

Deception Memory: When Will Consumers Remember Their Lies?

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Consumers tell many lies. While engaging in deception can provide a variety of benefits, a potential danger when lying is that the consumer may subsequently forget aspects of the lie told. To ensure the deception is not inadvertently revealed later, the consumer must remember the content of the lie. In this research, we introduce the notion of *deception memory*—which we define as memory for the content of a previously communicated lie—and examine what differentiates a memorable lie from a forgettable lie. Three behavioral studies where consumers lie to marketers (study 1) or fellow consumers (studies 2 and 3) and a critical incident study (study 4) show that increases in the consequentiality of the lie heightens lie-induced arousal (LIA), which narrows attention to the content of the lie and subsequently improves deception memory. Therefore, while more arousing lies may be more consequential, and therefore, riskier to tell, our results suggest that they are less likely to be forgotten. This is the first examination of retrieval accuracy for deception memory. Finally, many avenues for future research related to memorable and forgettable lies are proposed in this article.

Keywords: memory, deception, arousal, attention narrowing

INTRODUCTION

Deception occurs frequently in the marketplace (Boush, Friestad, and Wright 2015). Marketers mislead consumers in their advertisements (Darke and Ritchie 2007; Faerber and Kreling 2014), when using counterfeit parts as genuine (Mavlanova, Benbunan-Fich, and Kumar 2008), and during negotiations (Bickart, Morrin, and Ratneshwar 2015). But marketers are not alone in their use of deceptive tactics. Consumers also lie to marketers

(Andrade and Ho 2009; Anthony and Cowley 2012; Argo and Shiv 2012) and to other consumers (Argo, Dahl, and White 2011; Argo, White, and Dahl 2005; Sengupta, Dahl, and Gorn 2002). An emerging literature investigating consumers' lies has focused on the motivation to deceive and the immediate consequences of deceit. Consumer motivations to lie include gaining financial advantage (Andrade and Ho 2009) and impression enhancement (Argo et al. 2011; Sengupta et al. 2002). The immediate consequences of consumers lying include changes in the lying consumer's satisfaction with the outcome obtained (Anthony and Cowley 2012), shifts in judgments and behaviors toward the target of the lie (Argo and Shiv 2012), and feelings of guilt and shame (Kang, Packard, and Wooten 2013).

Understanding the motivations for lying and the immediate consequences of the lies consumers tell is important. But there are also longer-term, post-lying implications for the consumer who deceives: lying consumers must remember the content of their lie, which we label *deception memory*, to ensure consistency in subsequent conversations. Why does it matter if a consumer forgets a lie told to another consumer, marketer, or service provider? A forgotten lie, or inaccurate deception memory, puts the consumer at risk of revealing the deceptive statements made earlier. A

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discovered lie has a variety of unsavory ramifications (Ekman 1997a). For instance, revealing previously stated deceptive remarks may harm or destroy the lying consumer's relationships (Tyler, Feldman, and Reichart 2006), as deception has been reported as the ultimate betrayal of a relationship (Fitness 2001). For fellow consumers, the discovered lie means that past interactions with the liar must now be reviewed and that future statements should be treated with suspicion (Bok 1978; McCornack and Levine 1990). Additionally, the liar's reputation as a source of useful information may be damaged (Kozinets et al. 2010). For marketers and service providers, the lying consumer may be distrusted during future commercial interactions (King, Dennis, and McHendry 2007).

In summary, there is much to lose if a consumer becomes a confirmed liar. Given that consumers *are* willing to lie and that lying is common (DePaulo et al. 1996), it is necessary to understand when consumers will remember their lies. In the present research, we introduce the notion of deception memory and examine what differentiates a memorable lie from a forgettable lie.

CONCEPTUAL FRAMEWORK

We build our conceptual framework in three sections. In the first section, we assert that lies will become more memorable as the arousal generated by the act of lying, which we refer to as *lie-induced arousal* (LIA), increases. In the second section, we consider the process of how LIA affects deception memory and hypothesize that attention narrowing underlies the effect. In the third section, we consider the consequentiality of the lie as an antecedent to LIA and use specific examples of lies that vary in consequentiality to test our hypotheses.

Arousal and Deception Memory

Research across a variety of disciplines has found an increase in arousal when people engage in particular types of deceptive communication (Caso et al. 2005; Jung and Lee 2012; Ströfer et al. 2016; Zuckerman et al. 1981). We argue that LIA will affect deception memory because research has shown that emotionally arousing events are better remembered than nonemotional events (Brown and Kulik 1977; Cahill and McGaugh 1995; Conway 1995; Conway et al. 1994; Kensinger 2007; Kensinger and Corkin 2003). The classic example of the improvement in memory for emotionally arousing events is referred to as "flashbulb memory" (Brown and Kulik 1977). Flashbulb memories occur when people believe they have almost perfect memory for details of the moment they heard shocking news such as when they were told the president of the United States had been shot (Brown and Kulik 1977) or Princess Diana died in a car crash (Hornstein, Brown, and Mulligan 2003; Kvavilashvili et al. 2003). Flashbulb memory research considers a very

specific effect in a broader literature investigating the relationship of arousal felt during encoding and memory accuracy. For example, although flashbulb memory research focuses on shocking events, the emotionally arousing event need not be so dramatic, as recall accuracy in laboratory studies has been found to increase when participants view photos of snakes versus non-arousal-inducing objects (Waring and Kensinger 2009). Additionally, flashbulb memory research has focused on arousal stimulated by negatively valenced events, but neuropsychological research has demonstrated that positively valenced arousing stimuli are also remembered better than positive but neutral stimuli (Dolcos, LaBar, and Cabeza 2005; Hamann and Mao 2002; Hamann et al. 2002). Finally, although the arousal and memory accuracy effect is often documented in the short term, it has also been shown to occur one year after exposure to the arousing material (Bradley et al. 1992; Dolcos et al. 2005), highlighting the powerful and long-lasting encoding effect arousal has on memory.

The relationship between arousal and memory has also been explored in consumer research. For instance, emotionally arousing ads are better remembered than nonemotional ads (Aaker, Stayman, and Hagerty 1986; Ambler and Burne 1999; Bakalash and Riemer 2013; Bolls, Lang, and Potter 2001; Friestad and Thorson 1993), aroused consumers remember ads better than nonaroused consumers (Bennett 1998), and arousal-evoking program content is better remembered than the nonarousing material placed in the advertising breaks (Pavelchak, Anil, and Munch 1988). In summary, across a variety of contexts, research has shown that arousal caused by hearing shocking events or viewing tamer yet still arousing stimuli improves memory, that both positively and negatively valenced arousal impacts memory, and that the encoding effect can affect memory in both the short and long term.

Our first hypothesis is based on research cited here showing an increase in arousal when a person is lying and a causal relationship between arousal and memory. We expect that when a consumer tells a lie, the increase in LIA that occurs at the moment of deceit will predict an improvement in the accuracy of deception memory.

H1: As the consumer's LIA increases at the point of telling a lie, deception memory will be more accurate.

In the next section we discuss the possible mechanisms by which higher levels of LIA will improve consumers' deception memory.

Mechanisms Underpinning LIA's Effect on Deception Memory

A commonly cited mechanism underlying improved memory of an arousing (vs. a less arousing) event is attention narrowing. The attention-narrowing explanation employs Easterbrook's (1959) cue-utilization hypothesis to

suggest that emotional arousal narrows attention and favors processing of the emotion-eliciting information during encoding, which results in better memory for details central to the emotional aspects of an event compared to contextual or peripheral details (Christianson 1992; Christianson and Loftus 1991; Kuhbandner, Spitzer, and Pekrun 2011). For example, Christianson and Loftus (1991) found that participants viewing a set of slides remembered the details of Mary, the protagonist, and her situation better when she was shown lying beside a bicycle bloodied from a head injury than when she was riding the bicycle uninjured. They also remembered much less about the contextual details in the “head injury” slide condition compared to the “riding a bicycle” condition. In the context of lying, the attention-narrowing explanation would predict that because attention is a limited resource, the additional attention focused on the content of the lie (the arousing subject matter, in this case) should result in a reduction of attentional resources available for processing the non-lie-related content (the less arousing, contextual information, in this case). Accordingly, from an attention-narrowing perspective, if deception memory improves as the lying experience becomes more arousing, then memory for other, non-lie-related information should be less accurate.

A competing explanation for how arousal improves memory of emotional events is priority binding (Hadley and MacKay 2006; MacKay and Ahmetzanov 2005). A priority-binding explanation of improved memory is based on the premise that creating associations to contextual information during encoding of episodic memories is essential to the accurate retrieval of those memories (Johnson, Hashtroudi, and Lindsay 1993). The process underlying the priority-binding explanation is that emotional arousal during encoding primes a binding node to form connections between the arousing event and the context of the arousing event, which builds an internal representation of what occurred (Hadley and MacKay 2006). Therefore, priority binding encourages stronger connections from the information central to the emotionally arousing event to the episodic context of the event. These connections facilitate retrieval of the arousing event and, as a side effect, improve memory for the contextual details. Importantly, the context, as defined by priority-binding theory and research, includes temporal information. For example, a word presented before or after an arousing word (Hadley and MacKay 2006), if properly bound to the target arousing word, can facilitate retrieval of the target word and hence will be more deeply processed. Therefore, in contrast to an attention-narrowing account, a priority-binding explanation would predict that arousal should enhance memory for information both central and temporally related to the event. In this case, not only will deception memory improve as LIA increases, but so too will consumers’ memory for the lie-unrelated information communicated before and after the deceptive content.

