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The Impact Of Social Anxiety On Co-Witness Suggestibility

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THE IMPACT OF SOCIAL ANXIETY ON CO-WITNESS SUGGESTIBILITY

by

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This thesis, submitted by Susan Schober in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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                Susan Schober
                April 16, 2021

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Abstract

Misleading post-event information, especially presented through co-witness discussion, has consistently shown to be a powerful way to alter a witness's memory for an event. Less is known about how misleading co-witness information affects those with specific individual difference traits, however. The current study analyzed the impact of social anxiety on susceptibility to co-witness misinformation and memory conformity (i.e., co-witness suggestibility). Participants viewed a short film of a simulated home robbery and some discussed the film with a confederate posing as a co-witness. During the discussion, the confederate introduced either accurate or misleading information about events in the film. After the discussion, the participant-confederate pairs wrote a collaborative police report, and an individual recall test followed. Participants receiving accurate PEI had higher correct recall both collaboratively and individually, while participants receiving misleading PEI had higher misleading item recall both collaboratively and individually. In this preliminary sample, social anxiety did not predict differences in correct or misleading item recall (both collaboratively and individually), suggesting that social anxiety may not increase a person's vulnerability to co-witness suggestibility.

The Impact of Social Anxiety on Co-Witness Suggestibility

Eyewitness Memory and the Misinformation Effect

Eyewitness memory can be subject to contamination in a variety of ways because human memory is so malleable. When individuals attempt to recall specific details of an event, contamination can create a memory for the event that is misleading or incorrect. Exposure to post-event information is one of the more widely studied ways in which memory contamination can occur. The effects of post-event information become even more damaging when the information encountered is incorrect (i.e., misinformation). According to Loftus (2005), the misinformation effect is defined as an impairment in memory that arises after there is exposure to misleading post-event information.

The misinformation effect has been included in a considerable amount of eyewitness memory research. Many of the studies that have analyzed the misinformation effect have used a standard three-stage procedure where participants experience a complex event, receive additional information (true or false) about that event, and are then prompted to recall information during a memory test for the event. There is consistency in the research findings that misinformation often ends up being incorporated into the witness' memory of the event. This misinformation can lead individuals to believe that they saw things even if they were never there. Or believe they saw things differently from the way they really were (Loftus, 1992). For example, one of the classic demonstrations of the misinformation effect involves participants viewing a simulated car accident that includes a stop sign. After being given misinformation about a yield sign, individuals often reported seeing a yield sign instead of the stop sign that was present in the simulation (Loftus, 2005).

Researchers have also studied how misinformation potentially impacts eyewitness memory for simulated crimes. For example, after watching a simulation where a victim clearly becomes injured on a specific part of their body (i.e., on their arm), misinformation typically influences participants to recall the injury as being somewhere else on the body (i.e., on a leg) (Loftus, 2005). Additionally, Takarangi et al. (2006) showed participants a short movie about a tradesman snooping around an unoccupied home. The tradesman dug through personal items in the home, ate food, and stole various items. Participants also read a narrative about the film that included misinformation about critical items. Participants were then given a recognition test where they had to answer statements about items or events from the movie. Results indicated that participants were more accurate about the control items than the misled items and were also more confident about the accuracy of misled items. Overall, this suggests observing an event and being exposed to misinformation can distort a witness' memory. These findings hold important implications for the criminal justice system because eyewitnesses are quite regularly exposed to post-event information and their memories for events are malleable.

The Impact of Co-Witness Information

There are different ways individuals can be exposed to misleading post-event information, including through leading questions or suggestive techniques used by interrogators in the criminal justice system (Loftus, 2005) or through media coverage of an event. Even more common is the transfer of misinformation through a co-witness. This can take place when individuals discuss the events of a crime they have witnessed together. One might also overhear another witness share their memory of an event. Or this can occur through a third party, such as a police officer, disclosing information or sharing statements from another co-witness. While this discussion between witnesses of a crime can sometimes have a positive impact, it is more likely

that it could lead to the transfer of misinformation (Paterson et al., 2009). Thus, legal procedures have been constructed based on the fact that dangers can arise when witnesses discuss the event with one another (Paterson & Kemp, 2005).

Research has also compared how various sources of co-witness information differently impact a witness' memory for an event. For instance, Shaw et al. (1997) focused on the effects of co-witness information and suggestive questioning on the accuracy of eyewitness memory reports. One experiment illustrated the experience of a witness receiving information about the event from an interviewer or documentation of what other witnesses have already declared. Two additional experiments simulated a situation where a witness received information directly from a co-witness. Across all three experiments, participants were significantly more likely to give incorrect responses when they were given incorrect information about a co-witness' response. Thus, the effects of co-witness misinformation were much larger than those of suggestive questioning.

Further, Gabbert et al. (2004) had both young (17-33) and old (58-80) participants view a simulated crime and then exposed them to misinformation in one of two ways: during a discussion about the event with a confederate or embedded within a written narrative about the event that the participants were asked to read. After encountering misinformation, the participants were less accurate than the controls who had not been introduced to misinformation. An important finding for both the young and older adult groups was that misinformation encountered socially (via a confederate) led to more errors than the information from a non-social source (the written narrative).

