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Social Contagion of Autobiographical Memories

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We modified the social contagion of memory paradigm to track whether details mentioned during social interaction are transmitted to later individual recall for personal, autobiographical memories. Participants recalled four autobiographical events. A week later, participants described these events to a confederate, who described scripted "memories." They then summarised each other's recall. When summarising participants' memories, confederates inserted two specific new details. Finally, participants recalled the events individually. We scored final individual recall for suggested contagion (new details inserted by confederates) and unsuggested contagion (new details consistent with confederates' scripted memories but not suggested). We found social contagion for autobiographical memories: at final recall, 30% of participants recalled at least one suggested detail. Notably, at final recall, 90% of participants recalled at least one unsuggested detail from confederates' scripted memories. Thus, social interaction, even if fairly minimal, can result in the transmission of specific details into memory for personal, autobiographical events.

General Audience Summary

In social contagion experiments, participants remember alongside a *confederate* who behaves like a participant but actually is working for the experimenter. They view slides depicting household scenes (e.g., kitchen). Next, they take turns to recall items from the scenes, during which the confederate mentions incorrect items. Later, when participants recall alone they sometimes remember the incorrect items as if they had really seen them. In our study, we tested whether these findings extend beyond simple material learned in the experiment to personal memories from participants' lives: do they pick up and incorporate details mentioned by other people? In our study, people recalled four personal events like a birthday party. A week later, they described these events to a confederate, who in turn described scripted memories. The participant and the confederate then summarised each other's recall, but when the confederate summarised the participant's memories, they inserted two new details. Later, when participants remembered alone, we found social contagion for autobiographical memories: within their memories of the events, 30% of participants recalled at least one of the inserted details, and 90% recalled details from the confederate's scripted memory. This research shows how even fairly superficial social interactions can influence what we remember.

Keywords: Social contagion, Autobiographical memory, Social influence, Social memory

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We often remember in groups (Barnier, Sutton, Harris, & Wilson, 2008) to fulfill social goals (Alea & Bluck, 2003; Harris, Keil, Sutton, Barnier, & McIlwain, 2011; Harris, Rasmussen, & Berntsen, 2014) and joint reminiscing with intimate partners can facilitate memory (Barnier et al., 2014; Harris et al., 2011; Harris, Barnier, Sutton, Keil, & Dixon, 2017; Harris, Barnier, Sutton, & Keil, 2014; Sutton, Harris, Keil, & Barnier, 2010). In many settings precise accuracy is not the primary goal, and details recalled about an event during conversational reminiscing are likely to vary between recall occasions, reflecting memory's dynamic, goal-directed, and context-specific nature (Bavelas, Coates, & Johnson, 2000; Blank, 2009; Pasupathi, 2001; Pasupathi & Hoyt, 2010).

Much experimental research on social remembering comes from the *false memory* tradition, focusing on forensic settings in which concerns about the reliability of memory are central (e.g., Loftus, 2005; Wright, Memon, Skagerberg, & Gabbert, 2009). The *social contagion of memory* paradigm (Meade & Roediger, 2002; Roediger, Meade, & Bergman, 2001) is one such method. In the original social contagion methodology, participants studied and recalled household scenes with a confederate who was ostensibly a fellow participant. During joint recall, the confederate introduced several incorrect items. On a final individual test, some participants falsely recalled these incorrect items suggested by the confederate, even when accuracy was emphasised (Roediger et al., 2001) or warnings were provided (Meade & Roediger, 2002). Participants also recalled additional correct items mentioned by the confederate, likely due to re-exposure (see also Blumen & Rajaram, 2008). Thus, remembering with another person can benefit memory by cuing accurate recall (when correct) but can cost memory by introducing errors (when incorrect; Rush & Clark, 2013; see also Harris, Paterson, & Kemp, 2008; Wright, Self, & Justice, 2000).