Although evidence exists for both explanations, we believe attention narrowing is the mechanism underlying the improvement in deception memory for two reasons. First, attention-narrowing effects are particularly likely during the experience of threat-related events (Easterbrook 1959) and when the arousing situation is negative (Libkuman, Stabler, and Otani 2004). This is relevant because the act of lying is generally considered to be a negative and threatening experience (Ekman 1985). Second, when circumstances at encoding are challenging, attentional resources that might typically be allocated to processing contextual information (Knight and Mather 2009) may be redirected to processing the arousing material. Because there is a cognitive cost of switching from truth to a lie when deceiving (Debey et al. 2015), we believe engaging in deceptive communication is this type of challenging circumstance. Therefore, given that the source of the arousal when lying is a threatening and challenging act taken by the rememberer, our second hypothesis is:

H2: The mechanism underlying the relationship between LIA and improved deception memory is attention narrowing.

LIA Varies with the Consequentiality of the Lie

Lying is at odds with truthful discourse and thus elicits arousal because there are consequences if the deception is revealed (Zuckerman et al. 1981) or is unsuccessful. The arousal induced when a consumer is lying varies depending on the consequences associated with the lie. We consider two specific types of consequences associated with lies, moral and performance, as examples.

Moral Consequences. Not all lies are considered equally immoral. Commission lies, which occur when the liar intentionally provides false information to engender a belief that the false information is true, are considered more morally reprehensible than omission lies (Spranca, Minsk, and Baron 1991), which occur when the liar deliberately excludes information that the listener would expect to be included if the communicator were adhering to conversational norms (Grice 1975). The omission bias (Ritov and Baron 1990) can be used to explain the harsher judgment associated with commission lies as the bias captures “the tendency to judge the consequences of a negative [active] behavior (commission) as more harmful than the consequences of inaction (omission), even when both events lead to the same outcome (Baron and Ritov 2004)” (482, Pittarello, Rubaltelli, and Motro 2016). With commission lies, people perceive a direct connection between the person that believes the mistruth and the commission liar’s act (Baron and Ritov 2009). Omission lies, on the other hand, are not perceived to have the same causal connection because other events might explain how the person ended up

believing that a mistruth is true. For instance, imagine a consumer is motivated to lie about an unwise purchase decision because the truth is threatening to his self-worth or self-image (Argo, Dahl, and White 2011; Sengupta, Dahl, and Gorn 2002). In conversation with a fellow consumer, he might endorse the product (a lie of commission) to hide his poor purchase decision. If his false endorsement is revealed, then the misled consumer can tie her misinformed beliefs directly to the lying consumer. As a consequence, the lying consumer will be held more morally accountable for his behavior due to the direct causal connection made (i.e., the moral consequences are high). Imagine our misleading consumer uses a lie of omission instead, by talking about the product without revealing the to-be-hidden material (Adams and Jarvis 2006) or by being strategically evasive and vague (Van Swol and Braun 2014), hoping the consumer will generate an inference that the inferior product is good. In the omission case, the lying consumer can't be tied directly to the misled consumer's incorrect beliefs. Given the weaker causal connection, the moral consequences are lower, as the consumer is less likely to be held morally accountable for his behavior.

Importantly, the attribution of moral responsibility for a lie of commission (vs. omission) is not only more likely when one is judging the actions of others, but also when one is judging one's own actions (Pittarello et al. 2016), because it is difficult for the liar to avoid taking responsibility for the listener believing a mistruth. As moral consequences have been shown to increase arousal in the liar (Karim et al. 2010), we argue that telling a lie of commission (vs. omission) will elicit more LIA and therefore should be more memorable.

Performance Consequences. The perceived performance consequences of the lie should also impact the degree of LIA felt. As the performance consequences rise, it becomes increasingly important for the liar to be believed, which results in more arousal (Caso et al. 2005). For example, if a blogger relies on endorsement income, then being a successful liar by providing false endorsements may be important to his or her career success. If a blogger is not reliant on endorsement income, then being a skillful deceiver has little effect on that blogger's career success. For our endorsement-reliant blogger, lying has significant performance consequences. A focus on success can result in more effort to conceal emotions that could sabotage acceptance of the deception (Frank and Ekman 1997) and/or put a higher demand on cognitive resources required to ensure continuity in the lie (Burgoon et al. 1996), both of which cause an increase in arousal (Burgoon et al. 1996). Therefore, we argue that telling a lie with high performance consequences will elicit more LIA, compared to telling a lie with low performance consequences, and thus should be more memorable.

In summary, LIA will be higher if the lie is perceived to be more morally consequential (commission vs. omission) or if the performance consequences are higher (vs. lower). We manipulate these factors and measure consequentiality more generally to test our hypotheses that an increase in LIA improves deception memory through a process of attention narrowing.

THE PRESENT RESEARCH

The present research seeks to identify what distinguishes a memorable lie from a forgettable lie. In study 1, we manipulate the need for consumers to create a misleading endorsement of a brand. We measure the moral consequentiality of the lie told (via commission vs. omission lies) to test whether more consequential lies are better remembered because of an increase in LIA. In study 2, we manipulate the moral consequences associated with a lie told by participants providing a misleading endorsement to a friend who is using an online dating service. We selected online dating services because lying is ubiquitous in this consumption setting (Toma, Hancock, and Ellison 2008). In study 3, we manipulate performance consequences to further test whether increases in LIA improve deception memory. We also test the possible influence of arousal unrelated to the lie, or *non-lie-induced arousal* (NLIA), by manipulating physiological arousal via an exercise task. In study 4, we enhance the external validity of our "real" (Morales, Amir, and Lee 2017) but experimental data by using a critical incident methodology to measure individual differences in the perceived consequences of *real lies* told to fellow consumers, service providers, and marketers in natural consumption settings. Further, we use consumers' reported experience with the deception situation as a moderator of the relationship between lie consequentiality and LIA to offer further process evidence for our conceptual model.

The work presented here makes three important contributions to our understanding of deception. First, previous psychological and consumer research has focused on the antecedents and immediate consequences of engaging in deception, as well as cues for deception detection. The current research is the first to empirically examine the longer-term, post-lying implications by exploring when consumers will remember (or forget) the lies they tell. By introducing deception memory and examining the processes involved, we reveal many avenues for investigation of the downstream implications of memorable versus forgettable lies. Second, recent research has found that people are motivated to forget immoral actions, an effect called *unethical amnesia* (Kouchaki and Gino 2015, 2016). Specifically, when participants were asked to remember (or imagine) a time when they had (or could have) cheated, they had fewer vivid memories of the cheating event than they did

of unpleasant but not immoral acts (Kouchaki and Gino 2016). The explanation offered is that people are motivated to forget their immoral acts to reduce psychological distress and discomfort. In the current research, we show that more consequential lies—including lies of commission—are better remembered. We offer the following reconciliation: cheating is an *intrapersonal* event, where only the cheater is privy to the morally questionable behavior. Therefore, there is a moral motive to forget, versus remember, the cheating act in a bid to restore one's moral self-view without any risk of "being caught." Liars, however, should be motivated to remember the lie because it is an *interpersonal* event, and forgetting the lie could lead to revealing their status as a liar. Third, we discover that consumers telling lies of commission demonstrate more felt arousal than consumers telling lies of omission. This is important to the deception detection literature, where arousal and its physical manifestations during the communication of a lie may result in emotional leakage, which can be used as a cue to deception (Warren, Schertler, and Bull 2009).

We also contribute to the arousal-memory research. Previous work has focused on sources of arousal that are external to the remembering individual with material *witnessed by, reported to, or presented as* photos or words to the person asked to remember the information later (Burke, Heuer, and Reisberg 1992; Heuer and Reisberg 1990; Kensinger and Schacter 2006; Schaefer, Halldoran, and Dizon-Reynant 2011). Here, we examine the previously unexamined relationship between arousal and memory when the arousal is generated via an action taken by the individual whose memory will potentially be affected. We find support for attention narrowing, rather than priority binding, as the mechanism for the arousal-memory link in the context of deception. We argue the mechanism holds because the arousing event—executing a consequential lie—is a threatening and cognitively challenging action, which adds to our understanding of when superior encoding of arousing information occurs at the expense of contextual or episodic material.

Finally, we contribute to the memory literature more generally. Previous research has provided insight into how the existence of a false or alternative representation of an event can affect memory for the original event. Rumors (Principe et al. 2010), misleading questions (Loftus 1996), deceptive advertising (Braun 1999; Cowley and Janus 2004), and even deceiving others (Polage 2004) can alter memory for the "truth" or the original event. No research has investigated when, or if, the misleading information could be remembered, which may have significant implications for previously reported effects on memory reconstruction.