Similarly, Paterson and Kemp (2006) compared how the different means of encountering post-event information impacted memory for a witnessed event. After watching a simulated

robbery, participants were exposed to both correct and incorrect post-event information. The misinformation was introduced to the participants through either leading questions, a media report, indirect co-witness information (a narrative summary given by a hypothetical co-witness), or co-witness discussion using a confederate. One week later, the individuals were tested on their memory of the video. The results clearly showed that co-witness information had the largest influence on eyewitness memory, as the participants were much more likely to recall the misleading post-event information that came from both the co-witness narrative and the co-witness discussion.

Misleading post-event information that comes from a co-witness can also inflate participants' confidence in their memory accuracy. For example, participants in co-witness information conditions reported higher levels of confidence in incorrect responses that were based on misleading post-event information (Paterson & Kemp, 2006). Similarly, Goodwin et al. (2017) found that participants exhibited what is referred to as a "confidence conformity effect." This means that participants' confidence in their own memories mimicked the confidence of their co-witnesses. For example, when a misleading co-witness was highly confident, participants reported having higher levels of confidence in their recall of misleading information. Taken together, these increased confidence levels suggest participants may be more likely to endorse and believe misleading post-event information to be true.

Preventing discussion between witnesses is extremely difficult and at the same time extremely important. Eyewitness testimonies are meant to be treated as independent observations, and despite efforts aimed at keeping testimonies independent, research shows that co-witnesses often do talk to each other about the event (Paterson et al., 2009). Specifically, 88% of the real eyewitnesses at a UK identification suite reported having at least one co-witness

present at the time of the criminal event. Stemming from that, 58% of those who were part of a multi-witness event reported discussing the crime with their co-witness (Skagerberg & Wright, 2007). Furthermore, Paterson and Kemp (2006) found an even larger percentage of co-witnesses that discussed details with one another. They discovered that 86% discussed details of events with their co-witness. Overall, co-witness discussion is problematic because it is very likely that the discussion may lead to memory conformity and confabulated eyewitness accounts (Skagerberg & Wright, 2007). Therefore, there is a need for continued research on the effects of co-witness information on memory.

Memory Conformity

As previously mentioned, participants will often report misleading information when it is made available through co-witness discussion and in some cases, memory reports change after exposure to co-witness information. This effect is known as "memory conformity." For example, some researchers have had participant pairs unknowingly watch different versions of a simulated crime and then complete an initial memory task. Initial memories are typically very accurate, but once participants discuss the simulated crime with their partners, most pairs demonstrate memory conformity by mistakenly recalling information presented by their partner (who saw a different version of the film) during the co-witness discussion (Wright et al., 2000; Gabbert et al., 2003).

Wright et al. (2009) discussed three common reasons individuals may report misinformation given by a co-witness. First, they might not want to disagree with the other person, which is termed normative influence. This is when the individual will compare the cost of disagreeing to the cost of being wrong. When social cost tends to be high, the individual will be more likely to knowingly report errant information. Second, the individual may have beliefs

that the other person is right. This can be described as informational influence. Individuals will oftentimes weigh the relative likelihood of the other person being correct versus oneself being correct. Different factors such as the other person having a better view (being in a better place to encode the event), having a better memory, or appearing to have more confidence, can lead someone to believe that the other individual's memory is more accurate. The third reason is that the individual may have constructed a memory based on what the other person said, which can be termed memory distortion. Memory distortion occurs when there is information suggested by another person that becomes a part of an episodic memory. Individuals might recall seeing information that they only heard about from another eyewitness. Given these points, there is an understanding that factors such as confidence, perceived expertise, and the overall social cost of disagreeing with people play a role in memory conformity. The present study seeks to determine whether social anxiety leads to more memory conformity in participants exposed to co-witness information.

Individual Differences in Co-Witness Suggestibility

To date, there is significantly less research focusing on the interpersonal correlates of co-witness suggestibility—or an individual's vulnerability to co-witness influence. More exploration is needed to determine which individual differences might place a person at risk of memory conformity when co-witness misinformation has been shared. According to Loftus (2005), misinformation affects some people more than others. For example, age may play an important role. When compared to older children and adults, younger children and the elderly are much more susceptible to misinformation. Loftus (2005) also shares that personality variables such as empathy, absorption, and self-monitoring have been shown to have a relationship with greater susceptibility to misinformation.

Additionally, Doughty et al. (2017) found relationships between the Big 5 personality traits and memory conformity. Participants watched a simulated crime and then discussed the film with a co-witness that contributed misinformation about the event throughout the discussion. After discussing the film with the co-witness, the participants took a film recall test individually. The results indicated that individuals with low scores on openness, extraversion, and neuroticism were more likely to report post-event misinformation. Further, Mojtahedi et al. (2017) exposed participants to post-event misinformation about a simulated crime through a co-witness discussion, and then statements about the crime were taken from participants. Participants also completed the Fundamental Interpersonal Relations Orientation-Behavior assessment (FIRO-B; Schutz, 1958), which looks at measures of expressed and wanted control, affection, and inclusion. The wanted control dimension of the FIRO-B was an accurate predictor of co-witness suggestibility, such that high scores increased the likelihood of accepting co-witness misinformation. Further, interrogative suggestibility (i.e., increased vulnerability to misleading interviews) may provide insights into factors that are related to greater co-witness suggestibility. In particular, eyewitnesses with a high external locus of control, low memory efficacy, and high levels of neuroticism were found to be more vulnerable to interrogative suggestibility (Liebman et al., 2002). We may expect to find these same factors related to greater co-witness suggestibility as well, as comparative research suggests interrogative suggestibility may be comorbid with co-witness suggestibility (Thorley, 2013).

