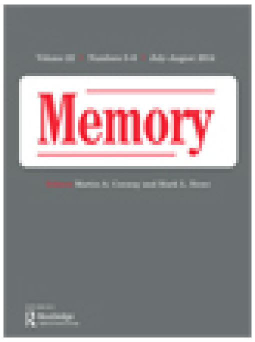

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The impact of own and others' alcohol consumption on social contagion following a collaborative memory task

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ABSTRACT
When one person alters his or her recollection of an event to be consistent with another person's erroneous account of the same event, social contagion has occurred. In two studies, we examined whether alcohol consumption influences the degree to which people engage in social contagion. In Study 1, participants consumed alcohol, an alcohol placebo, or a soft drink and then completed a collaborative recall test with a confederate who consumed a soft drink. In Study 2, participants consumed a soft drink and then completed a collaborative recall test with a confederate they believed had consumed a soft drink or alcohol (but no alcohol was ever consumed). In both studies, the confederate made scripted errors during the collaborative recall test. On post-collaborative individual recall and recognition tests, participants in both studies engaged in social contagion by including the confederate's errors in their own recollection. In Study 1, the drink participants consumed had no influence on social contagion. In Study 2, participants were less likely to engage in social contagion after collaborating with a confederate who had seemingly consumed alcohol. That same confederate was viewed as less accurate, trustworthy, and credible, which likely made participants less inclined to engage in social contagion.

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Social contagion; memory conformity; alcohol; misinformation; eyewitness

Collaborative remembering is used in several everyday contexts, including social contexts (e.g., family members recalling a shared experience together; see Reese & Fivush, 2008), educational contexts (e.g., students revising course materials together; see Wissman & Rawson, 2016), and forensic contexts (e.g., co-witnesses recalling a crime together; see Paterson & Kemp, 2006). Collaborative remembering can be beneficial as groups recall more than lone individuals (e.g., Clark & Stephenson, 1989) and their members can correct each other's errors (e.g., Ross, Spencer, Linardatos, Lam, & Perunovic, 2004). Collaborative remembering also has several costs. One is collaborative inhibition, whereby groups remember less than they would if their members recalled alone and their recollection was pooled (see Marion & Thorley, 2016). A second is social contagion, whereby one group member alters their recollection of an event to be consistent with another group member's erroneous account of the same event (Roediger, Meade, & Bergman, 2001).[1] Here, two studies examined whether the degree to which participants engage in social contagion is influenced by alcohol consumption. More specifically, Study 1 examined whether the degree changes when participants consume alcohol, an alcohol placebo, or a soft drink and an erroneous collaborative partner consumes a soft drink. Conversely, Study 2 examined whether the degree changes when participants consume a soft drink and an erroneous collaborative partner seemingly consumes alcohol or a soft drink. Both studies also examined veridical recollection.

Social contagion of memory

Social contagion can be induced in the laboratory using several different methods (see Gabbert, Wright, Memon, Skagerberg, & Jamieson, 2012). The most relevant here is one developed by Roediger et al. (2001) and Meade and Roediger (2002). Their method requires participant and confederate pairs to first study pictures of household scenes. Importantly, each picture has two scene-consistent items missing (e.g., a kitchen scene has no knife or oven mitts). Next, the participant and confederate take turns recalling scene items. During this collaborative remembering test, the confederate deliberately falsely recalls the missing items for half the scenes (these items are called *contagion lures*). Afterwards, the participant completes individual free recall and recognition tests. On these individual tests, participants typically report that the contagion lures appeared in the scenes. They rarely report that the scene-consistent missing items not falsely recalled by the confederate (called *control lures*) appeared in the scenes. Participants therefore incorporate the confederate's

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errors into their subsequent recollection, demonstrating social contagion.

Own alcohol consumption, social contagion, and veridical recollection

No published research has examined whether alcohol consumption influences the extent to which people engage in social contagion. Two studies have, however, examined whether people who consume alcohol *prior to* an event are at increased risk of having their recollection of it tainted by other types of misinformation. Both studies utilised an eyewitness memory paradigm (see Davis & Loftus, 2007, for an overview of how different types of misinformation can contaminate eyewitness memory). In the first study, Schreiber Compo et al. (2012) had participants consume a soft drink, an alcohol placebo, or a moderate amount of alcohol that induced a Mean peak breath alcohol content (BrAC) of 0.08 g/210 L (range = 0.04–0.14), which is equivalent to a blood alcohol content (BAC) reading of 0.08 (i.e., the two values are the same). For comparative purposes, this BAC value is the current drink drive limit in the UK and USA. The participants then observed a staged theft, overheard misinformation about the theft as it was being reported, and freely recalled the theft/answered cued recall questions about it. Participants in all three drink conditions included the misinformation in their accounts and they did not differ in the volume included. Consuming alcohol therefore had no impact upon susceptibility to misinformation.

Participants in all three of Schreiber Compo et al.'s (2012) conditions were also equivalent in the number of correct crime details recalled. Other eyewitness memory studies have also found that similarly moderate levels of alcohol intoxication have no effect, or a very small detrimental effect, on veridical recollection (e.g., Crossland, Kneller, & Wilcock, 2016; Flowe, Takarangi, Humphries, & Wright, 2016; Hagsand, Roos af Hjelmsäter, Granhag, Fahlke, & Söderpalm-Gordh, 2013; Hagsand, Roos af Hjelmsäter, Granhag, Fahlke, & Söderpalm Gordh, 2017; Hildebrand Karlén, Roos af Hjelmsäter, Fahlke, Granhag, & Söderpalm Gordh, 2015; La Rooy, Nicol, & Terry, 2013; Schreiber Compo et al., 2011; Yuille & Tollestrup, 1990).

In the second study, Van Oorsouw, & Merckelbach, and Smeets (2015) approached participants in a bar and measured their BrACs (but they refer to this as BAC). Their Mean BrAC was 0.09 g/210 L (range = 0.00–0.26). The participants then acted out a crime (a theft from a briefcase). Next, they freely recalled the crime and answered misleading/non-misleading questions about it. Each misleading question implied one of two factually incorrect false alternatives was the correct answer (e.g., participants were asked "*Was there an apple or a banana in the briefcase?*" when the briefcase contained an orange). When participants were divided into those who were sober (BrACs < 0.02 g/210 L), moderately intoxicated (BrACs 0.02–0.11 g/210 L), or highly intoxicated (BrACs > 0.11 g/210 L), the latter group were most likely to answer the misleading questions incorrectly. No difference was observed between the sober and moderately intoxicated groups.

Van Oorsouw et al. (2015) also found higher levels of intoxication (BrACs > 0.11 g/210 L) resulted in fewer correct crime details being recalled (see also Read, Yuille, & Tollestrup, 1992; Van Oorsouw & Merckelbach, 2012). This is unsurprising as studies from the wider memory literature generally show that memory impairments increase as a function of BrAC g/210 L and BAC levels, with low levels (circa 0.03) resulting in few impairments, moderate levels (circa 0.06) resulting in small impairments, and higher levels (circa 0.25) resulting in large impairments (e.g., Bisby, Leitz, Morgan, & Curran, 2010; Lee, Roh, & Kim, 2009; Perry et al., 2006; Ray & Bates, 2006; Wetherill & Fromme, 2011; White, 2003).