STUDY 1

Study 1 examined deception memory accuracy using an uninstructed lie paradigm. We tempt participants to

provide deceptive affirmations of a brand for a prize. Although the experiment is set in a laboratory environment, the procedure is very similar to competitions marketers run to elicit positive testimonials from consumers. For instance, a company called Lumosity encouraged consumers to provide endorsements for their services via competitions offering prizes. These endorsements were subsequently deemed to be false in a 2016 ruling of the Federal Trade Commission (Brill 2016).

Method

Participants and Design. One hundred twenty-two university students were randomly allocated to a lie condition or a truth condition. In the lying condition, participants had to tell a lie while recording a message to be eligible for the prize. An uninstructed lie paradigm in which participants are offered the opportunity to engage in deception but are not directly instructed to lie was considered essential for the design of the first experiment, because sanctioning a lie can affect the behavioral expressions of deception (Feeley and deTurck 1998), such as the fundamental frequency of the liar's voice. Approximately twice as many participants were randomly allocated to the lying condition ($n = 84$), which allowed us to 1) accommodate participants who would choose not to lie (based on pretesting and previous research; Ekman and Friesen 1974; Feeley and deTurck 1998) and 2) to code and compare deception memory for omission versus commission liars. In the truth condition, participants did not need to lie during the recording to be eligible for a cash prize.

Procedure. Participants ranked five existing brands of canned beverages (1 = most preferred to 5 = least preferred) among a variety of tasks. Participants were then informed of cash prizes offered by a "study sponsor." Prizes were to be awarded for recorded messages leaving the most positive impression of the sponsor's beverage. We used Audacity, a multitrack audio recording software, to capture the participants' recorded messages. In the lie condition, the sponsor's beverage was the beverage the participant ranked as least preferred (#5). Therefore, prize eligibility necessitated recording a deceptive message about the participant's ranking. In the truth condition, the sponsor's beverage was the beverage the participant ranked as most preferred (#1); hence, prize eligibility did not require deception. Participants responded to four questions in their recordings (see appendix A). The third question, "What was your ranking of [sponsor's beverage name]?" meant that participants in the lying condition had to omit information or commit to a false claim to mislead the sponsor about their ranking and be eligible for the prize. Directly after the recording, we measured whether the participants thought they had created a positive message by asking, "When the sponsors listen to your recording, how

do you think they will rate your attitude toward their beverage?" on a scale anchored at "very negative" (−50), "won't know" (0), to "very positive" (+50). We refer to this measure as the *sponsor impression scale*. Memory for the recorded message was tested the next day with recognition questions. Deception memory was measured with the following questions for participants in the lie condition: "Did you give the impression that you ranked [beverage ranked #5] highly?" (omission liars) and "Did you tell them you ranked [beverage ranked #5] highly?" (commission liars). Accurate memory was measured with an affirmative response to the critical question. For those in the truth condition, the critical question was "Did you tell them you ranked [beverage ranked #1] highly?" See [figure 1](#) for additional procedural details.

Results

Compliance and Coding of Lies. The compliance rate in the truth condition was 100% ($n = 38$) and 81% ($n = 68$) in the lie condition. We used both the content of the response to question 3 and the sponsor impression scale to determine compliance. Compliers in the lie condition lied about the ranking and reported that the sponsor would interpret their message as positive. Noncompliers in the lying condition did not lie about the rank in the recording and therefore could not be included in the analysis.

Two independent coders categorized the lying condition participants' lies as commission versus lies of omission, $r = .96$, $p < .001$. Lies were categorized as commission if the participant explicitly stated a rank other than #5 for the sponsor's beverage ($n = 40$; e.g., "I ranked Red Bull as #1"). Lies were categorized as omission if the participant did not explicitly include a numeric rank ($n = 28$) but gave the impression that the rank was better than #5 (e.g., "I said Coke was very popular; all of us drink it")—that is, omitting the rank but providing some information that would leave the listener with a positive impression of the participant's rank.

Overall Memory. A logistic regression run on the accuracy of the critical recognition response with lying versus truth condition as the independent variable revealed that participants were more accurate in the truth condition ($M = .97$) than in the lying condition ($M = .59$, Wald = 9.73, SE = 1.04, $p < .01$). Therefore, the liars' deception memory was less accurate than the truth tellers' memory.

Deception Memory. To test deception memory accuracy for lies of greater (vs. lesser) moral consequence, we ran a logistic regression on participants in the lie condition. The independent variable was the moral consequence of the lie (commission vs. omission lie). The analysis revealed more accurate deception memory for commission ($M = .70$) compared to omission lies ($M = .43$, Wald = 4.86, SE = .26, $p < .05$).

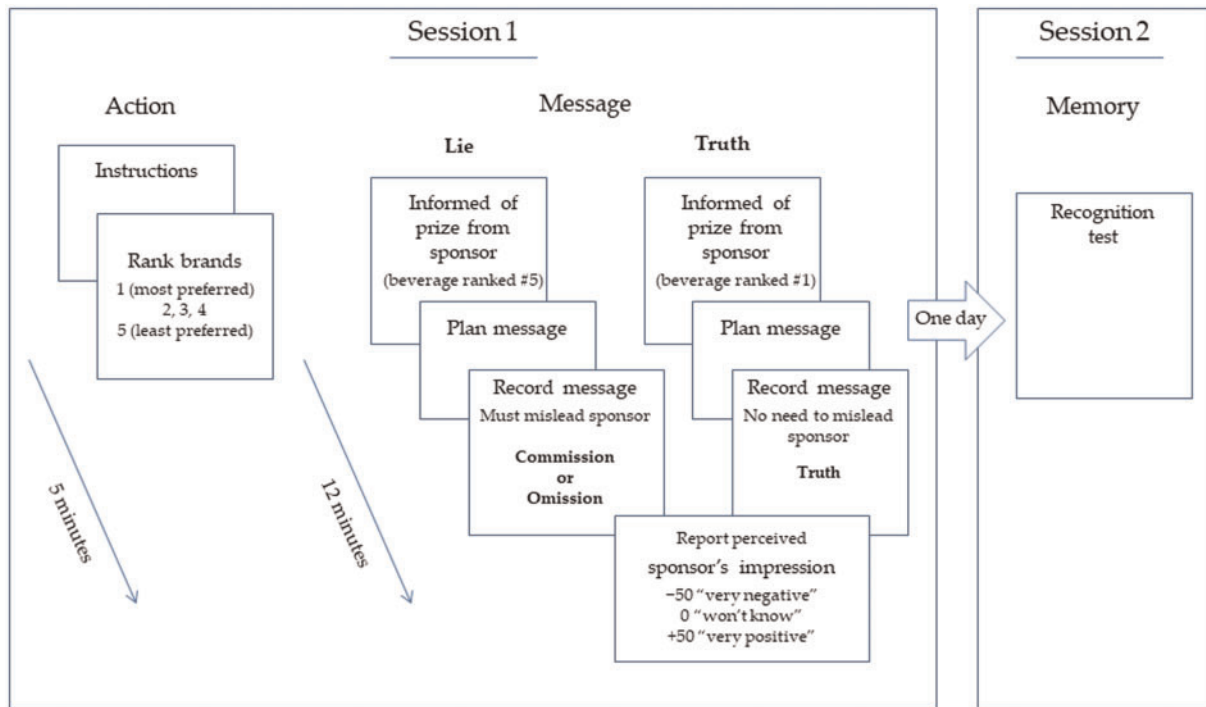
Increase in LIA. Fundamental frequency (F_0), the pitch of the speaker's voice, was used as a behavioral manifestation of LIA for those in the lie condition because high levels of arousal are associated with increases in mean F_0 ([Bachorowski 1999](#); [Creel, Tanenhaus, and Aslin 2006](#)). Specifically, an increase in F_0 represents a stronger concentration of energy associated with stressed speech ([Izdebski 2008](#)) and reflects arousal during deceptive statements better than other aspects of the voice, such as shimmer and jitter ([Sondhi et al. 2016](#)). Another important factor in the selection of F_0 as the measure of LIA is that it is difficult for the liar to control or manage F_0 ([Ekman 1981](#)), which enhances the measure's reliability. Audacity software captures the F_0 for every millisecond of the recording and a mean F_0 for a selected portion of the recording. To measure the increase in LIA, we used a difference score as is the practice in past research ([Gilboa-Schechtman et al. 2014](#); [Kaplan et al. 2002](#); [Kehoe, Stoel-Gammon, and Buder 1995](#)) because of the dramatic variation in F_0 between individuals. We calculated the difference score for each participant by subtracting the average mean F_0 of question 2 (before the lie) and question 4 (after the lie) from the mean F_0 from question 3.¹ We did not use the response to question 1, as it was a warm-up question that may have captured some initial anxiety regarding the recording process, which can affect F_0 ([Rantala, Vilkmann, and Bloigu 2002](#)).