Understanding individual differences in susceptibility to misinformation is exceedingly important, especially in a legal context. For example, being able to identify a vulnerable eyewitness would be beneficial in a court setting. Oftentimes, eyewitness testimonies play a concrete role when deciding whether someone is guilty or innocent (Doughty et al., 2017). When

a witness can be identified as vulnerable to misinformation, the jurors and legal professionals would be able to consider the reliability of their statements. In turn, this might reduce the rate of false convictions. In addition, if individual differences in susceptibility to misinformation can be reliably established, interventions that aim to prevent those vulnerable eyewitnesses from sharing their unwitnessed information can be developed. The true prevalence of influence is less likely to be overlooked when individual differences in interpersonal characteristics are included in this line of research (Mojtahedi et al., 2017).

Social Anxiety and Misinformation Susceptibility

In addition to personality traits, social anxiety is an individual difference trait that has been found to increase susceptibility to co-witness information. According to the Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition (DSM-5), social anxiety is characterized by a fear of social situations (real or imagined) where there is a possibility that the individual may be scrutinized by others and a persistent avoidance of these situations (American Psychiatric Association, 2013). People that engage in social interaction can experience relatively low levels of social anxiety, however for individuals with a social anxiety disorder, the fear can be extremely intense (Kupper & Denollet, 2012). Symptoms such as blushing, trembling, heart palpitations, and sweating are common. Social anxiety is associated with impaired working and private relationships, poor family functioning, and onset of psychiatric conditions (Blanco et al., 2001; Schneier et al., 1994). Therefore, social anxiety represents a considerable personal and societal burden.

In the United States, the 12-month prevalence estimate of social anxiety disorder is approximately seven percent (DSM-5, American Psychiatric Association, 2013). This rate increases to about 13% for 18-to-29 year-olds (Kessler et al., 2005). Although the nature and

prevalence of social anxiety has not been examined extensively in college students, some research has found increased prevalence rates for this age group. Purdon et al. (2001) found that a vast majority of the college students in their sample of 81 undergraduates experienced symptoms of anxiety in social situations quite frequently, while Russell and Shaw (2009) discovered that at least 10% of students reported experiencing marked to severe social anxiety.

Prior research has supported a connection between social anxiety and memory conformity. In particular, both components of social anxiety (fear of negative evaluation and social avoidance) have been correlated with a greater tendency toward conformity. *Fear of negative evaluation* pertains to the high cost associated with disagreeing in a social situation. Thus, if a person perceives the cost of disagreeing to be too high, they may be more likely to agree with another person in a social situation. Findings from Zhang et al. (2016) suggest this to be true—young adults with greater social anxiety were more likely to conform on a modified Asch paradigm task when they were told others would see their responses. The authors suggested greater conformity among those with higher social anxiety likely resulted from wanting to avoid negative evaluation from others. Additionally, the tendency to conform out of fear of negative evaluation has been extended to a memory conformity situation. Wright et al. (2010) had adolescent participants complete a face recognition memory task in pairs and found scores on the "fear of negative evaluation" subscale of the Social Anxiety Scale for Adolescents (La Greca & Lopez, 1998) to be positively correlated with memory conformity. This suggested that greater fear of negative evaluation resulted in a greater tendency to conform to a partner's choice during the recognition task.

Social avoidance pertains to the tendency to avoid social interactions and social information. If a person consistently avoids social information and feels stressed during social

interactions, then they may pay less attention to and process information from others more poorly. In turn, we would expect less memory conformity from these individuals, as memory conformity requires a person to adequately process and use social information. Prior research has confirmed this to be the case—in particular, social avoidance was negatively correlated with memory conformity in two recognition tasks completed by participants in pairs (Wright et al., 2010; Wright et al., 2012). Despite the connection between components of social anxiety and memory conformity, more research is needed to examine how social anxiety may impact memory conformity within an eyewitness situation, particularly one involving susceptibility to misleading co-witness information.

The Present Study

Study Design and Hypotheses

The present study contributes to the existing literature on co-witness influence and memory conformity. In particular, the present study adds to our limited understanding of individual differences in co-witness suggestibility by further examining social anxiety as a variable of interest. Prior research has focused almost exclusively on personality correlates and cognitive measures related to co-witness suggestibility (Read & Winograd, 1998; Mojtahedi et al., 2017). Given the social situation in which co-witness suggestibility occurs, variables related to social encounters (like social anxiety) should be considered when examining memory suggestibility (Wright et al., 2010).

Additionally, the present study replicates and extends prior work identifying a relationship between social anxiety and memory conformity (Wright et al., 2010). Despite identifying this relationship, researchers acknowledged the importance of examining whether the relationship holds with other populations, other measures of social anxiety, and within a more

ecologically valid memory conformity paradigm. Given college students reportedly have higher rates of social anxiety, it seems relevant to study the relationship between memory conformity and social anxiety using a young adult rather than an adolescent population. Further, this study utilizes a memory conformity procedure and recall task that is more generalizable to an actual co-witness experience and includes the presentation of misleading information (e.g., Wright et al., 2010).

