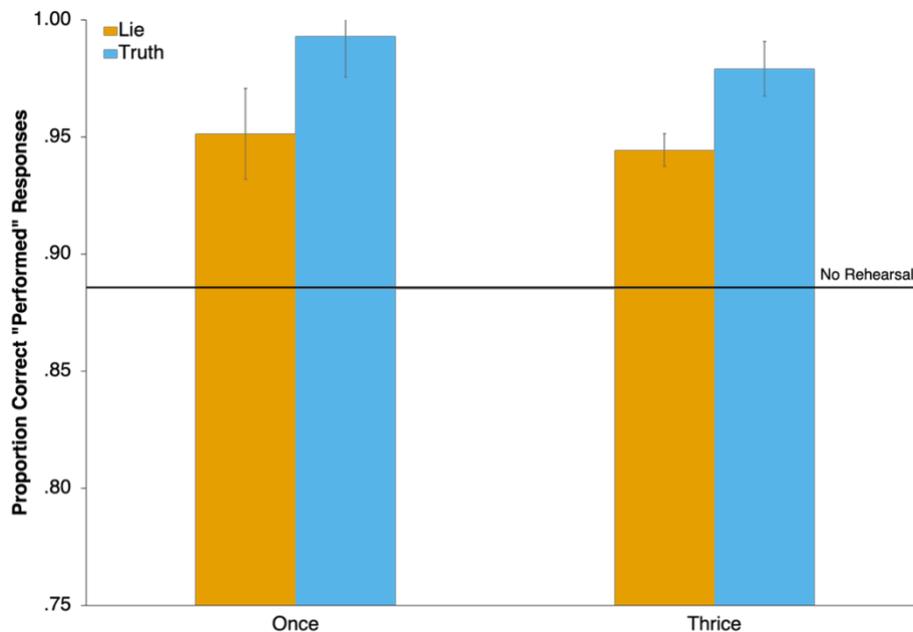


Figure 8. Accurate recognition of a performed action (lie-deny, truth-describe) as having been performed based on rehearsal type, Experiment 1. Errors bars represent standard errors.

Source performance was assessed in two additional ways: 1) the rate of *accurately* remembering having performed an action during the Action Phase, and 2) the rate of *falsely* remembering having performed an action during the Action Phase, based on response selections of “I performed this action but denied performing it on camera”, “I performed this action and truthfully described it on camera”, and “I performed this action but did not talk about it on camera”. See Table 2 for descriptive statistics.

A 2 (*Veracity*: Lie, Truth) x 2 (*Repetition*: Once, Thrice) repeated measures ANOVA was conducted on the mean proportion of accurate “performed” responses (i.e., *accurate recognition*; see Figure 8). There was a significant main effect of Veracity, $F(1, 35) = 8.63, p = .01, d = 0.49$ [0.14, 0.83]. Accurate recognition of an action as having been performed was significantly higher for truthfully (described) actions ($M = .99, SE = .01$) than for actions that were lied about (i.e., denied; $M = .95, SE = .01$). Neither the main effect of Repetition ($F(1, 35) = 0.69, p = .41, d = 0.14$ [-0.19, 0.47]) nor the interaction between Veracity and Repetition ($F(1, 35) = 0.05, p = .83, \eta^2 < .01$) were significant.

Pairwise comparisons were conducted to examine the effect of each performed and rehearsed item type (i.e., performed lie-deny once, performed lie-deny thrice, performed truth-describe once, performed truth-describe thrice) on accurate recognition rates, relative to the control items that were performed and not rehearsed. Accurate recognition was significantly higher for items that were truthfully described once ($M = .99, SE = .01$) compared to the performed no-rehearsal items ($M = .89, SE = .02, t(35) = 4.40, p < .001, d = 0.73$ [0.36, 1.10], and significantly higher for items that were truthfully described thrice ($M = .98, SE = .01$) compared to the performed no-rehearsal items, $t(35) = 4.12, p < .001, d = 0.69$ [0.32, 1.06]. After correcting for multiple comparisons, there was no difference for items that were falsely denied

once ($M = .95$, $SE = .02$; $t(35) = 2.26$, $p = .03$; $d = 0.38$ [0.04, 0.71]) or falsely denied thrice ($M = .94$, $SE = .02$; $t(35) = 2.69$, $p = .01$; $d = 0.45$ [0.10, 0.79]) compared to the no-rehearsal control items.

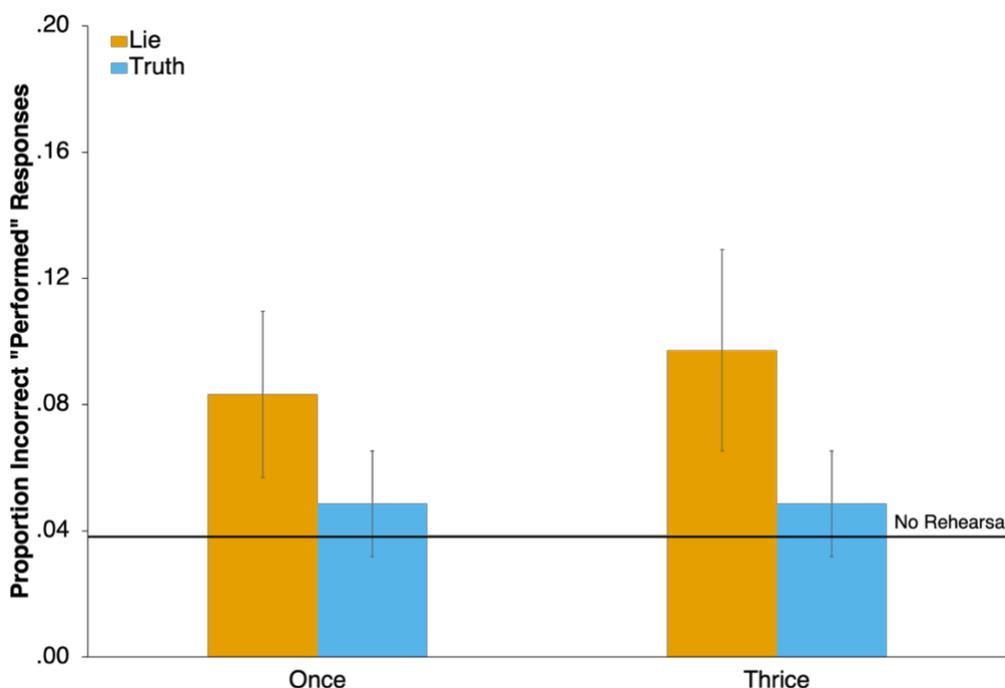


Figure 9. False recognition of an unperformed action (lie-describe, truth-deny) as having been performed based on rehearsal type, Experiment 1. Errors bars represent standard errors.

A 2 (*Veracity*: Lie, Truth) x 2 (*Repetition*: Once, Thrice) repeated measures ANOVA was conducted on the mean proportion of inaccurate “performed” responses (i.e., *false recognition*; see Figure 9). There was not a significant main effect of either Veracity, $F(1, 35) = 3.50$, $p = .07$, $d = 0.31$ [-0.03, 0.64], or Repetition, $F(1, 35) = 0.09$, $p = .77$, $d = 0.05$ [-0.28, 0.38], nor an interaction between the two, $F(1, 35) = 0.11$, $p = .74$, $\eta^2 < .01$. Pairwise comparisons to examine the effect of each unperformed and rehearsed item type (i.e., unperformed truth-deny once, unperformed truth-deny thrice, unperformed lie-describe once, unperformed lie-describe thrice) on false recognition rates, relative to the control items that were neither performed nor rehearsed, revealed no significant differences (t 's < 1.62 , p 's $> .11$).

Correlation between Predicted and Actual Performance

Pearson correlations were computed to compare the relationship between average predicted memory ratings and source accuracy for each item type. There was a small, nonsignificant positive correlation between predicted and actual memory performance for actions that were falsely denied once ($r(35) = .08, p = .65$), falsely denied thrice ($r(35) = .08, p = .64$), truthfully described once ($r(35) = .03, p = .88$), truthfully described thrice ($r(35) = .28, p = .10$), and truthfully denied thrice ($r(35) = .02, p = .89$). There was a small, nonsignificant negative correlation between predicted and actual memory performance for actions that were falsely described once ($r(35) = -.27, p = .11$), falsely described thrice ($r(35) = -.16, p = .34$), and truthfully denied once ($r(35) = -.06, p = .72$).

Resolution

Resolution refers to relative accuracy, or the degree to which participants gave higher JOL ratings to items that were correct on the final test, and lower JOLs to items that were incorrect on the final test. A resolution measure, Goodman-Kruskal gamma correlation, was computed between prediction ratings and source test performance for each subject separately for actions that were rehearsed truthfully and deceptively, once and thrice, as well as for actions that were rehearsed by denial or description. It was not possible to compute a gamma correlation in all cases, given that some participants failed to use a sufficient range of values when providing JOLs or were accurate on all items on the final test ($n = 3$). In these few instances, cases were excluded in lieu of having values imputed to account for incomplete data.

Because of small cells, I focused on comparing relative predictive accuracy for actions that were associated with main effects of either veracity (truths vs. lies), repetition (once vs. thrice) or rehearsal type (deny vs. describe). Paired-samples t-test were conducted to compare participants' resolution separately for lies and truths, statements that had been rehearsed once or

three times, as well as for statements that had been denied or described. Average resolution for truthfully rehearsed items ($M = .13$, $SE = .09$) was greater than resolution for actions that participants lied about ($M = -.15$, $SE = .08$), $t(32) = 2.48$, $p = .02$, $d = 0.43$ [0.07, 0.79]. However, there was no significant difference in resolution for items that were rehearsed once ($M = .04$, $SE = .09$) compared to three times ($M = -.01$, $SE = .08$), $t(31) = 0.13$, $p = .90$, $d = 0.02$ [-0.32, 0.37]; nor for denials ($M = .07$, $SE = .08$) compared to descriptions ($M = .20$, $SE = .10$), $t(23) = 1.18$, $p = .25$, $d = 0.24$ [-0.17, 0.65].

Summary of Findings

The results of Experiment 1 suggest that the act of lying does affect memory performance. Here, lying about an action led to lower source accuracy for how the action was encountered previously, especially when people lied by providing a description. Actions that were lied about were also associated with less accurate recognition for the action having been performed. With respect to actions that were described, people remembered fewer features of lied-about action descriptions than features of actions they had truthfully described. Finally, lying by describing an action that was not performed tended to inflate *incorrect* recognition of that action as having been performed – despite this effect being marginally significant, the effect size was in line with prior work using this paradigm (Dianiska, Lane, et al., in preparation).

The current findings suggest that a disparity between predicted and actual memory performance may not be apparent for all types of lies and truths. Rather, descriptions and denials appear to differ in their impact on not only a person's memory for lies and truths, but also what they *believe* about their memory. As in prior work (Besken, 2018), when people provided statements about actions that had (or had not) been performed, they predicted that they would remember their truthful statements better on a later memory test. In terms of actual memory performance, accuracy on a source memory test was also greater for actions that had been

rehearsed truthfully. This is counter to what would have been expected based upon the “metacognitive illusion” observed by Besken (2018) – if there was such a disparity between predicted and actual performance, actions that were rehearsed deceptively should have been associated with greater memory accuracy. Therefore, the extent to which predicted and actual memory for truths and lies are discrepant may depend on the type of statement being provided.

The inflation of predicted memory performance ratings for truthful statements and for denials may be rooted in the notion of fluency (Oppenheimer, 2008). When people truthfully describe or deny an action, they can rely on their memory of the experience to craft their response. In contrast, lying often requires more time to produce a response (see Suchotzki et al., 2017) and is more cognitively demanding (e.g., Vrij et al., 2008) – making it more effortful or more *disfluent*, relative to telling the truth. Brief denials require less effort to produce than elaborated descriptions and are thus more fluently processed. Items that are processed more fluently tend to receive higher JOLs (e.g., Hertzog, Dunlosky, Robinson, & Kidder, 2003).

Experiment 1 demonstrated several boundary conditions associated with differences in people’s memory and metamemory for lies and truths. However, as noted in the introduction, one aspect of deception that is often not apparent in experimental work is the notion of volition or intentionality. Further, although the same patterns of memory performance were observed as in prior studies using this paradigm (Dianiska, Lane, et al., in prep; Vieira & Lane, 2013), not all effects reached statistical significance. Experiment 2 was conducted primarily to examine the effect of volition on memory for lies and truths. A subsidiary aim of Experiment 2 was to explore whether discrepancies between Experiment 1 and prior work might be due to the provision of metacognitive judgments inviting *reactivity* (i.e., changes in behavior when performing metacognitive judgments; e.g., Janes, Rivers, & Dunlosky, 2018).

Table 2*Experiment 1 Mean Proportion of Source Responses for Each Item Type*

| Item Type | Response Options | | | | | |
|---------------------------------|--|---|---|--|--|---|
| | “I performed this action but denied performing it on camera” | “I performed this action and truthfully described it on camera” | “I performed this action but did not talk about it on camera” | “I did not perform this action and truthfully said so on camera” | “I did not perform this action but falsely described it on camera” | “I did not perform this action and did not talk about it on camera” |
| Performed Lie Deny Once | .30 (.05) | .11 (.03) | .54 (.05) | .01 (.01) | .01 (.01) | .03 (.01) |
| Performed Lie Deny Thrice | .49 (.06) | .17 (.04) | .29 (.05) | .02 (.01) | .01 (.01) | .02 (.01) |
| Performed Truth Describe Once | .06 (.02) | .85 (.03) | .09 (.03) | .00 (.00) | .00 (.00) | .01 (.01) |
| Performed Truth Describe Thrice | .02 (.01) | .93 (.03) | .03 (.03) | .01 (.01) | .01 (.01) | .00 (.00) |
| Performed No Rehearsal | .04 (.01) | .02 (.01) | .82 (.03) | .02 (.01) | .01 (.01) | .08 (.02) |
| Unperformed Truth Deny Once | .01 (.01) | .01 (.01) | .04 (.01) | .26 (.05) | .09 (.03) | .60 (.05) |
| Unperformed Truth Deny Thrice | .01 (.01) | .03 (.01) | .01 (.01) | .51 (.06) | .18 (.04) | .26 (.05) |
| Unperformed Lie Describe Once | .02 (.01) | .02 (.01) | .04 (.02) | .12 (.03) | .65 (.05) | .15 (.04) |
| Unperformed Lie Describe Thrice | .00 (.04) | .08 (.00) | .01 (.01) | .02 (.01) | .86 (.04) | .02 (.02) |
| Unperformed No Rehearsal | .00 (.00) | .00 (.00) | .03 (.01) | .05 (.01) | .01 (.01) | .90 (.02) |

Note. Values for correct source responses are in boldface. Standard errors are in parentheses.

Table 3*Experiment 1 Descriptive Statistics*

| Item Type | JOL Ratings | | Recognition as “Performed” | | Total Details - Rehearsal | | Total Details - Descriptions Test | | Number of Consistent Details | |
|---------------------------------|-------------|-----|-------------------------------|-----|------------------------------|-----|--------------------------------------|-----|---------------------------------|-----|
| | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Performed Lie Deny Once | .70 | .04 | .95 | .02 | -- | -- | -- | -- | -- | -- |
| Performed Lie Deny Thrice | .70 | .03 | .94 | .02 | -- | -- | -- | -- | -- | -- |
| Performed Truth Describe Once | .75 | .03 | .99 | .01 | 5.15 | .03 | 4.13 | .30 | 2.64 | .21 |
| Performed Truth Describe Thrice | .76 | .03 | .98 | .01 | 6.37 | .36 | 4.73 | .31 | 3.47 | .23 |
| Performed No Rehearsal | -- | -- | .89 | .02 | -- | -- | -- | -- | -- | -- |
| Unperformed Truth Deny Once | .71 | .04 | .05 | .02 | -- | -- | -- | -- | -- | -- |
| Unperformed Truth Deny Thrice | .73 | .03 | .05 | .02 | -- | -- | -- | -- | -- | -- |
| Unperformed Lie Describe Once | .62 | .04 | .08 | .03 | 4.88 | .38 | 3.45 | .29 | 2.25 | .22 |
| Unperformed Lie Describe Thrice | .66 | .03 | .10 | .03 | 6.25 | .38 | 4.14 | .26 | 3.15 | .22 |
| Unperformed No Rehearsal | -- | -- | .04 | .02 | -- | -- | -- | -- | -- | -- |

Note. Values for correct “performed” responses on the source test (i.e., accurate recognition) are in boldface

CHAPTER 3. EXPERIMENT 2

Here I examined how a volitional act of deception affects one's memory for their lies, as well as a potential mechanism for how volitional deception affects memory. Participants completed an adaptation of the paradigm used in the Experiment 1. Some participants were permitted to choose when they lied or told the truth (*volitional* participants). Other participants were yoked to volitional participants and were instructed when and how to lie based on the choices made by their yoked participant (*instructed* participants). After providing each lie or truth statement, some participants moved on to the next trial and some were asked to predict the likelihood that they would remember having lied (or told the truth) on a later memory test (a metacognitive judgment of learning or JOL; Rhodes, 2016). Recent research has shown that the act of making JOLs can influence subsequent memory performance (e.g., Mitchum, Kelley, & Fox, 2016). Therefore, manipulating whether participants provide JOLs allowed for an examination of whether metacognitive monitoring influences subsequent memory performance, and whether this was particularly so when participants lied or told the truth with volition. Following a delay, participants' memory for the original experience was assessed with a combined recognition and source test.