Combined the above suggests higher levels of intoxication (BrACs > 0.11) throughout a memory study can impair veridical recollection and may make participants more susceptible to having their recollection distorted by misinformation. From a theoretical perspective, Schreiber Compo et al. (2012) and Van Oorsouw et al.'s (2015) findings are consistent with the *discrepancy-detection principle*. This principle suggests that recollection of an event is most susceptible to distortion by misinformation when memory of it is degraded, as it becomes difficult to detect discrepancies between actual and suggested event details (Schooler & Loftus, 1986; Tousignant, Hall, & Loftus, 1986). Thus, when degradation occurs, the suggested details can become incorporated within memory reports. Consistent with this, Van Oorsouw et al. (2015) found the degree to which intoxicated people's recollection was altered by misleading questions was largely mediated by the completeness of their veridical recall. Van Oorsouw et al. (2015) and Schreiber Compo et al. (2012) did, however, utilise different types of misinformation in their studies and this could explain their conflicting findings. In the former, the participants were asked leading questions by an experimenter and had to provide immediate verbal answers, so they likely felt normative pressure to include the misinformation in their responses. Normative pressure is driven by a need for social acceptance, whereby participants privately believe the misinformation is inaccurate but publicly include it in their recollection to avoid disagreements with the source (Deutsch & Gerard, 1955; Wright, Memon, Skagerberg, & Gabbert, 2009). In the latter study, the participants overheard misinformation from one person, were later interviewed by another, and received no leading questions, meaning they likely felt little normative pressure to include the misinformation in their responses. It may be the case that higher levels of intoxication only increase susceptibility to misinformation in paradigms where normative pressure is present. This alternative explanation could be tested by exposing highly intoxicated individuals (BrACs > 0.11) to misinformation in a paradigm where normative pressures are low, such as the social contagion paradigm already described.

Interestingly, people who believe they have consumed alcohol, but have only consumed a placebo, may also be at increased risk of including misinformation in their recollection of events. Assefi and Garry (2003) claimed to demonstrate this in an eyewitness memory study where participants consumed either a soft drink they were told contained alcohol (i.e., a placebo group) or a soft drink they were told was a soft drink. The participants then watched a slideshow of a crime, read a narrative about the crime that contained misinformation, and had their memory of the crime assessed via a recognition test. On several of the recognition test questions, the misinformation was one of the two possible response options. The authors claimed that placebo participants were more likely to answer these latter questions with the misinformation, although they failed to report any test statistics for this effect and simply referred readers to a bar chart showing this trend (this point is further addressed in the General Discussion). In the only other study to examine this issue, Schreiber Compo et al. (2012), discussed earlier, found that a placebo group did not differ from controls in the volume of misinformation incorporated into their recall of a crime. Assefi and Garry did include a test statistic showing both groups answered a similar number of non-misinformation-related questions about the crime correctly. Others have also found a placebo has no effect on veridical recall and recognition (Crossland et al., 2016; Schreiber Compo et al., 2011, 2012; Yuille & Tollestrup, 1990). It is therefore an open question as to whether people who consume a placebo are more susceptible to having their recollection of events distorted by misinformation but placebos do not seem to impair veridical recollection.

Partner alcohol consumption and social contagion

Only Zajac, Dickson, Munn, and O'Neill (2016) have examined whether the extent to which sober people engage in social contagion with an erroneous collaborative partner changes when that partner is believed to have consumed alcohol. In their study, participant and confederate pairs consumed one of two drinks. In one condition, both were aware they were consuming a soft drink. In the second, both consumed a soft drink but participants were told the confederate consumed alcohol. Both then watched a crime video. Afterwards, they discussed the crime together and the confederate introduced several pieces of misinformation, with the misinformation introduced varying across trials (creating both contagion lures and control lures). Prior to introducing the misinformation, the confederate questioned the participant about the topic it related to (to obtain a pre-misinformation response). For example, the confederate asked participants what was stolen before introducing misinformation about what was stolen. On a subsequent individual cued recall test, participants in both conditions engaged in social contagion but the degree of social contagion did not vary according to the drink the confederate seemingly consumed.

Despite their null effects, Zajac et al. (2016) found a trend towards social contagion being less likely when participants worked with a confederate who had seemingly consumed alcohol. This trend, however, only emerged when participants' pre-misinformation response was inconsistent with the confederate's misinformation ($p = .09$). Importantly, this non-significant effect was medium-to-large, and the analysis was underpowered, suggesting a type 2 error may have occurred. The authors suggest this trend occurred as participants, in these instances, did not trust the seemingly intoxicated confederate and favoured their own initial memory over the misinformation. In line with this, participants rated the seemingly intoxicated confederate as being less able (than themselves) to accurately complete the experimental tasks. Other studies have also found that people are less likely to incorporate misinformation in their recollection of events when the person supplying the misinformation seemingly lacks credibility, competence, and/or trustworthiness (Andrews & Rapp, 2014; Ceci, Ross, & Toglia, 1987; Dodd & Bradshaw, 1980; Echterhoff, Hirst, & Hussy, 2005; French, Garry, & Mori, 2011; Kwong See, Hoffman, & Wood, 2001; Skagerberg & Wright, 2009; Smith & Ellsworth, 1987; Thorley, 2015; Underwood & Pezdek, 1998; Vornik, Sharman, & Garry, 2003). Given the trend observed in Zajac et al.'s data, a re-examination of this issue is worthwhile.

Aims and hypotheses

Our two studies have different aims. Study 1 will examine whether the type of drink a person consumes (alcohol, an alcohol placebo, or soft drink) influences the extent to which they engage in social contagion with an erroneous collaborative partner (who has consumed a soft drink only). Study 2 will examine whether the degree to which people (who consume a soft drink) engage in social contagion with an erroneous collaborative partner differs when that partner has seemingly consumed a soft drink or alcohol.

Both studies will commence with a participant and their collaborative partner (a confederate) consuming their drinks. Afterwards, they will complete Roediger et al. (2001) and Meade and Roediger's (2002) collaborative recall test and subsequent individual recall and recognition tests. In both studies, the primary measures of interest will be the number of contagion and control lures falsely recalled and falsely recognised by participants on these individual memory tests. As secondary measures, the number of studied items correctly recalled and recognised will be assessed. At the end of each study, participants will also rate the confederate's accuracy, trustworthiness, honesty, credibility, and competence during the collaborative recall test.

It is possible to form several hypotheses for Study 1. First, it is anticipated that social contagion will occur regardless of the drink consumed. This is expected as our collaborative recall test reliably induces social contagion (e.g., Roediger et al., 2001; Meade & Roediger, 2002). Whether or not consuming alcohol increases social contagion depends, according to the *discrepancy-detection principle*, on whether it also impairs veridical recollection. The volume of alcohol consumed here is expected to induce BrACs greater than 0.11 g/210 L, which was the level sufficient to impair veridical recall/increase susceptibility to misinformation in Van Oorsouw et al. (2015). It is therefore predicted that alcohol will impair veridical recollection and increase social contagion here. No predictions are made regarding the influence of a placebo on social contagion, given the uncertainty over whether placebos can increase the likelihood of recollection being tainted by misinformation (Assefi & Garry, 2003; Schreiber Compo et al., 2012). Consuming a placebo is not expected to influence veridical recollection, given the null effects in past research (Assefi & Garry, 2003; Crossland et al., 2016; Schreiber Compo et al., 2011, 2012; Yuille & Tollestrup, 1990). Finally, participants in all three drink conditions are not expected to differ in terms of how accurate, trustworthy, honest, credible, and competent they perceive the confederate to be, as the confederate's behaviour should be identical in each condition.

