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# Social contagion of memory and the role of self-initiated relative judgments☆

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ABSTRACT

Two experiments examined the role of spontaneous relative judgments within the social contagion of memory paradigm (Roediger, Meade, & Bergman, 2001). Participants viewed household scenes (for short or long durations) in collaboration with a confederate (with low, average, or superior memory ability) who falsely recalled incorrect items as having occurred in the scenes. Of interest was whether or not participants would spontaneously evaluate the state of their own memory relative to the state of the confederate's memory when remembering suggested information. Participant responses on a metacognitive questionnaire demonstrated that participants were aware of their own memory ability relative to the memory ability of their partner. Interestingly, this information influenced participants' remember responses on the recall test only when they felt their own memory was relatively poor. Participants make self-initiated, relative judgments of memory when working with others on a memory test, and these judgments are driven by metacognitive differences in remember responses. The results highlight the importance of metacognition in understanding relative judgments in social memory.

Despite the importance of accuracy, communication can result in the sharing of erroneous statements. Research in *social contagion*, or *memory conformity*, has established that individuals often incorporate others' erroneous suggestions into their own individual memories (e.g., Roediger III et al., 2001; Wright et al., 2000; see Gabbert & Wheeler, 2018; Paterson & Monds, 2018, for reviews). Of interest in the current experiment is the influence of self-initiated relative judgments on the magnitude of social contagion effects. Relative judgments refer to the idea that when incorporating information from others, participants dynamically and strategically evaluate their own memory ability relative to the memory ability of their partner. That is, rather than relying solely on beliefs about one's own memory or solely on beliefs about their partners' memory, participants consider the interaction of self and partner memory to flexibly determine if, and when, to incorporate their partner's suggestions. Most important to the current study is whether or not participants engage in relative judgments spontaneously. When participants are not explicitly instructed to consider their partner's memory ability relative to their own, do they rely on spontaneous, or self-initiated, relative judgments?

To explore these issues, the current experiments rely on the social contagion of memory paradigm. In the typical social contagion paradigm, a confederate and a participant view identical scenes in preparation for a memory test. They then collaborate to recall as many items from the scenes as possible. During this time, the confederate inserts misinformation into half of these scenes. The confederate and participant then split apart and complete individual recall and recognition tests where they are instructed to remember as many items from the scenes as possible. The general finding is the social contagion of memory; participants incorporate errant confederate suggestions into their subsequent individual memory reports (Meade & Roediger III, 2002; Roediger III et al., 2001). The related memory conformity paradigm is similar with the primary exception that rather than a confederate, two naive participants study slightly different versions of the event and so more naturally introduce incorrect information (cf. Gabbert & Wheeler, 2018). The two terms are used interchangeably in the current paper.

Much research has established that, with explicit instructions, both partner characteristics and personal characteristics separately influence the magnitude of the social contagion effect. For example, the social contagion effect is consistently reduced when individuals are explicitly instructed that their partners are not credible (Andrews & Rapp, 2014; Echterhoff et al., 2005; Meade & Roediger III, 2002; Skagerberg &

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Wright, 2009; although see Monds et al., 2013; Paterson & Monds, 2018). Likewise, the social contagion effect is consistently increased when participants' own memory is relatively poor (e.g., Gabbert et al., 2007). However, as Allan et al. (2012) point out, separate lines of research on partner and personal characteristics tell only part of the story and it is important to also consider how partner and personal characteristics interact with each other to influence the magnitude of the social contagion effect (see also Wright et al., 2010; Thorley & Kumar, 2017; and Horry, Palmer, Sexton, & Brewer, 2012 for further discussion of how beliefs in self and other influence memory). In other words, social contagion effects may be driven by a dynamic and strategic process that includes judgments about the participants' own memory ability *relative* to the judgments they make about their partner's memory ability.

Relative judgments have been shown to influence social contagion in experiments that manipulate both participant and partner memory ability with explicit instructions. Specifically, French et al. (2011) manipulated participants' visual acuity (normal or degraded) and whether they believed their visual acuity was the same, higher, or lower than their partner's. On a subsequent recognition test, participants who believed they had higher visual acuity relative to their partner were less susceptible to misinformation, and participants who believed they had worse memory relative to their partner were marginally more susceptible to misinformation. Likewise, Allan et al. (2012) manipulated participants' memory ability via presentation rate and whether they were told their partner had encoded the scenes for half as long or twice as long as they did. Allan et al. (2012) found effects of the participant memory manipulation (presentation rate) only when participants believed their own memory was relatively worse than their partner's memory (but not when they believed their own memory was relatively better). Finally, Monds et al. (2019) manipulated relative ability by giving participants false feedback that one had performed better than the other on an initial memory test. Monds et al. (2019) found that those participants who were told they scored more poorly were more susceptible to memory conformity. Together, these studies suggest that the magnitude of social contagion effects are influenced by strategic, dynamic, relative judgments such that participants flexibly consider both their own memory and the memory of their partner on social memory tasks. It is important to note, however, that previous studies used explicit instructions to inform participants of their partner's relative ability.

The current research extends these findings to examine whether or not relative judgments might occur spontaneously to influence the magnitude of social contagion effects. Spontaneous, self-initiated judgments are important because growing evidence suggests that without experimenter directives, participants do not always spontaneously consider partner characteristics. For example, when participants are explicitly instructed that their partners are not credible, social contagion effects are typically reduced (Andrews & Rapp, 2014; Echterhoff et al., 2005; Meade & Roediger III, 2002; Skagerberg & Wright, 2009). However, without explicit instructions about uncredible partners, social contagion effects are only sometimes reduced (e.g., Allan & Gabbert, 2007; Davis & Meade, 2013; Thorley, 2015) and sometimes they are unaffected (e.g., Meade et al., 2017; Numbers et al., 2014; Numbers et al., 2019). Given the different patterns of findings regarding partner characteristics across experimenter directed and self-initiated judgments, it is important to determine whether or not the relative judgment effects obtained with explicit instructions can also be obtained spontaneously.