Hypotheses

H1a: *Participants will provide higher judgments of learning for items that are truthfully rehearsed rather than deceptively rehearsed, regardless of statement type.*

This prediction aligns with prior studies that assess the influence of lying on metamemory (Besken, 2018; Experiment 1, this dissertation). Specifically, people consistently predicted that they would remember truthful responses more than their lies (*ds* ranging from 0.68

to 1.12 for Experiments 1- 4 in Besken, 2018; $d = 0.65$ in Experiment 1 above). I expect to replicate this pattern.

H1b: Participants will provide higher judgments of learning for items that are denied rather than described, regardless of veracity.

This prediction is based on the relative fluency of, or ease of producing, denials compared to descriptions (Oppenheimer, 2008). Based on participant self-reports, descriptions are more difficult to produce than denials (Dianiska, Lane, et al., in prep; Vieira & Lane, 2013). Further, particularly for *deceptively* rehearsed statements, participants in Experiment 1 predicted higher memory performance for false denials over false descriptions. Thus, I expect that participants will be sensitive to the relative perceived ease of generating different rehearsal types and give higher JOLs to denials rather than descriptions.

H1c: Participants will provide higher judgments of learning in the Volition-Present conditions than Volition-Absent conditions.

This prediction is borne out of the potential for the *act* of choosing to inflate predictions of memory performance through the sheer act of choosing. Though I do not have specific predictions as to which specific items will be chosen to be lied about during the Rehearsal Phase, one potential selection method that participants may use is to lie about items that are relatively more distinctive or (subjectively) more memorable than others. Thus, participants may give higher ratings of later memory performance to items that they selected to rehearse further.

H2a: Participants will have higher memory accuracy when they exercise volition over the items about which they lie and tell the truth compared to when the lies and truths are instructed by the experimenter, and this should be true especially for deceptively rehearsed statements.

This prediction is borne out of findings in the education domain regarding the self-choice effect. When respondents are able to exert control over the items about which they will lie or tell the truth, I predict that they will show enhanced source memory performance (e.g., Murty, DuBrow, & Davachi, 2015), compared to when lies and truths are selected by an experimenter. Further, I predict that this will benefit memory more for lies than truths.

H2b: Participants will have higher memory accuracy when providing metacognitive judgments of learning compared to when these judgments are not provided, regardless of item type.

A main effect of JOLs is expected should the act of providing a judgment of learning change how participant process or attend to the rehearsed items. This could be due to JOLs directing attention to easier items (Janes et al., 2018) or due to differential processing of the rehearsed items when JOLs are provided (e.g., Dougherty, Scheck, Nelson, & Narens, 2005). Overall, I expect that the provision of metacognitive judgments will enhance memory relative to when participants do not think critically about their future memory performance.

H2c: Participants will be more accurate when retrieving descriptions rather than denials, particularly for truthful descriptions.

Relative to denying an action, describing an action involves additional constructive processes required to create a realistic account (e.g., Walczyk et al., 2003; Walczyk et al., 2014). Therefore, more elaborated descriptions should increase the amount of available perceptual, contextual, and mental operations that can be used to correctly attribute the source of a memory (Johnson et al., 1993). This two-way interaction between Veracity and Rehearsal has also been observed in prior studies using the actions paradigm (Experiment 1; see also Dianiska, Lane, et al., in preparation).

H3: *The proportion of consistent details in participant descriptions will be higher for participants who choose items to describe truthfully and deceptively, compared to when instructed to describe an item truthfully or deceptively by an experimenter.*

If volition is related to improved metacognitive capabilities (e.g. Kornell & Metcalfe, 2006) then participants might exhibit better memory for the descriptions that they provided after having chosen to do so.

Method

Participants

In total, 136 undergraduate students (82 female) from Iowa State University participated in Experiment 2 in exchange for course credit. Three participants failed to return for Session 2, leaving 133 participants who successfully completed both sessions. The ages of participants varied between 18 and 31 years of age ($M = 19.43$, $SD = 1.80$). Fifteen participants identified as non-native speakers; however, non-native speakers were included in the final analyses as their inclusion did not change the results. A power analysis determined a total sample of $n = 112$ would be sufficient to detect a small within-between interaction effect ($f = .15$) to achieve power of .90 with an alpha value of .05 (Faul, Erdfelder, Buchner, & Lang, 2009). This power analysis was based on the expected effect of Veracity x Volition, given the size of the main effect of Veracity in prior work (d s between 0.30 to 0.48 in Dianiska, Lane, et al., in prep) in concert with an expected small-to-medium influence of Volition (as found in Hudson et al., 2019). Due to computer errors, some data from Session 1 is missing for four participants who completed the full experiment, and data from Session 2 was lost for one participant.

Materials and Design

Stimuli were the same set of 48 simple objects used in Experiment 1 that participants used to perform actions. A 2 (*Volition*: Instructed, Volitional) x 2 (*JOL*: Absent, Present) x 2

(*Veracity*: Lie, Truth) x 2 (*Rehearsal Type*: Deny, Describe) mixed design was used. Volition and JOLs were manipulated between-subjects, while Veracity and Rehearsal Type were manipulated within-subjects.

Procedure

Participants were run individually across two sessions conducted one week apart. The first session comprised the Action Phase and the Rehearsal Phase, and the second session comprised the Test Phase (see Figure 7).

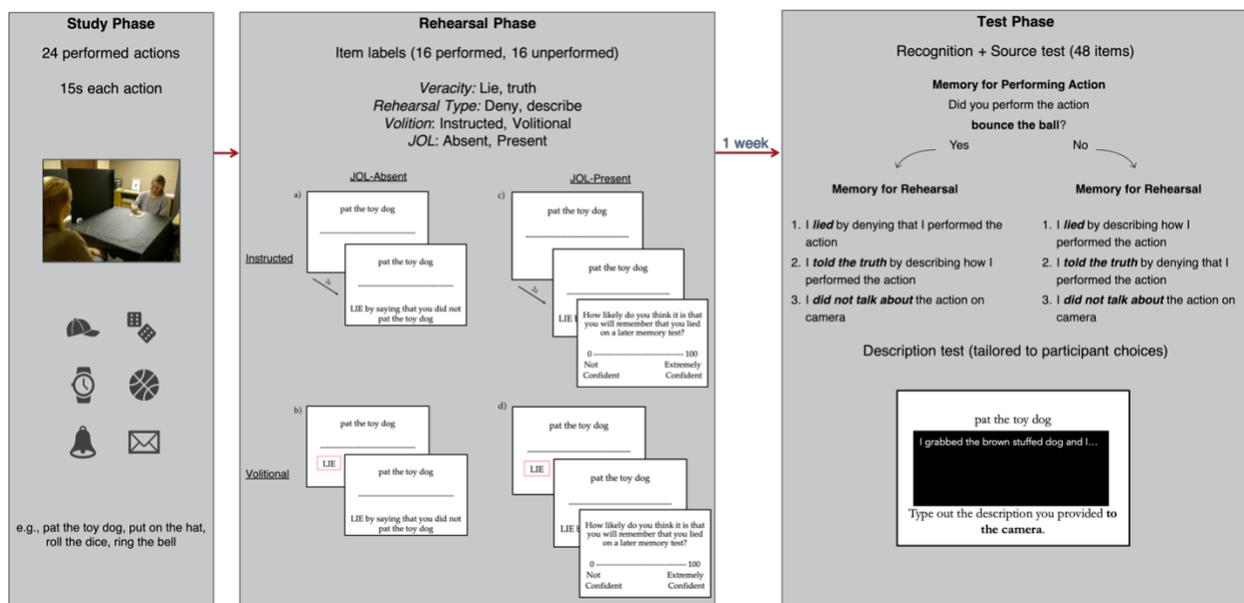


Figure 10. Depiction of procedure used in Experiment 2.

Session 1

Participants first completed the Action Phase as in Experiment 1. Participants performed 24 simple interactions with objects for 15 seconds each. Next, participants began the Rehearsal Phase (see Figure 11 for rehearsed item types). During this phase, participants were told that they would lie or tell the truth about actions that they had just performed, as well as actions that they had *not* performed. To motivate participants to lie or tell the truth convincingly, participants were told that another group of people would watch their videotaped responses and rate them on

believability, with the person rated most believable winning a \$50 reward. In reality, all participants were entered into a random drawing for the reward.

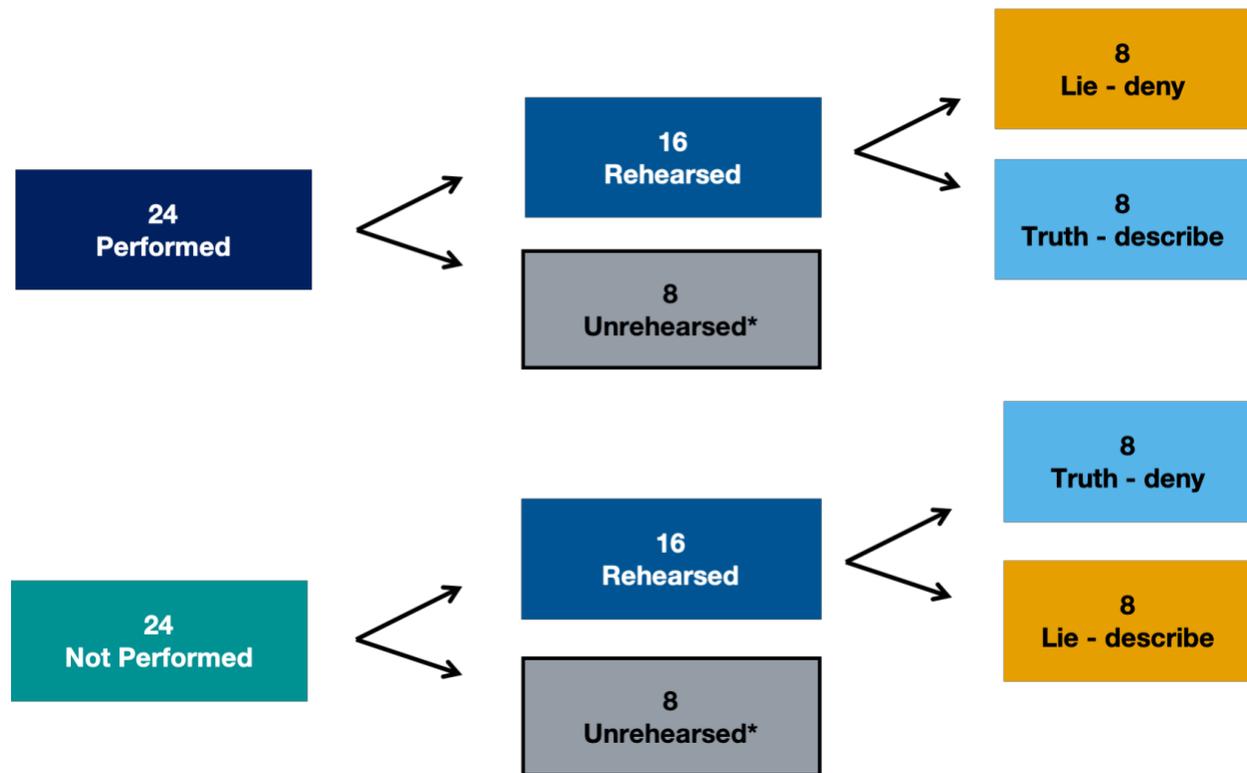


Figure 11. Item types presented in the Rehearsal Phase in Experiment 2. Items with an asterisk represent control items on the final test that were not rehearsed.

For studied actions, participants either *lied* by denying performing the action or *told the truth* by accurately describing the actions as if they had performed them. For unstudied actions, participants either *lied* by describing the actions as if they had performed them or *told the truth* by denying performing that action. Participants were randomly assigned to either a *volitional* or *instructed* between-subjects condition. For all participants, an action statement was presented on the screen (see Figure 10, Rehearsal Phase panel). Participants in the *volitional* condition were shown the action statement (e.g., “pat the toy dog”) and then exerted their volition by selecting “Lie” or “Truth.” After making their selection, the participants were shown instructions for how to either lie or tell the truth on that trial (e.g., “LIE by saying that you did not pat the toy dog”).

Participants in the *instructed* condition were yoked to volitional participants such that the items for which they were instructed to lie and tell the truth were chosen by a participant in the volitional condition. In the instructed conditions, participants were shown the action statement and then instructions for how to lie or tell the truth about the action.

Participants were also randomly assigned to a JOL Absent versus Present condition to account for the potential for reactivity when asking people to make JOLs. In the JOL-Present condition, after providing a response to the camera for each action statement, participants rated the likelihood that they will remember that they lied (or told the truth) about that action on a subsequent memory test on a scale from 0 to 100. Those in the JOL-Absent condition did not complete these ratings.

After providing all of the rehearsal statements on camera, participants provided demographic information (age, sex, ethnicity) and responded to several post-experiment questions regarding the frequency with which they lie in everyday life (white lies, serious lies), how difficult they found it to provide the different types of rehearsal statements (truthful descriptions, false descriptions, truthful denials, false denials), as well as how believable they think they are when lying (in the experiment, in everyday life). Finally, participants in the volitional condition responded to an open-ended prompt assessing their strategy in selecting items to lie or tell the truth about. All participants will then be dismissed from Session 1.

Session 2

One week later, participants completed a 48-item recognition and source test. For each action statement, participants indicated how they encountered the action in Session 1 by responding to two statements. First, participants were asked to respond “yes” or “no” about their memory for the *action*: “Did you perform the action?”. Depending on their response, participants chose from one of three response options assessing their memory for *rehearsal*. If participants

indicated “yes” they did perform the action, they were shown the options: “I lied by describing the action on camera,” “I told the truth by denying performing the action on camera,” or “I did not talk about this action on camera.” If participants indicated “no” they did not perform the action, they were shown the options: “I lied by denying performing the action on camera,” “I told the truth by describing the action on camera,” or “I did not talk about this action on camera.”

Following the source test, participants completed a test over the descriptions they provided in the first session. For each described item, participants were instructed to type in the exact description that they gave to the camera during the Rehearsal Phase. After typing out each description, participants provided a measure of their confidence in that description on a 3-point confidence scale. After completing the source test and the descriptions test, participants responded to a post-experiment questionnaire assessing whether they rehearsed or discussed the experiment since completing Session 1. Participants were then debriefed and dismissed from the study.

Results

All materials and data necessary to produce the statistical results are hosted on OSF (https://osf.io/u875g/?view_only=88e413644c114d90a7969e4429f8bd43). Descriptive statistics can be found in Tables 4 and 5. The following results are separated by whether they were hypothesized (and pre-registered) or exploratory. Below, I begin by assessing the effects of the type of rehearsal and the ability to exert volition on participants’ predicted memory performance (JOLs). I then assess the effect of the type of rehearsal, ability to exert volition and the provision of JOLs on actual memory performance on the final memory test. Next, I examine differences in consistency of described action statements based on veracity, volition, and JOL conditions.

Hypothesized Analyses

Primary hypotheses were pre-registered on Open Science Framework (OSF) prior to analysis. When null results are found for the pre-registered hypotheses, I provide Bayes Factors (BF_{01}) to discuss the strength of the observed evidence for a null effect.

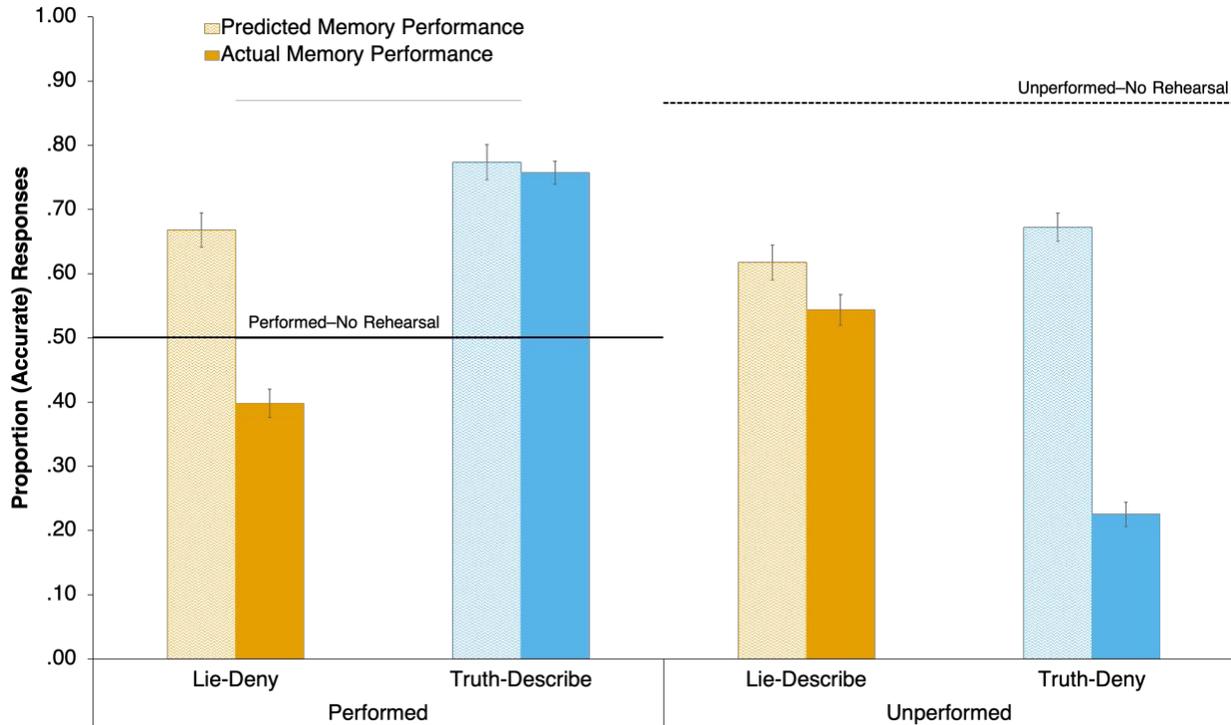


Figure 12. Predicted memory performance (JOLs) and actual memory performance (source test accuracy) in Experiment 2. Error bars represent standard errors.