It is also possible to form several hypotheses for Study 2. Consistent with Zajac et al. (2016),[2] it is anticipated that social contagion will be observed in both drink conditions and the degree will not vary according to the drink the confederate seemingly consumes. As mentioned, however, their study may have lacked the statistical Power needed to demonstrate that social contagion is reduced after working with a confederate who has seemingly consumed alcohol. Veridical recall and recognition should also be uninfluenced by the drink the confederate seemingly consumes. Finally, it is likely that the confederate will be rated as lower in competency, trustworthiness, and accuracy after seemingly consuming alcohol. This is based upon Zajac et al.'s finding that participants rated a confederate as less able to accurately complete experimental tasks after the confederate had seemingly consumed alcohol. Finally, a lack of past research prevents predictions regarding whether the drink the confederate seemingly consumes will influence how that person is rated in terms of honesty and credibility.

Study 1: Own alcohol intoxication and social contagion

Method

Participants

Ninety participants (69 females, 21 males) aged 18–62 (M = 25.72, SD = 9.66) were recruited from the second author's university via intranet advertisements. They participated for a small honorarium. The advertisements stated the study was examining how well people work together after consuming alcohol, that participants may be required to consume alcohol, and listed the inclusion/exclusion criteria. These criteria specified that participants must be over 18 years of age, native English speakers, and regularly drink more than 10 units of alcohol per week (to reduce the likelihood of adverse effects from any alcohol consumption). Here, one unit is defined as 10 ml or 8 g of pure alcohol and guidance was given on what constitutes one unit. They were also required to provide a BrAC reading of 0.00 g/210 L at the start of testing to ensure sobriety (assessed via a Lion Alcometer 500, Lion Laboratories, Barry, UK). In line with advisory bodies' recommendations (e.g., National Institute on Alcohol Abuse and Alcoholism, 2004), people were excluded from taking part if they self-reported having a current or past alcohol use disorder, were using medication that should not be taken in combination with alcohol, had any medical conditions where it may be unsafe to consume alcohol, or were currently pregnant or breastfeeding. Those who expressed an interest in taking part were emailed a Participant Information Sheet that reiterated these points and were encouraged to email the researchers if they had questions. There were three 21-year-old confederates (two females, one male) who were unacquainted with the participants. The study received institutional ethical approval.

Design

Study 1 had a 2 × 3 mixed-subjects design. Exposure to misinformation during a collaborative recall test was manipulated within-subjects (contagion lures, control lures), with the drink consumed by participants manipulated between-subjects (alcohol, alcohol placebo, soft drink). Participants were randomly allocated to the between-subjects conditions.

Stimuli

Study 1 utilised several alcohol-related stimuli, several memory-related stimuli, and an end of study partner perception questionnaire.

Drinks: The alcoholic drink contained vodka (37.5% alcohol by volume); the dose was calculated as 0.60 g of pure alcohol per kg of body weight, with a maximum of 200 ml of vodka. The drink was mixed with lemonade, with a ratio of one part vodka/three parts lemonade. 0.60 g/kg alcohol yields a peak BrAC approximately 65 min after consumption, meaning all cognitive tasks in this study were completed during the ascending limb of the blood alcohol curve (Fillmore & Vogel-Sprott, 1998). The alcohol placebo consisted of lemonade only (identical in total volume to the alcoholic drink). To create the illusion that the placebo contained alcohol, vodka was smeared on the rim of the drinking glass and an atomiser used to spray vodka mist on the drink's surface. This allows the drink to smell and taste of vodka but there is not enough alcohol to produce a breathalyser reading above 0.0 g/210 L. The soft drink consisted of lemonade only, in the same total volume as the alcoholic and placebo drinks. The confederate always received lemonade.

Time Line Follow Back (TLFB; Sobell & Sobell, 1992): The TLFB self-report questionnaire assessed participants' weekly alcohol consumption. It contains information about the number of alcohol units in a range of drinks (e.g., a small glass of wine) and space for participants to indicate how many units they have consumed during each of the past seven days. The total number of units is then calculated.

The Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993): The AUDIT is a self-report questionnaire that assesses the degree to which people engage in hazardous or harmful drinking. It has 10 fixed-response questions. Scores on the AUDIT range from 0 to 40, with scores of eight or above-indicating hazardous or harmful alcohol use.

Subjective Intoxication Scales (SIS; Duka, Tasker, & Stephens, 1998): The SIS consists of six Likert scales which assess participants subjective feelings of being light headed, irritable, stimulated, alert, relaxed, and content. Each scale ranges from one (not at all) to five (extremely).

The to-be-remembered stimuli (Roediger et al., 2001): Six images of common household scenes were used as the to-be-remembered stimuli. These scenes depicted a toolbox, a bathroom, a kitchen, a bedroom, a closet, and a desk. Each contained an average of 23.8 items and excluded 2 scene-consistent items (e.g., a knife in the kitchen scene; see Roediger et al., 2001, for information on how these excluded items were selected).

The free recall tests: This study contained both a collaborative recall test and a post-collaborative individual recall test. Both were "pen and paper" tests. The former was completed on blank lined sheets of paper. The latter was completed on lined sheets of paper that had a scene name at the top (e.g., kitchen scene) and 30 lines beneath, allowing space for 30 items to be recalled. At the end of each line were the letters R and K, representing the words *remember* and *know*. Participants were asked to circle one of these for each item recalled. These additional measures were taken to examine participants' recollective experience when recalling items. R responses signify participants recollect something specific about the item (e.g., its colour or location) whereas K responses signify they remember the item was presented, but lack specific recollective details about it (see Gardiner, 1988; Rajaram, 1993, 2011; Tulving, 1983). In past research, participants typically make more K than R judgements to contagion and control lures and more R than K judgements towards studied items (e.g., Meade & Roediger, 2002; Roediger et al., 2001). In the current study, this pattern of results persisted and the drink consumed did not influence participants' recollective experience. For brevity, the R and K analyses are not reported but the associated descriptive statistics appear in Table 2 and the full data set can be obtained from the first author.

The 36-item source monitoring recognition test (Meade & Roediger, 2002): This test contained 18 previously studied items (three from each of the 6 scenes), 12 contagion/control lures (2 items associated with each of the 6 scenes), and 6 filler items. Next to each of the 36 items were the words "Scene Only", "Partner Only", "Scene and Partner", or "Neither Scene nor Partner". Participants circled one of these, indicating if the item had been presented in the studied scene, presented in the studied scene and recalled by the confederate during collaboration, only recalled by the confederate during collaboration, or neither presented in the scene nor recalled by the confederate during collaboration.

Partner perception questionnaire: This 5-item questionnaire asked participants to rate how accurate, trustworthy, honest, credible, and competent their partner (the confederate) seemed during the collaborative recall test. All ratings were made using 7-point Likert scales, ranging from 1 (not at all) to 7 (extremely).

Procedure

Testing took place between 12.00 p.m. and 6.00 p.m. in a laboratory at the second author's institution. Trials were conducted by three undergraduate students who had received extensive training from the second author with regard to alcohol administration and associated protocols (e.g., the procedures in place in case of any adverse effects). Several qualified first aiders were in the same building during these hours in case of any adverse effects from alcohol consumption (e.g., a participant becoming ill). Each session involved one participant and one confederate. Both were initially asked to confirm they met the criteria for participation (all did) and both signed a consent form agreeing to participate. The consent form informed participants that, if they consumed alcohol, they must agree to remain in the laboratory at the end of the study until their BrAC reading declined to 0.04 g/210 L (half the UK drink drive limit). They were then breathalysed. All participants provided a breathalyser reading of 0.0 g/210 L, indicating sobriety. Both were then weighed so the volume of alcohol to be administered could be calculated (if necessary).