Theoretically, we predict that spontaneous relative judgments will influence the magnitude of the social contagion effect via the mechanisms outlined in source monitoring theory (Johnson et al., 1993). Source monitoring theory proposes that participants encode information along with memory characteristics associated with the information (e.g., perceptual characteristics including physical appearance and location of the information, cognitive characteristics including thoughts about the information, etc.). At retrieval, participants can rely on these memory characteristics to help distinguish the source of the information. Relative judgments may lead participants to either relax or narrow their focus on confederate responses and thus influence the memory characteristics associated with that item. The increased attention to memory characteristics may then lead to the accumulation of sufficient detail for the participant to attribute this as evidence of the presence of an item. Furthermore, it is possible that relative judgments may also lead to differential shifts in response criteria such that a participant may become more or less strict with what they are willing to attribute to memory. Both of the proposed mechanisms of source monitoring theory (attribution of memory characteristics and response criterion) could be influenced by the evaluations participants make regarding their own memory relative to the memory of their partner.

The current research examines the role that spontaneous relative memory judgments play in the social contagion of memory. That is, when participants are not explicitly informed about the memory ability of their partner, do they spontaneously consider their partner's relative memory ability when making memory decisions? Using the social contagion of memory paradigm, participant memory was manipulated by varying presentation rate and partner memory was manipulated using a practice task where confederates demonstrated poor, average, or exceptional memory. Importantly, participants were not explicitly informed about the presentation rate manipulation nor were they told anything about their partner's memory ability. Given that participants demonstrate better memory with longer presentation rates (Allan et al., 2012; Gabbert et al., 2006) and that confederate performance on a practice version of the experimental task influences spontaneous credibility judgments (Numbers et al., 2014), we predicted that participants would spontaneously engage in relative judgments when making their memory decisions.

In addition, the current experiments are the first, to our knowledge, to examine remember/know responses in relation to relative judgments. Remember judgments indicate specific recollective details while know responses indicate familiarity in the absence of recollective detail (cf. Gardiner, 1988; Rajaram, 1993; Tulving, 1985). Metamemory judgments are important because even if recall does not vary across conditions (a real possibility given the equivocal effects of spontaneous judgments), participants may still feel differently about the quality of their memory judgments. Indeed, French et al. (2011) demonstrated that, with explicitly directed relative judgments, participants were less confident in their responses after recalling with a partner who was relatively more or less credible than themselves. Relatedly, Rechdan et al. (2018) demonstrated that when participants received disconfirming feedback from a confederate, participants altered their metacognitive judgments and produced less detailed responses. In the current study, we predicted that relative judgments would influence remember responses such that participants would be more likely to indicate remember responses for suggested items when their own memory for the scene is poor relative to the confederate's memory. More specifically, source monitoring theory predicts that if participants are more willing to consider suggestions from confederates with relatively better memory, the memory characteristics involved in such extra consideration might be confused with evidence of remembering on a later test (cf. Johnson et al., 1993).

Further, the current experiments also include both recall and source monitoring recognition tests in order to examine the role of retrieval on self-initiated relative judgments. Given that task demands of the source monitoring recognition test direct participants to more closely scrutinize the source of the items and often reduce false memory overall (cf. Huff et al., 2013; Multhaup, 1995), we predicted that any effects of relative judgments would be selective to recall; they would disappear on the recognition test.

# 1. Experiment 1

## 1.1. Method

### 1.1.1. Participants

Ninety Montana State University undergraduates participated for course credit. Eighteen were excluded because of suspicion (6 participants), failure to follow instructions (3 participants), or experimenter error (9 participants), leaving 72 participants (24 participants per condition). Exclusions occurred across all condition, exclusions were determined during data collection (prior to data entry or analysis), and we replaced excluded participants in order to achieve equal group sizes. G*Power does not readily compute power for 3-factor designs, and so sample size was based on previous social contagion research. Specifically, existing social contagion studies with similar designs typically include 12–18 participants per condition (e.g., Roediger III et al., 2001; Meade & Roediger III, 2002; Davis & Meade, 2013; Numbers et al., 2014; McNabb & Meade, 2014; Meade et al., 2017). Including 24 participants per condition in the current study exceeds the upper range of sample sizes reported in previous research, and is further consistent with the recommendations of Simmons et al. (2011) to include at least 20 observations per condition.

### 1.1.2. Design

The experiment used a 2 × 2 × 3 mixed factorial design. Presentation rate of each scene (15 or 60 s) and exposure to contagion items (contagion or control) were within-subjects variables, and confederate recall for the practice scene (2, 10, or 30 items) was manipulated between-subjects. The primary dependent variables were false recall and false recognition.

### 1.1.3. Materials

Materials included four household scenes from Huff et al. (2015) containing an average of 22.75 schematically related items and a locally developed "practice slide" containing 30 items. Importantly, four critical items per scene served as contagion/control items. *Contagion items* refer to items suggested by the confederate that do not appear in the scenes. *Control items* refer to the same items when they were not suggested by the confederate. Other materials included filler tasks, individual recall sheets, a recognition task consisting of 40 items (4 contagion/control per scene, 4 filler, 20 correct), and a locally developed post-experiment questionnaire asking participants to assess their partner's memory (on a scale of 1 to 5) relative to their own memory (on a scale of 1 to 5; higher numbers correspond to better memory).

### 1.1.4. Procedure

Participants were tested along with a confederate. Four undergraduate students served as confederates in the study (3 female, 1 male) counterbalanced across conditions. Participants were informed they would be completing a memory test, and that they would complete a practice task prior to the experimental task.

Practice Task. Participants studied the practice slide for 15 s and then recalled 6 items from the scene with the confederate, who also recalled 6 items, including one contagion item. Participants and the confederate took turns recalling items. After a 2 minute filler task, the participant and confederate had 4 min to individually recall items from the scene and provide remember/know judgments. The individual recall task served as our confederate memory ability manipulation, as the confederate either recalled 2, 10, or 30-items including one contagion item so that participants were aware the confederate's responses might be incorrect. The 10-item condition was the baseline condition, as it was based on the average number of items participants recalled across several previous experiments with similar materials (McNabb & Meade, 2014; Huff et al., 2013), the 2-item condition was relatively worse than baseline and the 30-item condition was relatively better than baseline. The somewhat extreme 2-item and 30-item conditions were chosen because without explicit instruction to attend to partner memory performance, we wanted to maximize the chance that participants would notice the confederate's performance. The confederate and the participant exchanged papers for "grading" so participants could infer the relative memory ability of their partner without ever being explicitly informed (cf. Numbers et al., 2014).

