"I didn't see an iPod, but you did – so I'll say I did, too:"
Exploring source memory and subjective experiences accompanying memory conformity

by

Tanjeem Azad
B.A. (Honours), University of Calgary, 2006

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE

in the Department of Psychology

"I didn't see an iPod, but you did – so I'll say I did, too:"
Exploring source memory and subjective experiences accompanying memory conformity

by

Tanjeem Azad
B.A. (Honours), University of Calgary, 2006

Supervisory Committee

Dr. D. Stephen Lindsay, Supervisor
(Department of Psychology)

Dr. C. A. Elizabeth Brimacombe, Co-Supervisor
(Department of Psychology)

Dr. Michael E. J. Masson, Departmental Member
(Department of Psychology)

Supervisory Committee

Dr. D. Stephen Lindsay, Supervisor
(Department of Psychology)

Dr. C. A. Elizabeth Brimacombe, Co-Supervisor
(Department of Psychology)

Dr. Michael E. J. Masson, Departmental Member
(Department of Psychology)

Abstract

Memory conformity effects occur when witnesses report misleading suggestions they learned about from another witness. Using a new paradigm the present thesis investigated whether what subject-witnesses *report* about an event also implies what they personally *remember* or *know* about that event. Subjects were tested in pairs, with each member of a pair shown a different version of a video using the MORI technique. There were critical details (e.g., theft of an iPod) in each of the following conditions: visible to only one member of each subject spair, visible to both members of the pair, and not visible to either member of the pair. Pairs subsequently completed a questionnaire together to remember details from the video. Subjects then individually completed a similar questionnaire. A source monitoring and subjective experiences test revealed that co-witness discussion does not necessarily lead people to experience illusory recollections for details they did not witness themselves.

Table of Contents

List of Figures

Acknowledgments

The Natural Sciences and Engineering Research Council of Canada supported this research through a Canada Graduate Scholarship to Tanjeem Azad and a Discovery Grant to Steve Lindsay. Thanks to my incredibly wonderful supervisors, Steve Lindsay and Elizabeth Brimacombe, for their unbounded support, guidance and encouragement throughout this project. Thanks also to Danielle Greschner, Karen Lindsay and the students at Reynolds Secondary School for their valuable time and effort in helping create my eyewitness video as well as to Chris Darby for his technical assistance with the MORI technology. I also thank Michael Masson for his statistical advice during the preparation of this thesis and Joanna Pozzulo for serving as the External Examiner for my Masters thesis defense.

"I didn't see an iPod, but you did – so I'll say I did, too:"

Exploring source memory and subjective experiences accompanying memory conformity

Suggestive influences can distort past recollections in ways that can lead people to claim to have "seen" never-before-experienced items or events. In the classic *misinformation effect*, subjects who viewed a target event and were subsequently exposed to leading questions about the event later showed impairments in the accuracy of their reports about the original event (Loftus, Miller, & Burns, 1978). The finding that you can plant suggestive details into someone's memory is well documented (see Loftus, 2008; Pickrell, Bernstein, & Loftus, 2004, for reviews). In fact, misinformation effects are so potent that a lively debate that ensued in the 1980's was not about the existence of this memory phenomenon, but instead about the fate of the original event memory following exposure to suggestive details (see McCloskey & Zaragoza, 1985). In addition to distorting memory for event details that have been experienced, misleading suggestions can also lead people to report non-existent details of an event (e.g., claiming to have seen a barn in a bucolic scene when there were no buildings present in the scene). Furthermore, suggestive influences about entire false childhood events that have never been experienced can create illusory beliefs and even memories for those events (Loftus & Pickrell, 1995). Thus, it is evident that the study of misleading suggestions on memory has both practical implications regarding the accuracy of eyewitness testimony as well as theoretical implications for understanding the cognitive mechanisms involved in the misinformation phenomenon.

Sources of Misleading Suggestions

In most of the research on the misinformation phenomenon, leading questions and event narratives have been the primary sources of misinformation (Wright, Self, & Justice, 2000). Leading questions suggest an erroneous detail in the form of a question. In a classic study by

Loftus and Palmer (1974), subjects who were asked “About how fast were the cars going when they smashed into each other” later reported not only a higher speed but a week later also reported having “seen” broken glass relative to subjects in other comparison conditions, even though broken glass was not present in the original event. Written event narratives summarize the original event with the misinformation nested in the narrative. In prior studies, this event narrative has generally been provided by the experimenter but presented to subjects as mock witness responses, a mock witness report, or a media report (e.g., Betz, Skowronski, & Ostrom, 1996; Gabbert, Memon, Allan, & Wright, 2004; Loftus & Greene, 1980; Paterson & Kemp, 2006; Shaw, Garven, & Wood, 1997). For example, Loftus and Greene showed subjects a set of photographs of faces, after which a description of one of the faces said to have been written by a professor was provided to them.

The *source* of the misinformation can place different demands on subjects’ performance in an experiment (Roediger, Meade, & Bergman, 2001). In previous research, leading questions and event narratives have typically been provided by the experimenter. With experimenter-presented misinformation, subjects may have no reason to distrust the accuracy of the information contained in the post-event narrative, especially if they reason that the experimenter must have written the narrative or is perceived to be of power and prestige (Betz et al., 1996; Higham, 1998). Additionally, the level of detail provided in these narratives may lead subjects to assume that the person providing an account of the witnessed event must have extraordinary memory (Roediger et al., 2001). In some ways, experimenter-presented misinformation parallels real world scenarios in which a police investigator may expose a witness to misinformation, for example through suggestive questioning tactics. However, the effects of misinformation from an experimenter may not generalize to situations in which the source of the misinformation does not

exude the same level of power and prestige as an experimenter/investigator (Betz et al., 1996). For this reason, it is important to investigate other means of acquiring misinformation.