Next, the confederate and participant took part in a rigged lottery draw to determine whether they would receive a soft drink or alcohol. The confederate was always selected to receive a soft drink and the participant was selected to receive either a soft drink (one-third of participants) or alcohol (two-thirds of participants, with half receiving an alcohol placebo). The confederate and participant then completed the TLFB and SIS and the experimenter simultaneously made the drinks in an adjoining room. Upon completing the TLFB and SIS, the participant and confederate were given 8 min to consume their drinks and 8 min to absorb them. During this 16-min period, both were given magazines to read. Afterwards, they completed another SIS and were breathalysed again. The breathalyser readings were hidden so participants in the placebo condition would not know they had received a soft drink and those in alcohol condition would not know how intoxicated they were.

The participant and confederate were next shown the six household scenes for 15 s each. They then completed the AUDIT, followed by the collaborative recall test. During the collaborative recall test, they both verbally recalled six items from each scene. The participant always responded first and the confederate second, taking turns to recall one item each at a time. The scenes were recalled in the same order in which they were studied and the researcher recorded all responses. Participants were instructed to be as accurate as possible and to avoid guessing. They were encouraged to say "pass" if they were unsure of an answer. For each scene, the participant and confederate were given six opportunities each to recall an item, even if they passed on a previous turn. During this test, the confederate recalled items that had appeared in the scenes (studied items) as well as items not in the scenes (contagion lures). Specifically, for three of the six scenes, the confederate recalled six items that had appeared. For the remaining three scenes, the confederate recalled four studied items and two contagion lures. The confederate always recalled the contagion lures on their fourth and sixth turn. The three scenes the confederate recalled contagion lures for were counterbalanced. This counterbalancing allowed the authors to assess how likely it is that participants would later spontaneously falsely recall these contagion lures (so these are the control lures). Social contagion would occur if the participants recalled more contagion lures than control lures. Throughout the collaborative recall test, the confederate followed a practiced script. The confederate learnt a list of alternative contagion lure responses for each scene in case the participants recalled one of these items (see Roediger et al., 2001).

After the collaborative recall, the participant and confederate sat at separate tables (facing away from each other) and completed post-collaborative individual free recall tests. Each scene was recalled in the order in which it was studied. Participants were given 2 min to recall as many items as they could per scene, circling R or K for each item recalled. Again, participants were asked to be as accurate as possible and not guess. Afterwards, both were asked to turn their recall booklets over so no responses were visible.

Next, the participant and confederate completed the 36-item source monitoring recognition test. They then completed the partner perception questionnaire. Finally, they completed a third SIS and were breathalysed again. Afterwards, the participants were told they had worked with a confederate and asked if they knew this. Those in the placebo condition were also asked if they were aware they had consumed a soft drink. None claimed awareness of either form of deception. The study then ended and debriefing occurred. The procedure lasted approximately 1 h 10 min. Participants who consumed alcohol were told how intoxicated they were, had the legal and safety implications of their state explained (e.g., they were too intoxicated to legally drive), and were reminded that they had agreed to remain in the laboratory until their BrAC reading declined to 0.04 g/210 L (half the UK drink drive limit). Those who wished to leave prior to this (28 of the 30) were asked to sign an alcohol release waiver form indicating they had been told the above information and that they would not the hold the university responsible for any adverse event upon leaving.

Results

Alcohol-related measures

Our initial analyses focus on the participants' historical drinking behaviours, the impact of alcohol consumption on their breathalyser scores, and their subjective feelings as measured by the SIS.

One way between-subjects Analysis of Variance (ANOVA) revealed participants in the alcohol, placebo, and soft drink conditions were matched in terms of their weekly drinking habits, assessed by the TLFB, $F(2,87) = .85$, $p = .43$, $\eta_p^2 = .02$, and the degree to which they engaged in hazardous or harmful drinking, assessed by the AUDIT, $F(2,87) = 1.35$, $p = .27$, $\eta_p^2 = .03$.

All participants were also breathalysed at the start of the study, after consuming their drink/an 8-min absorption period, and at the end of the study. As expected, only those who received alcohol had a BrAC above 0.00 g/210 L and this was only after consuming their drink/the absorption period (*M* BrAC = 0.29 g/210 L, *SD* = 0.10, Range = 0.10–0.52) and at the end of the study (*M* BrAC = 0.29 g/210 L, *SD* = 0.06, Range = 0.18–0.41).

3 × 3 mixed-subjects ANOVAs were conducted to examine whether participants in the three drink conditions differed in their subjective feelings of being light headed, irritable, stimulated, alert, relaxed, and content, as measured by the SIS at the start of the study, after consuming their drink/the absorption period, and at the end of the study. There were no significant main effects or interactions in relation to feeling irritable, alert, relaxed and content (all *p*s > .11). There were significant effects in relation to feeling light headed and stimulated (see Table 1 for the Means and SDs).

For light headedness, there were main effects of drink consumed, $F(2,87) = 72.67$, $p < .001$, $\eta_p^2 = .63$, and time point, $F(2,174) = 86.72$, $p < .001$, $\eta_p^2 = .50$. These were qualified by a significant interaction, $F(4,174) = 63.52$, $p < .001$, $\eta_p^2 = .59$. Simple effects analyses showed that, at the start of testing, participants in all three drink conditions reported similar levels of light headedness, $F(2,87) = 0.44$, $p = .64$, $\eta_p^2 = .01$. Differences emerged between the three groups after the drinking/absorption period, $F(2,87) = 92.25$, $p < .001$, $\eta_p^2 = .53$, and at the end of the study, $F(2,87) = 80.57$, $p < .001$, $\eta_p^2 = .65$, with *post hoc* LSD tests

Table 1. Mean self-reported feelings of being light headed and stimulated at the start of the study before having any drinks (time point 1), after consuming alcohol, an alcohol placebo, or soft drink (time point 2), and at the end of the study (time point 3). The Means range from 1 to 5, with higher scores indicating stronger feelings of being light headed and stimulated. Standard deviations are in parentheses.

	Light headed			Stimulated		
Time point	Alcohol	Placebo	Soft drink	Alcohol	Placebo	Soft drink
1	1.13 (0.43)	1.01 (0.36)	1.17 (0.46)	2.23 (0.94)	2.23 (0.85)	2.13 (0.86)
2	3.03 (0.85)	1.23 (0.43)	1.20 (0.41)	2.83 (0.79)	2.70 (1.05)	2.23 (1.04)
3	2.93 (0.78)	1.12 (0.52)	1.27 (0.52)	2.80 (0.84)	2.90 (0.88)	2.10 (0.99)

showing the alcohol group always felt more light headed than the placebo group and soft drink group (all *p*s $< .001$). Finally, the light headedness of participants who consumed alcohol varied across the three time periods, $F(2,87) = 228.70$, $p < .001$, $\eta_p^2 = .84$, with *post hoc* LSD tests showing they were least light headed at the start of the study but more light headed after consuming alcohol/the absorption period ($p < .001$) and at the end of the study ($p < .001$). No other effects were significant (all *p*s $> .09$).