Predicted Memory Performance

During Session 1, participants in the JOL-Present conditions predicted their ability to remember a response on a later memory test on a scale from 0 to 100 (see Figure 12, lighter bars). A 2 (*Volition*: Instructed, Volitional) x 2 (*Veracity*: Lie, Truth) x 2 (*Rehearsal Type*: Deny, Describe) mixed ANOVA was conducted on the average judgment of learning (JOL) rating for each item type, with Volition as a between-subjects variable and Veracity and Rehearsal Type as within-subjects variables. Overall, I expected to see main effects of Veracity (H1a), Rehearsal

Type (H1b), and Volition (H1c), such that participants would provide higher JOLs for truthfully-rehearsed statements, higher JOLs for denied responses, and higher JOLs when they could choose the items about which to lie and tell the truth.

There was a significant main effect of Veracity ($F(1, 65) = 29.53, p < .001, d = 0.66 [0.40, 0.92]$) and Rehearsal Type ($F(1, 65) = 7.56, p = .01, d = 0.34 [0.09, 0.58]$). In support of H1a, people predicted they would remember items that they rehearsed truthfully ($M = .72, SE = .02$) better than items that they lied about ($M = .64, SE = .03$). Further, people predicted they would remember their described statements ($M = .70, SE = .02$) better than their denied statements ($M = .67, SE = .03$). This is opposite, however, to what was expected based on the fluency literature (H1b). These main effects were qualified by a significant interaction between Veracity and Rehearsal Type ($F(1, 65) = 38.48, p < .001, \eta_p^2 = 0.37$). People again predicted they would remember their truthful descriptions ($M = .77, SE = .02$) better than false descriptions ($M = .62, SE = .03$), $t(66) = 7.67, p < .001, d = 0.94 [0.65, 1.22]$. However, there was no difference in predicted memory performance for true denials ($M = .67, SE = .03$) compared to false denials ($M = .67, SE = .03$), $t(66) = 0.25, p = .80, d = 0.03 [-0.21, 0.27]$.

In contrast to H1c, there was no significant main effect of Volition, $F(1, 65) = 2.11, p = .15, d = 0.36 [-0.13, 0.84]$, $BF_{01} = 1.16$. Participants did not provide significantly higher JOLs based on whether they were able to choose when to lie or tell the truth ($M = .72, SE = .03$) or if they were instructed when to lie or tell the truth ($M = .65, SE = .04$). An estimated BF_{01} suggests that the data are 1.16 times more likely under the observed model with only main effects of Veracity, Statement Type, and an interaction between the two, than under the hypothesized model with Volition as a main effect. This suggests that the null effect is a product of an underpowered study to detect a small effect, rather than a true null effect of volition.

Actual Memory Performance

During Session 2, participants completed a 48-item memory test. For each action statement, participants responded to two questions assessing their interaction with an action during Session 1 – one assessing their memory for performing the action (a yes/no question, “Did you perform the action?”), and one assessing their memory for how they rehearsed the action on camera (selected from one of three response options). Responses on this test were considered accurate if participants were correct in classifying an action as performed (or not performed), as well as how they rehearsed the action during the first session. See Table 4 for response choice descriptive statistics, collapsed across between-subjects conditions.

A 2 (*Volition*: Instructed, Volitional) x 2 (*JOL*: Absent, Present) x 2 (*Veracity*: Lie, Truth) x 2 (*Rehearsal Type*: Deny, Describe) mixed ANOVA was conducted on the proportion of accurate memory test responses (see Figure 12, darker bars). I expected to see an interaction between Volition and Veracity (H2a), such that participants would be more accurate, particularly for deceptive statements, when they could choose which items they would provide lies and truths. I further predicted a main effect of JOLs (H2b), expecting that the act of providing JOLs would affect how participants process test items. Lastly, I expected to replicate the interaction between Veracity and Rehearsal Type (H2c), wherein source accuracy would be greater for descriptions than denials, especially for truthful descriptions.

In contrast to expectations (H2a, H2b), there was no significant interaction between Volition and Veracity, $F(1, 127) = 0.03, p = .87, \eta_p^2 < 0.01, BF_{01} = 30.66$; nor was there a significant main effect of providing JOLs, $F(1, 127) = 0.99, p = .32, d = 0.17 [-0.17, 0.52], BF_{01} = 3.48$. There was, however, a significant interaction between Veracity and Rehearsal Type, $F(1, 127) = 116.67, p < .001, \eta_p^2 = .48$, partially supporting H2c. For actions that were described, accuracy was higher for truthful descriptions ($M = .76, SE = .02$) than false descriptions ($M =$

.55, $SE = .02$), $p < .001$, $t(130) = 9.50$, $p < .001$, $d = 0.83$ [0.63, 1.03]. The opposite pattern was found for actions that had been denied – false denials ($M = .40$, $SE = .02$) were associated with higher accuracy on the memory test compared to true denials ($M = .23$, $SE = .02$), $t(130) = 6.89$, $p < .001$, $d = -0.60$ [-0.79, -0.42].

Additionally, there was a significant effect of Rehearsal Type, $F(1, 127) = 223.02$, $p < .001$, $\eta^2 = .64$. Source accuracy was greater for actions that had been described ($M = .66$, $SE = .02$) than for actions that had been denied ($M = .31$, $SE = .02$; $d = 1.29$ [1.06, 1.52]). Finally, there was a significant three-way interaction between Rehearsal Type, JOLs, and Volition, $F(1, 127) = 3.98$, $p = .05$, $\eta^2 = .03$. Follow-up comparisons were conducted to assess the effect of providing JOLs on accuracy for denials and descriptions separately based on Volition. For volitional participants, there was only a significant main effect of Rehearsal Type ($F(1, 64) = 120.21$, $p < .001$, $d = 1.37$ [1.03, 1.70]). Source accuracy for participants who could choose when to lie and tell the truth was greater for actions that were described ($M = .66$, $SE = .02$) rather than denied ($M = .33$, $SE = .02$). Neither the main effect of JOLs ($F(1, 64) = 0.40$, $p = .53$, $d = 0.16$ [-0.33, 0.64]), nor the interaction between JOLs and Rehearsal Type ($F(1, 64) = 0.43$, $p = .51$, $\eta^2 = .01$) were significant. Instructed participants similarly showed a main effect of Rehearsal Type, $F(1, 63) = 104.89$, $p < .001$, $d = 1.23$ [0.90, 1.55]. Accuracy was greater for actions that were described ($M = .65$, $SE = .03$) rather than denied ($M = .29$, $SE = .03$). Further, there was a significant interaction between JOL and Statement Type, $F(1, 63) = 4.28$, $p = .04$, $\eta^2 = .06$. Instructed participants who did not provide JOLs showed a greater difference in accuracy for denials ($M_{\text{deny}} = .18$, $SE_{\text{deny}} = .03$) than descriptions ($M_{\text{describe}} = .70$, $SE_{\text{describe}} = .04$; $d = 1.50$ [0.98, 2.01]), when compared to instructed participants who did provide JOLs ($M_{\text{deny}} = .31$, $SE_{\text{deny}} =$

.04; $M_{\text{describe}} = .60$, $SE_{\text{describe}} = .04$; $d = 1.03$ [0.61, 1.45]), No other effects from the omnibus test were significant, F 's < 3.41 , p 's $> .07$.

Consistency

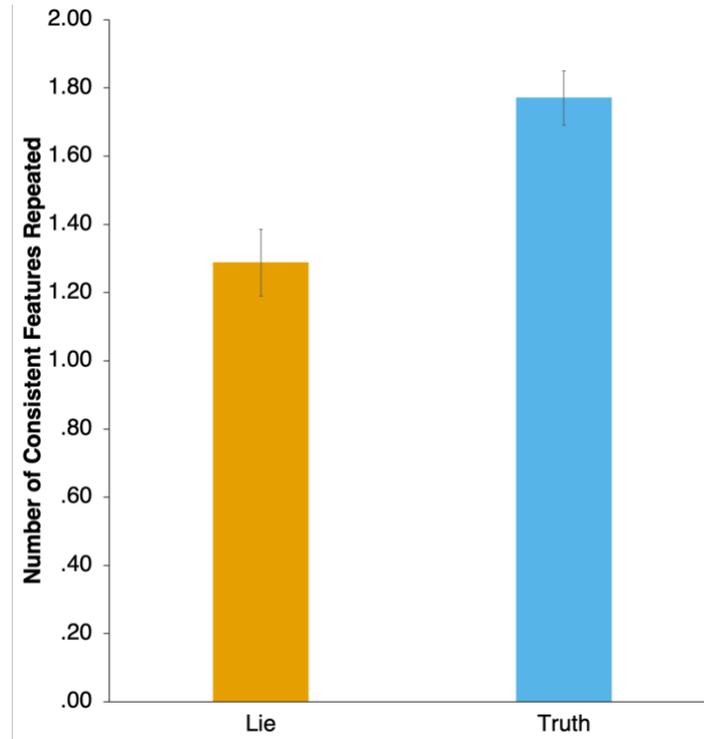


Figure 13. Number of consistent features from Rehearsal Phase provided on the Descriptions test based on Veracity, Experiment 2. Error bars represent standard errors.

Consistency data from 18 participants could not be calculated due to camera errors that prevented recording of Rehearsal Phase statements ($n = 11$), or due to incorrect completion of the descriptions test ($n = 7$). A 2 (*Volition*: Absent, Present) x 2 (*JOLs*: Absent, Present) x 2 (*Veracity*: Lie, Truth) mixed ANOVA was conducted on the number of features consistently remembered on the Descriptions test (see Figure 13). Supporting hypothesis H3, there was a significant main effect of Veracity ($F(1, 109) = 47.91$, $p < .001$, $d = 0.67$ [0.46, 0.87]). On the descriptions test, people remembered more features for actions that had been rehearsed truthfully

($M = 1.77$, $SE = .10$) rather than lied about ($M = 1.29$, $SE = .08$). No other main effects or interactions were significant, F 's < 2.29 , p 's $> .13$.

Exploratory Analyses

In addition to the pre-registered analyses, and in an effort to explore the replicability of other effects using adaptations of this paradigm, I examined accurate and false recognition for performing actions. Next, I explored metamemory with respect to the correlation between predicted and actual performance as well as the relative accuracy (i.e., resolution) for different statement types. I then examined whether participants adhered to experimenter instructions to keep their responses balanced. Finally, I examined any potential role for volition based on items that were wholly under the participant's control to choose (prior to an experimenter instructing individuals to remain even across their responses), as well as based on whether individuals chose items according to a strategy or at random.

Accurate vs. False Memory for Performing Actions

Prior research (Dianiska, Lane, et al., in prep) has also examined memory for having performed an action (or memory for having studied an image; Vieira & Lane, 2013), regardless of people's memory for whether and how an item was rehearsed. For *accurate* "performed/studied" responses, the general finding is that performed actions that were rehearsed (either by truthfully describing or lying by denying) are more correctly recognized as having been performed than performed actions that were not rehearsed. Similarly, for *inaccurate* "performed/studied" responses, unperformed actions that were rehearsed are sometimes more often falsely recognized as having been previously performed. In some studies, false recognition of actions is increased for repeated truthful denials (Dianiska, Lane, et al., in prep; Vieira & Lane, 2013) as well as for false descriptions (Dianiska, Lane, et al., in prep), compared to unperformed actions that were not rehearsed. Of particular practical importance are false

recognition errors, wherein repeatedly telling the truth (in the case of repeated true denials) or providing a false description (either once or three times) might paradoxically lead to false memories of never-seen items or pieces of information in an interview.

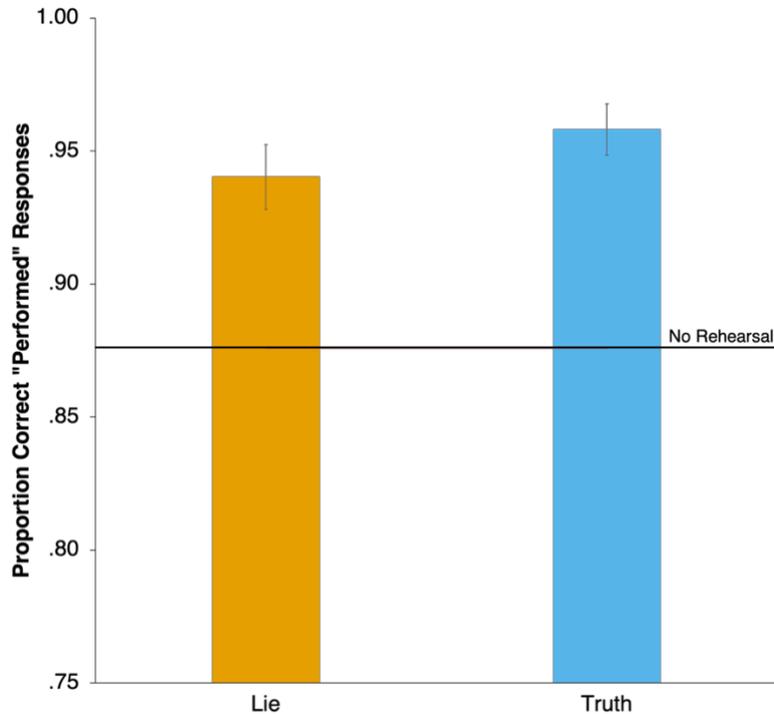


Figure 14. Accurate recognition of a performed action (lie-deny, truth-describe) as having been performed based on rehearsal type, Experiment 2. Errors bars represent standard errors.

In terms of *accurate recognition* for performing an action, a 2 (*Volition*: Instructed, Volitional) x 2 (*JOL*: Absent, Present) x 2 (*Veracity*: Lie, Truth) mixed ANOVA was conducted on the mean proportion of correct “yes” responses to the test item “Did you perform this action?” (see Figure 14). There was a significant main effect of Veracity, $F(1, 127) = 10.77, p = .001, d = 0.29 [0.12, 0.47]$. Accurate recognition of an action as having been performed was significantly higher for truthfully (described) actions ($M = .97, SE = .01$) than for actions that were lied about (i.e., falsely denied; $M = .94, SE = .01$). There were no other significant main effects or interactions, F 's < 2.59, p 's > .11.

Pairwise comparisons were conducted to examine the effect of each performed and rehearsed item type (performed lie-deny, performed truth-describe) on accurate recognition rates, relative to the control items that were performed and not rehearsed. Here, compared to actions that were not rehearsed during the first session ($M = .88$, $SE = .01$), accurate recognition was significantly higher for items that were truthfully described ($t(130) = 6.55$, $p < .001$, $d = 0.57$ [0.39, 0.76]) as well as for items that were falsely denied ($t(130) = 4.44$, $p < .001$, $d = 0.39$ [0.21, 0.57]).

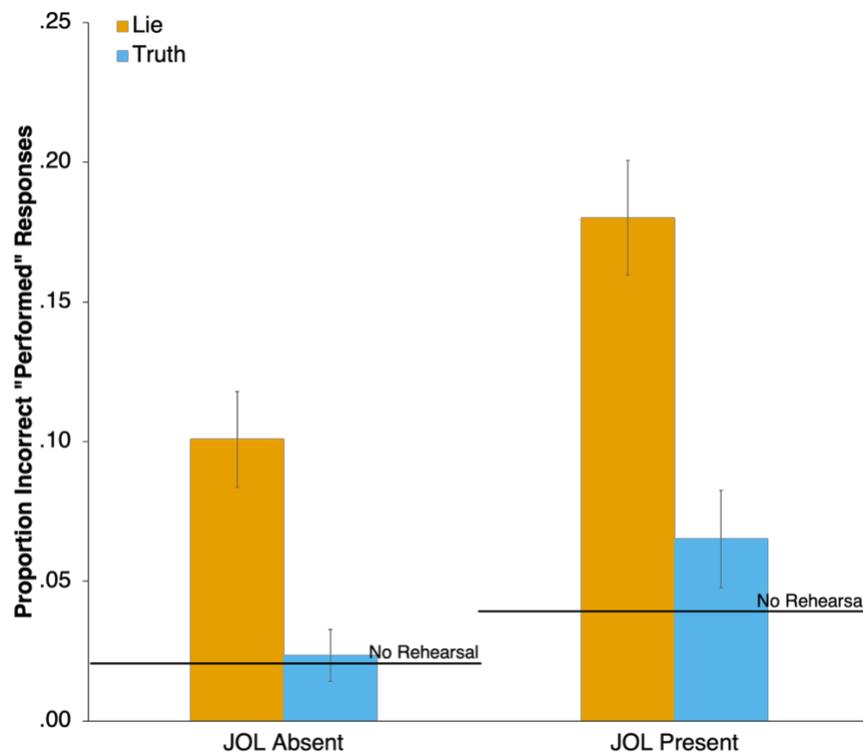


Figure 15. False recognition of an unperformed action (lie-describe, truth-deny) as having been performed based on rehearsal type, Experiment 2. Errors bars represent standard errors.