As expected, the difference in arousal, as measured by F_0 , was marginally larger and positive when participants told a lie of commission ($M = +6.16$, SE = 2.93) compared to a lie of omission ($M = -1.87$, SE = 2.34, $t(59) = 1.96$, $p = .055$). [Figure 2](#) depicts the pattern of mean F_0 at four points during the recording.

Mediation. Bootstrapping analysis with 10,000 resamples following [Preacher and Hayes's \(2008\)](#) procedure was conducted with lie consequentiality (omission, commission) as the predictor variable, LIA (change in F_0) as the proposed mediator, and deception memory as the dependent variable. Lie consequentiality had a positive effect on LIA (path a: $\beta = 8.03$, $t = 1.95$, $p = .055$), and LIA had a positive effect on deception memory (path b: $\beta = .04$, $z = 1.74$, $p = .081$). Importantly, the mean indirect effect of ($\beta = .32$) from the bootstrap analysis was significant, with a 95% confidence interval that excluded zero (.0071 to 1.1852). The direct effect of lie consequentiality on

¹ The calculation of the LIA measure is consistent with our conceptual model, but must be treated with caution in this study, as 28 of the participants in the lie condition continued to deceive when answering question 4. In studies 2 and 3, the questions to be answered on the recording were designed to ensure that question 4 did not encourage the continuation of the deception. Importantly, a supplemental analysis using question 2 as the only comparator reveals the same pattern of results with a significant difference between LIA for commission versus omission lies.

FIGURE 1
STUDY 1 PROCEDURE



NOTE.—The experiment consisted of two sessions separated by one day. The beverage ranking task and the recording of a message regarding the task occurred in session 1. Prizes were sponsored by the beverage brand the participant ranked as #5 in the temptation condition and #1 in the no temptation condition. A surprise recognition test measuring deception memory occurred in session 2.

deception memory was reduced from a total effect of (path c: $\beta = 1.37$, $z = 2.47$, $p = .013$) to (path c': $\beta = 1.17$, $z = 2.06$, $p = .040$) when we controlled for the mediator. The results provide initial evidence consistent with our hypothesis that LIA mediates the effect of lie consequentiality on deception memory accuracy.

Additional Analysis. It is possible that omission liars did not believe that omitting their rank of the sponsor's beverage left a misleading impression of their rank of the drink. Therefore, when responding to the DV, they did remember what they said, but did not report it as leaving a misleading impression of their rank. To test for this possibility, we compared the participants' response to the sponsor's impression question. There was no difference between commission liars ($M = +25.40$, $SE = 1.88$) and omission liars ($M = +21.43$, $SE = 2.01$, $t(66) = 1.38$, $p = .17$). Therefore, we are confident that memory differences cannot be explained by omission liars responding "no" more often to the DV because they didn't believe they misled the sponsor when recording the message.

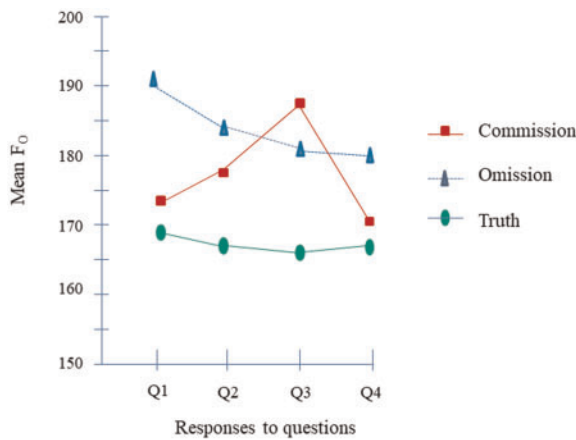
Discussion

Study 1 results show that deception memory is not as accurate as memory for the content of a truthful message. Therefore, the old adage is correct. Importantly, the results support hypothesis 1 that the increase in LIA improves deception memory accuracy. It is significant that the results were not driven by omission liars believing they did not mislead the sponsor in their recording. They did believe a listener would judge them to have ranked the beverage higher than they actually did.

STUDY 2

In study 2, we seek to increase the generalizability of our deception memory hypotheses by having participants lie to a fellow consumer (i.e., consumer-to-consumer lie). The consumer is a close friend of the liar, offering a higher likelihood of the liar needing to remember the content of the lie later. To eliminate any potential self-selection confounds, participants were explicitly instructed to lie by commission or omission. Study 2 also allowed for a

FIGURE 2
STUDY 1 RESULTS



NOTE.—Mean F_0 over the recording of the message by moral consequentiality (commission, omission) with control condition (truth).

comparison of memory for the lie-related and non-lie-related message content to provide a test of hypothesis 2: whether attention narrowing explains improved deception memory. We accomplished this by designing the recording and recognition questions to allow for the delineation of lie-related versus contextual message content. However, identifying what contextual information may have been used in the binding process is difficult. In acknowledgment of this measurement limitation and to strengthen the hypothesis testing, we included an additional test of priority binding (a remember/know measure: Tulving 1985) that does not require an experimenter-determined categorization of the content. Since priority binding is generally accompanied by vividness and feelings of conscious awareness (Kensinger and Corkin 2003; Rimmele et al. 2011), which is the basis for a *remember* response, a priority-binding explanation would predict that accurate participants would report “remembering” more often than “knowing” when evaluating their memory for an event.

Method

Participants and Design. Ninety university students were randomly allocated to a lie type condition (omission, commission).

Procedure. Participants’ first task was to name a male friend that might be interested in meeting a well-traveled female dating partner via an online dating service. Participants were then told that their male friend wanted them to communicate with a potential dating partner named Joy to offer their opinion of her as a dating partner. Participants received an email from Joy where she

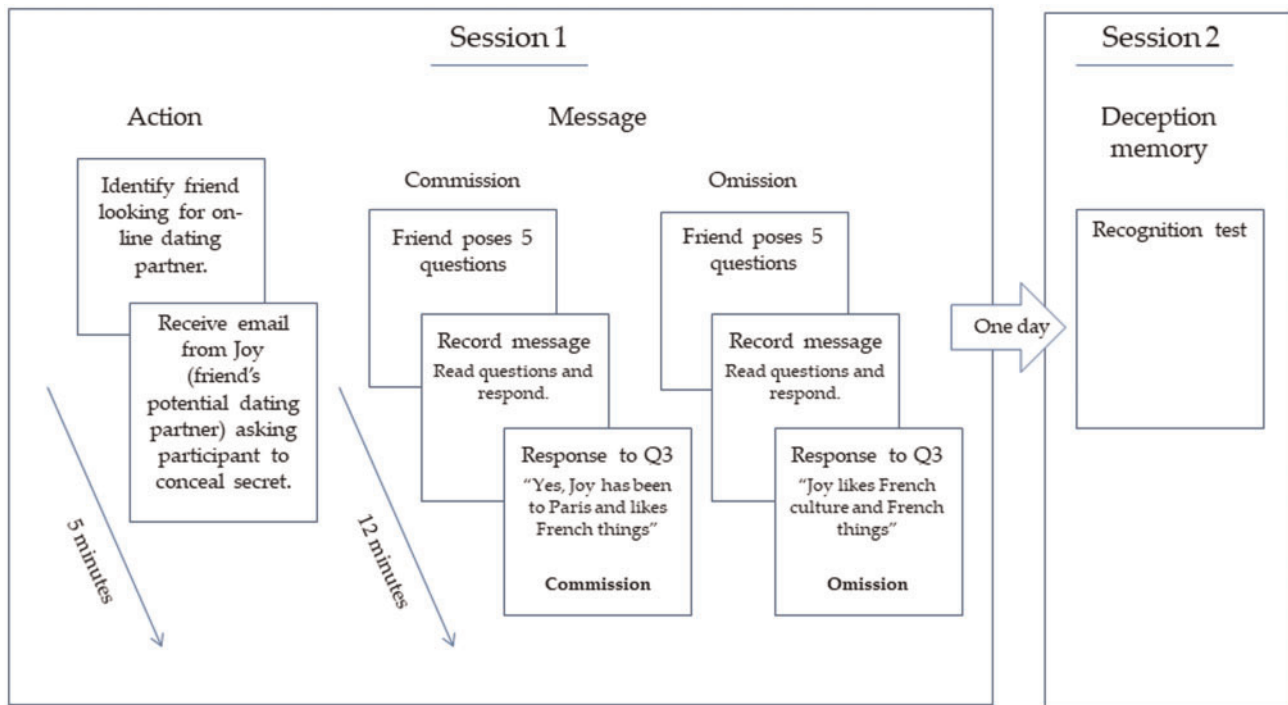
discloses to the participant that she told the participant’s friend she had been to Paris when, in fact, she has not. Joy asked the participant not to reveal her secret because she knew how important her traveling was to their friend. The focal task for participants was to record a message to his/her friend about the conversation with Joy. In the recorded message participants answered five questions posed by the friend (see appendix A). Four questions were benign; the target question was question 3, “Did Joy say she had been to Paris?” In the commission condition, participants were told to say, “She said she has been to Paris and she likes French culture.” In the omission condition they were told to say, “She said she liked French things and French culture.” The questions before and after question 3 were pretested to ensure that they did not invite any deception, which allowed for measurement of arousal at the moment of the deception. To ensure that the commission/omission manipulation affects perceived moral consequentiality, we ran a supplementary test. Participants ($n = 51$, university students) read about Joy’s request and reported whether they would feel more conflicted by telling a lie of commission versus omission. See appendix B for details. In fact, 87% of the sample indicated that would feel more morally conflicted if they lied by commission.