The present study utilized a 2 x 3 between-subjects factorial design, with Social Anxiety Level (measured as a continuous variable) and Post-Event Information Exposure (misleading, accurate, or control) as the between-subjects factors. Recall accuracy and recall confidence were the primary dependent variables of interest. Following the procedure of Goodwin et al. (2017), participants watched a short film clip of a simulated crime. Post-event information (PEI) was presented during the course of a live, collaborative discussion between participants and a trained confederate. During the discussion, confederates provided either misleading or correct details about the witnessed event. Participants then produced both collaborative and individual memory reports and provided confidence ratings for their individual memory reports. Participants in the control group did not participate in the collaborative discussion or receive post-event information, but did provide memory reports for the witnessed event. Additionally, the present study further addressed whether social anxiety impacted susceptibility to co-witness influence. Based on prior research, the following predictions were made:

a) *Recall accuracy will differ based on the type of post-event information received.* Specifically, participants who received accurate PEI and participants in the control condition should recall more correct details, while participants who received misleading PEI should recall more incorrect details.

b) Recall accuracy will differ based on the type of post-event information received and participants' social anxiety level. Specifically, in the experimental conditions, those higher in social anxiety are expected to recall more correct items and more misleading items than those lower in social anxiety, potentially due to their increased susceptibility to co-witness influence. Recall should be similar between those higher and lower in social anxiety in the control condition, as these participants will not be exposed to the co-witness manipulation.

c) Recall confidence will differ based on the type of post-event information received. Specifically, participants receiving correct PEI should be most confident in recall of correct items relative to participants in the misleading PEI and control groups, while participants receiving misleading PEI should be most confident in recall of misleading items relative to the correct PEI and control groups.

Method

Participants and Confederates

In total, there were 65 undergraduate student participants (19 males and 42 females), ranging in age from 18 years to 48 years ($M = 21.25$ years). This was about half of the total number of participants needed for the study, based on the a priori power analysis. Most participants were freshmen (38.5%) and sophomores (33.8%), while 15.4% were juniors, 7.7% were seniors and 4.6% declared "other." Participants were 72.3% Caucasian, 12.3% Latinx/Hispanic, 7.7% "Other", 4.6% African American, and 3.1% Asian American. All participants were compensated for their participation in the form of class credit toward their undergraduate psychology course.

A group of ten undergraduate research assistants majoring in psychology were trained to be the confederates in the study. In short, the confederates' responsibilities included discussing all critical items from the film clip during a collaborative discussion with the participant and typing up the written report created by the confederate-participant pair. Overall, the confederates' main goal was to ensure each of the seven critical items was included in the paired discussion. Each confederate was trained for one specific experimental condition (e.g., misleading confederate or accurate confederate). This way, scripted information was not confused across the conditions.

Materials

Eyewitness Stimulus Film

A short video of a home robbery was created for this experiment. The video was two and half minutes long and showed an individual entering a home, stealing several items that were in plain sight (e.g., laptop, tablet, purse, money, television), and then exiting the home.

Confederate Scripts

In the experimental conditions, the confederates were provided with a general script that included guidelines for the co-witness discussion (see Appendix A). Specifically, there were seven critical items that were mentioned during the co-witness discussion (see Table 1 for a list of the specific items). Correct PEI consisted of details about events that actually occurred within the video, and misleading PEI consisted of incorrect details about the events that took place in the video. Examples of the different types of post-event information participants received during discussion include:

Correct PEI: '… then she grabbed the TV, and left out the *patio door*'

Misleading PEI: '… then she grabbed the TV, and left out the *garage door*'

Table 1. Critical items in cued-recall test with information provided during CW discussion

Cued-recall test item	CW discussion information	
	Correct	Misleading
What color shirt was the burglar wearing?	Black	White
Was she wearing glasses?	No	Yes
In what room was the first item that the burglar picked up?	Kitchen	Living Room
What color laptop did she pick up?	Purple	Silver
What color purse did the woman pick up?	Blue	Red
What did the woman steal from the kitchen table?	Money	Coupons
Where did the woman exit the home?	Patio/Sliding Door	Garage

Note: CW, co-witness

Filler Tasks

A series of filler tasks were used throughout the experiment. Participants were given separate sets of math problems, general knowledge questions, vocabulary questions, the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960), and the Balanced Inventory of Desirable Responding (Paulhus, 1984).

Social Anxiety Measures

There are two common categories of social anxiety—social interaction anxiety and social performance anxiety (social phobia) (Kupper & Denollet, 2012). The Social Phobia Scale (SPS) and Social Interaction Anxiety Scale (SIAS) were developed as separate self-report measures of social anxiety (Mattick & Clarke, 1998) and were used as measures of social anxiety in the present study. Often administered together, the SPS pertains to fears of scrutiny during

observation by others, whereas the SIAS assesses anxiety experienced during interaction with others. The SPS contains 20 items on which respondents indicate how "characteristic or true" each statement is for them (0 = "not at all" to 4 = "extremely"). Items include both worries pertaining to signs of nervousness (e.g., "I fear I may blush when I am with others.") as well as to scrutiny of performance (e.g., "I become anxious if I have to write in front of others."). The SIAS includes 19 items rated on a 5-point scale from 0 ("not at all characteristic of me") to 4 ("extremely characteristic of me"). SIAS items pertain to discomfort in social settings (e.g., "I am tense mixing in a group.") including dyadic interactions (e.g. "I tense up if I meet an acquaintance on the street."). A total score from 0 to 80 is derived from the SPS and a total score from 0 to 76 is derived from the SIAS, with higher scores indicating higher levels of the social anxiety constructs. Internal consistency and test-retest reliability for the SPS and SIAS are well-supported and validity studies support the distinction between social interactional anxiety and scrutiny fears (Letamendi et al., 2010). It is worth noting that the scales were not used as a diagnostic tool in the present study, but rather as a way to identify those with higher and lower degrees of social anxiety.