Primary Task. Immediately following the practice phase, participants viewed two scenes for 15 s each, and two scenes for 60 s each (counterbalanced across scenes and conditions). Presentation rate served as our manipulation of participant memory ability (cf. Gabbert et al., 2006) and participants were not explicitly told anything about the varying presentation rates. Participants then completed a two-minute filler task, followed by the collaborative recall task.

During collaborative recall, the participant and the confederate took turns recalling items from each scene until they had named a total of 12 items, 6 items each. The confederate recalled four critical contagion items for two of the scenes (counterbalanced across scenes and conditions). The confederate and the participant alternated who recalled first for each scene (counterbalanced across scenes and conditions).

Next, the participant and the confederate were moved to separate rooms to complete the individual recall task. Participants were given 2 min to recall as many items as possible from each scene and provide remember/know judgments.

Finally, participants were given an individual recognition task (with no time limit). They were asked to indicate the source of each item: the scene, their partner, both, or neither. They then completed the locally developed questionnaire and were debriefed.

## 1.2. Results[1]

### 1.2.1. Recall

*1.2.1.1. False recall.* The false recall data are shown in Table 1. A 2 (Presentation Rate: 15 s or 60 s) × 2 (Contagion: contagion or control) × 3 (Confederate Recall: 2-items, 10-items, or 30-items) mixed factorial ANOVA was conducted on the mean proportion of contagion items recalled. Replicating past research, we found a significant social contagion effect, $F$ (1, 69) = 30.40, $MSE$ = 0.04, $p < .001$, $\eta_p^2 = 0.31$, as well as a main effect of Presentation Rate, $F$ (1,69) = 14.17, $MSE$ = 0.03, $p < .001$, $\eta_p^2 = 0.17$, both qualified by a significant Contagion and Presentation Rate interaction, $F$ (1, 69) = 7.16, $MSE$ = 0.04, $p$ = .009, $\eta_p^2 = 0.09$. Follow up $t$-tests revealed that presentation rate had no effect on the baseline guessing rate of control items, $t < 1.0$, $p > .05$, but that participants selectively recalled more contagion items when their memory was relatively poor (in the 15-second presentation rate condition relative to the 60-second condition, $t$ (71) = 4.00, $SEM$ = 0.03, $p < .01$, $d$ = 0.62). No other main effects or two-way interactions were significant, $F$'s $< 1.99$, $p$'s $> 0.05$.

Critically, the three way interaction between contagion, presentation rate, and confederate recall was not significant $F$ (2, 69) = 2.11, $MSE$ = 0.40, $p$ = .13, $\eta_p^2 = 0.06$. Note the data in Table 1 suggests a pattern consistent with relative judgments, however, the interaction failed to reach significance.

*1.2.1.2. Remember/know responses.* Table 2 presents remember and know data. A 2 × 2 × 3 mixed factorial ANOVA computed on remember judgments revealed a main effect of Contagion, $F$ (1, 69) = 18.47, $MSE$ = 0.02, $p < .001$, $\eta_p^2 = 0.21$, and an interaction between Contagion and Confederate Recall, $F$ (2, 69) = 3.50, $MSE$ = 0.02, $p$ = .037, $\eta_p^2 = 0.09$. The interaction between Confederate Recall and Presentation Rate was not significant, $F$ (2,69) = 2.71, $MSE$ = 0.01, $p$ = .07, $\eta_p^2 = 0.07$.

Most importantly, the three-way interaction between Contagion,

[1] Statistical significance is set at $p \leq .05$ unless otherwise noted.

**Table 1**
Mean proportion of false recall as a function of presentation rate and confederate recall condition in Experiment 1 ($N = 72$). Standard deviations are in parentheses.

| | Confederate recall condition | | |
|---|---|---|---|
| | 2 | 10 | 30 |
| 15 s | | | |
| Contagion | 0.23 (0.21) | 0.29 (0.19) | 0.41 (0.24) |
| Control | 0.14 (0.18) | 0.13 (0.15) | 0.11 (0.16) |
| 60 s | | | |
| Contagion | 0.13 (0.21) | 0.23 (0.27) | 0.17 (0.18) |
| Control | 0.08 (0.14) | 0.11 (0.16) | 0.14 (0.19) |

**Table 2**
Mean proportion of remember and know responses as a function of presentation rate and confederate recall condition in Experiment 1 (N = 72). Standard deviations are in parentheses.

| | Confederate recall condition | | |
|---|---|---|---|
| | 2 | 10 | 30 |
| 15 s | | | |
| Contagion | | | |
| Remember | 0.06 (0.11) | 0.06 (0.11) | 0.18 (0.21) |
| Know | 0.17 (0.20) | 0.23 (0.22) | 0.23 (0.21) |
| Control | | | |
| Remember | 0.04 (0.09) | 0.02 (0.07) | 0.01 (0.05) |
| Know | 0.09 (0.16) | 0.10 (0.13) | 0.09 (0.15) |
| 60 s | | | |
| Contagion | | | |
| Remember | 0.03 (0.08) | 0.13 (0.20) | 0.11 (0.16) |
| Know | 0.09 (0.16) | 0.09 (0.16) | 0.06 (0.11) |
| Control | | | |
| Remember | 0.02 (0.07) | 0.04 (0.10) | 0.05 (0.10) |
| Know | 0.06 (0.11) | 0.07 (0.14) | 0.08 (0.18) |

Presentation Rate, and Confederate Recall (previously discussed as important for recall), was significant for remember responses, $F$ (2, 69) = 3.34, $MSE$ = 0.01, $p$ = .041, $\eta_p^2$ = 0.09. Follow up tests revealed that when participant memory was relatively poor (15-second presentation rate), participants were more likely to indicate they remembered contagion items relative to the control items when the confederate's memory was the same as theirs (10-item condition, $t$ (23) = 2.15, $SEM$ = 0.02, $p$ = .043, $d$ = 0.45) and when the confederate's memory was better than theirs (30-item condition, $t$ (23) = 3.56, $SEM$ = 0.05, $p$ = .002, $d$ = 1.07). However, when the confederate's memory was also bad (2-item condition), participants were equally likely to report remembering contagion and control items, $t$ < 1.0, $p$ > .05. A different pattern emerged when scenes were encoded for 60 s: when participants' memory was relatively good, they were no more likely to indicate they remembered contagion items suggested by the confederate relative to control items, regardless of the confederate's memory, $t$'s < 1.7, $p$'s > 0.05. This pattern suggests that spontaneous relative judgments are driven by metacognitive differences in remember responses.