Social contagion effects are established for relatively mundane material learned within the experiment. However, it is unknown whether similar social influences operate on people's personal, autobiographical memories, of which they are the owner and author. In the current study, we developed an autobiographical version of the social contagion paradigm, tracking whether details introduced by a confederate were incorporated into participants' individual recall. False memory research suggests that social influences can lead people to recall autobiographical events that did not happen. Such research often involves "implanting" false memories from childhood (Loftus, 1997), and has used elaborate suggestions, like doctored photos (e.g., Wade, Garry, Don Read, & Lindsay, 2002), intermingling false events with true events obtained from parents (e.g., Loftus & Pickrell, 1995), or detailed imagination procedures (e.g., Mazzoni & Memon, 2003). In the social contagion paradigm, the suggestions are minimal and target details from within a larger scene. It is possible that—for autobiographical memories—social influences only have an impact after complex suggestions targeting distant events such as childhood memories. Moreover, research within the social contagion paradigm has suggested that both emotional information (Brown & Schaefer, 2010; Kensinger, Choi, Murray, & Rajaram, 2016) and confidently recalled information (Horry, Palmer, Sexton, & Brewer, 2012) are less susceptible to contagion. Thus, it is possible that the relatively minor suggestions used in the social contagion paradigm do not extend to personal, emotional, relatively recent autobiographical memories.

However, within a range of other research traditions—in which social influences on autobiographical memory have been examined in the context of naturalistic conversations rather than elaborate suggestions—research suggests that autobiographical memories can be influenced and shaped by simple conversations (Edwards & Middleton, 1986; Pasupathi, 2001). Harris, Barnier, Sutton, and Keil (2010) found that people's memories for emotion and shock upon hearing of the death of Australian celebrity Steve Irwin were altered by an open-ended conversation with their peers, even one month later. This study involved no direct suggestion or "contagion," but suggestions about how it was appropriate to react emerged naturally in conversation. Stone, Barnier, Sutton, and Hirst (2013) extended the socially-shared retrieval induced forgetting paradigm beyond word list stimuli to demonstrate that conversations induce forgetting of participant's autobiographical memories (see also Coman, Manier, & Hirst, 2009). These findings suggest that simple conversations can shape autobiographical memory for details, but so far, there is little research tracking the fate of specific details mentioned during conversation into later individual recall.

In the current study, we used an adapted version of the social contagion paradigm to study whether we might see social transmission (contagion) of specific details mentioned by a confederate for autobiographical events. First, participants described four events in detail to the experimenter (pre-contagion). Next, participants took turns with a confederate to describe their memories to the experimenter and then to summarise the other person's memory: for two of the events, the confederate inserted a new detail into their summary of the participant's memory (contagion). Our methodology resulted in two potential sources of social influence: (a) suggested contagion: the directly suggested, specific items that the confederate inserted; and (b) unsuggested contagion: details from the confederate's scripted "memory" of the same kind of event, where there was no direct suggestion that the participant's memory should be similar. We scored participants' final individual recall (post-contagion) for the presence of suggested and unsuggested contagion, as well as for details added or omitted from pre-contagion to post-contagion, to index changes across recall occasions.

We also tested the uptake of different kinds of contagion based on a motivational model of autobiographical memory: specifically, we compared whether positive or negative contagion items were more likely to be incorporated into participants' memories. Previous research has suggested that emotional valence does not influence memory conformity for non-personal stimuli (Wright, Busnello, Buratto, & Stein, 2012). However, given the self-enhancing, positively biased nature of autobiographical memory (e.g., Conway, Singer, & Tagini, 2004; D'Argembeau & Van der Linden, 2008; Demiray & Janssen, 2015; Walker, Skowronski, & Thompson, 2003), we expected that emotional valence may alter the influence of social contagion in our autobiographical version of the paradigm.

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Method

Participants and Design

We tested 40 undergraduate students (28 women, 12 men) in Sydney, Australia. Participants received course credit, and ranged in age from 15 years to 43 years ($M = 20.01$, $SD = 4.46$; one 15-year-old participant was an unusually young first year student). A correlational analysis of participants' age and their suggested and unsuggested contagion scores revealed no significant relationships, $rs < .25$, $ps > .11$. Data for an additional three participants were excluded; one participant was suspicious of the confederate and two participants did not return for Session 2.