For stimulation, there were main effects of drink consumed, $F(2,87) = 4.10$, $p = .02$, $\eta_p^2 = .08$, and time point, $F(2,174) = 9.14$, $p < .001$, $\eta_p^2 = .09$, and an interaction between the two, $F(4,174) = 2.58$, $p = .04$, $\eta_p^2 = .05$. Simple effects analyses showed that, at the start of testing, participants in all three conditions reported similar levels of stimulation, $F(2,87) = 0.18$, $p = .93$, $\eta_p^2 = .004$. Differences emerged between the three groups after the drinking/absorption period, $F(2,87) = 4.63$, $p = .01$, $\eta_p^2 = .10$, and at the end of the study, $F(2,87) = 6.87$, $p < .01$, $\eta_p^2 = .14$, with *post hoc* LSD tests showing that both the alcohol group and placebo group felt more stimulated than the no alcohol group (all *p*s $< .02$). Finally, self-reported stimulation varied across the three time periods for participants who consumed alcohol, $F(2,87) = 6.14$, $p < .01$, $\eta_p^2 = .13$, and the placebo, $F(2,87) = 6.23$, $p < .01$, $\eta_p^2 = .13$, with *post hoc* LSD tests revealing that, compared to the start of the study, they were most stimulated after consuming their drinks/the absorption period (both *p*s $< .01$) and at the end of the study (both *p*s $< .01$). No other effects were significant (all *p*s $> .25$).

In sum, participants across the three drink conditions were matched in terms of their recent drinking histories and habits, those who consumed alcohol were intoxicated throughout the study, and these same participants felt more light headed and stimulated as a result. The placebo group also felt more stimulated after their non-alcoholic drink, suggesting they believed they had consumed alcohol.

Social contagion

A 2×3 mixed-subjects ANOVA examined whether the number of contagion and control lures falsely recalled differed according to the drinks consumed (see Table 2 for the Mean proportions and SDs). As predicted, social contagion occurred, with more contagion lures falsely recalled than control lures, $F(1,87) = 106.76$, $p < .001$, $\eta_p^2 = .55$. The type of drink consumed did not impact upon overall false recall, $F(2,87) = 0.81$, $p = .83$, $\eta_p^2 = .004$. Contrary to expectations, there was no lure type × drink consumed interaction, $F(2,87) = 0.01$, $p = .99$, $\eta_p^2 = .001$.

Similar analyses were also run to examine whether the number of contagion and control lures falsely recognised differed according to the drinks consumed. False recognition refers to any contagion or control lure incorrectly classified as either "Scene Only" or "Scene and Partner", as both responses indicate participants believed these non-studied items appeared in a scene. The Mean proportions and SDs are in Table 3. Social contagion continued to be observed on this second memory test, with more contagion lures falsely recognised than control lures, $F(1,87) = 21.38$, $p < .001$, $\eta_p^2 = .20$. Again, there was no main effect of drink consumed, $F(2,87) = 0.99$, $p = .91$, $\eta_p^2 = .002$, and no lure type × drink consumed interaction, $F(2,87) = 0.32$, $p = .73$, $\eta_p^2 = .007$.

Combined, these findings demonstrate that social contagion occurred but that the drink consumed did not impact upon the extent to which it occurred during the post-collaborative free recall and recognition tests.

Veridical recollection

A one way between-subjects ANOVA compared the number of studied items correctly recalled in the three drink conditions. The Mean proportions and SDs are in Table 2. There was an overall effect observed, $F(2,87) = 11.64$, $p < .001$, $\eta_p^2 = .20$. *Post hoc* LSD tests revealed those who consumed alcohol recalled fewer studied items than those who consumed a placebo ($p < .01$) or soft drink ($p < .01$). Those who consumed the latter two drinks did not differ ($p = .19$).

Table 2. Mean proportion of contagion lures, control lures, and studied items recalled, and the remember (R) and know (K) responses to these, by participants who consumed alcohol, an alcohol placebo, or soft drink. Standard deviations are in parentheses.

Response type	Alcohol	Placebo	Soft drink
		Contagion lures	
Recall	.29 (.20)	.31 (.24)	.29 (.20)
R	.05 (.11)	.05 (.14)	.05 (.11)
K	.24 (.19)	.26 (.22)	.24 (.21)
		Control lures	
Recall	.06 (.10)	.08 (.11)	.06 (.10)
R	.02 (.06)	.01 (.04)	.03 (.06)
K	.04 (.08)	.07 (.11)	.03 (.07)
		Studied items	
Recall	.19 (.07)	.27 (.05)	.24 (.07)
R	.14 (.06)	.20 (.06)	.18 (.07)
K	.05 (.03)	.07 (.04)	.06 (.04)

Table 3. Mean proportion of contagion and control lures incorrectly recognised as studied items (Scene Only + Scene and Partner responses), attributed to the confederate (Partner Only responses), or correctly classed as never studied (Neither Scene nor Partner responses), separated according to the type of drink participants consumed (alcohol, an alcohol placebo, or a soft drink). Standard deviations are in parentheses.

Source of items	Contagion lures			Control lures		
	Alcohol	Placebo	Soft drink	Alcohol	Placebo	Soft drink
Scene Only	.11 (.14)	.18 (.15)	.14 (.13)	.10 (.13)	.15 (.16)	.12 (.15)
Scene and Partner	.26 (.13)	.17 (.14)	.20 (.21)	.08 (.14)	.07 (.11)	.07 (.10)
Total Incorrect Recognition	**.37 (.28)**	**.34 (.24)**	**.34 (.23)**	**.18 (.19)**	**.22 (.16)**	**.19 (.17)**
Partner Only	.38 (.23)	.47 (.24)	.42 (.21)	.05 (.10)	.08 (.15)	.11 (.09)
Neither Scene nor Partner	.24 (.16)	.19 (.17)	.23 (.17)	.77 (.21)	.70 (.25)	.70 (.17)

Similar analyses also examined whether the drink consumed impacted upon veridical recognition. Veridical recognition was defined as the number of studied items correctly attributed to the scenes (so "Scene Only" and "Scene and Partner" responses combined). There was an overall of effect of drink consumed on correct recognition, $F(2,87) = 7.82$, $p < .05$, $\eta_p^2 = .15$. *Post hoc* LSD analyses revealed fewer studied items were correctly recognised by those who consumed alcohol ($M = .44$, $SD = .15$) than those who consumed a placebo ($M = .59$, $SD = .15$, $p < .01$) or those who consumed a soft drink ($M = .58$, $SD = .18$, $p < .01$). There was no significant difference between these latter two groups ($p = .91$).

Combined, these two findings show that consuming alcohol impaired veridical recall and recognition.

Partner perception questionnaire

Finally, a Multivariate Analysis of Variance examined whether participants who consumed alcohol, a placebo, or a soft drink differed in how they perceived the confederate in terms of accuracy, trustworthiness, honesty, credibility, and competence during the collaborative recall test. The Mean scores and SDs can be seen in Table 4. Participants' mean ratings were above five for all measures, suggesting the confederate was perceived as quite accurate, trustworthy, honest, credible, and competent. As expected, the drink participants consumed did not impact upon how they perceived the confederate, $F(10, 166) = 1.54$, $p = .13$, Wilks' Lambda = .84, $\eta_p^2 = .09$.

Discussion

To summarise Study 1's principal findings, participants who consumed alcohol, an alcohol placebo, or a soft drink all engaged in social contagion by falsely recalling and falsely recognising more contagion lures than control lures. The drink consumed, however, had no impact upon the degree of social contagion they engaged in. It also had no impact upon how they perceived the confederate in terms of accuracy, trustworthiness, honesty, credibility, and competence during the collaborative recall test. Consuming alcohol, relative to consuming an alcohol placebo or soft drink, did harm veridical recall and recognition.