Know responses were analyzed separately and revealed significant main effects of Contagion, $F$ (1, 69) = 10.71, $MSE$ = 0.03, $p$ = .002, $\eta_p^2$ = 0.13, and Presentation Rate, $F$ (1, 69) = 25.00, $MSE$ = 0.02, $p$ < .001, $\eta_p^2$ = 0.27, and a significant interaction between Contagion and Presentation Rate, $F$ (1, 69) = 6.22, $MSE$ = 0.03, $p$ = .015, $\eta_p^2$ = 0.08. Participants were equally likely to give know responses for the baseline control items in the 15- and 60-second conditions, $t$ < 1.2, $p$ > .05. However, participants were more likely to give know responses to contagion items in the 15-second condition than in the 60-second condition, $t$ (71) = 4.67, $SEM$ = 0.03, $d$ = 0.72. No other main effects or interactions were significant, $F$'s < 1.0, $p$'s > 0.5.

**Table 3**
Mean proportion of falsely recognized items as a function of presentation rate and confederate recall condition in Experiment 1 (N = 72). Standard deviations are in parentheses.

| | Confederate recall condition | | |
|---|---|---|---|
| | 2 | 10 | 30 |
| 15 s | | | |
| Contagion | 0.48 (0.24) | 0.64 (0.28) | 0.69 (0.26) |
| Control | 0.46 (0.23) | 0.47 (0.28) | 0.52 (0.30) |
| 60 s | | | |
| Contagion | 0.52 (0.30) | 0.60 (0.33) | 0.66 (0.32) |
| Control | 0.36 (0.27) | 0.44 (0.26) | 0.47 (0.27) |

*1.2.1.3. Correct recall.* Participants recalled more correct items for scenes they viewed for 60 s ($M$ = 0.50) versus scenes they viewed for 15 s ($M$ = 0.40), $F$ (1, 69) = 43.17, $MSE$ = 0.01, $p$ < .001, $\eta_p^2$ = 0.39. No other main effects or interactions were significant, $F$'s < 1.0, $p$'s > 0.05.

#### *1.2.2. Recognition*

*1.2.2.1. False recognition.* False recognition data are presented in Table 3. False recognition was operationally defined as participants attributing contagion items to having occurred in the scene ("scene only" plus "scene and other" responses on the recognition test; see Meade & Roediger III, 2002, for an identical scoring procedure). A separate 2 × 2 × 3 mixed factorial ANOVA revealed a significant social contagion effect, $F$ (1, 69) = 20.07, $MSE$ = 0.08, $p$ < .001, $\eta_p^2$ = 0.23. The magnitude of the social contagion effect did not vary across Presentation Rate, $F$ (1, 69) = 2.80, $MSE$ = 0.03, $p$ = .10, nor was it influenced by Confederate Recall, $F$ (2, 69) = 2.52, $MSE$ = 16, $p$ = .09. No other main effects or interactions were significant ($F$'s < 1.0, $p$'s > 0.30).

*1.2.2.2. Correct recognition.* Participants correctly recognized a greater proportion of items when they had a longer time to study the items, ($M$ = 0.86 in the 60-second condition; $M$ = 0.74 in the 15-second condition, $F$ (1, 69) = 20.00, $MSE$ = 0.02, $p$ < .001, $\eta_p^2$ = 0.22. They also correctly recognized a greater proportion of items when recalling with a relatively better confederate, $F$ (2, 69) = 3.33, $MSE$ = 0.03, $p$ = .04, $\eta_p^2$ = 0.09. Correct recognition for participants in the 2-item and the 10-item did not differ significantly, $t$ < 1.0, $p$ > .5. However, correct recognition significantly increased from the 2-item ($M$ = 0.77) to the 30-item confederate recall condition ($M$ = 0.85), $t$ (46) = −2.50, $SEM$ = 0.03, $p$ = .02, $d$ = −0.72, as well as from the 10-item ($M$ = 0.78) to the 30-item confederate recall condition ($M$ = 0.85), $t$ (46) = −2.00, $SEM$ = 0.03, $p$ = .05. No other main effects or interactions were significant, ($F$'s < 0.5, $p$'s > 0.05).

#### *1.2.3. Final questionnaires*

*t*-Tests were run to examine differences between metacognitive ratings of self-memory vs. partner memory for each confederate recall condition (see Table 4). As expected, participants in the 2-item confederate recall condition ($M$ = 3.79) rated their own memories significantly better than their partner's memory ($M$ = 2.96, $t$ (23) = −4.70, $SEM$ = 0.18, $p$ < .001, $d$ = 1.05) and participants in the 30-item confederate recall condition (M = 2.50) rated their own memories significantly worse than their partners ($M$ = 4.75, $t$ (23) = 10.68, $SEM$ = 0.21, $p$ < .001, $d$ = 3.39). Interestingly, participants in the 10-item confederate recall condition ($M$ = 3.29) also rated their own memories as significantly worse than their partners ($M$ = 3.88, $t$ (23) = 4.37, $SEM$ = 0.13, $p$ < .001, $d$ = −0.86). Note

**Table 4**
Mean ratings of self and partner memory accuracy as a function of confederate recall condition on a scale of 1 to 5 (1 = poor memory; 5 = superior memory) in Experiment 1 (N = 72). Standard deviations are in parentheses.

| | Confederate recall condition | | |
|---|---|---|---|
| | 2 | 10 | 30 |
| Self | 3.79 (0.59) | 3.29 (0.62) | 2.50 (0.83) |
| Partner | 2.96 (0.95) | 3.88 (0.74) | 4.75 (0.44) |

that participants recalled an average of 9.7 items in the 10-item confederate recall condition. This suggests that participants were aware that their partner had a relatively better or worse memory, and interestingly, even when participants' memory was matched to the confederate, participants rated their partners as having relatively better memory.

## 2. Experiment 2

The results of Experiment 1 demonstrate that relative judgments influence remember judgments in the social contagion paradigm, but only when participants' own memory was relatively poor. Specifically, when participants' own memory was relatively poor, they were more likely to report remembering erroneous items suggested by confederates with relatively better memories than they were to report remembering responses suggested by confederates with relatively worse memories. In contrast, when participants' own memory was relatively good, they were equally likely to report remembering responses suggested by relatively better and relatively worse confederates. These results are consistent with the source monitoring theory; participants with relatively poor memories may have paid greater attention to the confederate's responses, thus influencing the memory characteristics associated with the confederate's responses and leading to the accumulation of sufficient detail for the participant to remember the items. Relative judgments did not influence overall recall or recognition in Experiment 1 suggesting that any influence of spontaneous relative judgments on social contagion are driven by metacognitive judgments.