In recent years researchers have begun to explore co-witness discussion as another source of misinformation (e.g., Bodner, Musch, & Azad, 2009; Dalton & Daneman; 2006; Gabbert, Memon, & Allan, 2003; Gabbert, Memon, Allan, & Wright, 2004; Gabbert, Memon, & Wright, 2006, 2007; Garry, French, Kinzett, & Mori, 2008; Hollin & Clifford, 1983; Hoffman, Granhag, Kwong See, & Loftus, 2001; Meade & Roediger, 2002; Paterson & Kemp, 2006; Roediger et al., 2001; Schneider & Watkins, 1996; Shaw, Garven, & Wood, 1997; Wright et al., 2000). Co-witness discussion is the passing of information from one eyewitness to another following an event that both witnesses observed (Lüüs & Wells, 1994). Akin to the misinformation effect, reporting suggested details as a result of discussing a witnessed event with another person is referred to as *memory conformity* (Wright et al., 2000), the *social contagion of memory* (Roediger et al., 2001), or the *social suggestibility effect* (Dalton & Daneman, 2006).

Co-witness discussion has gained considerable attention in the memory literature over the last few years because of its forensic significance (see Memon & Wright, 1999, on the Oklahoma bombing incident). Consequently, much of the empirical research has focused on factors that increase or decrease false reports of misinformation following co-witness discussion (e.g., the presence of confederate dissenters, Ost, Ghonouie, Cook, & Vrij, 2008). From an applied perspective it is justifiable to examine factors that moderate memory conformity, however, most prior studies that have studied different variables have not directly tested hypotheses about the cognitive processes underlying the phenomenon (but see Bodner et al., 2009; Meade & Roediger, 2001; Roediger et al., 2002). Specifically, as shown in this thesis, it is important to measure subjective experiences accompanying memory conformity. That is, to determine whether

memory conformity influences what individuals ultimately come to subjectively believe or remember about misleading suggestions. If co-witness discussion about misleading suggestions creates illusory beliefs or memories among experimental subject-witnesses then the potential for memory contamination to occur among co-witnesses to actual crimes becomes a serious concern (Zaragoza and Koshmider, 1989).

Rationale for Current Study

The rationale for the current study was to explore the role of different subjective experiences accompanying memory conformity. Specifically, the following research question was proposed in the present study: Does memory conformity merely influence *reports* (reporting suggested details because of demand characteristics and not believing or remembering that it occurred), *beliefs* (believing suggested details happened but having no recollection of it happening), or *memories* ("seeing" the suggested details as it happened in the witnessed event)? Previous findings on the memory conformity effect leave it unclear as to whether what subjects report about an event also implies what they personally *believe* or *remember* about that event. This very same issue regarding subjective experiences was raised in the late 1980s with regard to the standard misinformation effect (see Frost, 2000; Lindsay, 1990; Lindsay & Johnson, 1989; Zaragoza & Koshmider, 1989).

On the one hand, subjects may knowingly report suggested details – what the literature has coined as a *known error* (Newman & Lindsay, 2009). Even if subjects do not believe misleading suggestions to be correct and are aware of the source of the suggested information (the co-witness) they may, nonetheless, report the suggestions if they want to comply with the demands of the experiment. In social psychology, a known error is more commonly referred to as normative conformity – compliance solely to gain social acceptance. Such compliance is

demonstrated in the statement, “I am certain the answer is X, but my partner said Y and I don’t want to stir disagreement, so I’ll say Y” (cf. Betz et al., 1996). Suggested details can also be reported because of “informational compliance.” Here the individual believes that the information accurately reflects the original event *and* accurately remembers that the detail was mentioned by the other person. This is exemplified by the statement, “I’m not sure what was in the event, but my partner said Y, so it really must be Y” (cf. Betz et al., 1996). Note that for both normative and informational compliance to occur, the individual is *aware* that the co-witness provided the (suggested) information.

On the other hand, co-witness misinformation may also be reported because of a genuine memory distortion, wherein the individual is *not* aware of the source of the misinformation. Such memory distortions could be in the form of an illusory belief or a memory (cf. Tulving’s (1985) remember and know distinction). For example, individuals given false prevalence information regarding the frequency of a particular childhood event in a given population *and* a rationale explaining that it is normal to not remember most childhood events developed illusory beliefs but not memories for childhood events never experienced (Scoboria, Lynn, Hessen, & Fisicio, 2007). In applying this distinction to the current study, the goal is to extend these findings to the domain of co-witness discussion.

The Effects of Collaboration on Memory with Misleading Suggestions

Empirical research has used various methodological designs for examining how one person’s memory reports are influenced by another person’s misleading responses (Wright, Mathews, & Skagerberg, 2005). One of these designs involves using either a confederate to role play the other “co-witness” (e.g., Dalton & Daneman, 2006; Ost et al., 2008; Paterson & Kemp, 2006; Shaw et al., 1997, Experiment 2) or a virtual confederate to simulate responses given by

other co-witnesses (e.g., Hoffman et al., 2001; Meade & Roediger, 2002, Experiment 4; Reysen, 2005; Shaw et al., Experiment 3). Some of these studies have also differed in their design with regards to assessing the effect of a confederate's misleading responses at the time of discussion (e.g., Schneider & Watkins, 1996) or on later individual recollections (e.g., Roediger et al., 2001). Regardless of the design employed, the findings in these studies demonstrate that one person's erroneous responses often affect another person's memory reports. Like the misinformation effect, memory conformity is long lasting (e.g., Hoffman et al., 2001; Paterson & Kemp, 2006; Shaw et al., 1997), is obtained even on a source-monitoring test (e.g., Meade & Roediger, 2002, Experiments 1 and 2) but dramatically reduced with instructional warnings at test (e.g., Bodner et al., 2009), and varies with factors such as confidence (e.g., Wright et al., 2000), perceived encoding duration (e.g., Gabbert et al., 2007) and relationship among co-witness pairs, such as romantic partners and friends versus strangers (e.g., Hope, Ost, Gabbert, Healey, & Lenton, 2008).