Next, *false recognition* of unperformed actions was assessed. A 2 (*Volition*: Instructed, Volitional) x 2 (*JOL*: Absent, Present) x 2 (*Veracity*: Lie, Truth) mixed ANOVA was conducted on mean proportion of incorrect “yes” responses to the test item “Did you perform this action?” (see Figure 15). There was a significant main effect of Veracity, $F(1, 127) = 51.62$, $p < .001$, $d =$

0.64 [0.45, 0.83]. False recognition of an action as having been performed was significantly higher for actions that had been lied about (i.e., falsely described; $M = .14$, $SE = .01$) than for actions that were truthfully denied ($M = .04$, $SE = .01$). There was also a significant main effect of JOL condition, $F(1, 127) = 8.99$, $p = .003$, $d = 0.50$ [0.15, 0.85]. Participants who provided JOLs in the first session ($M = .12$, $SE = .01$) were more likely to falsely recognize unperformed actions as having been performed than participants who did not provide JOLs ($M = .06$, $SE = .02$). There were no other significant main effects or interactions, F 's < 2.04 , p 's $> .16$.

Pairwise comparisons were conducted to examine the effect of each unperformed and rehearsed item type (i.e., unperformed truth-deny, unperformed lie-describe) on false recognition rates, relative to the control items that were neither performed nor rehearsed. Overall, actions that were not performed but falsely described were more likely to be incorrectly recognized as having been performed ($M = .14$, $SE = .01$) compared to actions that were not rehearsed at all ($M = .03$, $SE = .01$; $t(130) = 7.78$, $p < .001$, $d = 0.64$ [0.45, 0.83]). There was no significant difference in false recognition rates when actions were truthfully denied ($M = .05$, $SE = .01$) compared to the no rehearsal control items, $t(130) = 1.31$, $p = .19$, $d = 0.12$ [-0.06, 0.29].

Correlation between Predicted and Actual Performance

Pearson correlations were computed to compare the relationship between average predicted memory ratings and source accuracy for each item type. There was a small, nonsignificant positive correlation between predicted and actual memory performance for actions that were truthfully denied ($r(67) = .19$, $p = .12$), falsely denied ($r(67) = .03$, $p = .78$), truthfully described ($r(67) = .09$, $p = .48$), and falsely described ($r(67) = .04$, $p = .75$).

Resolution

To explore relative accuracy, a resolution measure (Goodman-Kruskal gamma correlation) was computed between memory prediction ratings and memory test performance for

each subject separately for actions that were rehearsed truthfully and deceptively, as well as for actions that were rehearsed by denial or description. Gamma correlations could not be computed for participants who did not provide a range of values for judgments of learning ($n = 2$) or for participants who were accurate on all items on the final test ($n = 1$).

I first conducted a 2 (*Veracity*: Lie, Truth) x 2 (*Volition*: Instructed, Volitional) mixed ANOVA to compare participants' resolution for lies and truths. There was no main effect of Veracity ($F(1, 59) = 2.30, p = .14, d = 0.19 [-0.06, 0.45]$), no main effect of Volition ($F(1, 59) = 0.02, p = .88, d = 0.08 [-0.42, 0.57]$), nor an interaction between the two ($F(1, 59) = 0.48, p = .49, \eta_p^2 = .01$). Next, I conducted a 2 (*Rehearsal Type*: Deny, Describe) x 2 (*Volition*: Instructed, Volitional) mixed ANOVA to compare participants' resolution for denials and descriptions. Again, there was no main effect of Veracity ($F(1, 57) = 0.09, p = .77, d = 0.04 [-0.21, 0.30]$), no main effect of Volition ($F(1, 57) = 0.91, p = .35, d = 0.08 [-0.42, 0.08]$), nor an interaction between the two ($F(1, 57) = 0.32, p = .57, \eta_p^2 = .01$).

Item Choices

Before beginning the Rehearsal Phase, participants who were given volition over their lies and truths were instructed to do their best to keep their responses as even as possible across item types. After half of the trials, the experiment paused the Rehearsal Phase and provided participants with an update of their current item distributions. In the event that the items were extremely imbalanced (i.e., less than 3 or more than 5 per item type), the experimenter encouraged participants to try to balance their responses more evenly in the next half of the trials.

For the first half of the trials, participants tended to favor truthfully describing (57%) over falsely denying (43%) actions that had been performed during the Action Phase. For actions that had not been performed, participants provided true denials (50%) at the same rate as false

descriptions (50%). This pattern persisted in the second half of trials, such that across all 16 performed actions participants provided more truthful descriptions (55%) than false denials (45%) but equal amounts of true denials (50%) and false descriptions (50%) for the 16 unperformed actions.

Items Before Experimenter Interruption

There was no effect of volition on participants' source accuracy when all of the items were considered. However, these items include actions that participants may have exerted less control in choosing, given that they were paused halfway through the first session and reminded to even their responses. I explored whether volition might have an effect for actions that participants had the most volition over: items present in the first half of the rehearsal trials, before the experimenter interrupted them. When only these first half items are considered, there was neither a main effect of Volition ($F(1, 127) = 2.58, p = .11, d = 0.27 [-0.07, 0.62]$) nor an interaction between Volition and Veracity ($F(1, 127) = 0.01, p = .92, \eta_p^2 < .01$).

Accuracy Based on Self-Reported Strategy

After completing the Rehearsal Phase of Session 1, participants in the Volition conditions were asked to provide an open-ended response describing how they selected which items to lie or tell the truth about. These responses were coded as comprising one of six strategies: participant selections were either random (i.e., no strategy was used; $n = 6$), or participants endeavored to keep their responses even as per the experimenter instructions ($n = 18$); alternated back and forth between lies and truths ($n = 17$); based their decisions on how easy or difficult it was to describe (or deny) an action ($n = 20$); on the quality of their memory for the action ($n = 11$); or on how easy it was to imagine the action ($n = 7$). For analytic purposes, these strategies were collapsed into two overarching categories: instructional (keeping responses even, alternating) and memory-based (ease of describing, quality of memory, ease of imagining). If participants referenced

multiple strategies, only the first strategy provided was used for groupings. There was no significant difference in strategy selection based on whether or not participants provided JOLs, $\chi^2(2, 66) = 4.67, p = .10$.

I also explored whether participants' self-reported lie strategies might affect performance. Participant selections in the volitional group were further coded as i) having no strategy; ii) using an *instructional* strategy; or iii) using a *memory*-based strategy. To assess whether these strategy choices affected source accuracy, a 3 (*Strategy*: No Strategy, Memory-Based, Instructional) x 2 (*JOL*: Absent, Present) x 2 (*Veracity*: Lie, Truth) x 2 (*Rehearsal Type*: Deny, Describe) mixed ANOVA was conducted on the proportion of accurate source test responses. There was a significant main effect of Veracity ($F(1, 125) = 4.01, p = .05, d = 0.12 [-0.06, 0.29]$). Accuracy on the source test was higher for truthfully rehearsed actions ($M = .51, SE = .02$) than for deceptively rehearsed actions ($M = .47, SE = .02; d = 0.12$). Further, there was a significant main effect of Rehearsal Type ($F(1, 125) = 159.63, p < .001, d = 1.29 [1.06, 1.52]$). As in the earlier analysis, accuracy was higher for actions that were described ($M = .66, SE = .02$) rather than denied ($M = .32, SE = .02; d = 1.28$). These main effects were qualified by a significant interaction between Veracity and Rehearsal Type ($F(1, 125) = 81.88, p < .001, \eta_p^2 = .40$). For actions that were described, accuracy was higher for truthful descriptions ($M = .76, SE = .02$) than false descriptions ($M = .55, SE = .02, t(130) = 9.50, p < .001, d = 0.71$). The opposite pattern was found for actions that had been denied –false denials ($M = .40, SE = .02$) were associated with higher accuracy on the memory test compared to true denials ($M = .23, SE = .02, t(130) = 6.89, p < .001, d = -0.60 [-0.79, 0.42]$). As in the earlier analysis, there was no main effect of Strategy ($F(2, 125) = 0.52, p = .59, \eta_p^2 = .01$, nor an interaction between Strategy and Veracity ($F(2, 125) = 1.93, p = .15, \eta_p^2 = .03$). There was also no main effect of providing

JOLs, ($F(1, 125) = 0.03, p = .86, d = 0.17 [-0.17, 0.51]$). No other main effects or interactions were significant, F 's $< 2.69, p$'s $> .07$.

Summary of Findings

The primary focus of Experiment 2 was to explore the role of volition on both predictions of future memory performance and actual memory performance. As in Experiment 1, both predicted and actual memory performance only varied as a function of veracity and type of statement provided. People believed they would be more likely to remember their truthful statements, especially when they had truthfully described performing an action. Accuracy on the final source and recognition test was also greater for actions that were described – especially if those descriptions were truthful – whereas actions that were denied were better remembered if those denials were lies. Further, although similar patterns of predicted and actual memory performance were observed, there was not a statistically significant relation between JOLs and performance, nor any difference in this relationship based on any manipulated variables. Finally, people again remembered fewer features of lied-about actions than features of actions they had truthfully described. It appears that, relative to telling the truth, lying has negative consequences for memory accuracy.

In this experiment, I conceptualized volitional deception as a choice of *when* to lie. During the rehearsal phase, participants viewed an action statement and then decided to lie or tell the truth on that trial. However, this manipulation failed to significantly affect memory and metamemory performance. Based on Bayes factors (BF_{01}), there was weak evidence for a null effect of volition on JOL ratings, with volitional participants demonstrating numerically higher ratings of predicted memory performance relative to instructed participants. This weak effect suggests that volition might still be a worthy factor to consider in memory predictions, given it may be more likely a consequence of low power than a true null effect. In terms of accurate

memory performance, however, exploratory analyses showed no role for volition when only first half trials or strategic participants were included. Therefore, it may be the case that while volition may be an important qualitative characteristic of deception in everyday life, choosing when to lie may be inconsequential for memory performance after lying. Volition may only be important in the context of other ecologically valid characteristics not examined in this experiment, such as providing an incentive or motivation, allowing time to prepare or plan a statement, or allowing *free* choice unconstrained by an experimenter's instruction to balance response types.

Finally, I extended prior work assessing accurate and false memory for having performed an action. Previous studies have shown that rehearsing *unperformed* actions – either by truthfully saying “I did not perform [action]” or by creating a false description of having performed an action – can increase false recognition of these actions as having been performed on a final memory test. Here, I not only showed this pattern with respect to actions that had been lied about, but also found that false recognition overall was greater for participants who made JOLs during Session 1. I return to these effects and their implications in the General Discussion.

Experiments 1 and 2 offered a laboratory-based, controlled methodology to examine memory and metamemory for lies and truths, and also to examine whether volition might be important to the relationship between lying and memory. In the following experiment, I continued to examine the relationship between lying and memory using a more ecologically-valid investigative interviewing paradigm. The primary aim of Experiment 3 was to determine whether there are reliable differences in consistency for true and false narratives, and whether such consistency might be moderated by the type of interview approach.

Table 4*Experiment 2 Mean Proportion of Source Responses for Each Item Type*

| Item Type | Response Options | | | | | |
|--------------------------|--|--|--|--|--|--|
| | “I performed this action” | | | “I did not perform this action” | | |
| | “I lied by denying that I performed this action on camera” | “I truthfully described this action on camera” | “I did not talk about this action on camera” | “I told the truth by denying that I performed this action on camera” | “I lied by describing this action on camera” | “I did not talk about this action on camera” |
| Performed Lie Deny | .40 (.02) | .26 (.02) | .27 (.02) | .01 (.00) | .01 (.00) | .04 (.01) |
| Performed Truth Describe | .14 (.01) | .76 (.02) | .07 (.01) | .00 (.00) | .01 (.00) | .02 (.01) |
| Performed No Rehearsal | .20 (.02) | .18 (.02) | .50 (.03) | .01 (.00) | .02 (.01) | .09 (.01) |
| Unperformed Truth Deny | .01 (.00) | .02 (.01) | .02 (.00) | .23 (.02) | .18 (.02) | .55 (.02) |
| Unperformed Lie Describe | .04 (.01) | .06 (.01) | .05 (.02) | .10 (.01) | .55 (.02) | .21 (.02) |
| Unperformed No Rehearsal | .01 (.00) | .02 (.01) | .01 (.00) | .04 (.01) | .06 (.01) | .87 (.01) |

Note. Values for correct source responses are in boldface. Standard errors are in parentheses. Responses are collapsed across volition and metacognitive judgment conditions.

Table 5*Experiment 2 Descriptive Statistics*

| Item Type | JOL Ratings | | Recognition as “Performed” | | Total Details – Rehearsal | | Total Details – Descriptions Test | | Number of Consistent Details | |
|--------------------------|-------------|-----|-------------------------------|-----|------------------------------|-----|--------------------------------------|-----|---------------------------------|-----|
| | Mean | SE | Mean | SE | Mean | SE | Mean | SE | Mean | SE |
| Performed Lie Deny | .67 | .03 | .94 | .01 | -- | -- | -- | -- | -- | -- |
| Performed Truth Describe | .77 | .02 | .97 | .01 | 3.18 | .14 | 2.48 | .13 | 1.77 | .10 |
| Performed No Rehearsal | -- | -- | .88 | .01 | -- | -- | -- | -- | -- | -- |
| Unperformed Truth Deny | .67 | .03 | .04 | .03 | -- | -- | -- | -- | -- | -- |
| Unperformed Lie Describe | .62 | .03 | .14 | .01 | 2.90 | .14 | 1.92 | .11 | 1.29 | .08 |
| Unperformed No Rehearsal | -- | -- | .03 | .01 | -- | -- | -- | -- | -- | -- |

Note. Values for correct “performed” responses on the source test are in boldface. Responses collapsed across volition and metacognitive judgment conditions.

CHAPTER 4. EXPERIMENT 3

In Experiment 3, consistency across repeated interviews was examined using a behavioral paradigm in which participants completed a series of complex tasks prior to being interviewed. Given the difficulty of establishing ground truth when asking people to recall a prior experience, the current paradigm allowed for a more objective assessment of information obtained from an interviewee's statement as a function of recommended interviewing techniques used during an initial interview (a structured interview and a reverse-order recall instruction). Participants completed a scavenger hunt at four different locations on campus during an initial session. Subsequently, participants chose two of the buildings to tell the truth about their activities, and then created a lie about activities in two other buildings that had not been visited. Participants were interviewed on one or two occasions, depending on their assigned condition. Interviews occurred immediately following the event (for some participants) and following a 7-day delay (for all participants). Some participants were randomly assigned to be initially interviewed using one of two forensic interview protocols, or to not complete an initial interview. Seven days later, all participants returned for a second session, during which participants were interviewed about their activities the week prior. Participants were provided an open-ended prompt to freely recall each of the two events that they experienced in the first session, describing each event truthfully or deceptively. For participants for whom this was their second interview, they were instructed to continue lying or telling the truth as they had done in the first session. Lastly, participants provided a final truthful description of the lied-about event as well as a final account of the truthfully rehearsed event. Experiment 3 therefore examined how lying on a prior interview affects one's memory for what truthfully occurred, and how interviewing techniques might affect the consistency of information reported across repeated interviews.

Hypotheses

H4: Participants will recall fewer correct details about a lied-about event, compared to the events that were rehearsed truthfully.

Providing an initially deceptive, elaborated description might lead to inaccurate memory. For instance, Pickel (2004) showed that eyewitnesses who provide false descriptions or false details of a perpetrator were more likely to provide that self-generated false information on a later test, decreasing overall accuracy. This suggests that false descriptions, once generated, have the potential to powerfully influence a liar's memory.

H5a: Participants interviewed with a Reverse Order technique will show more omitted details than participants interviewed with a Structured Interview.

Interviewing techniques such as Reverse Order instructions tend to increase the amount of information provided in an event narrative. Therefore, I hypothesize that in the absence of retrieval cues on a subsequent recall attempt (as when only a free report is requested of an interviewee) participants will report fewer details overall on a subsequent interview. Following only a 3-minute delay between repeated interviews, Hudson et al. (2017) observed more omissions following a reverse-order recall instruction. However, the reverse-order instruction was administered by Hudson and colleagues after an initial open narrative – akin to the Phase I interview in the current dissertation. In contrast, the order of interview prompts in the current dissertation will be reversed such that participants will first provide a statement following a reverse-order instruction (during Phase I) and then omissions will be assessed when compared with the subsequent free recall instruction (during Phase II).

H5b: Participants will be more consistent when truthfully describing an event than when deceptively describing an event.

H5c: Participants will provide more new details when truthfully describing an event than when deceptively describing an event.

When faced with diverse retrieval cues (such as when asked to describe an event in reverse-chronological order), truth-tellers are able to rely on their memory for an event to provide an elaborated statement. When comparing consistency as the proportion of consistent details relative to *contradictions*, truth-tellers are more consistent than liars (Leins et al., 2012). However, because truth-tellers are able to draw from a truly experienced event, they might also be more likely to possess additional information to provide on a subsequent recall opportunity (Gilbert & Fisher, 2006).

H6a: Participants interviewed with a Reverse Order instruction will provide more detailed narratives overall, compared to participants interviewed with a Structured Interview.

Varied retrieval can enhance the amount of information reported from memory and is an important component of one of the most widely studied evidence-based interviewing techniques, the Cognitive Interview (Fisher & Geiselman, 1992). Thus, I expect to see longer initial statements from a Reverse Order interview instruction, compared to when these instructions are not administered prior to an interview.

H6b: Participants will provide more detailed statements when describing an event truthfully, compared to when describing an event deceptively.

Truth-tellers are able to draw on their memory for an episodic event to add details to their statements, whereas liars are likely to invent stories that lack the richness of such details. This assumption underlies a popular method of assessing credibility with verbal content: Criteria-Based Content Analysis (Steller, 1989; Steller & Köhnken, 1989). Evidence suggests that this may be particularly true when comparing liar and truth-teller statements following a Reverse

Order instruction (Evans et al., 2013). Thus, an interaction between Interview Technique and Veracity has some support in prior research, but only main effects are specifically predicted given the inconsistency in findings.