Importantly, data on the post experimental questionnaire revealed that participants did not consider the baseline manipulation (10-item confederate condition) to be neutral, but instead rated confederates in the 10-item confederate condition as having relatively better memories than themselves. This is an interesting finding on its own, however, the biased baseline is potentially problematic when interpreting the role of relative judgments on social contagion. In Experiment 2, we remove this baseline condition to allow a cleaner test of participants' memory when they feel their own memory is relatively better than their partner (2-item confederate condition) compared to when they feel their own memory is relatively worse than their partner (30-item confederate condition). That is, removing the baseline condition allowed a replication of the key findings from Experiment 1 without any influence of a biased baseline condition. Previous research on explicitly directed relative judgments varies in whether they include a baseline condition (French et al., 2011), or not (Allan et al., 2012; Monds et al., 2019). Therefore, an additional benefit of removing the baseline condition in Experiment 2 is to replicate the impact of relative judgments in the same paradigm (albeit across experiments) with and without the baseline condition.

Given that previous research has demonstrated relative judgments with and without the baseline condition (Allan et al., 2012; French et al., 2011; Monds et al., 2019), it is predicted that Experiment 2 will replicate Experiment 1, such that even with the baseline condition removed, any influence of spontaneous relative judgments on social contagion will be most evident in remember responses.

### 2.1. Method

#### 2.1.1. Participants

56 Montana State University undergraduates participated for course credit. Eight were excluded because of suspicion (4 participants), failure to follow instructions (1 participant), or experimenter error (3 participants), leaving 48 participants (24 participants per condition). As in Experiment 1, exclusions occurred across all conditions, we determined exclusions during data collection (prior to data entry or analysis) and we replaced excluded participants in order to achieve equal group sizes. Again, the number of participants per condition is higher than used in previous social contagion research with similar designs (e.g., Roediger III et al., 2001; Meade & Roediger III, 2002; Davis & Meade, 2013; Numbers et al., 2014; McNabb & Meade, 2014; Meade et al., 2017), and consistent with best practice recommendations from Simmons et al. (2011).

#### 2.1.2. Design

The experiment used a 2 × 2 × 2 mixed factorial design. Presentation rate of each scene (15 or 60 s) and exposure to contagion items (contagion or control) were within-subjects variables, and confederate recall for the practice scene (2 or 30 items) was manipulated between-subjects. The primary dependent variables were false recall and false recognition.

#### 2.1.3. Materials

The same materials used in Experiment 1 were used in Experiment 2. As in Experiment 1, materials included a locally developed practice slide, and the household scenes from Huff et al. (2015) all designed to exclude contagion/control items. The same filler task, individual recall sheets, recognition test, and post experimental questionnaires from Experiment 1 were also used in Experiment 2.

#### 2.1.4. Procedure

The procedure of Experiment 2 was the same as the procedure of Experiment 1 with the exception that there was no 10-item confederate condition during the practice task. As in Experiment 1, participants completed a practice task with a confederate who recalled 2 or 30-items including one contagion item (again, the 10-item condition was not included). Participants then studied the same four scenes as in Experiment 1 for either 15 or 60 s (counterbalanced across scenes), completed a 2 minute filler task, and then recalled the scenes in collaboration with a confederate who introduced 4 contagion items for half of the scenes (counterbalanced across scenes). As in Experiment 1, participants then completed the individual recall test (with remember/know judgments), the individual recognition test, and the post experimental questionnaires.

### 2.2. Results[2]

#### 2.2.1. Recall

*2.2.1.1. False recall.* The false recall data are shown in Table 5. A 2 (Presentation Rate: 15 s or 60 s) × 2 (Contagion: contagion or control) × 2 (Confederate Recall: 2-items or 30-items) mixed factorial ANOVA was conducted on the mean proportion of contagion items recalled. Replicating Experiment 1 and much past research, we obtained a significant social contagion effect, $F$ (1, 46) = 23.13, $MSE$ = 0.04, $p$ < .001, $\eta_p^2$ = 0.34, a main effect of Presentation Rate, $F$ (1, 46) = 13.16, $MSE$ = 0.03, $p$ = .001, $\eta_p^2$ = 0.22, and an interaction between Contagion and Presentation Rate, $F$ (1, 46) = 5.79, $MSE$ = 0.05, $p$ = .020, $\eta_p^2$ = 0.11. Follow up $t$-tests revealed that presentation rate had no effect on the baseline guessing rate of control items, $t$ < 1.0, $p$ > .05. Rather, presentation rate selectively impacted

[2] Statistical significance is set at $p \leq .05$ unless otherwise noted.

**Table 5**
Mean proportion of false recall as a function of presentation rate and confederate recall condition in Experiment 2 ($N = 48$). Standard deviations are in parentheses.

| | Confederate recall condition | |
|---|---|---|
| | 2 | 30 |
| 15 s | | |
| Contagion | 0.24 (0.23) | 0.41 (0.26) |
| Control | 0.14 (0.19) | 0.09 (0.16) |
| 60 s | | |
| Contagion | 0.13 (0.15) | 0.20 (0.16) |
| Control | 0.07 (0.12) | 0.11 (0.18) |

contagion items such that participants recalled more contagion items when their memory was relatively poor (in the 15-second presentation rate condition relative to the 60-second condition, $t\ (47) = 3.93$, $SEM = 0.04$, $p < .001$, $d = 0.77$). There was also a main effect of Confederate Condition, $F\,(1, 46) = 5.97$, $MSE = 0.04$, $\eta_p^2 = 0.12$, such that participants were more likely to recall false items when they recalled with a relatively better confederate (30-item condition; M = 0.20) compared to the relatively worse confederate (2-item condition; M = 0.15). The interaction between Confederate Condition and Contagion was not significant, $F\ (1, 46) = 3.70$, $MSE = 0.04$, $p = .061$, $\eta_p^2 = 0.07$. Critically, the three way interaction between contagion, presentation rate, and confederate recall was not significant, $F\ (1, 46) = 2.57$, $MSE = 0.04$, $p = .12$, $\eta_p^2 = 0.05$. Replicating Experiment 1, relative judgments did not influence recall (although again as in Experiment 1, the pattern is evident in Table 5, just not statistically significant). No other main effects or interactions were significant, *F's* $< 1.0$, *p*'s $> 0.05$.