Individual Cued-Recall Test

Memory accuracy was tested using a cued-recall test. Using a recall test is preferred because these types of tests, compared to recognition tests, are more similar to actual eyewitness interview and recall situations. A cued-recall test was created and administered individually to participants (see Appendix B). The test consisted of 15 items, with seven critical items and four non-critical items scored for accuracy. The other four items in the test were not scored for accuracy. If participants were unsure of an answer, they could answer with "I don't know" or "I

don't remember." After each of their answers, the participants also provided a memory confidence rating on a 7-point scale (1 = "not at all confident" and 7 = "extremely confident").

Demographic Questionnaire and Post-Experiment Survey

A short demographic questionnaire was administered to the participants during the final stage of their participation. The questionnaire included items related to gender identity, racial and ethnic identity, age, and years of education. A post-experiment survey was created to determine whether participants in the experimental conditions were aware of the experimental manipulation (See Appendix C). In particular, participants were asked whether they had discussed the film or study with anyone else who had participated in the experiment and what they thought the purpose of the experiment was. Participants were also asked if they knew their memory was going to be tested and if they noticed themselves going along with the other participant (confederate). No participants were excluded from data analysis on the basis of responses to the manipulation check questions.

Procedure

Due to the worldwide Coronavirus pandemic, participants were run individually through a secure videoconferencing website called Zoom. All participants were told they were participating in a study about personality and cognitive performance, so the true purpose of the study was concealed. All data for this experiment was collected on Qualtrics as the experimenter guided the participant through the study on the Zoom videoconference. In the experimental conditions, the participant-confederate pair watched the home robbery video on their own computers with a link that was provided to them by the experimenter. In the control condition, participants watched the video on their own. At no point were the participants told their memory for the video was going to be tested.

Next, in the experimental conditions, the participant and the confederate discussed the video before giving a collaborative eyewitness report. Specifically, the experimenter used these instructions (as used in Goodwin et al., 2017):

I would like you to work together and discuss the event in order to create a single eyewitness report for the event you just watched. You should pretend that you are real eyewitnesses and you are waiting for the police to arrive to take your report.

The participant-confederate pair were further instructed to only include information in the report that was collaboratively agreed upon. During training, the confederates were instructed to have a friendly discussion with the participant about the film. The confederate's role was to ensure all critical information was discussed (e.g., a description of the suspect and the events that occurred in the video). Discussions were no longer than five minutes in length and took place in a breakout room on Zoom, so the experimenter was not present. Based on direction from Goodwin et al. (2017), the confederate was the one to type the collaborative report to ensure that it accurately and fully represented the discussion. The confederate also recorded the discussion in the Zoom breakout room and all discussions were stored properly with the other data. Once the reports were complete, the experimenter had the participant-confederate pair return to the main Zoom room and gave further instructions about completing the subsequent filler tasks. In the control condition, no discussion took place. Instead, control participants completed an additional filler task for the same amount of time that the discussions took place in the experimental conditions. Additionally, control participants typed up a report on their own.

Following the filler tasks, in the experimental conditions, the experimenter explained that each person would be tested separately on their memory for the video. The participants were told they were being tested first and the confederate was excused from the main Zoom room into their

own breakout room to wait. In the control condition, participants were just told their memory for

the video was being tested. Once the cued-recall test was complete, participants were given the

two social anxiety measures, the manipulation check survey, and the demographic questionnaire.

Finally, participants were debriefed and asked not to discuss the experiment with other potential

participants.

Results

Social Anxiety and PEI Condition

In order to determine if initial differences between SIAS and SPS scores were present, a

one-way ANOVA for each social anxiety measure was conducted. Results indicated that there

were no significant differences between PEI conditions for SIAS scores (F (2, 62) = 1.124, p =

.331), but there were significant differences between PEI conditions for SPS scores (F (2, 62) =

4.081, p = .022). A subsequent Tukey HSD test was run to see where the significant differences

were present. Results indicated that there was a significant difference in SPS scores between the

misleading PEI and accurate PEI conditions (p = .024).

A Pearson correlation was conducted between the SPS and SIAS total scores and found

they were strongly correlated (r = .705, p < .001). Based on this finding, the scores on the SIAS

and SPS were combined into one total score for the remainder of analyses.

Memory Report Analysis (Collaborative Recall)

The confederate-participant collaborative memory reports were scored as the total

number of correct PEI items recalled (out of 7) and the total number of misleading PEI items

recalled (out of 7). Reports were scored by two independent coders. Inter-rater agreement for

correct recall and misleading recall was acceptable (76.19% and 78.5%, respectively).

To compare differences in correct critical item recall in the collaborative report, an independent samples t-test was run and revealed that participants receiving accurate PEI recalled significantly more correct critical items than those receiving misleading PEI during the collaborative discussion (t (1,40) = 7.118, $p < .001$). To compare differences between the number of misleading critical items reported during the collaborative discussion, another independent samples t-test was run and revealed that participants in the misleading PEI condition recalled significantly more misleading critical items than those in the accurate PEI condition (t (1,40) = -6.095, $p < .001$).