An important drawback to most past designs used in memory conformity studies is the use of confederates. Confederates allow for greater experimenter control, as researchers can be assured that subjects are exposed to the misleading suggestions, thus an increased likelihood of detecting an effect. However, as natural and believable as a confederate may appear to a researcher, a confederate's responses are scripted and this limits and constrains the dynamic exchange and flow that is characteristic of natural discussions (Garry et al., 2008). In addition to using a scripted dialogue, some studies have had the subject respond to test items after a confederate's response, in front of the confederate *and* the experimenter (e.g., Schneider & Watkins, 1996; Shaw et al., Experiment 3; Wright, Mathews, & Skagerberg, 2005). The

pressure to yield to a confederate's responses in those situations is much greater than when subjects' memories are privately assessed (Roediger et al., 2001).

Past research is also limited in terms of the extent to which its findings can be generalized to actual situations involving multiple witnesses to a crime. Erroneous responses to word lists and neutral pictures that produce memory conformity effects may help elucidate basic memory mechanisms, but these results do not yet hold much forensic value because of the lack of external validity of these designs (e.g., Reysen, 2005; Roediger et al., 2001; Wright et al., 2005). Because studies of eyewitness testimony typically involve subject-witnesses viewing simulated crime events, co-witness discussion about neutral stimuli may influence memory conformity differently compared to a discussion about more realistically-occurring events. For example, it is possible that a subject-witness may be more influenced by a co-witness's errant responses to misinformation for a simulated event than for neutral stimuli such as word lists. Reasons for this may have to do with the fact that simulated crimes document the unfolding of a sequence of events that portrays a storyline whereas word lists and pictures of neutral scenes generally do not (e.g., Gabbert et al., 2006, 2007; Meade & Roediger, 2001). As such, a subject-witness may not easily notice an erroneous detail when it is mentioned by a co-witness within the context of a simulated crime. Simulated crimes may also differ in emotional content, e.g., a violent crime versus a petty theft. Thus, differences in stimuli may influence the extent to which a subject-witness is susceptible to memory conformity following a discussion with a co-witness.

The Effects of Collaboration on Memory with "Real" Subject-Co-Witnesses

In response to concerns about the use of confederates and the potential lack of external validity in prior research, a number of recent studies of co-witness contamination have demonstrated more compelling examples of memory conformity by using actual subjects as co-

witnesses (e.g., Gabbert et al., 2003, 2004, 2006; Garry et al., 2008; Wright et al., 2000, Experiment 2). These studies have also implemented methodological features that better simulate actual experiences of memory contamination during co-witness discussion, such as using a mock crime video (as opposed to word lists or neutral slide shows) and free recall tests more akin to an eyewitness report. A study by Gabbert et al. (2003) is typical of most studies involving "real" subject co-witnesses. In this study, pairs of subjects separately watched a video of a simulated office theft. Although the pairs were led to believe they had watched the same video, each member of the pair actually witnessed the event from a different perspective. Each subject witnessed two details the other member did not see in his/her version of the event. Pairs collaborated on a mock eyewitness report about the witnessed event and then completed a similar report individually. Seventy one percent of subjects reported at least one detail that was *not visible* to them, compared to 0% of subjects who did not collaborate with a partner and thus were not exposed to misinformation.

The Source Monitoring Framework

As alluded to earlier, co-witness contamination can also occur because of genuine memory distortions in which the witness does not remember the source of the misinformation. In such cases, the phenomenon of memory conformity is an example of a source misattribution error: memories originating from one source (the co-witness discussion) are confused with memories derived from another source (the witnessed event). Source misattributions occur because our memories are not tagged with particular source specifying information. Rather, according to the source monitoring framework (SMF), we must attribute our mental experiences (thoughts, images, and feelings) to particular origins on the basis of various qualitative and quantitative characteristics associated with the memory (Johnson, Hastroudi, & Lindsay, 1993;

Lindsay, 2008). For example, you might need to make an attribution about the source of a tune that comes to mind, and ask yourself, 'Did I come up with that tune or did I hear it in a song?' In order to make this attribution you will consider different aspects of the memory. For instance, memories of imagined events typically contain more effortful cognitive processing, fewer perceptual (sound, smell, vision) and temporal (time, season) information, and generally appear to be less realistic than do memories of actually perceived events (Johnson, Foley, Suengas, & Raye, 1988). These source attributions are typically made effortlessly and without much conscious deliberation; however, sometimes quick decisions fail to specify source information and during such instances, we can bring to bear more deliberative strategies, such as relying on external cues, prior knowledge, plausibility, etc. For example, in attempting to recall the person who uttered the funny joke at a party you may try to remember who was at the party or may recall the events that preceded or followed the joke. In summary, source monitoring should be relatively easy and accurate when a memory is richly detailed, has unique source-specifying characteristics that separate it from memories of other sources, and effective decision strategies are used (Johnson et al., 1993).

The basic tenants of the SMF that are used to explain accurate source attributions can also explain source *mis*attributions. Given that memory for source is based on an evaluation of memory characteristics, errors arise when memories for a suggested event contain characteristics that are highly typical of a perceived event. Drivdahl, Zaragoza, and Learned (2009) noted that in the eyewitness misinformation effect the post-event suggestion is *about* the witnessed event and as such, there are extensive commonalities between the two events (but see Allen & Lindsay, 1998, and Lindsay, Allen, Chan, & Dahl, 2004, for exceptions). For example, watching a video of a burglar steal money and later reading a post-event narrative that inaccurately suggests that

the burglar *also* stole a ring may not be especially salient for the witness to detect that the suggestion did not also occur in the witnessed event. In this way, memories of a post-event suggestion may, like memories of a perceived event, be rich in semantic content. Furthermore, some post-event suggestions are especially evocative and may induce accompanying mental imagery that further creates a perceptual overlap between the witnessed event and post-event (e.g., Drivdahl & Zaragoza, 2001). Consequently, if the accompanying imagery is teeming with memory-like features such as vivid perceptual and contextual details then the post-event suggestion may be misattributed to a "witnessed" memory (for related examples see Henkel, 2004).

Source misattributions may also occur when the rememberer fails to recollect information that specifies the source of a memory. This is influenced by the extent to which processes at encoding bind together details about the event or experience that later give rise to those details that can be used for appropriate source monitoring (Johnson et al., 1993; Lindsay, 2008). Different test instructions also encourage different levels of source monitoring, which in turn affect the decision criteria used at test. For example, recognition memory instructions typically used in studies on the misinformation effect encourage lax source monitoring, which in turn lead to higher false reports. On the contrary, instructions to consider source information require more careful monitoring and effectively reduce or even eliminate false reports (Lindsay & Johnson, 1989).