Table 4. Mean participant ratings of the confederate's accuracy, trustworthiness, honesty, credibility, and competence after the participant consumed alcohol, an alcohol placebo, or a soft drink. Each trait was scored on a scale of 1–7 (1 = not at all; 7 = extremely). Standard deviations are in parentheses.

Trait	Drink type		
	Alcohol	Placebo	Soft drink
Accuracy	5.37 (0.61)	5.63 (.093)	5.80 (0.71)
Trustworthiness	5.03 (0.96)	5.50 (1.09)	5.40 (1.04)
Honesty	6.30 (1.08)	6.07 (1.31)	5.93 (1.08)
Credibility	6.03 (1.16)	5.87 (1.45)	5.73 (0.91)
Competence	5.70 (1.26)	6.10 (0.99)	5.67 (1.27)

Study 2: Others' alcohol intoxication and social contagion

Method

Participants

Seventy participants (57 females, 13 males) aged 18–48 ($M = 20.11$, $SD = 4.22$) were recruited from the second author's university via intranet advertisements. The inclusion and exclusion criteria matched Study 1. There were three 21-year-old female confederates who were unacquainted with the participants. The study received institutional ethical approval.

Design, stimuli, and procedure

Study 2 had a 2 × 2 mixed-subjects design. Exposure to misinformation during a collaborative recall test was manipulated within-subjects (contagion lures, control lures), with the drink the confederate seemingly consumed manipulated between-subjects (alcohol, soft drink). Participants were randomly allocated to each between-subjects condition.

Study 2 used same materials and procedure as Study 1, with one exception. When the participant and confederate completed the rigged lottery task at the start of testing, the participant was always selected to receive a soft drink and the confederate was selected to receive a soft drink or alcohol. In this latter condition, participants were told the confederate's drink contained vodka and lemonade. To emphasise, no alcohol was ever administered: the confederate always received lemonade only. In both drink conditions, the confederate behaved identically to Study 1. As in Study 1, participants made R and K judgements to each item recalled. Consistent with that study, they made more K than R judgements to contagion and control lures and more R than K judgements towards studied items (see also Meade & Roediger, 2002; Roediger et al., 2001). The type of drink the confederate seemingly consumed did not change participants' recollective experience. For brevity, the R and K analyses are not reported but the associated descriptive statistics appear in Table 5 and the full data set can be obtained from the first author.

Results

Alcohol-related measures

The alcohol-related measures taken in Study 1 were also taken in Study 2 to keep the two procedures similar and to perpetuate the belief that alcohol may be administered. Analysis of these measures, using between-subjects *t*-tests, showed that participants in both drink conditions were matched in terms of their recent drinking histories, assessed via the TLFB, and the degree to which they engaged in hazardous or harmful drinking, assessed via the AUDIT (both $ps > .18$). The breathalyser scores revealed all participants had a BrAC of 0.00 g/210 L throughout testing. A series of 2×3 mixed-subjects ANOVA's showed participants in both drink conditions were consistent in how light headed, irritable, stimulated, alert, relaxed, and content they felt, as assessed via the SIS, throughout the study (all $ps > .23$).

Social contagion

A 2×2 mixed-subjects ANOVA examined whether the number of contagion and control lures participants falsely recalled differed according to the drink the confederate seemingly consumed. The Mean proportions and associated SDs are in Table 5. As predicted, social contagion occurred, with more contagion lures falsely recalled than control lures, $F(1,68) = 49.72$, $p < .001$, $\eta_p^2 = .42$. There was also a main effect of drink condition, with more lures falsely recalled when the confederate was presumed to have consumed a soft drink compared to alcohol, $F(1,68) = 4.75$, $p = .03$, $\eta_p^2 = .06$. There was also a lure type × drink interaction, $F(1,68) = 6.11$, $p = .02$, $\eta_p^2 = .08$. Simple effects analyses showed that more contagion lures were recalled than control lures when the confederate was believed to have consumed alcohol, $F(1,68) = 10.49$, $p < .01$, $\eta_p^2 = .13$, and when she was believed to have consumed a soft drink, $F(1,68) = 45.34$, $p < .001$, $\eta_p^2 = .40$. These two findings confirm that social contagion occurred in both drink conditions. Contrary to the anticipated null effects, it was also found that participants falsely recalled fewer contagion lures after working with the confederate who seemingly consumed alcohol than with the confederate who seemingly consumed a soft drink, $F(1,68) = 7.43$, $p < .01$, $\eta_p^2 = .10$. The type of drink the confederate seemingly consumed had no impact upon the number of control lures recalled, $F(1,68) = 0.10$, $p = .75$, $\eta_p^2 = .01$.

Similar analyses were also conducted to examine whether the number of contagion and control lures falsely recognised differed according to the drink the confederate seemingly consumed. Table 6 presents the Mean proportions and associated SDs. As predicted, social contagion occurred, with more contagion lures falsely recognised than control lures, $F(1,68) = 21.45$, $p < .001$, $\eta_p^2 = .24$. There was no overall effect of drink condition on false recognition, $F(1,68) = 2.96$, $p = .09$, $\eta_p^2 = .04$. There was a lure type × drink condition interaction, $F(1,68) = 4.55$, $p = .04$, $\eta_p^2 = .06$. Simple effects analyses revealed that participants who believed the confederate consumed alcohol recognised an equivalent number of contagion and control lures, $F(1,68) = 3.12$, $p = .08$, $\eta_p^2 = .04$. Conversely, participants who believed the confederate consumed a soft drink recognised more contagion lures than control lures, $F(1,68) = 22.89$, $p < .001$, $\eta_p^2 = .25$. Moreover, participants who believed the confederate consumed a soft drink recognised more contagion lures than those who believed the confederate drank alcohol, $F(1,68) = 4.77$, $p = .03$, $\eta_p^2 = .07$. Both groups, however, recognised a similar number of control lures, $F(1,68) = 0.08$, $p = .77$, $\eta_p^2 = .001$.

Combined, the above demonstrate that believing a confederate consumed alcohol reduced social contagion on a free recall test and eliminated it on a recognition test.

Table 5. Mean proportion of contagion lures, control lures, and studied items recalled, and the remember (R) or know (K) responses to these items, by participants who worked with a confederate whom they believed had consumed alcohol or a soft drink. Standard deviations are in parentheses.

Response type	Alcohol	Soft drink
	Contagion	
Recall	.21 (.17)	.33 (.20)
R	.03 (.07)	.06 (.11)
K	.17 (.16)	.27 (.21)
	Control	
Recall	.10 (.12)	.11 (.13)
R	.03 (.07)	.03 (.08)
K	.07 (.10)	.08 (.12)
	Studied	
Recall	.26 (.05)	.26 (.06)
R	.20 (.06)	.19 (.06)
K	.06 (.03)	.07 (.04)

Table 6. Mean proportion of contagion and control lures incorrectly recognised as studied items (Scene Only + Scene and Partner responses), attributed to the confederate (Partner Only responses), or correctly classed as never studied (Neither Scene nor Partner responses), separated according to the type of drink the confederate was believed to have consumed prior to a collaborative recall test. Standard Deviations are in parentheses.