Cued-Recall Test Analysis (Individual Recall)

To compare recall of accurate critical items between the conditions, a one-way ANOVA was conducted. The main effect of PEI type was significant, indicating recall of accurate items was significantly different between the three conditions (F (2, 62) = 13.509, $p < .001$). Follow up Tukey HSD comparisons revealed that those in the accurate PEI condition recalled more correct critical items than those in the misleading PEI ($p = .002$) and control groups ($p < .001$).

To compare individual recall of misleading critical items between the conditions, a one-way ANOVA was conducted. The main effect of PEI type was significant, indicating that recall of misleading items was significantly different between the three conditions (F (2,62) = 10.855, $p < .001$). Follow up Tukey HSD comparisons revealed that those in the misleading PEI condition recalled more misleading critical items than those in the accurate ($p < .001$) and control conditions ($p = .048$).

To determine if there was a difference in correct recall of non-critical questions between the PEI conditions, a one-way ANOVA was conducted. The main effect of PEI type was nonsignificant, indicating non-critical question correct recall was not significantly different

between the conditions (F (2, 62) = 1.532, p = .224). See Table 2 for means and standard

deviations by condition and type of question.

Table 2. Means and Standard Deviations (in parentheses) of main effects for individual cued
recall by post-event information (PEI Type)

	PEI Type		
	Misleading PEI	Correct PEI	Control
Accuracy Measure	*M (SD)*	*M (SD)*	*M (SD)*
	(*n* = 20)	(*n* = 22)	(*n* = 23)
Critical Misinfo	1.45 (1.10)*	0.32 (.48)	0.87 (0.69)
Critical Correct	4.75 (1.29)	6.00 (1.23)*	4.26 (0.92)
Non-critical Correct	2.40 (0.94)	2.27 (0.77)	1.96 (0.88)

Note: Critical Misinfo, critical items answered with misinformation; Critical Correct, critical items
answered correctly; Non-critical Correct, non-critical items answered correctly; SD, standard deviation.
* p < .05.

Social Anxiety and Co-Witness Influence (Collaborative Recall)

To assess whether social anxiety influenced collaborative recall of correct critical items

between PEI conditions, a multiple linear regression test was conducted. Social anxiety was not

found to predict differences in correct item collaborative recall across conditions (B = -.002, p =

.816). However, a significant regression equation was found (F (2, 39) = 24.762, p < .001) with

an R^2 of .559, indicating that being in the accurate PEI condition predicted higher recall of

accurate critical items during the collaborative recall task (B = 2.765, p < .001).

To assess whether social anxiety influenced collaborative recall of misleading items

between PEI conditions, another multiple linear regression test was conducted. Again, social

anxiety was not found to predict differences in collaborative recall of misleading items across

conditions (B = .002, p = .778). However, a significant regression equation was found (F (2, 39)

= 18.191, p < .001) with an R^2 of .483, indicating that being in the accurate PEI condition

predicted lower recall of misleading PEI during the collaborative recall task (B = -2.400, $p <$ .001).

Social Anxiety and Individual Recall Differences

In order to assess whether social anxiety influenced individual recall of critical questions answered with misleading information between PEI conditions, a multiple linear regression test was conducted. Social anxiety was not found to predict differences in recall of misleading PEI across conditions (B = .000, p = .977). However, a significant regression equation was found (F (2, 39) = 9.440, $p <$ .001) with an R^2 of .326, indicating that being in the accurate PEI condition predicted lower recall of misleading PEI on the individual recall test (B = -1.129, $p <$ .001).

To assess whether social anxiety influenced individual recall for critical questions answered correctly between PEI conditions, another multiple linear regression test was conducted. The results indicated that social anxiety did not predict differences in recall of critical questions answered correctly across conditions (B = .007, p = .381). However, a significant regression equation was found (F (2, 39) = 5.501, p = .008), with an R^2 of .220, indicating that being in the accurate PEI condition predicted differences in recall of critical questions answered correctly (B = 1.123, p = .010).

Memory Confidence and Type of Post-Event Information

To compare individual recall confidence based on PEI type, a one-way ANOVA was conducted. No significant differences in confidence were found for critical questions answered correctly (F (2, 62) = .385, p = .682). Further, an independent samples t-test revealed that those in the misleading PEI condition were significantly more confident in their recall of critical questions answered with misleading information than those in the accurate PEI condition (t (1, 40) = -3.480, p = .001). Another one-way ANOVA found no significant differences in

confidence for non-critical questions answered correctly (F (2, 62) = .943, p = .395). Finally, there were no significant differences in confidence for all non-critical questions (F (2, 62) = .231, p = .794), or for all scored cued-recall questions (F (2, 62) = .815, p = .447).

Social Anxiety and Memory Confidence

To determine if there was a relationship between social anxiety and memory confidence, a series of linear regressions were conducted. The results indicated that social anxiety did not predict significant differences in confidence for critical questions answered correctly (B = .001, p = .791), or for all cued-recall questions (B = -4.159, p = .991). Interestingly, social anxiety almost predicted differences in confidence for critical questions answered with misleading information at a level approaching significance (B = -.032, p = .062).