One day later, one question was posed to measure deception memory (information central to the lie) among four recognition questions measuring memory for non-lie-related content (or details of the conversation before and after the arousing lie content: see appendix C). The DV measuring deception memory was whether participants concealed that Joy had not been to Paris (omission) or whether participants explicitly said that Joy had been to Paris (commission). Deception memory was coded as accurate if they answered affirmatively. Participants provided a remember/know response. For example, if the participant said “yes” to the recognition question measuring deception memory for commission liars, then the next question was “On the last screen you indicated that you told [friend’s name inserted] that Joy had been to Paris. Do you REMEMBER specific details of saying this or does it sound familiar, so you KNOW you said it? Choose either ‘remember’ or ‘know.’” Figure 3 provides more details of the procedure.

Results

Lie Manipulation Instruction Check. Seventy-eight percent of the sample ($n = 70$) followed instructions during the recording. Of the 20 remaining participants, 15 revealed Joy’s request to conceal her secret, and five provided the ambiguous response of “no” to question 3 during the recording. Although the “no” response could technically be deception by omission because the friend could think that they did not talk about Paris, it could also mean Joy hasn’t been to Paris. The deception memory question

FIGURE 3
STUDY 2 PROCEDURE



NOTE.—The experiment consisted of two sessions separated by one day. Interacting via email with Joy and the recording of a message regarding her travels occurred in session 1. The critical manipulation was whether the participant was instructed to explicitly say Joy had been to Paris (commission) or give the impression she had been to Paris (omission). A surprise recognition test measuring deception memory occurred in session 2.

was not set up to capture this type of obfuscation. The analysis included data for participants that followed instructions only.

Deception Memory. Replicating the results of study 1, memory for question 3 was significantly more accurate for morally consequential lies: commission ($M = .79$) versus omission lies ($M = .54$, Wald = 4.56, SE = .54, $p < .05$).

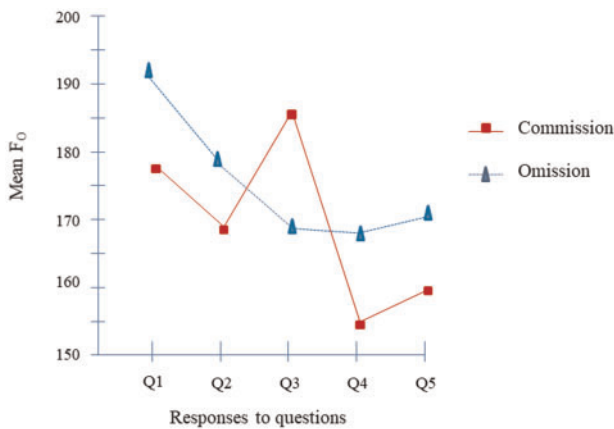
Increase in LIA and Mediation. To capture any changes in LIA, similar to study 1 we used a difference score calculated for each participant by subtracting the average mean F_0 from questions 2 and 4 from the mean F_0 from question 3. No participants included deceptive content in their response to question 2 or question 4. Figure 4 depicts the pattern of mean F_0 at five points during the recording. As expected, the increase in LIA was higher for a lie of commission ($M = +23.25$, SE = 9.21) compared to a lie of omission ($M = -3.84$, SE = 4.38, $t(65) = 2.73$, $p < .01$).

Bootstrapping analysis with 10,000 resamples following Preacher and Hayes's (2008) procedure revealed that lie consequentiality had a positive effect on LIA (the change

in F_0 : path a: $\beta = 27.09$, $t = 2.73$, $p = .008$), and LIA had a positive effect on deception memory (path b: $\beta = .02$, $z = 1.70$, $p = .089$). Importantly, the mean indirect effect of ($\beta = .47$) from the bootstrap analysis was significant, with a 95% confidence interval that excluded zero (.0426 to 1.4626). The direct effect of lie consequentiality on deception memory was reduced from a total effect of (path c: $\beta = 1.10$, $z = 2.02$, $p = .044$) to nonsignificance (path c': $\beta = .80$, $z = 1.41$, $p = .158$) when we controlled for the mediator. The results provide further evidence consistent with our hypothesis that LIA mediates the effect of lie consequentiality on deception memory accuracy.

Attention Narrowing. Analyses of memory accuracy for non-lie-related details across the moral consequence manipulation revealed a significant difference for memory performance ($t(68) = 2.93$, $p < .05$). Commission liars were less able to correctly recognize non-lie-related details ($M = .73$, SE = .037) compared to omission liars ($M = .86$, SE = .027). In addition, analyses of memory performance for non-lie-related details of participants reporting accurate deception memory was significantly

FIGURE 4
STUDY 2 RESULTS



NOTE.—Mean F_0 over the recording of the message by moral consequentiality (commission, omission).

lower ($M = .74$, $SE = .029$) than participants with inaccurate deception memory ($M = .91$, $SE = .029$, $t(68) = 3.67$, $p < .001$).

Although supportive of an attention-narrowing explanation, we also compared the frequency of “remember” versus “know” responses for the deception memory question. If the alternative explanation of priority binding explains the improvement of deception memory, then there should be more remember responses accompanying accurate deception memory because retrieving the perceptual details of the context creates clearer images of the event, which leads to a feeling of remembering (Meiser, Sattler, and Weißer 2008; Perfect et al. 1996) rather than knowing. In fact, there were no differences between correct or incorrect answers for the remember/know decision for deception memory ($\chi^2 = 1.32$, $p = .24$). Therefore, we do not find support for a priority-binding explanation as the process by which LIA enhanced deception memory.

Discussion

Study 2 replicated the results from study 1: an increase in LIA when the liar communicated the critical content of the lie resulted in more accurate deception memory (support for hypothesis 1). The results also support attention narrowing as the mechanism explaining the LIA-deception memory relationship (support for hypothesis 2).

STUDY 3

In study 3, we manipulate the performance consequences associated with successful deception to provide

complementary causal evidence for the role of LIA in improving deception memory. We also designed this study to test whether deception memory is improved when the source of arousal is not specific to the deception, which would contradict hypothesis 1. We use a non-lie-induced arousal (NLIA) manipulation of physical exercise to test whether it is LIA, or any form of arousal, that improves deception memory. If the arousal induced from any source (both LIA and NLIA) improves deception memory, then the data should reveal either two main effects or an interaction. Two main effects would suggest that both arousal induced by exercise (NLIA) and LIA arising from the performance consequences manipulation increased deception memory independently. An interaction would indicate that the two sources of arousal influence deception memory interdependently. If, as we expect, LIA, but not NLIA, affects deception memory, then we should find only a main effect for the performance consequences manipulation, but no other effects on deception memory.

Method

Participants and Design. One hundred twenty-one university students were randomly allocated to a 2 (performance consequences: high, low) \times 2 (exercise task: present, absent) between-subject design. Ninety-five percent of the sample ($n = 115$) followed instructions during the recording. Participants that did not follow the deception instructions (5%) were excluded. We ran a preliminary study to test for the main effect of performance consequences on deception memory. The results of this study are presented in the web appendix as supplementary study 1.

Procedure. The procedure was identical to study 2 with five exceptions. Before participants recorded the message, they were given information about research finding a significant relationship between successful lying and career success (a performance consequences manipulation adapted from DePaulo, Lanier, and Davis 1983). In the high- (low-) performance-consequences condition, participants were told that research has found that the ability to conceal information and mislead people is a critical predictor of (has no effect on) career success. We expected that participants in the high-performance-consequences condition should feel more LIA than participants in the low-performance-consequences condition because, according to the research they heard about, their career success is at least partially predicated on being able to deceive well. Second, all participants lied by commission. This allowed for the same wording of the deception memory measure across conditions and the examination of relative differences in LIA (based on performance consequences) within the same category of lie. Third, immediately following the performance consequences manipulation, participants were either asked to wait 2 minutes (exercise absent) or climb

stairs on a stair stepper for 2 minutes (exercise present). The manipulation is adapted from Berger (2011). Participants then rated how they felt on three seven-point scales anchored with 1 = "low energy" and 7 = "high energy"; 1 = "mellow" and 7 = "fired up"; and 1 = "passive" and 7 = "active." These measures were used to check that exercise-present participants were significantly higher in energy, felt more fired up, and felt more active (Berger 2011) than participants in the exercise-absent conditions. Fourth, following the recording, participants were asked to reflect on the way they felt while responding to each question during the recording using the Self-Assessment Manikin (SAM) arousal scale (Lang 1980) where 1 = very highly aroused and 9 = not aroused. The responses were used as a measure for LIA. Finally, just before the debriefing, participants were asked to report their agreement on a seven-point Likert scale with the statement "The ability to conceal information is very important to career success" where 1 = strongly disagree and 7 = strongly agree, which was used as an NLIA manipulation check.