H7: Participants who provided an initial statement during Interview Phase I will provide more detailed statements on a subsequent interview, compared to participants in the Initial Interview-Absent condition.

Given the known benefits of retrieval for later memory performance (e.g., Roediger & Karpicke, 2006), I hypothesize that on a later free report, participants who provided an account of their activities on an initial interview will provide more information than those not initially tested.

Method

Participants

A total of 112 participants (56 female) were recruited from Iowa State University, and 105 completed the full experiment ($n = 7$ dropped out between Session 1 and Session 2). Data from six additional participants were excluded for not complying with interview instructions for either Phase I or Phase II interviews. Thus, the final sample analyzed for the dissertation had slightly uneven cells for Interview Absent ($n = 29$), Reverse Order ($n = 32$), and Structured Interview ($n = 38$) conditions. The ages of participants varied between 18 and 28 years of age ($M = 19.38$, $SD = 1.39$).

Due to University closure in the Spring of 2020 in response to the COVID-19 virus, data collection ended prematurely. The target sample of 144 research participants ($n = 48$ per group) would provide sufficient power to detect a relatively small within-between interaction effect size ($f = .15$) with power of .90 (Faul et al., 2009). This power analysis is based on prior work demonstrating differences in consistency for liars and truth-tellers across repeated interviews

(e.g., $f = .31$ in Leins et al., 2012) and robust increases in total detail following strategic interviewing techniques (e.g., $f = .20$ when comparing chronological recall and reverse order recall in Hudson et al., 2019). To appropriately power an interaction between Veracity and Interview Technique, a more conservative effect size was used ($f = .15$) than has been observed in prior work. Data analyzed and presented here represent those collected prior to the university closure in March of 2020. The remaining participants needed to fulfill the proposed target sample will be collected when the University reopens and initiates human subject research. Had the power analysis been less conservative (e.g., to power .80), the current sample size would have been sufficient to detect the anticipated effect size.

Design

A 3 (*Initial Interview Technique*: Absent, Reverse-Order, Structured Interview) x 2 (*Veracity*: Lie, Truth) x 2 (*Interview Time*: Phase I, Phase II) mixed design was used. Initial Interview Technique was manipulated between-participants, and Veracity and Interview Time were manipulated within-participants.

Procedure

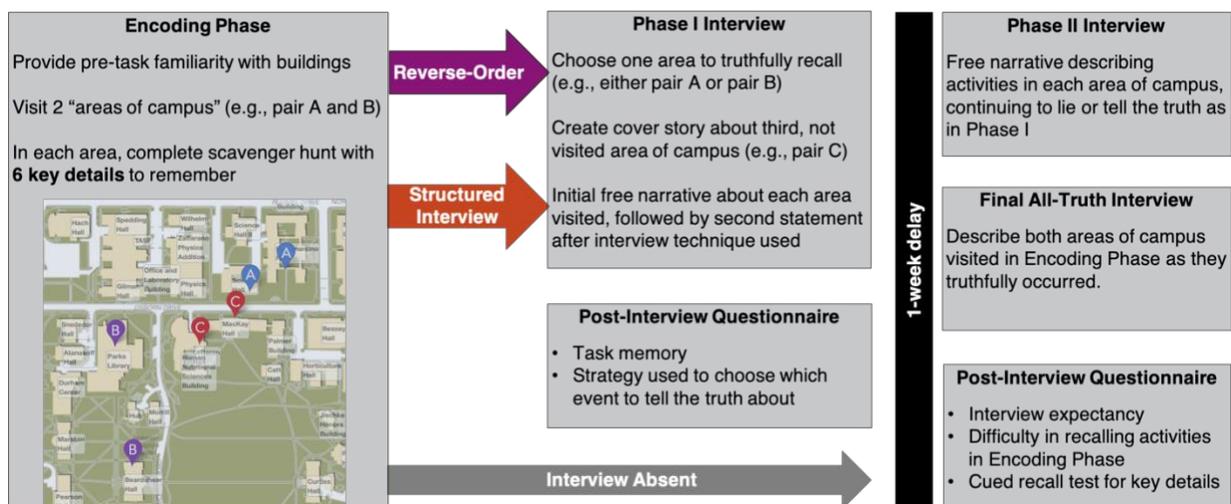


Figure 16. Depiction of procedure used in Experiment 3

Participants completed two sessions conducted one week apart (see Figure 16). The first session comprised the Encoding Phase and the Phase I Interview (for initially-interviewed conditions). Participants visited four buildings (two pairs of buildings total) on the Iowa State University campus and completed a scavenger hunt for information within each building. After completing the scavenger hunt, some participants were interviewed about their activities (Reverse Order, Structured Interview conditions) and some were dismissed from the session (Absent condition). Before being interviewed, participants were instructed that they would truthfully tell the interviewer about one pair of buildings of their choice; they would not discuss the other pair of buildings they visited, and instead were instructed to lie about a specific set of buildings that were not visited during the experiment.

Encoding Phase

Upon arrival to the session, participants received instructions and provided informed consent to complete the experiment. Before beginning the Encoding Phase, participants completed a brief survey assessing their familiarity with six buildings on the University campus on scale from 1 (I have never been there/Not familiar) to 7 (I know the ins and outs of the building/Extremely familiar).

During the Encoding Phase, participants completed what they believed to be a study assessing people's memory for previously performed activities. Participants received instructions that they would be going to different buildings on the university campus and performing a scavenger hunt at each one. Participants then navigated to two "areas" of campus (i.e., two buildings near each other: Pair A: Science Hall & Lagomarcino Hall; Pair B: Parks Library & Beardshear Hall; Pair C: LeBaron Hall & Mackay Hall) and completed a series of brief tasks at each one. Throughout the course of the Encoding Phase, participants were tasked to remember six key pieces of information that they learned in each area. Three versions of the scavenger hunt

were created, such that each pair of buildings was equally presented to participants as the first area or second area to which they navigated. All version tasks and instructions for the scavenger hunt can be found on the OSF repository.

Science Hall I and Lagomarcino Hall

Participants went to the first, second, and third floors of Science Hall I. Pieces of information included the states present in a topographical map at the top of a set of stairs, information about properties of minerals, and the type of geological specimen present in a display case. Next, participants headed to the Lagomarcino Hall courtyard and café, and were tasked to remember details such as the daily hot special, a made-to-order sandwich order slip, and the title of a book carved into the façade of a fountain.

Parks Library and Beardshear Hall

In Parks Library, participants sought objects on the first and third floors. For instance, participants had to find murals throughout the building and remember details about what was present in each scene, and retrieve a book with a specific call number from the shelving stacks and remember the theme of a certain page. From Parks Library, participants navigated to Beardshear Hall. In this administration building, participants located a plaque honoring Distinguished Professors (and were tasked to remember the Colleges associated with awardees) as well as a bulletin board of campus event advertisements (and picked an upcoming event that they planned on attending).

LeBaron Hall and Mackay Hall

Participants were first tasked to count the number of bikes outside of LeBaron Hall. Within the building, participants found information about majors offered by the College of Human Sciences as well as a plaque for recipients of the Honorary Alumni Award. From LeBaron Hall, participants headed to Mackay Hall and located a memorial fountain

(remembering the date that it was installed), an outreach bulletin board (taking a recipe card and imagining preparing the dish), and a career development display case (remembering the types of industries available in a particular state).

When participants arrived back to the lab, those in the Interview-Absent condition were dismissed and asked to return one week later to complete Session 2. Those in the Interview-Present conditions (Reverse-Order, Structured Interview) received instructions for the initial interview phase. Participants will be instructed that they will be interviewed about their actions after leaving the lab. For the interview, they will be asked to tell the truth about one area of campus (meaning one “pair” of buildings) and lie about another area of campus. The participants could choose either the first pair of buildings that they visited or the second pair of buildings that they visited about which to tell the truth but were instructed that they must lie about a pre-specified set of buildings. For instance, if participants in reality had visited Science Hall I and Lagomarcino Hall (Pair A) as well as Parks Library and Beardshear Hall (Pair B), their statements would involve a truthful account of either Pair A or Pair B and a false account about having visited LeBaron Hall and Mackay Hall (Pair C).

For the lied-about event, participants were instructed that they needed to create a detailed, believable cover story. Participants were provided with a worksheet with minimal information about the buildings they were tasked with lying about (that was gleaned from the public access building information available on the University’s Facilities Planning and Management website; see OSF for the worksheet) and given 5-6 minutes to write down details that could be provided in their narratives. To motivate participants to lie well during the task, participants were told that their interviews will be evaluated by other people after the session has concluded, and the person who is judged to be most believable will win a \$25 reward. After the cover story prep time was

complete, the experimenter confirmed that the participant understood the instructions for the interview task and then left the room to notify the interviewer.

Phase I Interview

The participants interviewed in Phase I were randomly assigned to be interviewed with a Reverse Order Instruction or a Structured Interview (the scripts for each interview condition can be found on OSF). The interviewers always began by asking for an initial open-ended narrative for their activities at the first area of campus, and then an open-ended narrative for the second area of campus.

In the *Reverse Order* condition, the interviewer followed up the initial request by asking the participant interviewee to recall their activities in the two areas again in reverse chronological order, beginning from the last temporal detail that they provide for each area. In the *Structured Interview* condition, the interviewer followed up the initial request by asking for more specific information about the participant's statement. For each area of campus, the interviewer asked three probing questions about details the participant had mentioned in their initial open narrative.

After the conclusion of the interview, participants completed a brief post-interview questionnaire. In addition to demographic information, participants reflected on how well they remembered the tasks that they had completed, what strategy they used to select which event to describe deceptively, how motivated they were to be perceived as truthful, if they did anything in particular to convince the interviewer that they were telling the truth, how comfortable they are with lying in everyday life, as well as global perceptions of the interviewer.

Phase II Interview

One week later, all participants (Interview-Absent, Reverse-Order, Structured Interview) returned to the lab for Session 2 to complete the Phase II interview. At the beginning of the session, the experimenter informed all participants that they will be interviewed (for the first

time, for Interview-Absent participants; or again, for Reverse-Order and Structured Interview participants) about their activities during the first session of the experiment. Participants will be asked to provide a free recall narrative of the two areas of campus that they visited the week prior. At this time, Interview-Absent conditions were given the same lie-truth instructions and cover story prep time as participants who were interviewed in Session 1. All other participants (Reverse-Order and Structured Interview participants) were instructed to continue to respond truthfully or deceptively for each area of campus as they did in Session 1. During the Phase II interview, the interviewer again requested an open-ended narrative from participants recalling as much information as possible about their activities in both areas of campus.

Final All-Truth Interview

After describing the two areas of campus truthfully and deceptively, the interviewer informed the participants that they knew the participants were told to lie about their activities in the previous session. Therefore, the participant's last experimental task was to describe both events as they *actually* occurred. In addition to providing a third and final statement about their truthfully rehearsed event, participants were told to cease responding deceptively (about their chosen, lied-about event) and to describe their activities truthfully and in as much detail as possible.

At the conclusion of the Phase II interview, participants completed a similar post-experiment questionnaire as in the earlier session. These questions reflected overall task memory, strategy use, motivation, comfort with lying in everyday life, and perceptions of the interviewer and the interview experience. Further, they were asked to what extent did they expect to be interviewed again, as well as to what extent did they expect the second half of the interview (when they were asked to provide a truthful account of both areas they visited in session 1), and how difficult was it to truthfully recall their activities during the first session. For

participants who did receive an initial interview (either Reverse Order or Structured Interview conditions), they were asked to what extent did they try to repeat everything they had already said about their activities during Session 1 (i.e., to be consistent) and to what extent did they try to provide new information about the first and second areas they visited during the Encoding Phase. For the Interview-Absent participants, this questionnaire also contained the same questions as the post-Phase I interview questionnaire. Finally, participants completed a cued-recall test for the details that they were tasked to remember during Session 1. Before being debriefed, participants were asked whether they rehearsed their story or discussed the experiment with anyone since completing Session 1.

Coding of Interview Statements

Video recorded interviews for each Phase (Phase I, Phase II) were coded for subsequent analysis. For Phase I interviews, research assistants coded details that were present during the initial chronological narrative that were also repeated post-tactic as well as details that were added to participant statements after the tactic or instruction was implemented. A Total Phase I unique details measure was computed by summing: i) consistent pre- and post-tactic details, and ii) new details post-tactic.

For participants who were not interviewed during Phase I, the same coding scheme was applied for their Phase II interviews. For all other participants, Phase II interviews were coded for details that were: i) repeated between Phase I and Phase II (*consistent* details); ii) contradictory to details provided during Phase I (*inconsistent-contradiction* details); iii) added during Phase II that were not said during Phase I (*inconsistent-reminiscent* details); and iv) failed to be provided during Phase II that were said at Phase I (*inconsistent-omitted* details).

There is some variability in the *kinds* of inconsistency that have been examined empirically. For instance, some researchers have focused on inconsistency in terms of

reminiscent items (Gilbert & Fisher, 2006), while others focused on consistency relative to contradictions provided (Leins et al., 2012), or simply the sum total of each type of (in)consistent detail (Hudson et al., 2019). For the current dissertation, I assessed the *amount* of consistent details provided, rather than proportion of consistent details relative to other information provided. Additionally, I also assessed two specific types of inconsistency, including the amount of information that participants omitted on the Phase II interview (*omitted details*), and the amount of information that participants added during the Phase II interview (*new details*).

During the final interview, participants were told to provide a final truthful statement for both areas of campus that they actually visited during the encoding phase of Session 1. These all truthful statements were then coded for the amount of detail provided for both areas of campus – one that they had rehearsed truthfully in the earlier Phase I and Phase II interviews, and one that they had lied about by describing their activities in an alternate area of campus. In addition to the quantity of details provided during this final, all-truth interview, I coded the content of participants statements in terms of accuracy for the specific key details (six per “area” of campus) could be assessed, given the highly variable nature of the remainder of the encoding experience.

Results

All materials and data necessary to produce the statistical results present in the Results are hosted on OSF (https://osf.io/atz5h/?view_only=9145768db8994851a122bcdd495f5003). The following results are separated by whether they were hypothesized (and pre-registered) or exploratory. Below, I begin by assessing the effects of the veracity of a statement and the presence and type of interview tactic used to elicit an initial narrative on participants’ ability to correctly recall information learned during the scavenger hunt. I then assess the effect of the veracity of a statement and the type of interview technique used on proportions of consistent and

inconsistent details provided between two statements. Next, I examine differences in the amount of unique detail provided during initial and subsequent interviews based on the veracity of the statement and the presence and type of interview technique used to elicit an initial narrative.

Hypothesized Analyses

All predictions in the committee-approved dissertation were pre-registered on OSF before being analyzed. When null results are found for the pre-registered hypotheses, I provide Bayes Factors (BF_{01}) to discuss the strength of the observed evidence for a null effect.

Correct Recall on Final Interview

During the last portion of the Phase II interviews, participants were asked to provide a final truthful account of their activities in both areas of campus that they visited during the Encoding Phase in the first experimental session. This interview offered the opportunity to assess the influence of having previously recalled an event truthfully vs. deceptively. Accuracy is considered here in two ways. First, with respect to the accuracy of the six key details that participants were tasked to remember while completing the scavenger hunt in the Encoding Phase that were present in participant's narratives. Second, with respect to accuracy for the six key details on the cued-recall test at the end of the experiment. The present analysis is a coarse-grained assessment of accurate memory for the to-be-remembered key details. If participants mentioned a detail they were tasked to remember during their narrative during the interview, the detail was coded as a '1' if it was present and accurate in the statement (e.g., correctly recalling "1926" as the year a fountain was installed in Mackay Hall). The same was true if participants correctly answered the cued recall question on the final test. A score of '0' for a detail was given for inaccurate details (e.g., an incorrect year), non-specific details (e.g., saying they were told to remember a year, but not providing the year), or when the participant said they could not remember the item. If a detail was not mentioned at all, it was omitted from consideration in

creating accuracy proportions. Accurate details per area thus ranged from 0 to 6 details, and from these I created a proportion of accurate details based on the number of details that were mentioned (note: the pattern of results does not change when the proportion of all potential key details are included, rather than just those details mentioned correctly or incorrectly). I expected that participants would recall more accurate details about the events that they had truthfully rehearsed in prior interviews, compared to the events that participants lied about visiting (H4).