*2.2.1.2. Remember/know responses*. Table 6 presents remember and know data. A 2 × 2 × 2 mixed factorial ANOVA computed on remember judgments revealed a main effect of Contagion, $F\ (1, 46) = 5.84$, $MSE = 0.02$, $p = .020$, $\eta_p^2 = 0.11$, and an interaction between Contagion and Confederate Recall, $F\ (1, 46) = 7.29$, $MSE = 0.01$, $p = .10$, $\eta_p^2 = 0.14$.

Most importantly, and replicating Experiment 1, the three-way interaction between Contagion, Presentation Rate, and Confederate Recall was significant for remember responses, $F\ (1, 46) = 4.51$, $MSE = 0.02$, $p = .039$, $\eta_p^2 = 0.09$. As in Experiment 1, follow up tests revealed that in the 15-second presentation rate condition (when participant memory was relatively poor), participants were more likely to indicate they remembered contagion items suggested by the confederate relative to the control items when the confederate's memory was better than theirs (30-item condition, $t\ (23) = 3.08$, $SEM = 0.05$, $p = .005$, $d = 0.97$). However, when the confederate's memory was also bad (2-item condition), participants were equally likely to report remembering contagion and control items, $t = 1.0$, $p > .05$. In contrast, in the 60-second presentation condition (when participant memory was relatively good), they were equally likely to indicate they remembered contagion and control items suggested by the confederate regardless of the confederate's memory, *t's* $< 1.1$, *p*'s $> 0.05$. Replicating Experiment 1, spontaneous relative judgments influence social contagion effects via remember responses.

Know responses were analyzed separately and revealed significant main effects of Contagion, $F\,(1, 46) = 15.76$, $MSE = 0.03$, $p < .001$, $\eta_p^2 = 0.26$, and Presentation Rate, $F\ (1, 46) = 12.09$, $MSE = 0.02$, $p = .001$, $\eta_p^2 = 0.21$, and a significant interaction between Contagion and Presentation Rate, $F\ (1, 46) = 5.96$, $MSE = 0.03$, $p = .019$, $\eta_p^2 = 0.12$. Follow up *t*-tests on the interaction revealed that participants were equally likely to give know responses for the baseline control items in the 15- and 60-second conditions, $t < 1.0$, $p > .05$. However, participants were more likely to give know responses to contagion items in the 15-second condition than in the 60-second condition, $t\,(47) = 3.85$, $SEM = 0.03$, $p < .001$, $d = 0.68$. No other main effects or interactions were significant, *F*s $< 1.0$, *p*'s $> 0.5$.

*2.2.1.3. Correct recall*. As in Experiment 1, participants recalled more correct items for scenes they viewed for 60 s ($M = 0.50$) versus scenes they viewed for 15 s ($M = 0.38$), $F\ (1, 46) = 46.25$, $MSE = 0.01$, $\eta_p^2 = 0.50$. No other main effects or interactions were significant, *F*s $< 1.2$, *p*'s $> 0.05$.

*2.2.2. Recognition*

*2.2.2.1. False recognition*. False recognition data are reported in Table 7. A separate 2 × 2 × 2 mixed factorial ANOVA revealed a significant social contagion effect, $F\ (1, 46) = 12.49$, $MSE = 0.07$, $p = .001$, $\eta_p^2 = 0.21$. Further replicating Experiment 1, false recognition was not influenced by Presentation Rate, $F\ (1, 46) = 2.97$, $MSE = 0.06$, $p = .09$, $\eta_p^2 = 0.06$, or Confederate Recall, $F\ (1, 46) = 3.04$, $MSE = 0.17$, $p = .09$. No other main effects or interactions were significant (*F*s $< 2.5$, *p*'s $> 0.05$).

*2.2.2.2. Correct recognition*. Participants correctly recognized a greater proportion of items when they had a longer time to study the items ($M = 0.86$ in the 60-second condition; $M = 0.73$ in the 15-second condition, $F\,(1, 46) = 24.33$, $MSE = 0.02$, $p < .001$, $\eta_p^2 = 0.35$). No other main effects or interactions were significant, (*F*s $< 1.6$, *p*'s $> 0.05$). Finding no effect of confederate recall condition is inconsistent with Experiment 1. Correct items were not controlled or counterbalanced across contagion and control conditions and so this

**Table 6**
Mean proportion of remember and know responses as a function of presentation rate and confederate recall condition in Experiment 2 (N = 48). Standard deviations are in parentheses.

| | Confederate recall condition | |
|---|---|---|
| | 2 | 30 |
| 15 s | | |
| Contagion | | |
| Remember | 0.02 (0.07) | 0.17 (0.23) |
| Know | 0.21 (0.18) | 0.24 (0.25) |
| Control | | |
| Remember | 0.05 (0.13) | 0.02 (0.07) |
| Know | 0.06 (0.13) | 0.06 (0.13) |
| 60 s | | |
| Contagion | | |
| Remember | 0.05 (0.10) | 0.09 (0.12) |
| Know | 0.09 (0.16) | 0.10 (0.15) |
| Control | | |
| Remember | 0.03 (0.08) | 0.05 (0.15) |
| Know | 0.03 (0.08) | 0.09 (0.19) |

**Table 7**
Mean proportion of falsely recognized items as a function of presentation rate and confederate recall condition in Experiment 2 (N = 48). Standard deviations are in parentheses.

| | Confederate recall condition | |
|---|---|---|
| | 2 | 30 |
| 15 s | | |
| Contagion | 0.53 (0.31) | 0.71 (0.32) |
| Control | 0.50 (0.27) | 0.53 (0.31) |
| 60 s | | |
| Contagion | 0.51 (0.28) | 0.66 (0.24) |
| Control | 0.40 (0.30) | 0.46 (0.30) |

**Table 8**
Mean ratings of self and partner memory accuracy as a function of confederate recall condition on a scale of 1 to 5 (1 = poor memory; 5 = superior memory) in Experiment 2 (N = 48). Standard deviations are in parentheses.

| | Confederate recall condition | |
|---|---|---|
| | 2 | 30 |
| Self | 3.79 (0.66) | 2.75 (0.68) |
| Partner | 3.00 (0.83) | 4.92 (0.28) |

discrepancy is likely due to random variations across experiments.