Results

Manipulation Checks. Participants in the high-performance-consequences condition believed more strongly that the ability to conceal information was important to career success ($M = 5.54$, $SE = .15$) than participants in the low-performance-consequences condition ($M = 4.89$, $SE = .21$, $F(1, 107) = 6.32$, $p < .05$). There was no significant effect for the exercise task condition ($F(1, 107) = 2.34$, $p = .13$), nor was there an interaction of performance consequences and exercise task ($F(1, 107) = .03$, $p = .87$).

Participants who performed 2 minutes of exercise reported feeling higher in energy ($M = 4.78$) compared to participants in the exercise-absent condition ($M = 3.55$, $F(111) = 26.75$, $p < .0001$). There was no effect for performance consequences ($F(1, 111) = 1.17$, $p = .28$) or the interaction ($F(1, 111) = .52$, $p = .47$). Participants in the exercise-present condition reported feeling more fired up ($M = 4.60$) compared to participants in the exercise-absent condition ($M = 3.67$, $F(111) = 13.63$, $p < .001$). There was no effect for performance consequences ($F(1, 111) = .04$, $p = .85$) or the interaction ($F(1, 111) = .12$, $p = .73$). Participants in the exercise-present condition reported feeling more active ($M = 5.12$) compared to participants in the exercise-absent conditions ($M = 3.72$, $F(113) = 27.61$, $p < .0001$). There was no effect for performance consequences ($F(1, 111) = .43$, $p = .51$) or the interaction ($F(1, 111) = 1.53$, $p = .22$).² Therefore, both manipulations were successful. See web appendix for full descriptive statistics.

Deception Memory. Memory for question 3 was significantly more accurate for high-performance-consequences ($M = .82$) compared to low-performance-consequences lying conditions ($M = .64$, Wald = 4.40, $SE = .22$, $p < .05$, odds ratio = 1.59). Memory for question 3 was not significantly more accurate for exercise-absent ($M = .72$) compared to exercise-present conditions ($M = .73$), Wald = .01, $SE = .22$, $p = .93$, odds ratio = 1.02). The interaction was also nonsignificant (Wald = .09, $SE = .22$, $p = .76$, odds ratio = 1.07).

Increase in LIA and Mediation. As in previous studies, to capture the increase in LIA, we used a difference score calculated for each participant by subtracting the SAM for question 3 from the average SAM from questions 2 and 4. No participants included deceptive content in their response to question 2 or question 4. As expected, the difference was larger and positive for participants in the high-performance-consequence condition ($M = +2.05$, $SE = .29$), compared to the low-performance-consequence condition ($M = +1.23$, $SE = .29$, $t(113) = 2.01$, $p < .05$). Figure 5 depicts the pattern of reversed SAM scores (low score is equivalent to low arousal) at five points during the recording.

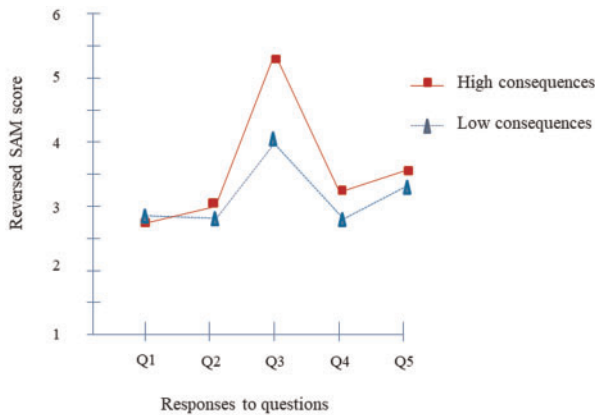
Bootstrapping analysis with 10,000 resamples following Preacher and Hayes's (2008) procedure was conducted with the lie consequentiality manipulation as the independent variable, the increase in LIA as the mediator, and deception memory as the dependent variable. The results revealed that lie consequentiality had a positive effect on the increase in LIA (path a: $\beta = .41$, $t = 2.01$, $p = .047$), and the increase in LIA had a positive effect on deception memory (path b: $\beta = .24$, $z = 2.22$, $p = .026$). Importantly, the mean indirect effect of ($\beta = .10$) from the bootstrap analysis was significant, with a 95% confidence interval that excluded zero (.0083 to .2885). The direct effect of lie consequentiality on deception memory was reduced from a total effect of (path c: $\beta = .47$, $z = 2.11$, $p = .035$) to (path c': $\beta = .39$, $z = 1.71$, $p = .086$) when we controlled for the mediator. The results provide further evidence consistent with our assertion that LIA mediates the effect of lie consequentiality on deception memory accuracy.

Attention Narrowing. Memory accuracy for non-lie-related details across the performance consequences manipulation revealed a marginally significant difference for memory performance ($t(113) = 1.86$, $p = .07$, $\eta^2 = .035$). Liars in the high-performance-consequences conditions were less able to recognize non-lie-related details ($M = .73$, $SE = .027$) compared to liars in the low-performance-consequences conditions ($M = .80$, $SE = .022$). Therefore, we found evidence in the participants' memory performance to support an attention-narrowing, not priority-binding, explanation.

² We note a limitation of study 3 is that we did not use a more direct measure of the physiological arousal, such as galvanic skin response, as a manipulation check for the exercise task.

FIGURE 5

STUDY 3 RESULTS



NOTE.—Arousal scores (reverse SAM score) over the recording of the message by performance consequences (high, low).

Discussion

The results of study 3 provide supporting evidence for the role of LIA on deception memory (replicating support for hypothesis 1) using a different example of consequentiality. The results also replicated support for attention narrowing as the process by which LIA affected deception memory (hypothesis 2). Importantly, the results do not reveal that heightened NLIA improves deception memory. Therefore, not all arousal affects deception memory performance.

META-ANALYSIS

Across four studies (studies 1–3 and [supplementary study 1](#)), we have demonstrated that heightened LIA improves deception memory. To estimate a summary effect, a single-paper meta-analysis (SPM) was conducted using the methodology developed by [McShane and Böckenholt \(2017\)](#). An SPM of our studies estimates a contrast effect of $.2196 \pm .0934 = (.13, .31; p < .001)$, indicating that more arousing lies significantly improve deception memory. I^2 was estimated at 48% (95% CI: 0%–77%), which signals moderate heterogeneity.

This estimate, along with the visual convergence of effects depicted in [figure 6](#), is encouraging of the robustness and generalizability of our findings given between-study differences in the manipulations of the treatment effect, the target of the lie, and the behavioral paradigm employed. However, the width of the uncertainty interval for the heterogeneity estimate indicates imprecision, which is not uncommon with so few studies ([Ioannidis, Patsopoulos, and Evangelou 2007](#)).