Source of items	Contagion lures		Control lures	
	Alcohol	Soft drink	Alcohol	Soft drink
Scene Only	.10 (.31)	.09 (.10)	.15 (.12)	.15 (.15)
Scene and Partner	.21 (.20)	.37 (.30)	.06 (.09)	.05 (.09)
Total Incorrect Recognition	**.31 (.24)**	**.45 (.32)**	**.21 (.15)**	**.20 (.15)**
Partner Only	.47 (.31)	.39 (.27)	.06 (.09)	.10 (.14)
Neither Scene Nor Partner	.19 (.22)	.16 (.20)	.73 (.17)	.70 (.19)

Veridical recollection

A between-subjects *t*-test examined whether the type of drink the confederate seemingly consumed influenced participants' veridical recall. The Means and associated

Table 7. Mean participant ratings of the confederate's accuracy, trustworthiness, honesty, credibility, and competence during a collaborative memory task when they believed the confederate had consumed alcohol or a soft drink. Each trait was scored on a scale of 1–7 (1 = not at all; 7 = extremely). Standard deviations are in parentheses.

Trait	Drink type	
	Alcohol	Soft drink
Accuracy*	5.20 (0.87)	5.71 (0.67)
Trustworthiness*	4.88 (1.05)	5.51 (0.89)
Honesty	5.69 (1.13)	6.00 (0.94)
Credibility*	5.34 (0.76)	5.94 (0.84)
Competence	5.54 (1.17)	5.77 (1.19)

Note: Traits denoted with an asterisk show between-group differences that were statistically significant ($p < .01$).

SDs are in Table 5. Overall, participants recalled a similar number of studied items regardless of whether they had collaborated with a confederate who had seemingly consumed alcohol or a soft drink, $t(68) = 0.28$, $p = .78$, $d = 0.07$. A similar analysis also found participants correctly recognised an equivalent number of studied words, regardless of the drink the confederate seemingly consumed (alcohol $M = .55$, $SD = .16$; soft drink $M = .58$, $SD = .16$), $t(68) = 0.89$, $p = .38$, $d = 0.19$.

Partner perception questionnaire

Finally, five between-subjects *t*-tests examined whether there was a difference in how accurate, trustworthy, honest, credible, and competent the confederate was perceived to be during the collaborative recall test after seemingly consuming a soft drink or alcohol. The Means scores and associated SDs are in Table 7. Participants Mean ratings were above the midpoint on all measures, suggesting the confederate was perceived quite favourably. Between-subjects *t*-tests revealed the confederate who seemingly consumed alcohol was rated as lower in accuracy, $t(68) = 2.78$, $p < .01$, $d = 0.66$, trustworthiness, $t(68) = 2.70$, $p < .01$, $d = 0.64$, and credibility, $t(68) = 3.13$, $p < .01$, $d = 0.74$. The type of drink seemingly consumed did not influence ratings of honesty, $t(68) = 1.26$, $p = .21$, $d = 0.30$, and competence, $t(68) = 0.81$, $p = .42$, $d = 0.19$.

Discussion

To summarise Study 2's principal findings, participants engaged in social contagion with an erroneous confederate they believed had consumed a soft drink. Participants were, however, less likely to engage in social contagion with a confederate whom they believed consumed alcohol, with the effect being reduced on a recall test and eliminated on a recognition test. Interestingly, the confederate who seemingly consumed alcohol was rated lower in terms of accuracy, trustworthiness, and credibility during the collaborative recall test. The type of drink the confederate seemingly consumed had no impact upon participants' veridical recall and recognition.

General discussion

Two studies were conducted examining the impact of alcohol consumption on social contagion. Study 1 examined whether the type of drink a participant consumes (alcohol, an alcohol placebo, or soft drink) prior to a collaborative remembering test with an erroneous confederate (who has consumed a soft drink) influences the extent to which they later engage in social contagion. Study 2 examined whether the type of drink an erroneous confederate seemingly consumes (alcohol or soft drink) prior to a collaborative remembering test influences the extent to which a participant (who has consumed a soft drink) later engages in social contagion.

Social contagion

Social contagion was evident in the "soft drink" control conditions in both studies when participants completed post-collaborative free recall and recognition tests. In other words, participants recollected more contagion lures (i.e., items falsely recalled by the confederate during collaboration) than control lures (i.e., items not falsely recalled by the confederate during collaboration). This is unsurprising as our collaborative recall test reliably induces social contagion (e.g., Meade & Roediger, 2002; Roediger et al., 2001).

Own alcohol consumption, social contagion, and veridical recollection

Participants who consumed alcohol were equally intoxicated during encoding and retrieval, with a Mean BrAC of 0.29 g/210 L. In simpler terms, their intoxication levels put them 3.625 times over the current UK/USA drink drive limit. Consuming alcohol, relative to a soft drink, had no impact upon social contagion. In a conceptually similar study, Schreiber Compo et al. (2012) also found participants, who were less intoxicated than ours (*M* BrAC = .08 g/210 L), were no more likely than sober controls to include misinformation in their recall of a crime. Combined, these null effects suggest alcohol consumption may not make people more susceptible to having their recollection of events tainted by misinformation. We did, however, initially predict that consuming alcohol would increase social contagion. The reasons why this did not occur are considered at the end of this sub-section.

Participants who consumed an alcohol placebo reported feeling more stimulated than those who consumed a soft drink, suggesting they believed they had consumed alcohol. Despite this, the two groups did not differ in the extent to which they engaged in social contagion. Combined, our first two findings suggest neither the physiological effects of consuming alcohol, nor the expectancy effects that could arise from consuming an alcohol placebo, impact upon social contagion (see Testa et al., 2006, for more on expectancy effects). Schreiber Compo et al. (2012) also found that participants who consumed a placebo in their study felt intoxicated but were no more likely than controls to include misinformation in their recall of a crime. Thus, once again, these two conceptually similar studies have comparable findings. Contrary to this, Assefi and Garry (2003) claimed that consuming an alcohol placebo, relative to a soft drink, made their participants more likely to include misinformation in their recollection of a crime. Assefi and Garry did not include any inferential statistics to support this claim and instead referred readers to a bar chart showing this trend. They did report a significant interaction effect ($p = .04$) for a statistical test where the comparison between the placebo group and soft drink group (in terms of their responses to misinformation questions) would have been one of the simple effects but it is unclear if this analysis was conducted/if they adjusted alpha accordingly/if any test was statistically significant/what the effect size was. Given this ambiguity, a replication of their study is recommended to clarify whether consuming an alcohol placebo, using their procedures, can impact upon susceptibility to misinformation.

Consuming alcohol, relative to a soft drink, impaired veridical recall and recognition. These impairments are unsurprising as the intoxication levels observed in our study would be expected to harm veridical recollection (see Bisby et al., 2010; Lee et al., 2009; Perry et al., 2006; Ray & Bates, 2006; Van Oorsouw et al., 2015; Wetherill & Fromme, 2011; White, 2003). Consuming an alcohol placebo, relative to soft drink, had no impact on veridical recollection. This is also unsurprising as alcohol placebos typically have no such effect (e.g., Assefi & Garry, 2003; Crossland et al., 2016; Schreiber Compo et al., 2011, 2012; Yuille & Tollestrup, 1990).