Memory Conformity and Source Monitoring

In prior research, most memory conformity effects appear to have involved source misattributions (Gabbert et al., 2003, 2004, 2006; Paterson & Kemp, 2006; Wright et al., 2001). Contributing to source misattribution are factors such as delay, which has varied considerably in

these studies, ranging from a 5-minute retention interval (Wright et al., 2001) to a long retention interval of 1-week (Paterson & Kemp, 2006). It has been shown that increases in retention interval further blur the distinction between post-event and witnessed sources (see Frost, 2002). Other factors include the type of memory test used. Garry and colleagues (2008) gave subjects a two-alternative forced choice recognition test in which the alternatives were between the detail they saw in a video and heard from their co-witness. Compared to control details that were not discussed, subjects were significantly less likely to select the correct response when their partner reported the suggested critical detail during discussion. As the authors state, it is not evident under what basis memory conformity occurred. Subjects may have selected the suggested details because relative to the control details, the suggested item seemed more familiar and they may not have spontaneously monitored the source of each item's familiarity (i.e., that it could have come from the partner). In addition, inherent among forced choice recognition tests are problems such as demand characteristics and response bias (Paterson, Kemp, & Ng, 2009), so it is possible that Garry et al.'s (2008) findings reflect memory conformity due to these factors.

Similar to the experiments of Garry and colleagues (2008), most memory conformity studies have not encouraged subjects to consider the sources of their memories at the time of the memory test. Among the studies that have examined source memory, it has not always been evident whether false reports reflect illusory beliefs as opposed to illusory memories, or *knowing* versus *remembering*, respectively (e.g., Bodner et al., 2009; Gabbert et al., 2007; Meade & Roediger, 2002). Importantly, these studies have typically used standard source memory tests, which may not fully capture the phenomenological experiences that accompany decisions to attribute suggested details to a particular source(s). The standard source memory test asks subjects to attribute reported details to the actual source, the post-event source, both, or neither

(e.g., Gabbert et al., 2007; Lindsay & Johnson, 1989; Meade & Roediger, 2002; Zaragoza & Lane, 1994). Different variants of the source memory test have also been used, for example, by requiring subjects to only choose among the actual and post-event sources (e.g., Bodner et al., 2009).

Regardless of which version of a source monitoring test is used, however, it is unclear from previous findings on what basis subjects decide to attribute suggested details to a given source(s). For instance, when the *both* source option is selected, it may suggest that subjects "remember" the suggested detail from the actual source even though that may not necessarily be the case (cf. Higham, 1998). In fact, subjects may choose the *both* source option if they correctly remember the suggested detail from their co-witness and "just know" that it also occurred in the actual event, without necessarily "remembering" that it did – a data pattern evident in Meade and Roediger's (2002) results, but one that had not been addressed. Specifically, Meade and Roediger added the proportion of erroneous items mentioned by a confederate attributed to the "slide only" and "both slide and confederate" sources to report a 'total false recognition' score. However, a closer examination of their findings reveals that the proportion of erroneous items recalled were numerically more likely to be falsely attributed to the "both slide and confederate" source than to any of the other single sources.

Even if subjects have a vague sense of familiarity that they encountered the suggested detail somewhere and cannot ascertain the source of the detail, they may attempt to guess the source (rather than indicate a "don't know" response) given that the other source categories "indicate that the object was encountered somewhere in the experiment" (p. 268, Higham, 1998). Thus, standard source memory tests may give the appearance of a false recollection when that may not necessarily be true, as source attributions may be contaminated by guessing.

Current study

In summary, the extent to which reports of misleading suggestions learned during co-witness discussion are based on illusory beliefs or memories has not been thoroughly addressed in previous studies. The current study takes an initial step toward investigating the *combined* source decisions and subjective experiences that accompany the memory attributions underlying the memory conformity effect. To this end, a new paradigm was developed that encompasses the following features. First, the standard source judgment test used in prior studies of the memory conformity effect was modified (Bodner et al., 2009; Gabbert et al., 2007; Meade & Roediger, 2002). The modified version assessed whether responses that result in source attributions are associated with subjective experiences of remembering, knowing, or guessing. Second, unlike most previous studies the assignment of critical details was fully counterbalanced across seen and unseen conditions, which is a design similar to the collaborative word recognition paradigm used by Schneider and Watkins (1996). In prior studies, the possibility remains for item-specific confounds, whereby particular items in the seen condition may have been more memorable than items in the not seen condition. Third, a new eyewitness memory video was created in which *forensically relevant* critical details were selected to serve as evidence leading to the perpetrator's guilt.

Most past studies of co-witness discussion have had each witness in a pair watch a separate video display (e.g., Gabbert et al., 2003, 2004) or separate pictures (e.g., Gabbert et al., 2006, 2007; Wright et al., 2001). The drawback of this setup is that it does not allow for the experience of jointly witnessing an event together and subjects are likely to be suspicious as to whether the video they watched is in fact identical to their partner's. The current study did not want subjects to suspect that there were different videos because that would make it difficult to obtain a

memory conformity effect. The fourth contribution to the paradigm was addressing this shortcoming by employing the MORI technology, which allows subjects to view one of two different images that appear simultaneously on the same screen without subjects taking notice of the manipulation (Garry et al., 2008; Mori, 2007). The current research is the first to apply this technique on a Canadian sample.

In the current study, pairs of subjects jointly watched a video depicting a simulated theft. Certain critical details in the video (e.g., a tattoo on the thief's bicep) were (a) visible to only one member of each subject pair, (b) visible to both subjects in the pair, and (c) not visible to either subject in the pair. Pairs subsequently completed a questionnaire together that asked them to recall details from the video, including probes for critical details in each of the four conditions. After a brief filler task, all subjects individually completed a questionnaire similar to the one they completed during discussion. Following each reported detail subjects indicated the *source* of the detail, i.e., whether they remembered the detail from the video and/or from their partner. Each source judgment was then followed by a remember/know/guess judgment task wherein subjects were asked to indicate the subjective experience accompanying their decision to attribute reported details to a particular source(s).