Materials

Participants described four autobiographical events. Within-subjects, we assigned these events to two contagion conditions: two events were in the *suggested contagion* condition and two in the *control* (no suggested contagion) condition. These events were recent and personally significant: first HSC exam (final high school exams), high school formal (graduation dance), first day at university, and 18th birthday. In cases where the participant reported that they did not sit an HSC exam, they described an exam that was equivalent to the first HSC exam. Similarly, if the participant was younger than 18 years of age or significantly older than 18 years of age, they described their most recent memorable birthday (e.g., 16th, 21st or 40th birthday). In other cases where the participant had not experienced a particular event, or reported having a very poor memory of an event, the participant wrote about an alternate autobiographical event selected from a list, such as a first date, first day at most recent place of employment or first driving test. In cases where an alternate event was used, this alternate event never received suggested contagion; it was always assigned to the control condition.

Suggested contagion took the form of specific details that were suggested to the participant by the confederate when summarising their memory. The contagion items were either positive or negative thoughts during the event (manipulated between subjects, see Table 1). Of the five kinds of episodic details in Addis, Wong, and Schacter's (2008) autobiographical memory coding system, we chose details regarding thoughts as our suggestions (rather than details regarding time, place, sensory-perceptual information, etc.), as we expected suggestions for thoughts to be most plausible and likely to be accepted by participants, and to keep the nature of suggestions constant across events.

Confederates had scripted memories of the four events, which they learned and were able to deliver in a natural way. For example, for the first exam, the confederate narrated the following script:

> "I think the first HSC exam was early Monday morning and it was English. I felt really nervous because I knew that if I didn't think and write fast enough I wouldn't finish the exam on time, especially because it was English. I remember entering the exam hall and seeing all these empty tables and seats. The exam hall was so quiet, it was incredible, I think you could have heard a pin drop. As soon as the exam supervisors told us to start I remember feeling this surge of adrenalin. I just kept writing not knowing whether any of it made any sense. Towards the end of the exam my hand was so sore from writing but I was so scared that I wouldn't finish on time that I just kept going. I didn't have the faintest idea how I went after the exam was over, but I didn't care because I felt so good knowing that the first exam was done."

Procedure

Confederate training. Two male and two female undergraduate students were recruited as confederates. Confederates memorised a script and received training to ensure that they recalled their script in a neutral manner (similar to the way in which participants recalled their memories) and that they summarised participants' memories with no differences between the details from Recall 1 and the new, contagion details. Participants and confederates were gender matched where possible: 11 out of 12 male participants were matched with a male confederate and 26 out of 28 female participants were matched with a female confederate. A one-way ANOVA comparing suggested and unsuggested contagion scores across participants assigned to each of the four different confederates yielded no significant effects, all $Fs < 2.07$, all $ps > .12$; hence, we collapsed across confederates.

Session 1.

Recall 1: pre-contagion. To obtain a baseline, participants wrote detailed narratives for the four autobiographical events. The experimenter instructed participants to write about what happened from beginning to end, their sensory impressions, how they felt and what they thought, where and when the event took place, and any social interactions they had with others (all types of episodic details in the taxonomy of Addis et al., 2008). Participants had 5 min to record their memory for each event in detail, and the order of the events was randomised.

Session 2.

Description and summary: contagion. One week later, participants returned for Session 2. Participants described the four events that they had written about in Session 1 to the confederate, ostensibly a fellow participant. The experimenter told the participant and confederate to pay close attention to each other's accounts, that they would be asked to summarise what the other person had described, and that they should write down the six most important details of the other person's memory into a booklet. Confederates described their (scripted) memory of the first event. Then participants described their memory of the same event. This pattern of turn taking took place until confederates and participants had finished describing their memories of all four events to each other.

After they had described four events each, participants and confederates took turns to summarise each other's memories by reading out the six points they had written down in the booklet. The events were summarised in the same order as they were described during the previous phase. Participants read out their summary of the confederate's description of the first event, and

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Table 1
Suggested Contagion Details

Event type	Positive suggestion	Negative suggestion
First HSC Exam	"You thought that you were going to get to the exam on time"	"You thought that you were going to be late for the exam"
18th/Recent Birthday	"You thought that it was a big turning point in your life"	"You thought that it was no big deal"
First Day of University	"You thought that you were going to do well at university"	"You thought that you weren't going to do well at university"
High School Formal	"You felt confident that the night would go well"	"You didn't feel confident that the night would go well"

then confederates read out their summary of the participant's memory of the same event. This pattern of turn taking took place until participants and confederates finished summarising each other's memories of all four events.