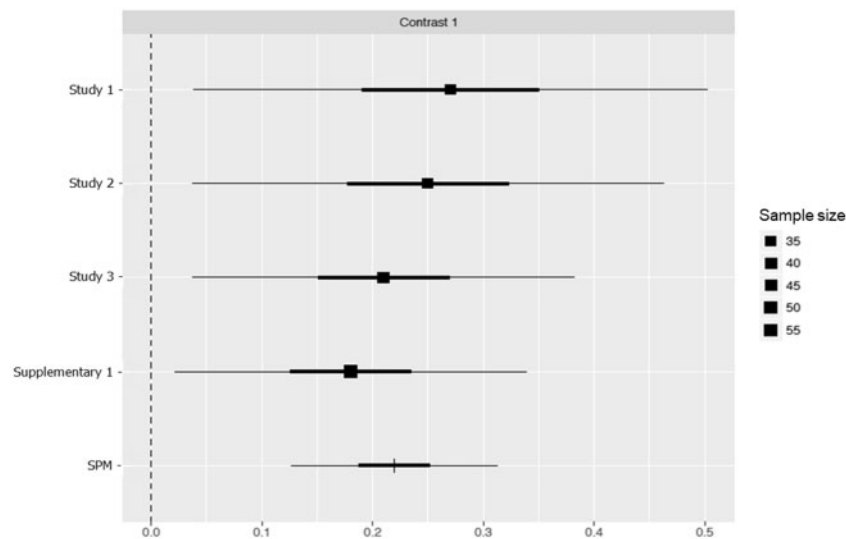
STUDY 4

Study 4 was designed with five objectives in mind. First, although we have shown support for our hypotheses in a series of behavioral laboratory experiments, one might question whether the relationships between the constructs hold in natural consumption settings. To increase the external validity of the research we used a critical incident methodology ([Dahl, Honea, and Manchanda 2003](#)) where participants reflect on a situation when they provided incorrect information with the intent to mislead. We also use a more generalized measure of consequentiality to broaden the results beyond the moral and performance examples. Second, we introduced a proxy for attention narrowing that is independent of deception memory. This allows us to provide a more complete test of our theoretical account via a serial mediation of LIA and attention narrowing as proximal and distal mediators of the relationship between lie consequentiality and deception memory. Third, we included a measured moderator of the relationship between lie consequentiality and LIA to provide stronger evidence that it is LIA and not an alternative antecedent of attention narrowing such as task involvement that explains the effect.³ We selected *experience* with the deception situation as the moderator because research suggests that initial smaller breaches of dishonesty can snowball into bigger lies, because arousal decreases as the liar's experience with the deception situation increases ([Garrett et al. 2016](#)). Specifically, people become desensitized to the negative emotions associated with dishonesty through repetition. Thus, experienced liars may become less aroused by smaller, inconsequential lies through a process of adaptation, and as a result only lies associated with more harmful consequences will trigger an arousing response over time. Conversely, when liars are inexperienced with the deception situation, lies associated with benign consequences may be equally arousing as lies associated with more harmful consequences because adaptation has not taken place. Fourth, we included a measure of *retrieval arousal* to test whether the arousal felt at the time of recalling a previous lie might play a role in the relationship between the consequentiality of the lie and deception memory. We include this variable because some research has shown that arousal attributed to anxiety at retrieval can decrease memory for a previous experience ([Eysenck and Calvo 1992](#)). Finally, both positive and negative LIA may play a role in deception memory accuracy. For instance, instead of the anxiety and/or nervousness one typically feels when lying, it is

³ A preliminary study conducted to test for simple serial mediation through the proposed pathways of LIA (M1) and attention narrowing (M2) was significant (refer to [supplementary study 2](#) in the [web appendix](#)). In addition, when the experience moderator was removed from the model in this study, the significant pattern of serial mediation through the indirect pathways of LIA and attention narrowing was replicated.

FIGURE 6

PLOT OF THE SPM RESULTS



possible that lying may activate a high-arousal positive emotion, such as excitement (see Ekman 1985 for his “duping delight” hypothesis). We used scales to parse out positive versus negative arousal, as the SAM arousal measure used previously in study 3 is not designed to provide that kind of emotional specificity.

Method

Participants. Two hundred fifty-two MTurk panelists were asked to reflect on a time when they had provided inaccurate information to a fellow consumer, service provider, or organization with the intention to mislead.

Procedure. Before asking participants to reflect on their own past situation, we offered some examples of when consumers provide misleading information (see appendix D for details). Participants reported to whom (a fellow consumer, service provider, or organization), and when, they provided the inaccurate information. Participants used 100-point continuous rating scales to report how nervous and anxious they felt when providing the information (“not at all” = 0 to “very much” = 100); how much they were sweating when providing the information (“I was sweating less than normal” = 0 to “I was sweating more than normal” = 100); how much attention they were paying to what they were saying at the moment of providing inaccurate information (“very little attention” = 0 to “a lot of attention” = 100); how well they could remember

what inaccurate information they had provided (“not at all” = 0 to “very well” = 100); and how consequential they believed it was—at the time—to provide the inaccurate information (“not a big deal at all” = 0 to “a very big deal” = 100).

We then measured the moderator of experience with the deception situation by asking participants to report whether they had found themselves in a similar deception situation before the event they were reporting on in the study with a binary yes/no choice. Finally, we measured retrieval arousal with three 100-point continuous rating scales; how nervous and anxious they felt *today* when remembering the time they provided inaccurate information (“not at all” = 0 to “very much” = 100) and how much they were sweating today when remembering the time they provided the inaccurate information (“less than normal” = 0 to “more than normal” = 100).

Results

Moderated Serial Mediation. To test the proposed pathways, we conducted a moderated serial mediation analysis following the procedures outlined in Hayes (2018). In the model estimated by this analysis, the perceived consequentiality of the lie was the independent variable ($X: M = 53.73, SD = 26.10$), LIA was the proximal mediator ($M1$: anxiety, nervousness, sweating $a = .74; M = 37.24, SD = 23.08$), attention narrowing was the distal

mediator (M2; $M = 77.55$, $SD = 22.78$), deception memory was the dependent variable (Y : $M = 60.79$, $SD = 26.62$), and participants' level of experience with the deception situation (W : 0 = inexperienced; 58.7% of the sample, 1 = experienced; 41.3% of the sample) was the measured moderating variable. We performed mean-centering to construct the product term.

The analysis revealed a significant lie consequentiality \times experience interaction on LIA ($\beta = .27$, 95% CI = .0504 to .4835). Specifically, spotlight analyses revealed that the perceived consequentiality of the lie had a significant positive influence on LIA when consumers had previous experience with this type of deception situation ($\beta = .27$, 95% CI = .1322 to .4023). In this instance, more consequential lies (1 SD above the mean) were associated with an increase in LIA ($M = 40.86$), while less consequential lies (1 SD below the mean) were associated with a decrease in LIA ($M = 26.91$). However, when consumers did not have previous experience with this type of deception situation, there was no significant relationship between the consequentiality of the lie on LIA ($\beta = .00$, 95% CI = $-.1690$ to $.1696$), as more consequential lies ($M = 42.42$) were equally arousing as less consequential lies ($M = 42.41$).

The analysis also revealed that an increase in LIA had a significant positive influence on attention narrowing during the communication of the lie ($\beta = .20$, 95% CI = .0724 to .3179), and this greater attention narrowing in turn had a significant positive influence on consumers' reported deception memory ($\beta = .32$, 95% CI = .1783 to .4662). Importantly, the index of moderated mediation for the serial indirect effect through both an increase in LIA and attention narrowing was significant (95% CI = .0014 to .0410), providing evidence for the moderating role of experience on the serial mediation pathway. Conditional probing of the serial indirect effect at each value of the experience moderator revealed that the perceived consequentiality of the lie \rightarrow increase in LIA \rightarrow attention narrowing \rightarrow deception memory pathway was positive and significant when consumers had previous experience with the type of deception situation (95% CI for the indirect effect = .0042 to .0353), but the serial pathway was not significant when consumers did not have experience with this type of deception situation (95% CI for the indirect effect = $-.0130$ to $.0115$).

Alternate Models. A serial mediation model with retrieval arousal ($a = .66$; $M = 23.30$, $SD = 19.98$) as the distal mediator (M2) and attention narrowing as the proximal mediator (M1) revealed no significant relationship between retrieval arousal and attention narrowing ($p = .819$), and the confidence intervals for all causal chains contained zero. In addition, excitement ($M = 17.92$, $SD = 23.38$) was not a significant mediator in the serial chain (95% CI = $-.0029$ to $.0034$). Additionally, the reverse path model with attention narrowing as the proximal mediator (M1) and

arousal as the distal mediator (M2) did not reveal a significant relationship between attention narrowing and arousal ($p = .781$), and the confidence intervals for all causal chains contained zero. Finally, the pattern of results remained significant even though there was wide diversity in who the target of the lie was (25% fellow consumer; 46% service provider; 29% organization) and when the lie was told (in the last week 12%; 1–4 weeks ago 27%; 1–4 months ago 26%, 5–12 months ago 13%; 1–2 years ago, 11%, 2 years + 11%).

Discussion

The results of study 4 support the conceptual model with deception memory for everyday consumer lies. The results show a serial mediation from consequentiality of the lie via an increase in LIA and attention narrowing to deception memory. Importantly, we introduced a moderator to show that it is LIA, and not some other alternative mediator, that causes the narrowing of attention and improved deception memory. Furthermore, we did not find evidence that retrieval arousal plays a role in the relationship of lie consequentiality and deception memory. This, of course, does not preclude arousal having an effect if the retrieval setting was particularly consequential, such as during a discussion with the police or a lawyer if the lying consumer had to retrieve what he had said as part of an investigation, but it does show that measuring retrieval arousal did not eliminate the effects we found here. We do not find that excitement is a significant mediator in the serial chain. It is also noteworthy that although the distribution of when the lies were told is relatively uniform even after two years, the serial mediation results still hold, which is consistent with work showing attentional influence on memory to be time-invariant (LaBar and Cabeza 2006). Finally, it is important to acknowledge that the accuracy of deception memory in study 4 is not objectively measured, but instead was reported by our participants. This was a tradeoff that allowed us to explore deception memory for lies told in natural consumption settings.

GENERAL DISCUSSION

Consumers tell lies to marketers and fellow consumers. There can be unpleasant consequences for the liar if deception memory is inaccurate. Therefore, the memorability of the lie is an important consideration. We found that higher LIA predicted more accurate deception memory. We show convergence of this effect by varying the moral consequences of the lie (studies 1 and 2) and manipulating performance consequences (study 3). We also tested LIA's mediating effect on deception memory (study 4). The mediation of LIA was demonstrated in a consumer-to-marketer lie (studies 1 and 4) and a consumer-to-consumer lie (studies 2–4). We found that LIA narrows the liar's

attention to the content of the lie, which enhances deception memory. The source of arousal was shown to matter, as LIA, but not NLIA, affected deception memory (study 3). Importantly, participants in each study did tell a lie instead of imagining a situation where they communicated a lie. We replicated the effects found in the laboratory experiments with a critical incident methodology (study 4). We also provided more systematic process evidence with a serial mediation including LIA as the proximal mediator and attention narrowing as the distal mediator, which is consistent with our conceptual model and a moderated serial mediation model (study 4).