With the development of a new co-witness memory paradigm and the implementation of the MORI technique, the first attempt was to replicate the memory conformity effect. As such, high rates of false remembering or knowing were not expected, for variables specifically hypothesized to affect subjective experiences were not manipulated. The aim of the new paradigm is to provide a methodological design better suited than existing procedures for testing theoretical questions regarding memory attributions. However, given that the MORI technology

allows viewers to believe they are watching the same video, it was speculated that subjects may at least develop illusory beliefs regarding suggested details mentioned by a co-witness.

Method

Subjects

Students at the University of Victoria participated in exchange for optional bonus points in an undergraduate psychology course (N = 24, 12 pairs). During the manipulation check, two subjects expressed suspicion that they had watched a different video from their partner; these subjects were excluded from analysis, leaving a total of 22 subjects.

Materials

Simulated theft videos. Two videos of a simulated theft were created. The videos featured four high school students involved in different activities at school (e.g., working in the computer lab at the library; attending a chemistry lab lecture; hanging out in the cafeteria). One of the students wore a black hoodie; one scene depicted this character stealing something from another student's purse, and other critical scenes showed details that might be useful in identifying the black hoodie guy (e.g., objects he touched, distinguishing marks, etc.). Each video had the same order of events but across subjects critical details were rotated across the following four conditions to complete the counterbalancing: (1) *seen only by self*, (2) *seen only by partner*, (3) *seen by both self and partner*, (4) *not seen by self or partner (control)*.

In the *seen only by self* condition, a particular subject views details that their partner does not also view. In the *seen only by partner* condition, a particular subject's partner views details that the subject does not also view. These conditions were obtained by presenting a subject a version of the video containing scenes filmed from a camera angle different than their partner's (cf. Gabbert et al., 2003). For example, one version showed the thief stealing an iPod from

another student's purse while in the other version, the thief's back was towards the camera so that it could only be seen that he took some object from the purse and put it in his pocket without the object being visible to the viewer. In the *seen by both self and partner* condition, the subject and the subject's partner view the same details from the same camera angle. In the *not seen by self or partner* condition, neither the subject nor the subject's partner view details since these serve as a baseline measure. The assignment of critical details to conditions was fully counterbalanced to ensure that, across subjects, each pair of details appeared equally often in each of the four conditions.

MORI technique. Both videos were shown using a state-of-the-art technology called Manipulation of Overlapping Rivalrous Images (MORI), originally developed by Kazuo Mori (2007; see Figure 1). In this technique, each video is played on a separate DVD player that is connected to a NEC ViewLight Mobile DLP projector. One projector is positioned above the other on a projector stand, with one projector tilted upwards and the other downwards, resulting in the image from each projector completely overlapping. A polarizing filter attached to the lens of each projector leads one projector to beam light waves on a horizontal plane while the other projector transmits light waves on a vertical plane. To the naked eye, the projected images from both videos appear simultaneously as overlapped images on a rear projection screen. However, polarizing glasses worn by viewers hide one of the two projected images of the video, i.e., one pair of glasses allows the image on the horizontal plane to be viewed while blocking the vertical image, and vice versa. A cover story provides the rationale for wearing the glasses, e.g., that the researchers are using the glasses to simulate variations in ambient lighting. As a result, subject pairs strongly believe they are viewing the same video when in fact they are viewing different

videos. To encourage the subject's belief that only one video was shown, a music soundtrack also played in the background.

Memory tests. Two memory tests were administered to subjects, the first to pairs of subjects and the second to each subject individually. Both tests were similar in format to those used by Gabbert et al. (2003) except that the free recall portion of the first test was removed due to time constraints of the study (i.e., pilot subject pairs spent too much time deciding what to write about the witnessed event). Both tests began with instructions to subjects to "think back to the video" and to imagine that they are real witnesses recalling the series of events that occurred in the video. The first memory test contained 16 cued-recall questions. As an index of overall correct memory for the video, eight of these questions pertained to details that occurred in both versions of the video. The remaining eight questions pertained to critical details in each of the four conditions: s*een only by self, seen only by partner, seen by both self and partner,* and *not* s*een by self or partner.* To increase the likelihood that both members of each pair were exposed to each other's unique critical details, questions were designed to elicit each member's reports of the critical details.

The second memory test began with free recall followed by 16 cued-recall questions. A free recall task was added to assess how often subjects spontaneously reported non-witnessed critical details. Again, eight of these questions pertained to the critical details of interest in each of the four conditions and the remaining eight were about details common to both versions of the video. Of these eight common-version details, three appeared on the first memory test while the remaining five were new details.

Procedure. The study consisted of three phases similar to those used in past experiments on memory conformity (e.g., Gabbert et al., 2003; Garry et al., 2008).

Phase one: View video. Pairs of subjects arrived at the testing room and were informed that they would watch a video together. Subjects were seated approximately 15 feet from the rear projection screen and given glasses to wear that would allegedly simulate variations in lighting. The purpose of the experiment, as told to the subjects, was to examine the effects of different lighting conditions on peoples' sensory impressions about the details of an event (cf. Garry et al., 2008). Subjects were asked to keep their head straight and level (i.e., not to tilt their heads) during the video because movement would interfere with the "lighting simulation" of the glasses. In actuality, subjects were told to keep their head level because polarizing glasses are very sensitive to head tilts that can cause the other version of the video to become apparent. To further give subjects the impression that the glasses simulated variations in lighting, the lights were dimmed during the video.

Phase two: Joint memory test. After watching the videos, subject pairs were asked to imagine they were actual witnesses of the events they had just viewed. They were told that the police would arrive shortly to take a statement from them individually, and prior to their arrival they had the opportunity to discuss their memories for the witnessed events by completing a questionnaire together (see Appendix A). Pairs were asked to complete the questionnaire by providing the most detailed collaborative notes possible and recording written answers as a pair, with pair members taking turns at reading a question aloud and writing the answer to that question. Pairs were not required to provide an answer to each question (i.e., to guess). Each member of the pair was designated to be the left or the right witness if they sat on the left or right side of the projector screen upon entering the room, with the left witness beginning the first question.