Crucially, for two of the four events, confederates included a suggested contagion item in their summary of participants' memories (see Table 1). Suggested contagion items were always the third of the six details read out by confederates. Confederates did not have to memorise suggested contagion items; the experimenter wrote six details (including suggested contagion for the contagion events) in the booklet used by confederates. The contagion manipulation was counterbalanced, so that each event was presented to an equal number of participants with and without contagion, but events that included contagion were always the second and third of the four events. For the two control events, confederates simply summarised participants' autobiographical memories using six previously mentioned details and not including any new details.

Filler task. Next, the experimenter told participants and confederates that they would be in separate testing rooms for the remainder of the experiment. Participants spent 5 min completing the filler task (the Matrix-reasoning subtest from the Wechsler Adult Intelligence Scale-Third Edition). Confederates left the laboratory at this point and did not complete any subsequent tasks. The experimenter opened the door of the adjoining room periodically to give the impression that confederates were undergoing an identical procedure.

Recall 2: post-contagion. On a final individual recall task, participants wrote down everything they could remember about the four events using the same procedure as Recall 1. The events were recalled in the same order as during the other phases of the experiment. After participants had finished recalling all four events, they made remember/know judgements for each detail in their written recall of the two events in the contagion condition. This distinction was based on the instructions of Gallo, Roediger, and McDermott (2001). Participants rated a detail as *remembered* if they consciously recollected some specific aspect of what happened or what they experienced at the time of the event, and rated a detail as *known* if they were simply confident that it had occurred without having a specific memory for it.

Post-experimental inquiry. To assess whether participants believed that the confederate was a genuine fellow participant, the experimenter asked them (a) "Did you notice anything different or strange about the other participant that you discussed your memories with?"; and (b) "Do you remember the other participant saying anything in his/her recall of your memories that you didn't mention?" Finally, the experimenter debriefed and thanked participants.

Design and Analysis Strategy

The design was a 2 (Contagion Condition: suggested contagion vs. control) × 2 (Suggestion Valence: positive vs. negative) mixed design. Contagion Condition was manipulated within subjects: all participants had two events with suggested contagion and two control events. Suggestion Valence was manipulated between subjects: half the participants received the positive suggestions and the other half received the negative suggestions (see Table 1).

We scored two sources of social contagion: suggested and unsuggested. Suggested contagion came from those specific new details inserted by the confederate during the summary phase; thus, suggested contagion was operationalised as the reporting on post-contagion Recall 2 of at least one new detail that was consistent with the suggested detail (either verbatim or gist). Unsuggested contagion came from the details that the confederate reported in their scripted memory: thus, unsuggested contagion was operationalised as the reporting on Recall 2 of at least one new detail that was consistent with the confederates' script (either verbatim or gist). Details were only scored as suggested or unsuggested contagion when they were added to the post-contagion individual recall and had not appeared at Recall 1.

We also quantified contagion uptake using two different metrics. First, we measured the *frequency* of contagion uptake by participants, calculated as the percentage of participants who reported contagion for at least one event. This is consistent with scoring in the misinformation literature, in which frequency of false memories is the main measure. For instance, in the classic "lost in the mall" study, 25% of participants were found to develop a partial or full memory for the false event (Loftus & Pickrell, 1995). This allowed us to compare the frequency of participants showing evidence of social contagion in autobiographical memory with the frequency of participants showing social influence on memory in other paradigms in which suggestions are made about false autobiographical events.

Second, we gave each participant a contagion score, calculated as the *proportion* of events for which they reported contagion. For suggested contagion, each participant could receive a score of 0, 0.5, or 1.0, depending on the incidence of contagion items in the two events for which contagion was suggested. This is consistent with Roediger et al.'s (2001) scoring method for the standard social contagion paradigm, and allows us to compare the incidence of social contagion in

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our autobiographical memory experiment with their slideshow experiment (reported as 0.22, and corrected to 0.16 to remove effects of guessing by chance). For unsuggested contagion, each participant could receive a score of 0, 0.25, 0.5, 0.75 or 1.0, depending on the incidence of unsuggested contagion in the four events recalled (since for all events, they heard the confederate's version of the equivalent event). We report results in terms of both scoring methods below.