As mentioned, we initially predicted that consuming alcohol would increase social contagion. That finding would have been consistent with the *discrepancy-detection principle*, which suggests people's recollection of an event is most susceptible to distortion by misinformation when their memory of the event is degraded as it is more difficult for them to detect discrepancies between actual event details and suggested event details (Schooler & Loftus, 1986; Tousignant et al., 1986). Consistent with this, Van Oorsouw et al. (2015) found being highly intoxicated (BrACs > 0.11 g/210 L), relative to being moderately intoxicated or sober (BrACs < .11 g/210 L), harmed participants veridical recall of an event and made them more inclined to answer misleading questions about it with implied incorrect answers. Moreover, van Oorsouw et al. found the degree to which intoxicated people acquiesced when answering misleading questions was mediated by the completeness of their veridical recall. As consuming alcohol decreased veridical recollection in our study, it should have, according to the *discrepancy-detection principle*, increased social contagion. It did not.

Why did the *discrepancy-detection principle* correctly predict performance in Van Oorsouw et al.'s (2015) study but not ours? We can only speculate, but it is possible that this principle was an inappropriate explanation for their effects (and it was also inappropriate to expect similar effects here). Thus, whilst consuming alcohol impaired veridical recollection in both studies, this impairment may not have directly impacted upon the degree to which participants acquiesced when answering misleading questions in their study or the degree to which they engaged in social contagion in ours. Instead, there were methodological differences in both studies that may have contributed towards their divergent findings. To briefly recap, van Oorsouw et al.'s participants were asked misleading questions during an interview and these questions explicitly directed them towards an incorrect answer (e.g., they were asked "*Did the wallet contain 50 or 100 euros?*" when in fact it contained 70 euros). Their participants would have felt normative pressure to provide one of the incorrect implied answers. In our study, participants were exposed to misinformation and then completed private memory tests that did not explicitly direct them towards including the misinformation in their responses. It is therefore unlikely our participants experienced any normative pressure to report the misinformation. If higher levels of intoxication (BrACs > 0.11 g/210 L) increase the likelihood of people succumbing to normative pressures, this would explain these divergent misinformation effects. We acknowledge this suggestion is speculative but it highlights how differences in the way misinformation is introduced in a study could potentially impact upon the effects observed. Future research on this issue is recommended.

Partner alcohol consumption and social contagion

Social contagion was less likely when participants encountered misinformation from a confederate who seemingly consumed alcohol, compared to a soft drink. The confederate who was believed to have consumed alcohol was also rated lower in terms of accuracy, trustworthiness, and credibility, even though alcohol was never consumed/the confederate acted similarly regardless of the drink seemingly consumed. These lower ratings likely meant participants doubted the veracity of the confederate's misinformation and therefore failed to include it in their free recall and recognition test responses. Consistent with this suggestion, previous research has shown that people are less likely to incorporate misinformation in their recollection of events when the person supplying the misinformation lacks credibility, competence, and/or trustworthiness (Andrews & Rapp, 2014; Ceci et al., 1987; Dodd & Bradshaw, 1980; Echterhoff et al., 2005; French et al., 2011; Kwong See et al., 2001; Skagerberg & Wright, 2009; Smith & Ellsworth, 1987; Thorley, 2015; Underwood & Pezdek, 1998; Vornik et al., 2003).

Contrary to our findings, Zajac et al. (2016) found that the type of drink a confederate seemingly consumed (alcohol, soft drink) had no overall effect on social contagion. Zajac et al. acknowledged that their failure to find a significant reduction in social contagion when the confederate seemingly consumed alcohol may have been "due to inadequate statistical power" (p. 137). Our findings do not contradict that suggestion. Zajac et al. did, however, find a marginally significant reduction ($p = .09$) in social contagion when the confederate seemingly consumed alcohol, but only when participants provided a pre-misinformation response that was inconsistent with the confederate's misinformation. No pre-misinformation responses could be obtained using our procedure, so we could not check for a similar effect. Zajac et al. also found that participants rated the seemingly intoxicated confederate as being less able than themselves to accurately complete the experimental tasks. This therefore provides additional evidence that people are less likely to incorporate misinformation into their recollection of events when they doubt the veracity of its source.

In Study 2, working with a confederate who had seemingly consumed alcohol, relative to a soft drink, had no impact upon participants' subsequent veridical recall and recognition of studied items. This is unsurprising as the confederate did not attempt to influence participants' recognition of these items.

Limitations and future directions

Whilst this research provides a valuable first step in understanding the impact of alcohol consumption on social contagion, both studies had limitations that must be borne in mind. First, both had acceptable power for detecting medium-to-large effects, but lacked sufficient Power to detect small effects. Critically, we cannot rule out the possibility that alcohol had no significant effect on social contagion in Study 1 due to a lack of statistical Power. In that study, the sample size of 90 participants was sufficient to obtain Power above .80 in our social contagion ANOVA analysis, but only if we anticipated a large effect and alpha was set at .05 (estimated using G*Power 3; Faul, Erdfelder, Lang, & Buchner, 2007). If a small effect was anticipated, and alpha was set at .05, then 726 participants would have been required to obtain Power above .80. Despite this, both studies found evidence of social contagion and alcohol consumption did influence recollection, so effects were detectable. Further studies with larger sample sizes are, however, needed to check the reliability of our findings.

Second, in Study 1, participants were intoxicated throughout testing (so prior to encoding the to-be-remembered information, when encountering the misinformation, and at retrieval). It is known that the stage at which people become intoxicated can influence how they respond to misinformation. For example, Gawrylowicz, Ridley, Albery, Barnoth, and Young (2017) found that providing participants with alcohol *after* encoding to-be-remembered information, but prior to encountering misinformation, reduces the likelihood of misinformation tainting their recollection. This is believed to occur as intoxication inhibits the formation of newer memories, meaning the new misinformation is forgotten and cannot contaminate existing memories (see also Santtila, Ekholm, & Niemi, 1999). It remains to be determined whether the stage at which participants become intoxicated can impact upon the extent to which they engage in social contagion. It is possible that if participants encoded an event sober, became intoxicated, and then encountered misinformation from another person whilst intoxicated, that they would fail to encode this misinformation and social contagion would not occur. Future research exploring this issue would be beneficial.

Conclusion

The present studies were the first to examine the impact of own and other's alcohol consumption on social contagion. Study 1 found that consuming alcohol, or an alcohol placebo, relative to a soft drink had no impact upon the extent to which participants engaged in social contagion with a sober, but erroneous, confederate. Consuming alcohol did, however, impair their veridical recollection. Study 2 found that sober participants were less likely to engage in social contagion with a confederate they believed had consumed alcohol, relative to a confederate who they believed consumed a soft drink. In that same study, the confederate who seemingly consumed alcohol was viewed as less accurate, trustworthy, and credible, which likely made participants less inclined to engage in social contagion with that confederate. The drink the confederate seemingly consumed had no impact upon participants' veridical recollection. Further research replicating and extending these findings would be welcome as investigations in this area may offer an insight into how susceptible people are to social contagion in everyday contexts where error-laden collaborative remembering can occur and one or more group members has consumed alcohol (e.g., two eyewitnesses incorrectly recalling a barroom incident together that occurred whilst one or both were intoxicated).

Notes

1. Social contagion is sometimes referred to as memory conformity (Wright, Self, & Justice, 2000). The term memory conformity is, however, more general as it encapsulates instances where group members' recollection can be shaped by other's errors and/or each other's veridical recollection (see Roediger, 2010, for a fuller discussion).
2. As mentioned, Zajac et al. (2016) did find a non-significant reduction in social contagion when participants worked with a confederate who had seemingly consumed alcohol, but only when participants' pre-misinformation response was discrepant with the confederate's misinformation. Our Study 2 (which we commenced prior to the publication of Zajac et al.) does not permit participants to provide pre-misinformation responses, so we cannot check for a similar trend.

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