During the discussion phase, the experimenter was present to observe and record whether critical details were mentioned by each subject in the pair. Subjects were able to view the experimenter as she made entries, however, they could not see what she was writing since she stood behind a podium. Using a checklist, the experimenter recorded the following pieces of information: version of the video seen by each subject in a pair; type of glasses worn by each subject (horizontal or vertical); whether each subject mentioned his/her unique details to the partner; and subjects' responses to each detail (e.g., "B says grey wool long ones [socks] and A doesn't remember but goes along with B" or "Both said chemistry lab"). In the event that a dispute occurred, which was rare, subject pairs were asked to write down the most agreed upon answer. Only one pair of subjects disagreed to the extent that they were unsure about what answer to provide. The experimenter then instructed them to each write their answer. For this particular pair, this kind of disagreement occurred not only for some questions about the critical details but also about common details, and neither member detected the actual purpose of the study.

Phase three: Individual memory test. Shortly after the discussion, each subject individually completed an unrelated filler task for 10 minutes. During this time, subjects were asked to imagine that the police were delayed and in the meantime, they have been asked to do other things. Following the filler task, all subjects individually completed the second memory test in the same room. The second test began with a 5-minute free recall task. Again, subjects were instructed to "think back to the video" and to provide a written statement detailing the sequence of actions, as if they had witnessed the event in real life and are providing information to the police. After the free recall, subjects read a one-page instruction sheet explaining the

source monitoring and remember/know/guess judgment tasks for each of the subsequent 14 cued-recall questions (see Appendix B).

Subjects indicated whether they had any memory for the source of each reported detail, indicating whether the detail closely resembled what they had seen in the video *and/or* what they remembered hearing from their partner. Subjects then indicated as to their subjective experience associated with each detail an experience of *remembering* seeing that detail in the selected source, an experience of *knowing* the detail happened in the selected source without any recollection of seeing it, or an experience of guessing – they were unsure about whether or not they saw/heard about the detail. The experimenter also verbally reiterated these instructions to ensure that both subjects clearly understood how to make source monitoring decisions and ratings of subject experiences for their reported details.

Following completion of the second memory test, subjects were asked to write down the purpose of the study. In addition, the experimenter asked each subject four manipulation check questions (two of which are similar to those used in French, Gerrie, Garry, and Mori, 2009, about the MORI technique). The four questions were as follows: 1) Did you notice anything unusual about the video? 2) What are some reasons why two people would disagree with another about a witnessed event? 3) Do you believe you saw the same video as your partner? 4) Have you learned about eyewitness memory in any of your psychology classes? Afterwards, subjects were fully debriefed and thanked for their participation. The entire study lasted approximately 60 minutes.

Results

A significance level of .05 was used for all statistical tests reported in this section, unless otherwise noted.

Rate of reporting critical details during discussion. For details seen only by one member of the pair, the rate of reporting was computed by tallying the number of details reported during discussion divided by the combined number of critical details each member was assigned (out of four). For example, if a given subject was exposed to one critical detail and the subject's partner was exposed to two critical details, the rate of report between the pair would be three out of four, or 0.75. Across subjects, rate of reporting critical details seen by only one member of the pair was 0.59. The rate at which pairs reported critical details when details were seen by both members was 0.71, and this mean proportion was calculated for each pair[1] rather than by subject. The rate of report for details that were not seen by either member of the pair (i.e., guesses of the critical details) was 0.05, and this mean proportion was calculated by subject.

Free recall of critical details on the individual memory test. For each condition, the proportion of recalled details was contingent on the number of details a subject recalled on the individual test divided by the number to which that subject was exposed during discussion. A 2 (seen by self and not seen by self) x 2 (seen by partner and not seen by partner) repeated ANOVA on the proportion of recalled critical details revealed a significant main effect of self: recall of critical details seen by the subject was significantly higher than details that were not seen by the subject (M = .58, SE = .60 vs. M = .09, SE = .04), respectively), $F(1, 21) = 57.02$, MSE = .21. However, as depicted in Figure 2 below, there was no main effect of partner [$F(1,21) = .48$, MSE = .21, p = .50] nor a significant self by partner interaction [$F(1, 21) = 1.66$, MSE = .21, p = .21].

[1] Of the 22 subjects, two subjects were not paired because their partners had become suspicious of the manipulation. However, for these two subjects a rate of report for details that were seen by both was calculated because the details could have been mentioned by either member of the pair.

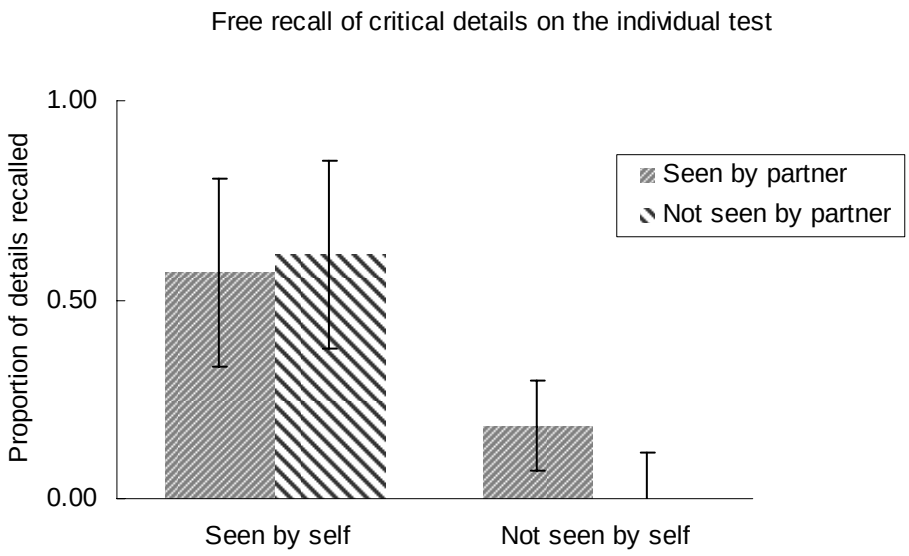

Figure 2. Proportion of details recalled during free recall as a function of whether details were seen or not seen by the self as well as seen or not seen by the partner. Error bars represent 95% within-subjects confidence intervals (Loftus & Masson, 1994).