Results

Recall 1: Pre-Contagion

On their baseline individual recall, most participants described memories for the four target autobiographical events. Of 40 participants, 40 described their first day at university, 38 described their 18th birthday, 39 described their first HSC exam, and 35 described their high-school formal. Eight participants described memories for one substitute event out of their four events. On average, at Recall 1 each memory consisted of 11.75 details ($SD = 3.02$), defined as grammatical clauses describing one discrete concept or idea unit. A second independent rater parsed 25% of event narratives into clauses with good inter-rater reliability (intraclass correlation = 0.83).

Recall 2: Post-Contagion

All of the individual narratives that participants wrote following discussion with the confederate were scored for suggested and unsuggested contagion by two raters, who were blind to whether contagion had been suggested for each event. Inter-rater reliability was high (agreement = 92.5%, $\kappa = 85.65$). Disagreements were resolved by discussion.

Suggested contagion. When contagion was suggested (i.e., for the two contagion events), 30% of participants reported at least one suggested contagion detail for at least one event, similar to frequencies of participants responding to social influence in other paradigms that focus on false memory (e.g., Loftus & Pickrell, 1995). For instance, after hearing the suggestion about their 18th birthday that "You thought it was a big turning point in your life," one participant stated, "I felt like I had finally matured," a detail that was completely absent from pre-contagion recall. Another participant, after hearing the suggestion "You thought you were going to be late for the exam," included the detail "I couldn't make sense of the map" in her final recall. When contagion was not suggested (i.e., for the two control events), no participant ever by chance added a suggested contagion detail (see Table 2).

We also scored the proportion (out of the two events) of suggested contagion (see Table 2), such that each participant received a score of 0, 0.5, and 1.0. Using this proportional scoring method, the average incidence of suggested contagion was .16, similar to Roediger et al.'s (2001) average incidence of social contagion (0.22 overall or 0.16 corrected for chance). Hence, in this experiment, we replicated Roediger et al.'s effects, and found that social contagion occurred at a comparable rate for details within personal, autobiographical memories as it did for erroneous details within non-personal stimuli in previous research. A 2 (Contagion Condition: contagion vs. control) × 2 (Suggestion Valence: positive vs. negative) mixed ANOVA of the proportion scores yielded a significant main effect of Contagion Condition, $F(1, 38) = 15.22$, $p < .001$, $\eta_p^2 = .29$. This confirms a higher incidence of suggested contagion ($M = 0.16$, $SD = 0.26$) than for control events ($M = 0.00$, $SD = 0.00$), which is unsurprising since there was no variation for control events. This analysis also yielded no significant main or interaction effects of Suggestion Valence, Fs < 0.82, ps = .37. That is, overall incidence of suggested contagion was similar whether the suggested details were positive or negative (see Table 2).

Unsuggested contagion. Overall, 90% of participants reported at least one unsuggested contagion detail for at least one event. These details ranged from thoughts and feelings (e.g., "I was nervous"; "It was fun") to specific event details (e.g., "It was a Monday"; "We caught a limousine"; "I saw the empty chairs and tables"). For instance, after hearing the confederate's narrative about their first exam as detailed above, one participant's final recall included the statement "Afterwards my hand hurt but I was relieved it was over." This participant had not mentioned their hand hurting in their baseline recall although they had mentioned feeling relieved. Thus, this detail "afterwards my hand hurt" was scored as one unsuggested contagion detail—indicating influence from hearing the confederate's scripted memory—while the detail of being "relieved" was not.

We scored the number of events for which participants reported unsuggested contagion items as a proportion of the four total events (see Table 2). Based on these, 30% of participants recalled unsuggested contagion for 1 event, 47.5% for two events, and 12.5% for three events (and the remaining 10% did not recall any unsuggested contagion). Using this proportional scoring method, the average incidence of unsuggested contation was 0.40. A 2 (Contagion Condition) × 2 (Suggestion Valence) mixed ANOVA of the proportion scores yielded no significant main or interaction effects (all Fs < 2.96, all ps > .09). In summary, most participants added at least one detail from the confederate's script on their own final recall test, independently of whether the event had received positive or negative suggested contagion or not (see Table 2).