Post-Experiment Survey Differences

Based on guidance from Goodwin et al., (2017), additional analyses were conducted to look for differences in post-experiment survey responses based on PEI condition. A Chi Square test of independence indicated that participants in the accurate and misleading PEI conditions did not differ in reports of "questioning their memory" in reaction to the confederate's statements (χ^2 (1, N = 42) = .764, p = .382). Another Chi Square test of independence indicated that participants in the accurate and misleading PEI conditions did not differ in reports of feeling themselves "going along" with the confederate's statements (χ^2 (1, N = 42) = .004, p = .952). A final Chi Square test of independence indicated that participants in the accurate and misleading PEI conditions did not differ in their reports of "changing their initial statements" (χ^2 (1, N = 42) = .030, p = .863).

To examine whether social anxiety was related to post-experiment survey responses, a series of point biserial correlations were conducted. First, social anxiety did not significantly

relate to participants' reports of "questioning their own memory" ($r = -.078$, $p = .625$). In addition, social anxiety did not significantly relate to participants' reports of "going along" with the confederate ($r = -.221$, $p = .161$). Finally, social anxiety did not significantly relate to participants' reports of "changing their initial statements" ($r = -.076$, $p = .631$).

Discussion

The present study sought to replicate and extend the current eyewitness memory literature by examining the impact on social anxiety on co-witness suggestibility. The present study was the first known study to examine social anxiety as an individual risk factor for co-witness suggestibility in a young adult population. Given that young adults may experience higher rates of social anxiety, it was important to focus on that population specifically.

Overall, the hypotheses in the current study were partially supported. First, memory conformity was demonstrated during collaborative recall between the confederate and participant. Collaborative recall of misleading items was greater in the misleading PEI group than the accurate PEI group, and collaborative recall of correct items was greater in the accurate PEI group than in the misleading PEI group. These findings are similar to prior research demonstrating memory conformity in a co-witness situation (Wright et al., 2010; Goodwin et al., 2017). The current study also demonstrated co-witness misinformation effects. Individual recall of misleading items was highest in the misleading PEI group compared to the accurate PEI group. This finding is consistent with prior studies utilizing a co-witness to present misinformation—groups encountering misinformation socially via a confederate typically report more recall errors and greater recall of misleading details (Gabbert et al., 2004; Paterson & Kemp, 2006; Goodwin et al., 2017).

Three processes have been identified to explain memory conformity effects (Wright et al., 2009). These include normative influence, informational influence, and memory distortion. The current study found evidence for memory conformity effects, while also finding that recall rates of misinformation changed slightly from collaborative to individual memory reports. Specifically, on average, reporting of misinformation was higher in the collaborative report compared to the individual recall test. The higher endorsement of misinformation in the collaborative setting may be due in part to normative influence—or going along with the confederate because the cost of disagreeing is perceived to be too high (Goodwin et al., 2017).

Additionally, current study found benefits associated with discussing an event with an accurate co-witness. Specifically, recall accuracy differed based on the type of PEI participants received. Recall of correct items was greater both collaboratively and individually in the accurate PEI group compared to the control and misleading groups. This is in line with prior research demonstrating greater correct recall in participants paired with an accurate co-witness (Paterson et al., 2009; Goodwin et al., 2017).

Contrary to what was expected, recall accuracy was not influenced by social anxiety. We originally planned to compare recall accuracy between participants with low vs. high social anxiety but could not do so because of the number of current participants reporting high levels of social anxiety. We initially planned to group participants using established SPS and SIAS cutoff scores (18 and 22, respectively; Mortberg et al., 2017). All three groups (control, misleading PEI, and accurate PEI) had average social anxiety scores that exceeded these cutoffs, indicating that a majority of the current sample reported being highly socially anxious. This made creating equivalent "low" and "high" social anxiety groups difficult. As a result of the lack of clear "low" and "high" groups, social anxiety was run as a continuous predictor. However, it was not found

to be a significant predictor of accurate recall or misleading recall in the co-witness discussion conditions, contrary to what was hypothesized. It is important to note that the linearity and normality assumptions were not met in the multiple regression model, which likely impacted the ability of social anxiety to predict differences in recall. As more data is collected and the sample size increases, it is hoped that the model improves or that group difference analyses are possible.

It was also hypothesized that recall confidence would differ based on the type of PEI received. This was partially supported. The accurate PEI group did not report greater confidence in correct item recall than the misleading PEI and control groups. This finding is not in line with most prior research, which typically finds that accurate PEI participants report higher confidence in correct recall than misleading PEI participants (Goodwin et al., 2017). The lack of differences in confidence between PEI groups in the current study might be due to the critical items that were selected for the recall test. Most of the critical items were more obvious details related to the simulated crime, and thus accurate items may have been remembered more confidently across all conditions.

Despite the lack of differences in correct item recall confidence, the misleading PEI group reported greater confidence in misleading item recall than the other groups. Therefore, not only were misleading PEI participants more likely to report and recall misleading details, but they did so more confidently. Prior research has also found that misled participants recall misleading information with high levels of confidence, or with as much confidence as non-mislead participants (Paterson & Kemp, 2006).