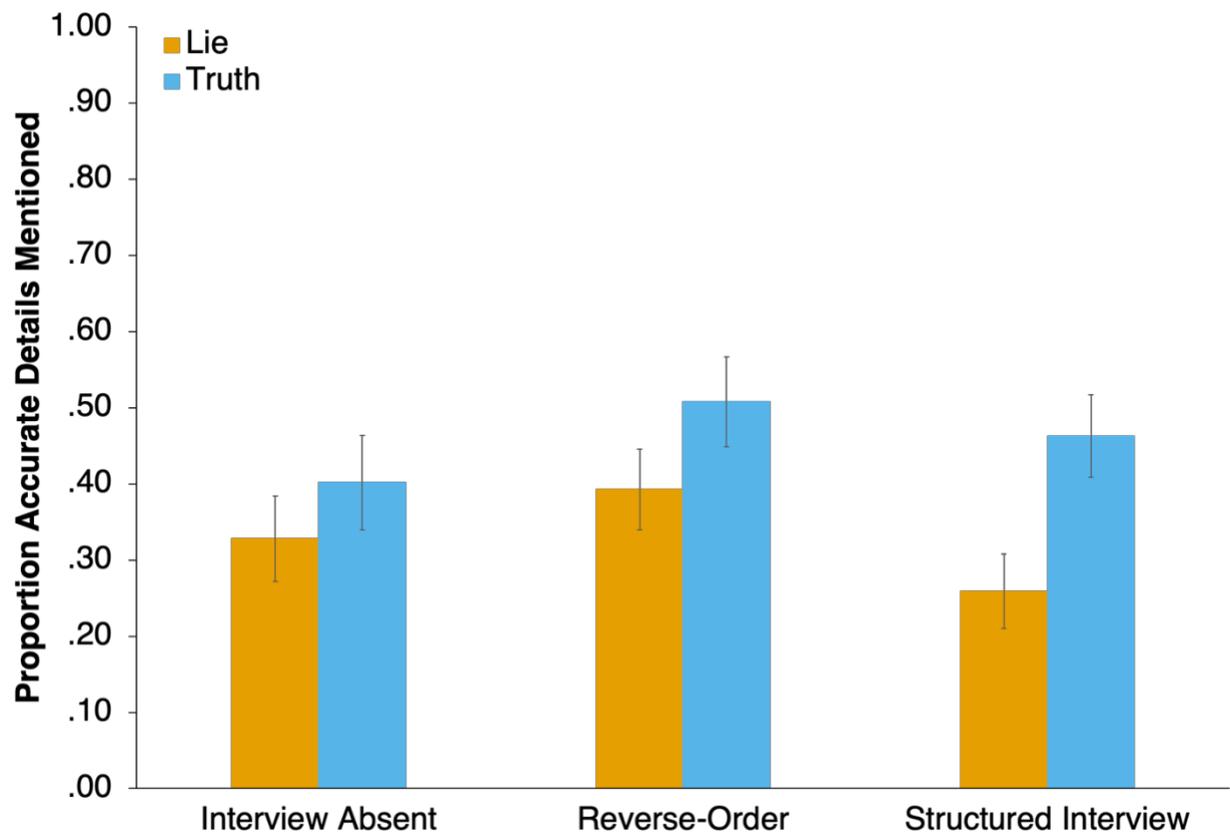


Figure 17. Proportion of key details correctly recalled during the final all-truth interview, Experiment 3. Errors bars represent standard errors.

A 3 (Initial Interview Technique: Absent, Reverse-Order, Structured Interview) x 2 (Veracity: Lie, Truth) ANOVA was conducted on the proportion of accurate details mentioned in participants' all-truth interview statements (see Figure 17). Supporting hypothesis H4, there was a significant main effect of Veracity, such that memory for the key details was more accurate for

areas of campus that had been previously truthfully recalled ($M = .46$, $SE = .03$) than areas of campus that were lied about ($M = .33$, $SE = .03$), $F(1, 96) = 15.44$, $p < .001$, $d = 0.41$ [0.21, 0.62]. Neither the main effect of Interview Technique ($F(2, 96) = 1.13$, $p = .33$, $\eta^2 = .02$) nor the interaction between Initial Interview Technique and Veracity ($F(2, 96) = 1.37$, $p = .26$, $\eta^2 = .03$) were significant.

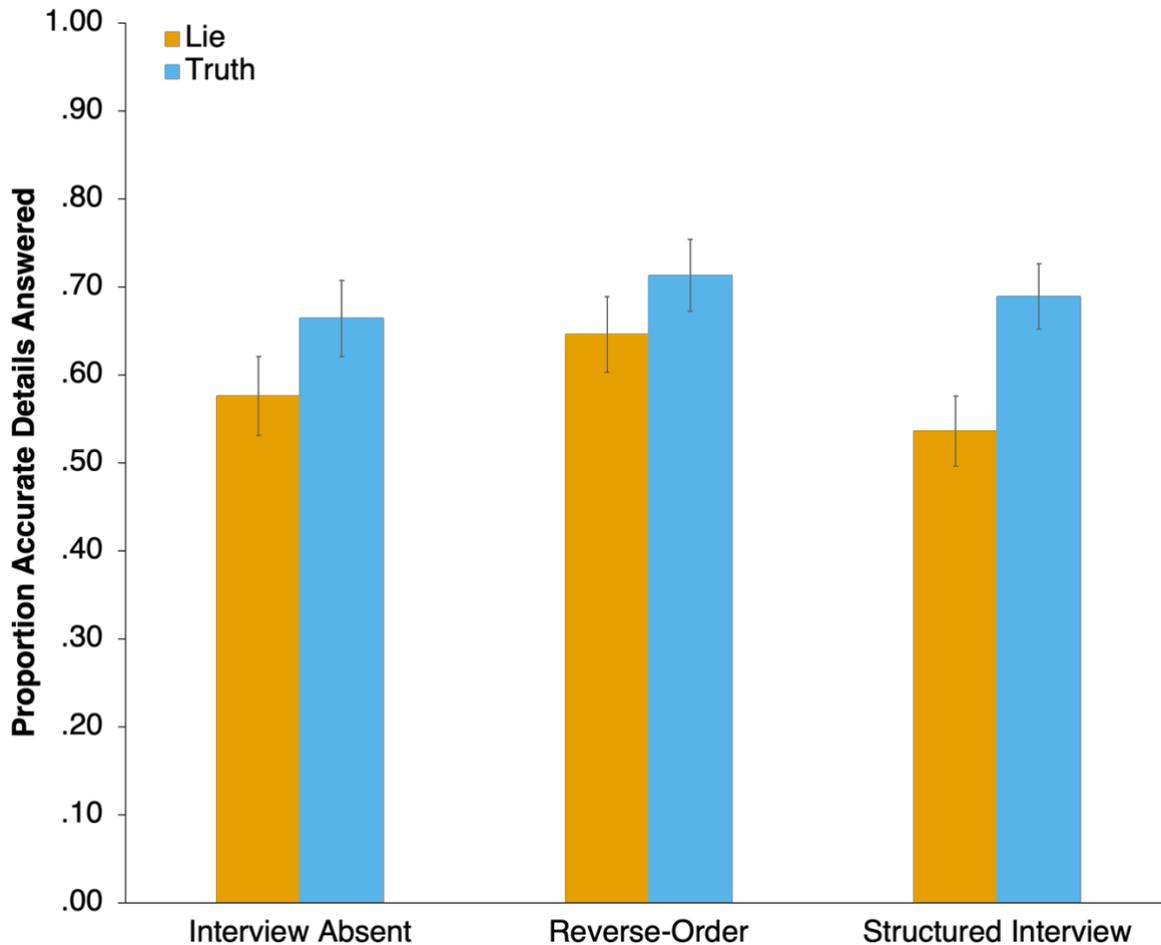


Figure 18. Proportion of key details correctly answered on the final cued-recall test, Experiment 3. Errors bars represent standard errors

A 3 (Initial Interview Technique: Absent, Reverse-Order, Structured Interview) x 2 (Veracity: Lie, Truth) ANOVA was also conducted on the proportion of details that were correctly answered on the cued-recall test (see Figure 18). Again, there was a significant main

effect of Veracity, such that memory for the key details was more accurate for areas of campus that had been previously truthfully recalled ($M = .69$, $SE = .02$) than areas of campus that were lied about ($M = .58$, $SE = .03$), $F(1, 96) = 11.51$, $p = .001$, $\eta_p^2 = .11$, $d = 0.36$ [0.15, 0.56].

Neither the main effect of Initial Interview Technique ($F(2, 96) = 1.31$, $p = .28$, $\eta_p^2 = .03$) nor the interaction between Initial Interview Technique and Veracity ($F(2, 96) = 0.80$, $p = .45$, $\eta_p^2 = .02$) were significant.

Between-Statement Consistency

Statements from participants who were interviewed in Phase I and Phase II were coded by two research assistants for the volume of information provided (discussed in a later section) and the consistency of details that were provided. Inter-rater reliability was high (r 's $> .93$ for each described area), therefore only one coder's ratings were used for the present analyses. I assessed the correspondence between features present in participant statements from Interview Phases I and II with respect to consistent details, omitted details, and new details. I expected to see a main effect of Initial Interview Technique for omitted details (H5a), such that participants interviewed with a Reverse Order instruction would provide fewer details that were said in Phase I compared to the Structured Interview. I also expected a main effect of Veracity for the number of consistent items (H5b) and new items (H5c), such that truthfully described events should be associated with a higher rate of consistent details and additional information that had not been previously provided.

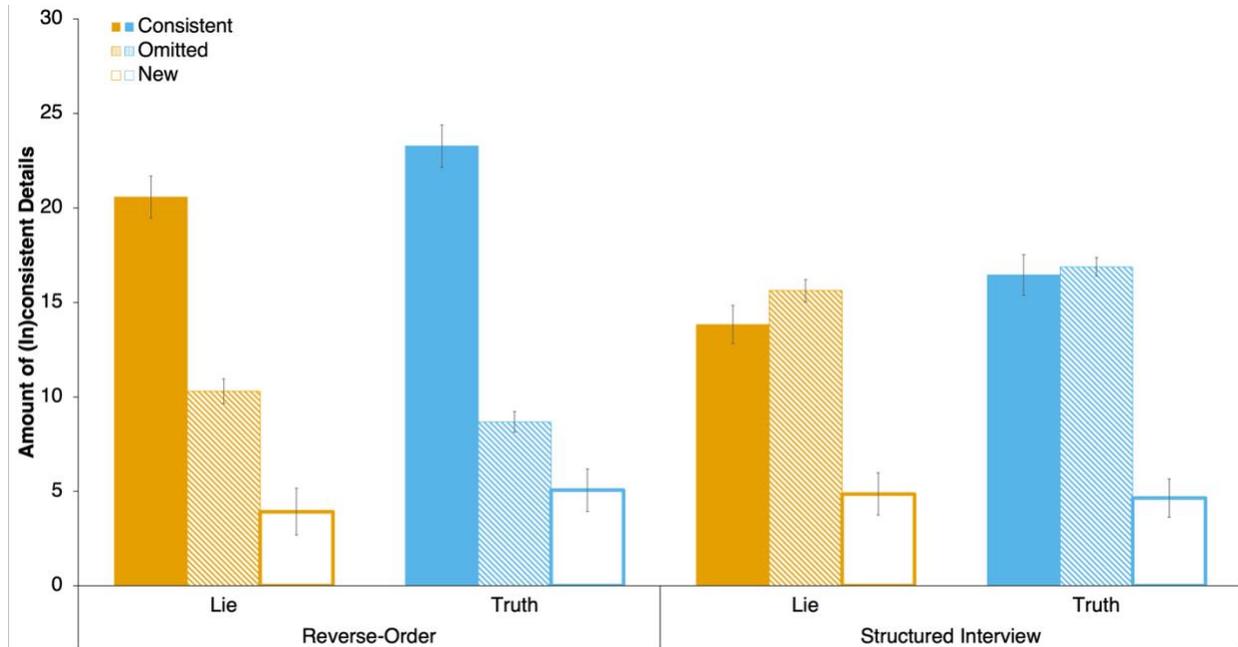


Figure 19. Proportion of details that were consistent or inconsistent between Phase I and Phase II interviews in Experiment 3. Errors bars represent standard errors.

A 2 (*Initial Interview Technique*: Reverse-Order, Structured Interview) x 2 (*Veracity*: Lie, Truth) mixed ANCOVA was conducted on the number of details consistently provided between Phase I and Phase II, with the total amount of detail provided in Phase I as a covariate (see Figure 19, solid bars). Phase I total detail was related to the number of consistent details provided, $F(1, 67) = 174.40, p < .001, \eta^2 = .72$). After accounting for the total number of details provided during Phase I, there was a significant main effect of Interview Technique, $F(1, 67) = 24.54, p < .001, d = 1.28 [0.76, 1.80]$. People provided more consistent details between Phase I and Phase II when interviewed initially with a Reverse Order instruction ($M = 21.92, SE = .95$) than when interviewed with a Structured Interview ($M = 15.16, SE = .86$). However, there was no main effect of Veracity ($F(1, 67) = 2.45, p = .12, d = 0.45 [0.11, 0.78]$) nor an interaction between Veracity and Interview Technique ($F(1, 67) < 0.01, p = .98, \eta^2 < .01$).

With respect to inconsistency, I examined differences in omissions and new details separately with 2 (*Initial Interview Technique*: Reverse-Order, Structured Interview) x 2 (*Veracity*: Lie, Truth) mixed ANCOVAs on the number of omitted details (see Figure 19, shaded bars) and the number of new details added in Phase II (see Figure 19, open bars). Phase I total detail was significantly related to the number of omitted details ($F(1, 67) = 168.83, p < .001, \eta_p^2 = .72$) and the number of new details ($F(1, 67) = 43.21, p < .001, \eta_p^2 = .39$). After accounting for the total number of details provided during Phase I, there was a main effect of Interview Technique on the number of details *omitted* from Phase II statements, $F(1, 67) = 24.54, p < .01, d = 1.28 [0.77, 1.80]$. Participants omitted more details from Phase II statements after being interviewed with a Structured Interview in Phase I ($M = 16.25, SE = .86$) relative to those interviewed with a Reverse Order instruction in Phase I ($M = 9.49, SE = .95$). Further, there was a significant effect of Veracity ($F(1, 67) = 4.314, p = .04, d = 0.03 [-0.36, 0.30]$). People omitted more details between Phase I and Phase II for truthfully rehearsed areas of campus ($M = 12.96, SE = .78$) than for lied-about areas of campus ($M = 12.78, SE = .71$). The interaction between Veracity and Interview Technique was not significant, $F(1, 67) = 2.07, p = .15, \eta_p^2 = .03$. With respect to *new* details provided during Phase II, there was no main effect of Technique ($F(1, 67) = 0.14, p = .71, d = 0.10 [-0.37, 0.57]$) or Veracity ($F(1, 67) = 2.20, p = .14, d = 0.15 [-0.18, 0.48]$), nor an interaction between the two ($F(1, 67) = 1.74, p = .19, \eta_p^2 = .03$).

Phase I and Phase II Interviews

Statements from participants who were interviewed in Phase I and Phase II were coded by two research assistants for the volume of information provided. For participants' Phase I interviews, unique details were coded for pre- and post-tactic for each area of campus. For Phase II interviews, total details included those that were consistent with their Phase I details, as well as new details that were not provided in Phase I (see above analysis of these details). The full

descriptive statistics per condition can be found in Table 6. I expected to see a main effect of Initial Interview Technique (H6a) and a main effect of Veracity (H6b) on total details provided during Phase I and Phase II interviews. Specifically, I hypothesized a greater amount of detail would be present in: i) statements provided by participants interviewed with a reverse-order recall instruction, and ii) when participants truthfully described their activities.

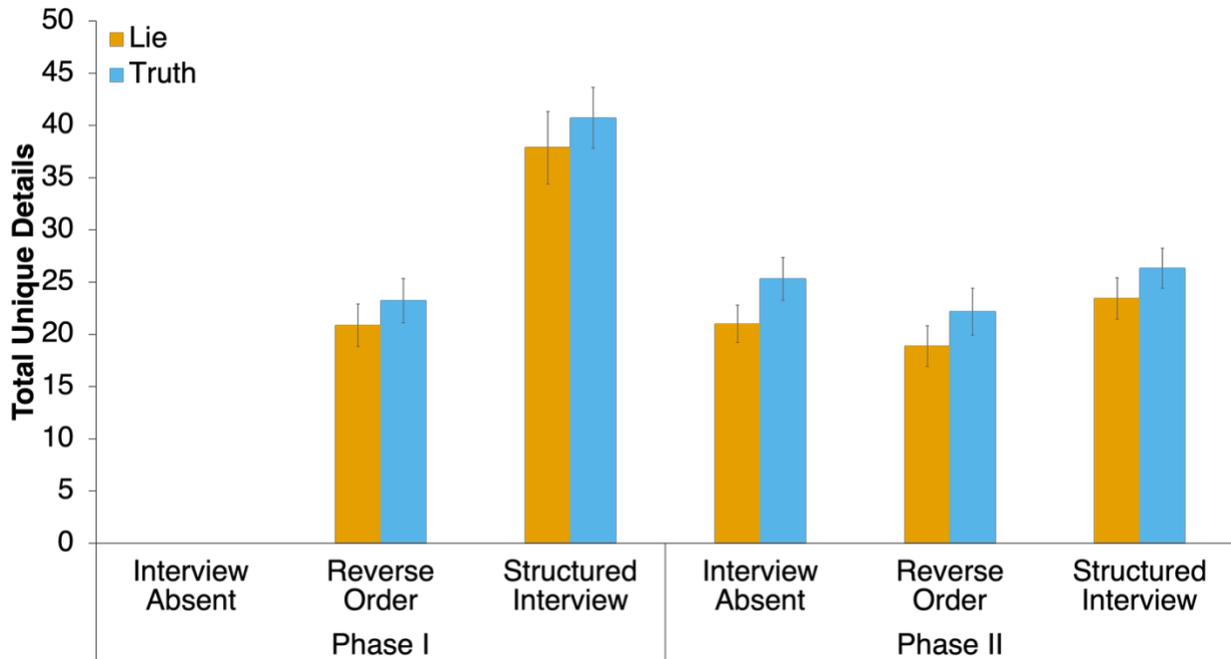


Figure 20. Total details provided during Phase I and Phase II interviews in Experiment 3. Error bars represent standard errors.