The results presented here contribute to a growing body of research investigating consumers lying. We explore when and how consumers will remember (or forget) the lies they tell. Forgetting a lie is a critical antecedent to revealing the deception (Ekman 1997b), which may have important consequences for future consumption behavior. Now that we have established the process by which lies are memorable or forgettable, many new avenues of consumer research have opened for examining the variety of consequences of forgotten lies. One of the intriguing questions to be investigated is whether having told a lie in the past may affect the consumer's mindset during purchase decisions. For instance, remembering that transmitted information has been deceptive may lead consumers to make consumption decisions that allow for moral cleansing (Zhong and Liljenquist 2006) or that bolster their self-view (Gao, Wheeler, and Shiv 2009). Recalling a deceptive act may also alter the salience of consumption information (Reed 2004). Forgetting the lie told earlier may also impact brand evaluations and future purchase decisions, but for different reasons. Previous studies of forgetting (Mehta, Rajiv, and Srinivasan 2004) have generally been based on a weakening of the brand evaluation information (Beattie and Mitchell 1985; Hastie and Park 1986). In a lying setting there are two sets of details, the original experience or evaluation and the misleading information, while in previous forgetting research there was just one fading set of details. There may be competition between the two sets of details in memory (Barnier, Hung, and Conway 2004). This potential competition between the truth and the forgotten falsehood may present interesting implications for the consumer in terms of a pattern of biases in future decision-making. Another avenue for future research is to consider how fallible deception memory will impact the relationship with the target if forgetting leads to revealing the lie. How will the emotional and relational consequences of discovered lies affect consumer-to-consumer relationships, and will consumers avoid the target or company/brand involved in the deception following a discovered transgression to alleviate their shame? Furthermore, a potentially fruitful area for research on consumer deception stems from the current practice of communicating via social media, where many social exchanges are recorded

(i.e., Facebook) and therefore traceable. This relieves the burden of ensuring accurate deception memory because the liar can check her message threads and chat logs for what she said earlier, but the onus may now be on her to behave in a manner consistent with the deceptive statements into the future. How might these hyper-memorable lies affect the information used in purchase decisions and the willingness to pass on word-of-mouth material?

We provide evidence supporting an attention-narrowing explanation for accurate deception memory, but this support should be interpreted through the lens of Arousal-based Competition Theory (Mather and Sutherland 2011), where the focus of attention is determined by the task and stimuli at encoding. In the situations studied here, the lie was the focus of attention to ensure it was told successfully. Previous research considering how priority binding or attention narrowing during encoding might explain emotional arousal's effect on memory has employed visual stimuli in the form of negatively valenced photos (Burke et al. 1992; Heuer and Reisberg 1990), words (Guillet and Arndt 2009; Kensinger and Schacter 2006), remembered previous out-of-lab experiences (Berntsen 2002), imagined scenarios (Laney et al. 2004), or viewing of sports matches (Pavelchak et al. 1988). Here we create a situation where the participant does something while communicating (lie during a recording), which has been considered an active process for commission lies (Spranca, Minsk, and Baron 1991). It is possible that binding is critical when one is passively absorbing information, but narrowing explains improved memory when one is actively engaging in an action. Additionally, although a priority-binding explanation cannot explain the results presented in this context of a single interpersonal exchange, there could certainly be situations where binding is essential to deception memory. Binding may be critical if a number of versions of an event are recounted to different people—in other words, when destination memory (Gopie and MacLeod 2009) plays a role in deception memory. The task, in that case, becomes not only what did I say, but to whom did I say it. This remains an intriguing avenue for future research.

We did not find evidence that retrieval arousal influenced deception memory accuracy in study 4. This might be unsurprising given the participants were assured of their anonymity and were remembering a lie of their own choice. There might be consumption settings where retrieval arousal does have an effect on deception memory. Research has shown that highly stressful retrieval situations can result in source-monitoring errors (Johnson et al. 1993) where “what was told to whom” mistakes are made. We also know that when under threat, people pay attention to the interviewer's actions, which divides attention and disrupts memory retrieval (Vredevelde, Hitch, and Baddeley 2011). Consumers who are attempting to mislead and are asked to provide the misinformation to more than one person might find that retrieval arousal impairs their

deception memory. For instance, when trying to return an item that was worn (i.e., wardrobing) or when reporting misleading information about an accident to an insurer, the consumer may be passed from a frontline service provider to a manager. The consumer may also face service providers who appear suspicious and may react to the threat by spending precious cognitive resources on attending to the demeanor or behaviors of the service provider. In both cases, increases in retrieval arousal may inhibit deception memory.

In the studies presented here, we did not introduce feelings of regret for telling the lie. It is possible that when consumers experience these feelings after they have lied, they will be motivated to forget the deceptive act. This might be even more likely when the lie is perceived by the liar as consequential. In this case, instead of highly arousing lies being more memorable, they might be the very lies that are forgotten. This situation could result in memory outcomes more in line with the unethical amnesia findings reported by Kouchaki and Gino (2015, 2016). It would be interesting to consider when consequential lies become forgettable.

In conclusion, forgetting a lie can be dangerous—so perilous that most counsel against lying at all. Abraham Lincoln warned that “no man has a good enough memory to be a successful liar”; Mark Twain stated “if you tell the truth you don’t have to remember anything”; and even Bruce Lee offers the guidance that “if you don’t want to slip up tomorrow, tell the truth today.” We show that highly arousing lies are better remembered. This result presents an interesting paradox for the liar. While telling a more consequential lie may be safer from a deception memory perspective because the liar will be *less* likely to subsequently forget what he said, if the lie is detected he will likely suffer harsher damage.

DATA COLLECTION INFORMATION

Both authors contributed to the study designs. Both authors supervised the collection of data by research assistants at the University of Sydney. Data was collected between 2013 and 2018. Both authors contributed to the analysis of the data.

APPENDIX A

Questions Participants Answer During Their Recordings Study 1

The questions for the recording were:

- Q1. How do you select beverages in general?
- Q2. How do you select canned beverages specifically?
- Q3. What was your ranking of the sponsor’s brand?
- Q4. What is your opinion of the sponsor’s branding?

Study 2 and 3

The questions for the recording were:

- Q1. Did Joy email you?
- Q2. Did Joy talk about internet dating?
- Q3. Did Joy say she had been to Paris?
- Q4. Did you reply to Joy’s email?
- Q5. Did Joy mention watching films?

APPENDIX B

Scenario for the Pretest for Study 2

Scenario

Imagine a good friend of yours is looking for a female dating partner on the internet. It is really important to your friend that his dating partner is well traveled. Your friend has found a potential date (her name is Joy) and your friend is asking for your opinion.

Your friend arranges for Joy to email you. In your email exchange, you find out that your friend believes Joy has been to Paris, when in fact Joy has not traveled overseas at all. In the email exchange Joy asks you to lie about her traveling to Paris.

Which type of lie would make you feel more conflicted (i.e., uneasy and uncomfortable)?

Your friend calls and you lie by *explicitly stating* that Joy HAD been to Paris.

Your friend calls and you lie by *failing to mention* the fact that Joy had NOT been to Paris.

APPENDIX C

Recognition Questions—Studies 2 and 3

The recognition questions for memory for non-lie material⁴ were:

Did you tell [friend’s name inserted] that Joy talked about internet dating?

Yes, I told [friend’s name inserted] that Joy talked about internet dating.*

No, I did not tell [friend’s name inserted] that Joy talked about internet dating.

Did you tell [friend’s name inserted] that Joy emailed you?

Yes, I told [friend’s name inserted] that Joy emailed me.*

No, I did not tell [friend’s name inserted] that Joy emailed me.

Did you tell [friend’s name inserted] that Joy sent you a text message?

Yes, I told [friend’s name inserted] that Joy sent me a text message.

No, I did not tell [friend’s name inserted] that Joy sent me a text message.*

Did you tell [friend’s name inserted] that you had returned Joy’s email?

Yes, I told [friend’s name inserted] that I returned Joy’s email.

4 Correct responses are marked with an asterisk.

No, I did not tell [friend's name inserted] that I returned Joy's email.*

APPENDIX D

Examples of Consumers Lying Used in Study 4

"Consumers might leave someone with the impression that they paid more (or less) for a product or service than they really did; or that the product or service is of better quality than it actually is; or that they enjoyed an experience like a movie, concert, or vacation more (or less) than they actually did.

There are also situations where consumers might find themselves wanting to withhold information or not wanting to provide accurate information to a service provider or company. For example, a consumer might provide false details or leave out details when returning a product to a store clerk; or might exaggerate how good (or bad) a meal was when asked by a waiter or waitress about their dining experience; or might try to hide their true age when asked by a doorman at a night club giving an impression s/he is older; or might provide inaccurate information (or try to hide information) when a banking or insurance person asks for personal information or event details."

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