The findings in the current study are not without limitations. For the entirety of data collection, participants were facing unprecedented times as the international Coronavirus pandemic was at its peak. Many participants were likely experiencing heightened levels of

anxiety, stress, or depression due to the pandemic. Indeed, a high percentage of participants appeared to reach clinically significant levels of social anxiety, as reported on the SPS and SIAS. This is consistent with other recent young adult mental health findings. Young adults reported experiencing high rates of loneliness, COVID-19-specific worry, and low distress tolerance during the pandemic. Additionally, these outcomes were significantly associated with clinical levels of depression, anxiety, and PTSD (Liu et al., 2020). Attempting to study and measure social anxiety was undoubtedly confounded by the mental health impacts of the pandemic.

Another limitation of the current study is that data was collected online via Zoom. This type of social interaction might not hold the same type of influence on socially anxious individuals, as they are able to manipulate how they are perceived via the video camera and could participate from the comfort of their own homes. While all participants were required to have their cameras on, this is quite different from an in-person co-witness discussion. Further, many of the participant sessions were conducted at the beginning and end of the fall semester when student stress and anxiety are also heightened. This type of data collection pattern in undergraduate student populations can be cause for concern, especially in research that aims to assess memory performance. Future research will benefit from utilizing an in-person study design to replicate a co-witness situation where discussion occurs.

At present, it is unclear whether social anxiety will emerge as a risk factor for co-witness suggestibility. Currently, higher social anxiety is not a clear predictor of greater susceptibility to misinformation from a co-witness, nor is it a clear predictor of greater influence from an accurate co-witness. This could be due to the current low sample size, or it could also be an early sign that higher social anxiety is not a reliable risk factor for co-witness suggestibility in a young adult population using this particular memory conformity paradigm.

The findings from the present study bear relevance to the area of eyewitness memory and further underscore the need to keep witnesses from discussing events. In particular, findings from the present study show that witnesses report information from a co-witness as part of their recall of a witnessed event—in some cases the co-witness information is accurate, but in other cases the co-witness information is misleading. Altogether, this supports the idea that misinformation about witnessed events is frequently passed along from a co-witness (Paterson & Kemp, 2006; Skagerberg & Wright, 2008).

However, findings from the current study also illustrate benefits associated with collaborative recall. Specifically, an accurate co-witness may encourage more accurate recall of details that are central to a witnessed event. Recent research has revealed similar effects associated with collaborative eyewitness recall (Thorley, 2018). Collaborative pairs recalled details of a crime faster and recalled more correct information compared to individual participants. Taken together, these findings suggest that the presence of a co-witness may not always be deleterious to eyewitness memory.

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Appendix A

Confederate Script

Instructions to the Confederate: Have a friendly discussion that includes a depiction of the suspect in the video and a description of the events that transpired. Please initiate the discussion but be sure not to dominate it. Also make sure all critical details are discussed. If a participant disputes any of the critical details presented during the discussion, respond by reiterating that you remembered seeing the critical detail. Ex: "That is what I remember seeing."

Critical Details to Discuss:

1) Shirt color
2) Glasses
3) Location of first burgled item
4) Laptop color
5) Purse color
6) Item stolen from kitchen table
7) Burglar exit location

Initiating the Discussion: If we need to talk about the event to create a single eyewitness report, then maybe we should start at the beginning with the burglar's appearance—I remember seeing the burglar wearing a (black vs. white) shirt. Is that right? (*wait for participant's response*) I also remember that the burglar (was vs. wasn't) wearing glasses. (*wait for participant's response*)

We should probably try to remember the things the burglar stole, too. She took the tablet first and I remember it was in the (kitchen vs. living room)—is that right? (*wait for participant's response*). I also remember her picking up a (purple vs. silver) laptop and putting it in her bag. (*wait for participant's response*) There was also a purse that she stole—I think it was a (blue vs. red) purse. (*wait for participant's response*) And there was (money vs. a coupon) on the table that she put in her bag before she left. (*wait for participant's response*) I also remember she left the house through the (patio door vs. garage door). (*wait for participant's response*)

Appendix B

Cued Recall Test

1. What color shirt was the burglar wearing? *
2. What color was her hair?
3. Was she wearing glasses? *
4. About how tall was the burglar?
5. What kind of shoes was she wearing?
6. What color was the door the woman used to enter the home?
7. In what room was the first item that the burglar picked up? *
8. Did you see her steal the tablet? **
9. What color laptop did she pick up? *
10. Did you see her steal the laptop? **
11. What color purse did the woman pick up? *
12. Did you see her steal the purse? **
13. What did the woman steal from the kitchen table? *
14. Did you see the woman steal the item from the kitchen table? **
15. Where did the woman exit the home? *
    *Critical items manipulated with misleading or correct information provided during discussion.
    **Not scored.

Appendix C

Post-Experiment Survey

1. Had you heard about this study from anyone else prior to participating? (yes or no; if yes, please explain.)
2. What do you think the purpose of this experiment was?
3. Before viewing the video, were you aware that your memory for the video would be tested?
4. After viewing the video, and before you were instructed to discuss the event, were you aware that your memory for the video would be tested?
5. After the discussion, and before the personality and vocabulary measures, were you aware that your memory for the video would be tested?
6. Did you notice yourself questioning your memory in reaction to the other participant's statements?
7. At any time, did you feel yourself 'going along' with the other participant's statements during the discussion in spite of what you really remembered? (If yes, please explain.)
8. Did you change any of your initial statements from the discussion when answering questions during the individual memory test with the experimenter? (Please explain your response.)