Event type. To examine whether the suggestions differentially influenced different events, we conducted separate 2 (Contagion Condition) × 2 (Suggestion Valence) between groups ANOVAs on each event (considering each event separately, Contagion Condition becomes a between-participants manipulation). For the 18th birthday, the two main effects were significant and there was also a significant interaction between Contagion Condition and Suggestion Valence, all Fs > 7.00, all ps < .012, all η_p^2s > .16). While the positive suggestion influenced memory, the negative suggestion never did (see Table 2). For the first day at university, there was a marginally significant effect of Contagion Condition, $F(1, 36) = 4.05$, $p = .052$, $\eta_p^2 = .10$, but no main effect of or interaction with Suggestion Valence, all Fs < 0.45, all ps > .50. That is, both positive and negative contagion had a similar influence on memory (see Table 2). For the first HSC exam, there were no significant main or interaction effects, all Fs < 1.22, all ps > .277. Overall for this event, rates of contagion were very low regardless of Contagion Condition (see

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Table 2
Proportion of Suggested Contagion and Unsuggested Contagion Reported For Each Event Across Conditions

	Contagion events		Control events	
	Positive suggestion group	Negative suggestion group	Positive suggestion group	Negative suggestion group
Suggested contagion				
Birthday	0.50 (0.52)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
University	0.22 (0.44)	0.11 (0.33)	0.00 (0.00)	0.00 (0.00)
Exam	0.00 (0.00)	0.11 (0.33)	0.00 (0.00)	0.00 (0.00)
Formal	0.00 (0.00)	0.33 (0.50)	0.00 (0.00)	0.00 (0.00)
Total	0.20 (0.41)	0.13 (0.34)	0.00 (0.00)	0.00 (0.00)
Unsuggested contagion				
Birthday	0.25 (0.45)	0.00 (0.00)	0.13 (0.35)	0.14 (0.38)
University	0.11 (0.33)	0.33 (0.50)	0.64 (0.51)	0.45 (0.52)
Exam	0.75 (0.46)	0.78 (0.44)	0.67 (0.49)	0.73 (0.47)
Formal	0.27 (0.47)	0.33 (0.50)	0.44 (0.53)	0.36 (0.51)
Total	0.33 (0.047)	0.33 (0.47)	0.50 (0.51)	0.45 (0.50)

Note. Values are mean proportion of events containing details scored as contagion; values in parentheses are standard deviations.

Table 2). Finally, for the school formal, the two main effects were significant and there was also a significant interaction between Contagion Condition and Suggestion Valence, all Fs > 4.95, all ps < .032, all η_p^2s > .12. While the negative suggestion influenced memory, the positive contagion never did (see Table 2). We return to these differences across events in the Discussion.

Remember/know judgements. At final recall, for only the two events that received suggested contagion, participants rated whether each reported detail within the event—including suggested contagion details, unsuggested contagion details, and control (non-suggested) details—was *remembered* or *known*. We scored the proportion of each type of detail that were rated as *remembered*. We conducted a pairwise *t*-test to compare the proportion of suggested contagion details ($M = 0.77$, $SD = 0.42$) versus control details ($M = 0.82$, $SD = 0.17$) that were rated as *remembered*, for the subset of participants who recalled at least one suggested contagion item on these two contagion events ($n = 12$). This analysis yielded no difference, $t(11) = 0.39$, $p = .705$. We conducted a pairwise *t*-test to compare the proportion of unsuggested contagion details ($M = 0.80$, $SD = 0.27$) versus control details ($M = 0.76$, $SD = 0.15$) that were rated as *remembered*, for the subset of participants who recalled at least one unsuggested contagion item on these two events ($n = 22$). Again, this analysis yielded no difference, $t(21) = 0.70$, $p = .493$. That is, by and large participants rated all details as remembered regardless of their source.