### 2.2.3. Final questionnaires

*t*-Tests were run to examine differences between metacognitive ratings of self-memory vs. partner memory for each confederate recall condition (see Table 8). Replicating Experiment 1, participants in the 2-item confederate recall condition ($M = 3.8$) rated their own memories significantly better than their partner's memory ($M = 3.0$, $t(23) = 4.16$, $SEM = 0.19$, $p < .001$, $d = 1.06$,) and participants in the 30-item confederate recall condition (M = 2.8) rated their own memories significantly worse than their partners ($M = 4.9$, $t(23) = 15.12$, $SEM = 0.14$, $p < .001$, $d = 4.53$). This suggests that participants were aware that their partner had a relatively better or worse memory across all experimental conditions in Experiment 2.

## 3. Discussion

The current experiments revealed novel findings on the role of spontaneous relative judgments within the social contagion paradigm. Most importantly, we found evidence that spontaneous relative judgments of self versus partner memory ability influence remember judgments. Participants who felt that their own memory was poor and confederate memory was superior were more likely to indicate they “remembered” the suggested items; in contrast, participants who felt their own memory was relatively good were equally likely to report remember responses regardless of partner memory. Finding significant effects on remember judgments, but no effects on overall recall or recognition suggests that spontaneous relative judgments primarily influence social contagion via metacognitive judgments.

These results are broadly consistent with previous research on relative judgments with explicit instructions (Allan et al., 2012; French et al., 2011; Monds et al., 2019) that demonstrate social memory is a dynamic strategic process influenced by metacognitive factors. However, in contrast to previous research with explicit instructions, the current experiments found no effects on recall or recognition performance. This discrepancy is possibly due to the different stimuli used across experiments (identical schematic scenes vs. slightly altered narrative videos), the type of misinformation (additive vs. contradictory) as well as the use of a confederate in the current experiments (see Gabbert & Wheeler, 2018; Huff et al., 2013; Paterson & Monds, 2018 for further discussion of paradigmatic differences between social contagion and memory conformity). However, most likely, this discrepancy is due to the absence of explicit instructions used in the current study, as the effects of spontaneous judgments on recall are equivocal (e.g., Davis & Meade, 2013; Meade et al., 2017; Numbers et al., 2014; Numbers et al., 2019).

The current study was the first to examine remember/know judgments, and to demonstrate that even without explicit instructions, spontaneous relative judgments significantly impact remember responses for items suggested by the confederate. These results are consistent with French et al. (2011) who found that explicitly directed relative judgments influenced participants' confidence, and suggest that relative judgments influence metacognitive assessments. Importantly, relative judgments only influenced remember responses when participants' own memory was poor (i.e., in the 15 second presentation rate condition). Allan et al. (2012) also found that participants rely on relative judgments only when their own memories are relatively poor. Such findings demonstrate that participants flexibly and strategically consider both their own memory and their partners' memory when deciding if and when to incorporate their partner's suggestions.

The results of the current experiments can be explained by the source monitoring theory (Johnson et al., 1993). Specifically, when participants judge their partner's memory as better than theirs, they may adjust their response criteria to be more lenient and/or they may be more likely to consider their partner's responses. Additional consideration may influence the memory characteristics associated with their partner's responses. Specifically, at retrieval, the extra processing and cognitive operations associated with their partner's response may be more easily confused with the specific recollective details of remember responses. In contrast, when participants judge their partners' memory as worse than theirs, they may be less likely to consider their partner's responses and so have less confusion between the presented items and the suggested items (cf. Johnson, Foley, & Leach, 1988).

Importantly, the influence of spontaneous relative judgments on remember responses replicated across two experiments; one with a baseline condition in which the confederate's memory ability was matched to the participants' memory ability (Experiment 1) and one without this baseline condition (Experiment 2). Previous research differs on whether or not they include a baseline condition (French et al., 2011), or they do not include the baseline condition (Allan et al., 2012; Monds et al., 2019) and so it is noteworthy that the current experiments replicated with and without the baseline condition. Also interesting is that responses on the post experimental questionnaire in Experiment 1 indicated that the baseline condition was biased such that participants rated their own memories as significantly worse than their partners' memories even though they were matched. As Monds et al. (2019) discuss, such post hoc measures include not only the relative judgment manipulations, but also other cues and judgments participants picked up on during the course of the experiment (e.g., confidence, interaction style, etc.). Nonetheless this finding is consistent with previous work suggesting participants distrust their own memories (Van Bergen et al., 2010), and that participants generally assume the best of their partners on social memory tests (e.g., Harris et al., 2008; see too Jaeger et al., 2012).

Notably, the results reported here focus on false memory. However, the effects of spontaneous relative judgments on veridical memory are also important. In the current experiments, we were unable to determine if participants were positively impacted by the confederates' correct responses because we did not counterbalance the confederates' correct responses across contagion and control conditions. Therefore, it remains an essential question for future research to determine how/if relative judgments influence any possible benefits of collaboration.

In conclusion, the present experiments provided compelling evidence for the role of spontaneous relative judgments within the social contagion paradigm. Participant responses on metacognitive questionnaires demonstrated that participants were aware of their own memory ability relative to the memory ability of the confederate. Interestingly, participants utilized this information on the false recall test only when they felt their own memory was relatively poor. These relative judgments affected remember judgments on the recall test, a finding that highlights the importance of metacognitive judgments and task demands on relative judgments. Even without explicit instructions, relative judgments influence remember judgments in the social contagion of memory paradigm.

## Open practices statement

The data and materials for all experiments are available upon request. The program codes for experimental programs and data analyses for all experiments are available upon request. Please email mlmeade@montana.edu.

## CRediT authorship contribution statement

Katherine Hart: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis Writing-Original Draft, Michelle Meade: Writing-Review & Editing, Supervision.

## References


Allan, K., & Gabbert, F. (2007). I still think it was a banana: Memorable "lies" and forgettable "truths". *Acta Psychologica, 127*, 299–308.

Allan, K., Midjord, J. P., Martin, D., & Gabbert, F. (2012). Memory conformity and the perceived accuracy of self versus other. *Memory and Cognition, 40*, 280–286.