A 2 (*Initial Interview Technique*: Structured Interview, Reverse-Order) x 2 (*Veracity*: Lie, Truth) x 2 (*Interview Time*: Phase I, Phase II) ANOVA was conducted on the total amount of unique details present in participant's statements (see Figure 20). There was a significant main effect of Veracity, $F(1, 68) = 9.28, p = .003, d = 0.37 [0.13, 0.61]$; Interview Time, $F(1, 68) = 67.53, p < .001, d = 0.83 [0.55, 1.10]$; and Interview Technique, $F(1, 68) = 11.62, p = .001, d = 0.82 [0.33, 1.31]$. In support of hypothesis H6b, people provided more details when truthfully describing their activities ($M = 28.10, SE = 1.62$) than when creating false descriptions of their

activities ($M = 25.26$, $SE = 1.69$). Further, participants provided more detailed statements during Phase I ($M = 30.67$, $SE = 1.90$) compared to Phase II ($M = 22.69$, $SE = 1.37$). In contrast to hypothesis H6a, however, participants provided more detailed statements when they were interviewed with a Structured Interview script ($M = 32.08$, $SE = 2.14$) rather than a Reverse Order instruction ($M = 21.28$, $SE = 2.33$). Importantly, the main effects of Interview Time and Initial Interview Technique were qualified by a significant interaction, $F(1, 68) = 44.09$, $p < .001$, $\eta_p^2 = 0.39$. While there was a significant decrease in the amount of information recalled from Phase I to Phase II for both conditions, this difference was much greater in the Structured Interview condition ($t(37) = 8.24$, $p < .001$, $d = 1.34$ [0.89, 1.77]) than in the Reverse Order condition ($t(31) = 3.95$, $p < .001$, $d = 0.70$ [0.31, 1.08]). No other main effects or interactions were significant, F 's < 0.25 , p 's $> .62$.

With respect to Phase II interviews, I expected that participants who were interviewed during Phase I would provide more detailed statements during Phase II, compared to participants who were not initially interviewed (H7). A 3 (*Initial Interview Technique*: Absent, Reverse-Order, Structured Interview) \times 2 (*Veracity*: Lie, Truth) ANOVA was conducted on the total amount of unique details present in participant's statements for the Phase II interview only. Only a main effect of Veracity was observed ($F(1, 96) = 20.28$, $p < .001$, $d = 0.45$ [0.24, 0.66]). In Phase II interviews, participants were more detailed when describing events truthfully ($M = 24.59$, $SE = 1.21$) than deceptively ($M = 21.10$, $SE = 1.13$). In contrast to hypothesis H7, there was no main effect of Interview Technique ($F(2, 96) = 1.39$, $p = .25$, $\eta_p^2 = .03$, $BF_{01} = 8.09$). Participants provided statements of similar levels of detail during Phase II when they were interviewed during Phase I with a Reverse Order instruction ($M = 20.52$, $SE = 1.93$), when they interviewed during Phase I with a Structured Interview ($M = 24.87$, $SE = 1.77$), and when they

were not interviewed during Phase I ($M = 23.16$, $SE = 2.03$). The interaction between Veracity and Initial Interview Technique was not significant ($F(2, 96) = 0.29$, $p = .75$, $\eta^2 = .01$).

Exploratory Analyses

As an exploratory measure, I assessed the strategies by which participants chose an area to lie or tell the truth about as well as pre-task familiarity with the six campus buildings. Next, I explored whether Interview-Absent participants' initial recall was similarly detailed to participants who did receive an interview in Phase I. Finally, I explored whether differences in consistency might appear when conceptualized as a proportion of repeated items relative to the total amount of Phase I details (similar to how it was calculated in Experiments 1 and 2 in this dissertation).

Interview Strategies

Similar to the procedure in Experiment 2, participants were asked to provide an open-ended response describing how they selected which area to tell the truth about in the post-interview questionnaire. These responses were coded as comprising one of seven strategies in which participants decided which area to tell the truth about at random ($n = 37$), or because they remembered one area better than another ($n = 19$); remembered one area worse than another ($n = 9$); perceived one area to be easier to lie about ($n = 4$); thought it made more sense logically or based on proximity ($n = 13$); the types of details available at the locations ($n = 6$); or because of their prior familiarity and knowledge of the building ($n = 11$).

Prior to beginning the scavenger hunt, participants rated how familiar they with the six campus buildings relevant to the experiment (four that they would visit during the upcoming scavenger hunt, and two that they would generate a plausible false narrative about during the Phase I/II interview) on a scale from 1 (not familiar) to 7 (extremely familiar). A 3 (*Initial Interview Technique: Absent, Reverse Order, Structured Interview*) x 6 (*Campus Building:*

Science Hall, Lagomarcino Hall, Parks Library, Beardshear Hall, LeBaron Hall, Mackay Hall) mixed ANOVA was conducted to assess whether there were differences in pre-task familiarity with the buildings for participants randomly assigned to different interview technique conditions. Participants were similarly familiar with the buildings regardless of the condition to which they were assigned, $F(2, 96) = 0.43, p = .65, \eta_p^2 = .01$.

One plausible strategy for choosing an area of campus to truthfully describe is that people may have been more familiar with the buildings prior to engaging in the scavenger hunt. As a result, pre-task familiarity for the two buildings associated with each area of campus were included as predictors in a logistic regression for whether that area was selected to be truthfully rehearsed. A participant's choice to tell the truth about the area of campus comprising Science Hall and Lagomarcino Hall was predicted by pre-task familiarity with Science Hall ($M = 2.98, SE = .14; B = .47, Wald = 4.27, p = .04$), but not pre-task familiarity with Lagomarcino Hall ($M = 3.42, SE = .15; B = -.33, Wald = 2.53, p = .11$). Familiarity with Parks Library ($M = 4.80, SE = .14; B = -.14, Wald = .50, p = .48$) and familiarity with Beardshear Hall ($M = 3.29, SE = .15; B = .07, Wald = .19, p = .66$) did not predict choosing to tell the truth about Parks Library and Beardshear Hall. Finally, pre-task familiarity with LeBaron Hall ($M = 3.11, SE = .16; B = .01, Wald < .01, p = .98$) or Mackay Hall ($M = 2.54, SE = .16; B = .08, Wald = .21, p = .65$) did not predict participant choosing to tell the truth about LeBaron and Mackay Halls.

Initial Recall

As an exploratory analysis, I examined whether there were differences in the amount of detail provided for the first time an area of campus was discussed, depending on whether it was truthfully rehearsed initially or after it had been lied about previously. For participants who received an initial interview, I examined whether the total amount of detail differed for their initial truthful statement (during the Phase I interview) relative to their truthful statement about

the unrehearsed area of campus that they visited (during the Final All-Truth interview). For participants who were not interviewed during Phase I, I compared the amount of detail in their initial truthful statement (during the Phase II interview) to their truthful statement about the area of campus they visited that they did not rehearse previously (during the Final All-Truth interview).

Pairwise analyses were conducted to compare the amount of detail provided for the initial narrative about the previously deceptively rehearsed event relative to the initial narrative about the previous truthfully rehearsed event for participants in each interview condition. Participants provided significantly more detailed statements when initially recalling their truthful event compared to when they truthfully recalled the event that they previously lied about in the Interview Absent condition ($t(26) = 6.80, p < .001, d = 1.31 [0.78, 1.82]$), the Reverse Order condition ($t(31) = 4.40, p < .001, d = 0.78 [0.38, 1.17]$), and the Structured Interview condition ($t(36) = 9.55, p < .001, d = 1.57 [1.08, 2.05]$).

Alternative Consistency Metric

The primary analysis of consistency used the number of consistent items provided, with the total amount of detail in Phase I as a covariate. I also explored whether the computation of consistency matters. I assessed whether there were differences when consistency is conceptualized as a proportion of repeated items relative to repeated and contradictory items, as used by Leins et al. (2012).

A 2 (*Initial Interview Technique*: Reverse-Order, Structured Interview) x 2 (*Veracity*: Lie, Truth) mixed ANCOVA was conducted on consistency proportions, with the total amount of detail provided in Phase I as a covariate. Phase I total detail was not significantly related to the proportion of consistent details ($F(1, 67) = 0.13, p = .72, \eta^2 < .01$). There was a significant main effect of Veracity, $F(1, 67) = 4.74, p = .03, d = 0.36 [0.13, 0.60]$. In support of H5b, participants

provided a higher proportion of consistent details when they were truthfully describing their activities ($M = .99$, $SE = .003$) compared to when they were lying ($M = .96$, $SE = .01$). No other effects were significant, F 's < 0.43 , p 's $> .51$.

Summary of Findings

Several key findings emerged from Experiment 3. First, experiences that participants had truthfully rehearsed were associated with more accurate memory of to-be-remembered details when compared with those that were initially lied about, and truthfully described experiences were associated with more detailed narratives than lied-about experiences. Regardless of whether and how they were interviewed during the initial session, participants provided more spontaneous accurate details in the Final All-Truth interview for the area that they had previously truthfully rehearsed compared to the area they had previously lied about. The same was true of accuracy for key details on the cued-recall test at the end of the experiment. Participants also provided more elaborated statements when truthfully describing their activities. Thus, in line with the general findings of the first two experiments, it appears that choosing to lie is detrimental to later memory for what truthfully occurred.

Experiment 3 differed from the prior work in that *every* participant in Experiment 3 exerted volition over their lies and truths. Prior to being interviewed, all participants were tasked with choosing one area to tell the truth about and were then given an area of campus to create a lie about. Though prior knowledge and familiarity with the buildings (assessed before beginning the scavenger hunt) did not affect participants' choices of which area to tell the truth about, after completing the scavenger hunt some people chose to tell the truth about the area from which they remembered more key details. Thus, because memory for the event contributed to a person's choice to tell the truth, differences in memory accuracy for the key details may not necessarily be due to solely lying or truth-telling.

Asking participants to recall their activities in reverse chronological order improved between-statement consistency. Specifically, people in the Reverse Order condition repeated more consistent details and omitted fewer details between Phase I and Phase II interviews, compared to people who were asked follow-up probing questions in the Structured Interview condition. I also hypothesized that participants interviewed with a Reverse Order technique would provide more detailed initial narratives. In actuality, however, participants provided more details during Phase I when they were interviewed with additional “tell me more” questions in the Structured Interview, and they subsequently omitted many of these details in the Phase II interview. One possibility is that the interviewers in the current experiment may have probed less important details in the initial interview, leading participants to omit these details during a subsequent interview.

In contrast to expectations, participants were similarly detailed during their Phase II interviews regardless of whether they had been previously interviewed. This may be due to participants in the Initial Interview-Absent conditions receiving their cover story information and preparation time immediately preceding their interviews during Phase II. However, this preparation time was needed to equate the instructions with those received by initially interviewed participants.

The current findings add further evidence that the act of lying has downstream consequences for accurate recall of truthfully experienced events. That is, activities that participants lied about suffered in terms of both accuracy and quantity of information. Additionally, regardless of veracity, the type of interview approach used may have unintended consequences for credibility assessment. That is, people appear to be more inconsistent when a Structured Interview is used to elicit an initial statement for both true and false narratives.

Table 6*Experiment 3 Descriptive Statistics*

| | | Initial Interview Absent | | Reverse-Order | | Structured Interview | |
|---|-------|-----------------------------|------|---------------|------|-------------------------|------|
| | | Mean | SE | Mean | SE | Mean | SE |
| Phase II – Final Recall Accuracy | | | | | | | |
| | Lie | .33 | .06 | .39 | .06 | .26 | .04 |
| | Truth | .40 | .06 | .51 | .06 | .46 | .05 |
| Phase II – Cued Recall Accuracy | | | | | | | |
| | Lie | .58 | .04 | .65 | .05 | .54 | .04 |
| | Truth | .66 | .05 | .71 | .04 | .69 | .03 |
| Phase II - Consistency | | | | | | | |
| | Lie | -- | -- | 20.57 | 1.11 | 13.83 | 1.00 |
| | Truth | -- | -- | 23.27 | 1.18 | 16.48 | 1.07 |
| Phase II - Omissions | | | | | | | |
| | Lie | -- | -- | 10.30 | 1.24 | 15.62 | 1.12 |
| | Truth | -- | -- | 8.68 | 1.12 | 16.88 | 1.02 |
| Phase II - Reminiscence | | | | | | | |
| | Lie | -- | -- | 3.92 | 0.65 | 4.86 | 0.59 |
| | Truth | -- | -- | 5.06 | 0.54 | 4.64 | 0.49 |
| Phase I – Total Detail | | | | | | | |
| | Lie | -- | -- | 20.88 | 2.05 | 37.87 | 3.47 |
| | Truth | -- | -- | 23.22* | 2.13 | 40.71* | 2.91 |
| Phase II - Total Detail | | | | | | | |
| | Lie | 21.00 | 1.80 | 18.88 | 1.96 | 23.42 | 1.99 |
| | Truth | 25.31* | 2.07 | 22.16 | 2.23 | 26.32 | 1.93 |
| Final All-Truth – Total Detail | | | | | | | |
| | Lie | 13.96* | 0.90 | 14.84* | 1.02 | 14.92* | .94 |
| | Truth | 14.37 | 1.06 | 15.38 | 0.93 | 14.17 | .93 |

Note: Asterisks represent conditions compared for initial recall exploratory analysis

CHAPTER 5. GENERAL DISCUSSION

Suspects are often repeatedly interviewed during an investigation. As a result, the consistency of a suspect's statements has the potential to serve as an important indicator of credibility. However, guilty and innocent suspects may approach an interview differently and therefore between-statement consistency may be less effective for discriminating between liars and truth-tellers. In three experiments, I examined conditions under which lying might affect memory with respect to accuracy, as well as how an interviewer's questioning tactic might affect between-statement consistency. The two primary aims of this dissertation were to assess: (i) the effect of intentional deception on memory for the truth, and (ii) the extent to which between-statement (in)consistency is related to deception. I assessed people's metacognitive abilities when lying and telling the truth (Experiments 1 and 2), the effect of intentional deception on memory (Experiment 2), as well as how evidence-based interviewing techniques might lead to the production of inconsistencies (Experiment 3). Across all three experiments, I examined accurate memory for the encoded material (performed actions in Experiments 1 and 2; key facts acquired during a scavenger hunt in Experiment 3) as well as differences in the consistency of statements that were provided one week apart.

Memory for Truthful and Deceptive Events

Memory accuracy was greater for truthfully rehearsed information compared with information that was deceptively rehearsed or information that was not rehearsed. Specifically, source memory accuracy in Experiments 1 and 2 was significantly greater for truthfully rehearsed actions, especially when those actions were truthfully described. Additionally, people recalled more correct details learned during the scavenger hunt in Experiment 3 for areas of campus that had been previously rehearsed truthfully. With respect to consistency, people

initially interviewed with a Reverse Order instruction were more consistent when truthfully and falsely describing their activities during a scavenger hunt, compared to people who were initially interviewed with a Structured Interview.

Evidence-based interviewing techniques were only assessed in Experiment 3. People provided more inconsistencies between initial and delayed recall when they were first interviewed with a Structured Interview. The Structured Interview in this experiment invited people to provide more information regarding three details within the free narrative using a “tell me more” prompt. Though accuracy for the details added following a “tell me more” prompt could not be assessed (though other work suggests they may be less accurate than unprompted details; Kontogianni et al., 2020), it is likely that these additional details were more peripheral to the primary tasks. For instance, some of these details reflected other people that they saw (but presumably did not interact with; e.g., “there was a guy with big black glasses” and “I almost ran into a girl”), while others reflected their personal thought processes or observations during the task (e.g., “it was loud in there [Mackay Hall]” and “I was too lazy to scan [a QR code on a flyer in Beardshear Hall] with my phone”). A more fine-grained analysis of the types of details provided and their centrality to the event would further elucidate this point.

Metamemory and false memory were assessed in Experiments 1 and 2 only. A prior study by Besken (2018) demonstrated a metacognitive illusion associated with lying wherein people predicted they would remember truthful responses better but in actuality recalled more lie responses. This finding occurred when participants provided lies and truths about semantic information, providing either incorrect responses (lies) or correct responses (truths) to general knowledge questions. I did not find that people showed a metacognitive illusion for lying in this dissertation. Here, when lies and truths were provided about episodic information – actions that

people had or had not performed – people predicted they would remember truthfully rehearsed actions better than deceptively rehearsed actions (in line with Besken’s “prediction” aspect of the metacognitive illusion). The “performance” piece of the metacognitive illusion, however, was not replicated. In Experiments 1 and 2, truthfully rehearsed actions were associated with greater accuracy on the source memory test, especially when the actions had been truthfully described (rather than denied). Truthful descriptions were also more consistent than were false descriptions. However, false descriptions should have been better remembered (and arguably more consistent) if I were to observe this aspect of the metacognitive illusion.

Overall, people appeared to overestimate their ability to remember denials on a future memory test. This disparity between prediction and performance for denials is likely to have implications for guilty suspects who choose to deny information during an interview. That is, guilty suspects may do so because they believe they will remember what information they denied. If they fail to remember that they denied information on a subsequent interview attempt, such inconsistencies are likely to be scrutinized more heavily by investigators.

Compared to actions that were not performed and not rehearsed, lying about an action by creating a false description increased false recognition of having performed that action on a final memory test. This false recognition effect was exacerbated for participants who provided JOLs during the Rehearsal Phase, which may be due to the provision of JOLs changing how participants approached the rehearsal task (e.g., Dougherty et al., 2005). Researchers in the education domain have shown that participants who make JOLs may alter their learning strategies to be more effective (Sahakyan, Delany, & Kelley, 2004). Additionally, people may attempt to retrieve information when they make a JOL, and such a retrieval attempt may improve subsequent memory (Spellman & Bjork, 1992). Though I cannot assess whether a strategy

change occurred in the current data set, it is plausible that participants who made JOLs spontaneously retrieved their lie or truthful response when considering their future memory performance.