Added and omitted details. To test whether recalling contagion had broader shaping effects on the narrative, making it more changeable across retellings, we scored the number of details that were added and omitted from pre-contagion to post-contagion. We scored *added details* reported for the first time on Recall 2, not including those details already scored as suggested or unsuggested contagion. We scored *omitted details* reported on Recall 1 but omitted on Recall 2 (see Table 3). In order to maximise our power, we analysed added and omitted details using *events* as the level of analysis, comparing those events which included contagion and those that did not, and we used multi-level linear modelling with *participant* as a random factor, to account for the fact that participants contributed multiple events to the data set (see Wright, 1998).

Table 3
Mean Number of Added and Omitted Details, By Event

	Added details	Omitted details
Suggested contagion		
Included	8.15 (3.11)	5.92 (3.07)
Not included	4.90 (2.70)	4.78 (2.57)
Unsuggested contagion		
Included	5.81 (2.25)	5.14 (2.72)
Not included	4.73 (3.15)	4.70 (2.56)

Note. Values are mean number of details (idea units); values in parentheses are standard deviations.

A multi-level linear model on the number of additional details—specifying the between-subjects factor of Contagion (suggested contagion: included or not included) and the random factor of Participant—yielded a significant effect of Contagion, $F(1, 158) = 16.97$, $p < .001$. That is, at final recall, those events which included suggested contagion details also had more new details in general compared to those events which did not include suggested contagion (see Table 3). However, this was not the case for omitted details (see Table 3). A multi-level linear model on the number of omitted details—specifying the between-subjects factor of Contagion (suggested contagion: included or not included) and the random factor of Participant—yielded no significant effect of Contagion, $F(1, 158) = 2.27$, $p = .134$. The same results emerged for unsuggested contagion (see Table 3). A multi-level linear model on the number of additional details—specifying the between-subjects factor of Contagion (unsuggested contagion: included or not included) and the random factor of Participant—yielded a significant effect of unsuggested contagion, $F(1, 158) = 5.65$, $p = .019$, but the same analysis yielded no significant effect of unsuggested contagion on omitted details, $F(1, 158) = 1.09$, $p = .297$. Overall,

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participants added more new details into their recall of events in which they included either suggested or unsuggested contagion.

Post-Experimental Questionnaire

We asked participants two post-experimental questions to assess whether they believed the confederate was a genuine participant. For the first question—"Did you notice anything different or strange about the other participant that you discussed your memories with?"—32 out of 40 participants (80%) indicated "no." The remaining 8 participants indicated "yes," and reported that the other participant had "made some mistakes" or "said things I didn't say." As noted above, one additional participant reported that she did not think the confederate was a real participant, and her results were excluded from the study. For the second question—"Did the confederate say anything when they described your memories that you didn't mention?"—37 out of 40 participants indicated "yes." Thus, the majority of participants, both those who reported contagion and those who did not, had noticed at least some of the suggested items.

Discussion

We extended the social contagion paradigm to autobiographical memories. We found evidence for two ways in which social interaction introduced new details into participants' individual recall. First, one third of participants recalled a new detail suggested to them by the confederate. Second, after hearing confederates' scripted memories, almost all participants recalled details from the script. This extension of social contagion to autobiographical material confirms the paradigm's robustness and supports its applicability to everyday conversations.

Identifying two kinds of contagion—suggested and unsuggested—is a new finding, and future research could examine whether unsuggested contagion also occurs for laboratory stimuli. Social contagion experiments establish a situation in which the confederate is being deliberately misleading. This situation may differ in important ways from everyday conversations about memory in which the goal of both parties is to recall an event as accurately as possible. Our findings suggest that social influence does not depend on creating deliberately misleading situations. Even hearing another person describe their memory for an unshared event, with no implication that this was related to the participant's experience, influenced recall (see also Harris et al., 2010).