Andrews, J. L., & Rapp, D. N. (2014). Partner characteristics and social contagion: Does group composition matter? *Applied Cognitive Psychology, 28*, 505–517.

Davis, S. D., & Meade, M. L. (2013). Both young and older adults discount suggestions from older adults on a social memory test. *Psychonomic Bulletin Review, 20*, 760–765.

Echterhoff, G., Hirst, W., & Hussy, W. (2005). How eyewitnesses resist misinformation: Social postwarnings and the monitoring of memory characteristics. *Memory and Cognition, 33*, 770–782.

French, L., Garry, M., & Mori, K. (2011). Relative-not absolute-judgments of credibility affect susceptibility to misinformation conveyed during discussion. *Acta Psychologica, 136*, 119–128.

Gabbert, F., Memon, A., & Wright, D. B. (2006). Memory conformity: Disentangling the steps toward influence during a discussion. *Psychonomic Bulletin and Review, 13*, 480–485.

Gabbert, F., Memon, A., & Wright, D. B. (2007). I saw it for longer than you: The relationship between perceived presentation rate and memory conformity. *Acta Psychologica, 124*, 319–331.

Gabbert, F., & Wheeler, R. (2018). Memory conformity following collaborative remembering. In M. L. Meade, C. B. Harris, P. Van Begen, J. Sutton, & A. J. Barnier (Eds.). *Collaborative remembering: Theories, research, and applications*. Oxford University Press.

Gardiner, J. M. (1988). Functional aspects of recollective experience. *Memory & Cognition, 16*, 309–313.

Harris, C. B., Paterson, H. M., & Kemp, R. I. (2008). Collaborative recall and collective memory: What happens when we remember together? *Memory, 16*, 213–230.

Horry, R., Palmer, M. A., Sexton, M. L., & Brewer, N. (2012). Memory conformity for confidently recognized items: The power of social influence on memory reports. *Journal of Experimental Social Psychology, 48*, 783–786.

Huff, M. J., Davis, S. D., & Meade, M. L. (2013). The effects of initial testing on false recall and false recognition in the social contagion of memory paradigm. *Memory & Cognition, 41*, 820–831.

Huff, M. J., Weinsheimer, C. C., & Bodner, G. E. (2015). Reducing the misinformation effect through initial testing: Take two tests and recall me in the morning? *Applied Cognitive Psychology, 30*, 61–69.

Jaeger, A., Lauris, P., Selmeczy, D., & Dobbins, I. G. (2012). The costs and benefits of memory conformity. *Memory & Cognition, 40*, 101–112.

Johnson, M. K., Foley, M. A., & Leach, K. (1988). The consequences for memory of imagining in another person's voice. *Memory & Cognition, 16*, 337–342.

Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin, 114*(1), 3–28.

McNabb, J. C., & Meade, M. L. (2014). Correcting socially introduced false memories: The effect of re-study. *Journal of Applied Research in Memory and Cognition, 3*, 287–292.

Meade, M. L., McNabb, J. C., Lindeman, M. I. H., & Smith, J. L. (2017). Discounting input from older adults: The role of age salience on partner age effects in the social contagion of memory. *Memory, 25*, 704–716.

Meade, M. L., & Roediger, H. L., III (2002). Explorations in the social contagion of memory. *Memory and Cognition, 30*, 995–1009.

Monds, L. A., Howard, M., Paterson, H. M., & Kemp, R. I. (2019). The effects of perceived memory ability on memory conformity for an event. *Psychiatry, Psychology and Law*. https://doi.org/10.1080/13218719.2018.1556130.

Monds, L. A., Paterson, H. M., & Whittle, K. (2013). Can warnings decrease the misinformation effect in post-event debriefing? *International Journal of Emergency Services, 2*, 49–59.

Multhaup, K. S. (1995). Aging, source, and decision criteria: When false fame errors do and do not occur. *Psychology and Aging, 10*, 492–497.

Numbers, K. T., Barnier, A. J., Harris, C. B., & Meade, M. L. (2019). Ageing stereotypes influence the transmission of false memories in the social contagion paradigm. *Memory, 27*, 368–378.

Numbers, K. T., Meade, M. L., & Perga, V. A. (2014). The influences of partner accuracy and partner memory ability on social false memories. *Memory and Cognition, 42*, 1225–1238.

Paterson, H., & Monds, L. (2018). Forensic applications of social memory research. In M. L. Meade, C. B. Harris, P. Van Bergen, J. Sutton, & A. J. Barnier (Eds.). *Collaborative remembering: Theories, research, and applications*. Oxford University Press.

Rajaram, S. (1993). Remembering and knowing: Two means of access to the personal past. *Memory & Cognition, 21*, 89–102.

Rechdan, J., Hope, L., Sauer, J. D., Sauerland, M., Ost, J., & Merckelbach, H. (2018). The effects of co-witness discussion on confidence and precision in eyewitness memory reports. *Memory, 26*, 904–912.

Roediger, H. L., III, Meade, M. L., & Bergman, E. T. (2001). Social contagion of memory. *Psychonomic Bulletin and Review, 8*, 365–371.

Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science, 22*, 1359–1366.

Skagerberg, E. M., & Wright, D. B. (2009). Susceptibility to postidentification feedback is affected by source credibility. *Applied Cognitive Psychology, 23*, 506–523.

Thorley, C. (2015). Blame conformity: Innocent bystanders can be blamed for a crime as a result of misinformation from a young, but not elderly, adult co-witness. *PloS one, 10*(7), e0134739.

Thorley, C., & Kumar, D. (2017). Eyewitness susceptibility to co-witness misinformation is influenced by co-witness confidence and own self-confidence. *Psychology, Crime & Law, 23*, 342–360.

Tulving, E. (1985). Memory and consciousness. *Canadian Psychology, 26*, 1–12.

Van Bergen, S., Horselenberg, R., Merckelbach, H., Jelicic, M., & Beckers, R. (2010). Memory distrust and acceptance of misinformation. *Applied Cognitive Psychology, 24*, 885–896.

Wright, D. B., Self, G., & Justice, C. (2000). Memory conformity: Exploring misinformation effects when presented by another person. *British Journal of Psychology, 91*, 189–202.

Wright, D. B., London, K., & Waechter, M. (2010). Social anxiety moderates memory conformity in adolescents. *Applied Cognitive Psychology, 24*, 1034–1045.