A common thread across all experiments is a within-subjects condition reflecting something that was performed (simple actions in Experiments 1 and 2, or a series of activities in two campus buildings in Experiment 3) yet not rehearsed. This condition may be akin to what occurs in the real world, as when a guilty suspect does not provide a statement about what they actually did and instead creates a false narrative. The items that were performed but not rehearsed in Experiments 1 and 2 were counterbalanced and were not subject to participant selection. That is, participants did not actively choose to not rehearse an item – the only choice made was whether to lie or tell the truth for a specific action statement. However, in Experiment 3, participants were able to choose which area of campus they would not discuss and which they would truthfully describe. Of the two areas of campus that were actually visited during encoding, participants chose one area to tell the truth about and, in lieu of rehearsing the second area that was visited, they instead provided a false description of an area that they did not visit.

Across all three experiments, memory performance benefited with prior rehearsal. However, the extent of that benefit was dependent upon how the information was rehearsed. In Experiments 1 and 2, for instance, actions that were described were associated with higher source accuracy relative to performed-no rehearsal actions, but this was not true for actions that were denied. This may be similar to the denial-induced forgetting effect observed by Otgaar and his colleagues (e.g., Otgaar et al., 2016), wherein the act of denial impairs memory for having discussed a piece of information during an interview, but not necessarily for having witnessed it. True denials, in particular, may further reflect an extension of a phenomenon known as

“negation-induced forgetting,” which is characterized by a failure to recognize a studied item as having been seen before if a feature of the item was previously associated with a negation (Dianiska, Meissner, & Chan, in preparation; Mayo, Schul, & Rosenthal, 2014). Upon examining the accuracy and the amount of detail associated with experiences that participants had previously not rehearsed (and instead had provided a false description of another event; see Experiment 3), it is clear that prior rehearsal is beneficial to memory.

Volitional Deception and Memory

Research on the relationship between lying and memory has been dominated by paradigms that involve experimenter-instructed lies and truths. Though some neuroimaging data suggests that volitional deception involves greater activation compared to instructed deception (Lisofsky et al., 2014), few prior studies have attempted to assess whether volition might influence memory for lies and truths. Those studies that have manipulated volition allowed for self-selection to a lying condition, yet observed no differences (if the instructed and intentional groups were analyzed separately) when volition was considered. The present Experiment 2, however, only manipulated volition with respect to which items were lied about, not with respect to whether lying occurred at all. As a result, I was able to circumvent a methodological issue that might lead too few people to choose to lie (as was the case in Romeo et al., 2018). Despite this, no differences were found between individuals who exercised volition and those who were yoked to choosers and instructed when to lie and tell the truth.

It is possible that in the context of generating a lie or truth, the role of volition does not matter as much. In Experiment 2, generation of a lie was controlled while participant choice in when to generate was manipulated. Some participants were able to exert volition over the items that they would deny or describe (either truthfully or falsely). Participants in the yoked instructed

condition were prompted on which items to deny or describe, but these yoked participants still generated responses to the action statements. Future research could assess volition by also manipulating whether the participant self-generates a response, or is given a response to read and repeat by the experimenter. The current dissertation suggests that volition does not influence memory or metamemory performance. Though volition may be an important characteristic of lying in everyday life, its effects on memory may be too small to be of interest.

Consistency Across Repeated Statements

The content of people's statements, both initially elicited and elicited from subsequent interview opportunities, may serve to discriminate lies from truths. In the three experiments presented here, truthfully provided statements about prior experiences were more detailed than experiences that were lied about. This was the case for statements obtained during both initial interviews (the video-recorded statements in the Rehearsal Phase in Experiments 1 and 2; Phase I interview in Experiment 3) and delayed interviews (the statements typed out during the descriptions test in Experiments 1 and 2; Phase II interview in Experiment 3). Therefore, the level of detail provided about an event could serve as an indicator of truthfulness (e.g., Evans et al., 2013).

The nature of these details, such as whether they are consistent across time points, may also be important for the discrimination of lies and truths. Consistency and inconsistency across repeated interviews were considered with respect to four main types of information: repeated, omitted, reminiscent, and contradictory. Opportunities for repeated recall offer truth-tellers an occasion to appear inconsistent, should they provide new information in a subsequent statement. The addition of information that is reminiscent (and therefore inconsistent) may be more likely when people are cued to provide a second statement with a different cue than was used to elicit a

prior statement (Gilbert & Fisher, 2006). Liars, on the other hand, may be perceived as suspicious should their statements be inconsistent across interviews and therefore may strategically attempt to maintain their narratives over time. Across all three experiments, truthfully described actions or activities were associated with a greater proportion of consistent details than were experiences that people lied about.

The diagnosticity of between-statement consistency may be dubious, however, given the lack of agreement regarding how best to assess “consistency.” As shown in Experiment 3, the pattern of results differed based on whether two types of information were considered when calculating a consistency metric (repeated and contradictory details, see Leins et al., 2012) or whether the total number of details provided during an initial statement was considered. When consistency was computed with respect to only repeated and contradictory details, there was a main effect of veracity; however, using the proportion of total details that were consistent differed across interviews led to an effect of interview technique, not veracity. Given that laypeople and professionals tend to associate truthfulness with consistency, a consensus is needed on how best to ascertain a consistency metric for practitioners.

Though it may be possible for truth-tellers to be inconsistent as a result of their ability to rely on their memory for an event, the findings in Experiment 3 suggest that the type of memory cuing afforded by a subsequent recall opportunity may be important for this to occur. Contrary to what I expected, people did not provide more reminiscent details during the Phase II interview when truthfully describing their activities. However, this was likely due to the Phase II interview not encouraging varied retrieval – rather, the recall prompt was free recall in nature. As a result, any reminiscence would have been spontaneous, as interviewers did not engage any memory-enhancing or statement-enhancing techniques. Future work could examine the replicability of the

tendency for truth-tellers to provide more details on a subsequent interview when the type of technique used during Phase II is manipulated to be varied.

Theoretical Implications

The current set of experiments provides information on when lying affects memory for the truth. However, these experiments cannot definitively answer why lying affects memory. One potential explanation is rooted in the source monitoring framework. False descriptions require constructive processes to generate details, and people may leverage memory for these constructive processes to determine whether an action was performed or not. Poor memory for false denials, on the other hand, could be explained by a relative lack of constructive processes able to be used in making a source judgment (compared to false descriptions). Alternatively, poor memory for false denials could be a result of a lack of rehearsal, or an implicit “instruction” to forget (akin to a not-directed directed forgetting effect).

Findings from Experiment 1 and 2 support a source-monitoring account of why lying affects memory (Johnson et al., 1993). Here, people were better able to remember whether an action was performed and how it was rehearsed when they were required to produce more effortful responses (descriptions) during the Rehearsal Phase. Presumably, these effortful constructive processes made the cognitive operations involved in generating the descriptions more memorable. With respect to false memory, one study (Dianiska, Lane, et al., in preparation) found that false descriptions increased recollection-based false memories whereas true denials increased familiarity-based false memories. It may be the case that participants who made JOLs during the Rehearsal Phase in Experiment 2 spontaneously retrieved their lie and truth responses, and such retrieval could increase source confusion and facilitate the formation of recollection-based false memories.

Though effortful production of a description led to greater memory performance, some evidence suggests such effortful tasks may lead people to underestimate their future ability to remember having provided a description. This is in line with a fluency account (Oppenheimer, 20080), with respect to how metacognitive accuracy may depend on the how a lie was generated. Creating a detailed true or false description is a relatively less fluent process when compared to providing a brief denial. However, this relative disfluency may be moderated by veracity. Truthfully described actions rely on a person's memory for the event, and therefore may be easier to retrieve and describe than when a person creates a false description.

Denials in this experiment were either explicit (Experiments 1 and 2) or implied (Experiment 3). The provision of explicit denials, and the subsequent poorer memory for both true and false denials on the final memory test, could be understood in terms of several underlying mechanisms. As noted previously, true denials may serve as an extension of a negation-induced forgetting effect. Negation-induced forgetting is a phenomenon wherein after studying an image of an object (e.g., a blue ball), people may fail to recognize an object as having been seen before if the object was associated with a correct "negation" on a test about features of encoded objects (e.g., correctly saying "no" to the feature test statement, "The ball was red"; Mayo et al, 2014). Though some evidence suggests that this may be due to interference created by the feature test statement (Dianiska, Meissner, & Chan, in preparation), the current data are unable to speak to such an interference mechanism when people lie versus tell the truth.

The mnemonic effect of implicit denials may be due to a relative lack of rehearsal, as suggested by the MAD framework (Otgaar & Baker, 2018). When participants in Experiment 3 provided false descriptions about an unvisited area of campus, they did so at the expense of not rehearsing an area of campus that was visited during the scavenger hunt. As a result, people

provided less information about the unrehearsed area of campus when they were later asked to truthfully recall their experience. The fact that the unrehearsed experience was associated with less detail could also be due to a spontaneous inhibition strategy that people may use to facilitate their lie-telling. That is, relative to areas that were truthfully rehearsed, in order to effectively produce a false description of an unexperienced event, people may have attempted to intentionally inhibit information about their activities in the unrehearsed area of campus. Future research could assess these cognitive mechanisms.

Applied Implications

Interviewing techniques that are considered best practice are designed to increase the volume of information obtained from an interview. Memory-enhancing interviewing techniques, such as the Cognitive Interview, can increase the amount of information obtained from cooperative eyewitness as well as provide more verbal content cues that can be used to discriminate between liars and truth-tellers. In Experiment 3, for instance, content cues such as the length of participants' statements and the consistency of details within those statements were reliably more associated with truthfully described experiences than falsely described experiences. However, in order to be compliant with an interviewer's request, a person may provide information that they are less confident in (and may thus be inaccurate) or provide information that they know to be false in order to appear cooperative. The current experiments show that knowingly providing false information has the potential to impair memory for the truth.

Both of the interviewing techniques used to elicit narratives in Experiment 3 are considered "best practice". The current research did not assess the effect of these best practice techniques in comparison to customary accusatorial tactics, such as those trained in the Reid

technique (Inbau, Reid, Buckley, & Jayne, 2013; see Meissner, Kelly, & Woestehoff, 2015). Tactics that are characteristic of the Reid technique include shutting down denials and confronting the suspect with evidence of their guilt. In future work, it may be useful to contrast the effects of lying on memory when best practice interview techniques are compared to such guilt-presumptive techniques.

Despite the benefit to some interrogation outcomes when “best practice” interview techniques are used (e.g., the diagnosticity of a confession; see Meissner, Redlich, Bhatt, & Brandon, 2012 for a review), such techniques allow a subject to “tell their story” in a way that permits both denials as well as deceptive narratives. In a similar manner, approaches like the Cognitive Interview can lead to small increases in incorrect details being provided by the subject – though such interviews also lead to large increases in correct details, thereby mitigating the effect on a person’s overall accuracy (Memon, Meissner, & Fraser, 2010). Could such provision of deceptive or incorrect information harm subsequent recall? The current data suggest that people who have previously lied are at a disadvantage (mnemonically speaking) should they decide at a later point to be truthful and forthcoming with an interviewer. In Experiment 3, participants provided significantly less detail about an area that had previously been lied about (compared to the first time that they provided a truthful account of their activities in a different area) and were less accurate when asked to recall the correct answers to the key details they had been tasked to remember during the scavenger hunt.

An open question remains: how could we aid individuals who later decide to tell the truth? With respect to the Mueller investigation mentioned previously, once Manafort withdrew his plea could interviewers use strategic interviewing techniques to increase the quality of his subsequent statements? Some evidence from the forced fabrication literature suggests that an

interview with a statement-enhancing technique (such as a modified Cognitive Interview) that occurs after a person forcibly fabricates information can increase the amount of correct information recalled about an event (Memon, Zaragoza, Clifford, & Kidd, 2010). However, this effect on correct information was overshadowed by the persistence of suggestibility, relative to those interviewed with a control (free recall) interview. While further research is warranted, it appears that the use of memory-enhancing techniques may not entirely ameliorate the detrimental effects of lying on memory.

Based on the current data, both follow-up questioning (as in the Structured Interview) and asking participants to recall an event in reverse chronological order appear to be beneficial techniques. However, though the Reverse Order instruction encouraged fewer overall details during the initial recall attempt, the use of this technique had the benefit of promoting fewer inconsistencies for truth-tellers relative to the Structured Interview. Further, it seems as though the Reverse Order instruction may serve to improve memory accuracy for key details associated with the unrehearsed experience ($d = 0.46$, relative to the Structured Interview condition). Though more information was provided during Phase I with the Structured Interview, these participants also showed more omissions and reminiscences during Phase II.

Limitations and Future Directions

Future work should further elucidate the mechanisms by which lying affects accurate and false memory. As noted above, an effect of volition may become apparent when compared to an instructed condition that lacks a generation component. Furthermore, though people did not tend to show a correlation between predictions of future performance and actual performance, it may be instructive to assess retrospective confidence. In future research, post-source judgment confidence ratings and memory basis judgments could be included (as in Dianiska, Lane, et al.,

in prep) to further examine false memory for participants who provided JOLs during the Rehearsal Phase, as well as to explore whether (potentially) volitional liars might be better calibrated with respect to the relationship between confidence and accuracy. Finally, participants who chose items to lie or tell the truth about in Experiment 2 did so “in the moment” when they saw the action statement appear on the screen. However, in real-world settings, a guilty suspect may expect to be questioned and therein prepare a cover story in advance. Future work could manipulate not only volition but also the ability to plan the lie. For instance, instead of having participants make online judgments about whether they would lie or tell the truth, participants could select the items prior to beginning the Rehearsal Phase.

While Experiment 3 offers a more ecologically valid paradigm, it does so at the expense of being able to assess participant’s statement accuracy. Given the variability in participants’ episodic experiences during the scavenger hunt (e.g., encountering different people and obstacles along the way), accuracy could only be assessed for the information that was required to be learned during the scavenger hunt. Future iterations of this paradigm might involve the inclusion of a confederate in the experimental task that would allow for a more natural, yet verifiable, encoding task. Additionally, in the current experiment only memory accuracy following an (implicit) false denial could be assessed. The current paradigm does not assess whether people may develop false memories of having visited the area of campus that they describe in their false narrative. Future research could examine whether participants come to believe that they visited those areas of campus as well.

Additionally, two comparison conditions were absent from Experiment 3 that would be useful to examine in future research. First, a Phase I “free recall” interview condition that does not involve a memory or statement-enhancing technique would be useful for discerning whether

a Structured Interview is (statistically) equivalent to the Reverse Order condition with respect to both total detail and consistency. Second, a Phase I “free recall” interview condition that is then immediately is asked to recall both areas of campus that were visited truthfully (akin to the current Phase I interview) would allow for a cleaner assessment of whether and how lying affects memory in this paradigm.

Finally, of interest to the current dissertation was whether truth-tellers, who may be more likely to be inconsistent when interviewed with either a reverse-order recall instruction or a structured interview, may be misattributed as liars when such inconsistencies arise. Though truth-tellers tended to be more consistent in this study, future research should examine whether people can accurately discern whether participants in the current experiment lied and told the truth.

Conclusions

In three experiments, I examined the effects of lying on memory when ecological validity is considered through both manipulations (in Experiments 1 and 2) and paradigm (Experiment 3). Though intentionality is considered to be characteristic of deception in everyday life, allowing participants to choose when to lie and tell the truth failed to moderate the relationship between lying and memory. Furthermore, lying about one’s experiences led to both less accurate memory for those experiences and less consistent statements. The current data suggest that the act of lying, regardless of whether it is instructed or volitional, has a detrimental effect on memory for what truthfully occurred.

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APPENDIX. IRB APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
2420 Lincoln Way, Suite 202
Ames, Iowa 50014
515 294-4566

Date: 10/11/2018

To: Rachel Dianiska Christian A Meissner

From: Office for Responsible Research

Title: **The Influence of Lying on Memory**

IRB ID: 18-394

Submission Type: Initial Submission **Review Type:** Expedited

Approval Date: 10/11/2018 **Date for Continuing Review:** 10/10/2020

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

- Use only the approved study materials** in your research, including the **recruitment materials and informed consent documents that have the IRB approval stamp.**
- Retain signed informed consent documents** for 3 years after the close of the study, when documented consent is required.
- Obtain IRB approval prior to implementing any changes** to the study.
- Inform the IRB if the Principal Investigator and/or Supervising Investigator end their role or involvement with the project** with sufficient time to allow an alternate PI/Supervising Investigator to assume oversight responsibility. Projects must have an [eligible PI](#) to remain open.
- Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences** involving risks to subjects or others; and (2) **any other unanticipated problems involving risks** to subjects or others.
- Stop all human subjects research activity if IRB approval lapses**, unless continuation is necessary to prevent harm to research participants. Human subjects research activity can resume once IRB approval is re-established.
- Submit an application for Continuing Review** at least three to four weeks prior to the **date for continuing review** as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

IRB 03/2018

- Please be aware that IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. **Approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **IRB approval in no way implies or guarantees that permission from these other entities will be granted.**
- Please be advised that your research study may be subject to [post-approval monitoring](#) by Iowa State University's Office for Responsible Research. In some cases, it may also be subject to formal audit or inspection by federal agencies and study sponsors.
- Upon completion of the project, transfer of IRB oversight to another IRB, or departure of the PI and/or Supervising Investigator, please initiate a Project Closure to officially close the project. For information on instances when a study may be closed, please refer to the [IRB Study Closure Policy](#).

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.