Unlike traditional social contagion experiments, we do not make claims about accuracy, since we tested autobiographical material with no verifiability. However, we note that no participant (by chance) added suggested contagion details for control events, implying that participants would not have recalled these details unless they were suggested. In some cases, adopting contagion involved adding entirely new details, and it is possible that the confederate simply reminded participants of accurate details they had not mentioned previously. This seems particularly likely for specific episodic details that came from the confederate's script of similar events (e.g., "It was Monday"; "We caught a limousine"). Increased recall of correct details—cued by the accurate recall of the confederate—is typically seen within the social contagion paradigm (Rush & Clark, 2013). In other cases, adopting contagion involved participants altering details from their original recall. This suggests stronger, shaping social influences, but we still have no way of knowing whether the initial or the final recall was more accurate. Future research is needed to assess how the accuracy of details influences contagion for autobiographical memories. For instance, we could obtain correct and incorrect details via informant reports from family members, similar to Loftus and Pickrell (1995). Regardless of accuracy, social interactions can lead people to shape their memories in certain ways: to recall some details and forget others, or to emphasise particular aspects of their memory (see also Harris et al., 2010; Marsh, 2007; Pasupathi, 2001).

The valence of suggested details did not impact contagion rates, although we found strong variability across events. This variability may reflect differences in the plausibility of the suggested details, similar to Roediger et al.'s (2001) finding that high (compared to low) expectancy contagion had more impact. However, we did not directly index plausibility so further research is needed to test its impact on social contagion for autobiographical memories. A further issue is how motivation influences social contagion effects. Although we found no differences for positive versus negative contagion, this valence manipulation may not have sufficiently captured motivational effects. Future research could further investigate whether certain kinds of details (e.g., flattering vs. unflattering details) might be more likely to be incorporated into recall (Conway et al., 2004; Johnson, Hashtroudi, & Lindsay, 1993).

A subset of individuals adopted suggested contagion, implying that certain people may be more influenced, consistent with previous research on false memories (e.g., Loftus & Pickrell, 1995). Perhaps these individuals were more sensitive to social goals of remembering or were influenced by other individual differences (Temler, 2015; Wright, London, & Waechter, 2010). One possible individual difference that emerged was gender. Although we did not test for gender effects formally due to small sample size, it is worth noting that 1 out of 12 male participants adopted social contagion whereas 11 out of 28 female participants did. We gender-matched confederates as much as possible to enhance the likelihood of contagion effects (see also Barber & Mather, 2012), so these potential gender differences require further investigation. Research in other paradigms suggests that cognitive abilities and personality variables influence susceptibility to misinformation (Zhu et al., 2010a, 2010b), but it is not clear whether these same individual differences apply for autobiographical details. Further research on social contagion for autobiographical memories is needed to understand why some individuals have memories that change over retellings (see also Temler, 2015).

Overall, our finding of social contagion for autobiographical memories emphasises the potential for extending controlled experimental methodologies to study more ecological social memory phenomena. Despite quite substantial changes in methodology, our findings mirrored those of Roediger et al. (2001) in terms of the rate of social contagion. Future research could further adapt the paradigm to test the parameters of specific suggestions on memory. In this experiment we used events

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that were significant milestones in the lives of our participants. This was done to ensure that every participant would remember and elicit the target events. Given Roediger et al.'s finding that poorly remembered events were more susceptible to contagion, and Loftus, Miller, and Burns (1978) finding that misinformation effects were stronger with a longer delay since the event, we may find higher rates of contagion by examining different kinds of autobiographical events, particularly childhood memories.

We also found effects on memory—albeit subtle shifts in details recalled—even after a short interaction with a stranger, where the participant little reason to expect the confederate to have knowledge about their experience. Future research could investigate under what circumstances social contagion is stronger, occurs with higher frequency, or results in more substantial alterations. Previous research on memory conformity found stronger effects where conversation partners have an intimate relationship (French, Garry, & Mori, 2008; Peker & Tekcan, 2009), or where misinformation comes from a trusted source (Zhu, Chen, Loftus, Lin, & Dong, 2010). Thus, we might expect social contagion from a known other, particularly someone who shared the experience of the event, to have a stronger impact. Our findings indicate that even quite superficial social interactions can shape autobiographical memory.

Conflict of Interest Statement

The authors declare no conflict of interest.

Author Contributions

All the authors conceived and designed the experiments. Tasneem Khan performed the experiments. Harris, Khan, and Barnier analyzed and interpreted the data. Harris primarily wrote the paper, with comments from all other authors.

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