Cued-recall of critical details on the individual memory test. The results for the mean proportion of critical details recalled are shown in Figure 3. Similar to the free-recall data, recall on the individual test was contingent on prior exposure to critical details during discussion. A 2 (seen by self and not seen by self) x 2 (seen by partner and not seen by partner) repeated measures ANOVA on the proportion of recalled critical details revealed a main effect of self. Subjects recalled a significantly greater proportion of critical details they had seen (M = .92, SE = .04) relative to those they had not seen (M = .42, SE = .06), $F(1, 20) = 42.00$, MSE = .07. A main effect of the subject's partner also showed a similar pattern, whereby recall of critical details seen by the partner (M = .87, SE = .05) was significantly greater than details not seen by the partner (M = .48, SE = .05), $F(1, 20) = 42.00$, MSE = .07.

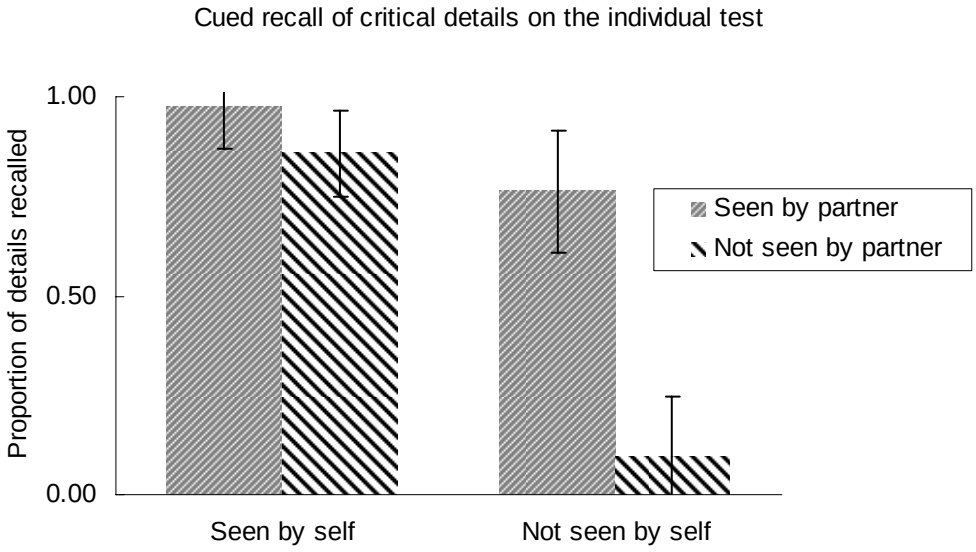

Figure 3. Proportion of details recalled on the cued-recall test as a function of whether details were seen or not seen by the self as well as seen or not seen by the partner. Error bars represent 95% within-subjects confidence intervals (Loftus & Masson, 1994).

In contrast to the free recall data, the effect of details seen by the self interacted significantly with details seen by the partner, $F(1, 20) = 22.00$, $MSE = .07$. If a subject did *not* see a critical detail, that subject was more likely to (falsely) recall the detail when it was seen and reported by the partner ($M = 0.76$, $SE = .10$) than when it was not seen by the partner ($M = 0.10$, $SE = .07$), $F(1, 20) = 37.97$, $MSE = .11$ (see Figure 3 above). This confirms that subjects exhibited memory conformity, thus replicating the phenomenon documented in prior studies. For details *seen* by the self, there was no influence of whether these details were also seen and not seen by the partner. Although the trend was in the expected direction, the proportion of details recalled in the seen by both self *and* partner condition ($M = .98$, $SE = .02$) was not significantly different from the proportion recalled when details were only seen by the self, ($M = .88$, $SE = .07$), $F(1, 21) = 2.42$, $MSE = .06$, $p = .14$.

Overall memory for the video. Subjects were also asked eight questions pertaining to details common to both videos on the second memory test. Memory accuracy was based on the proportion recalled out of the eight details, with a mean accuracy rate of .54. As in previous memory conformity studies, we assessed the relationship between overall memory accuracy for these eight details and susceptibility to falsely report critical details (Bodner et al., 2009; Gabbert et al., 2003, 2007). Memory conformity was found to be significantly and negatively correlated to overall accuracy ($r = -.46$, $p < .05$), suggesting that individuals who were most likely to report misinformation seen by their partner also had poorer recall of the original events in the video. This finding accords well with the literature on the standard misinformation effect (Liebmann, Mckinley-Pace, Leonard, Sheesley, Gallant, Renkey, et al., 2002); however, both Bodner et al. (Experiment 1), and studies by Gabbert and colleagues reported no relation between suggestibility to co-witness discussion and memory accuracy.

Source judgments for critical items. Subjects' performance on the source judgment test is shown in Figure 4. For each cued-recall question, subjects indicated whether the recalled detail was seen in the video and/or mentioned by their partner. Again, this was contingent on prior exposure to the detail during discussion. For each condition, the number of times subjects attributed recalled details to a particular source was less than the expected cell count of four for conducting a chi-square analysis. As a result, meaningful statistical analyses could not be conducted. As such, the data pattern for source judgments will be discussed broadly as per the figure below.

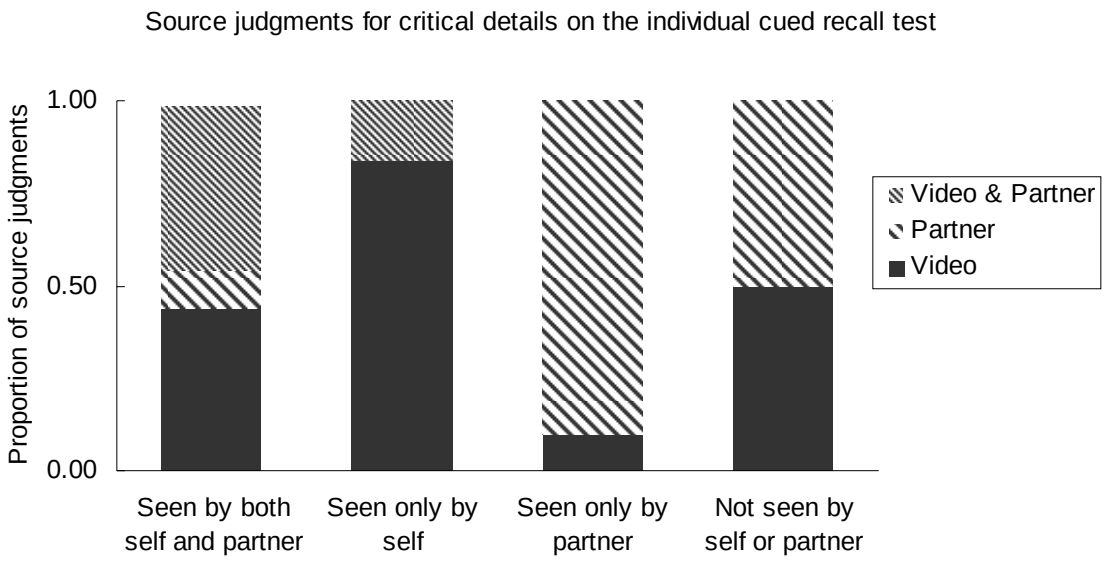

Figure 4. Proportion of source judgments for recalled critical details for each condition.

Seen by both self and partner. Critical details seen by both members of the pair were equally attributed to the *video* only source (.44) and the *video and partner* source (.44). Only a small proportion of the time (.10) were these details attributed to the *partner-only* source. Correct source attributions to the *video and partner* source may have been reduced by subjects' recollections of their partner not remembering the details (and hence their decision to primarily attribute those details to the *video* only source). For details that were only attributed to the partner, it is plausible that subjects did not remember seeing the details themselves at encoding but remembered their partner discussing them.

S*een only by self*. Subjects correctly attributed critical details seen themselves more often to the *video* only source (0.84) than to the *video and partner* (0.16) source. It is likely that when both sources were selected, subjects may have remembered their partner agreeing to the reported detail (s) recalled by the self, even if the partner did not actually seen the information. These high proportions of correct source attributions to the video sources for seen details (in both of the

seen by self conditions) suggest that when queried, subjects can accurately monitor the source of details that were personally witnessed.

Seen only by partner. As depicted in Figure 4, subjects appeared to have accurately monitored the source of critical details that were not personally witnessed but were seen and mentioned by their partner. When one member of the pair falsely recalled at least one critical detail actually seen by the partner, the detail was mostly said to have come from the partner (0.90) rather than the video (0.10).

Remember/know/guess responses for critical items.

Subjects were asked to indicate whether they remembered, knew, or guessed the source of each reported detail. Figures 5-7 separately present the mean proportion of remember, know, and guess responses accompanying each source judgment for each of the three conditions.

Seen by both self and partner. In Figure 5, critical details that were seen by both members of the pair, when attributed to the *video* only source, were numerically higher in remember responses (0.91) than a know (0) or guess (0.08) response. Details in this condition were also always said to have been correctly remembered when attributed to the *partner* only source (1.00), for even if the subject did not remember seeing it, the subject's partner did and correctly reported the detail(s). When details were said to have come from the *video and partner*, those attributed to the video were always given a remember response (1.00) and those attributed to the partner were accompanied by a greater proportion of remember responses (0.92) than know (0.00) or guess responses (0.08). Thus, it is evident that details that had been seen and discussed were later reported at test (and attributed to at least one of the two correct sources) because they were primarily accompanied by accurate subjective recollections.

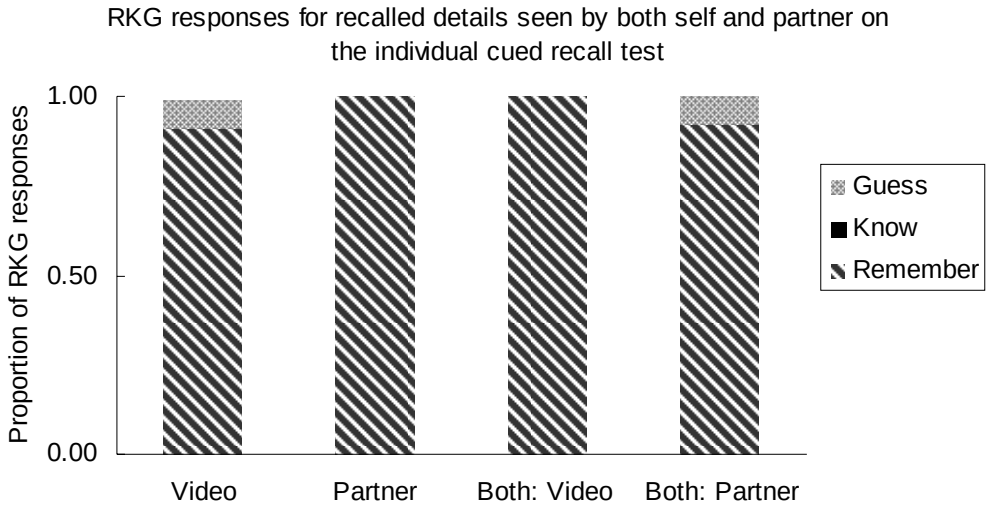

Figure 5. Proportion of remember/know/guess responses for critical details seen by both self and partner.

S*een only by self.* Recall that critical details that were seen by the subject only were correctly attributed to the *video* only source 0.83 proportion of the time. Details recalled from the video were always said to have been remembered (see Figure 6 below). Again, when *both* sources were selected the subjective experience associated with the *video* was a greater proportion of remembering (0.75) than knowing (0.25). The subjective experience associated with the *partner* also exhibited the same pattern, with a trend toward more remembering rather than knowing (0.75 vs. 0.25, respectively). It is unclear what subjects may have remembered their partner talking about in relation to critical details that the partner could not have actually seen, other than the subject remembering the partner nod along or agree to the details.

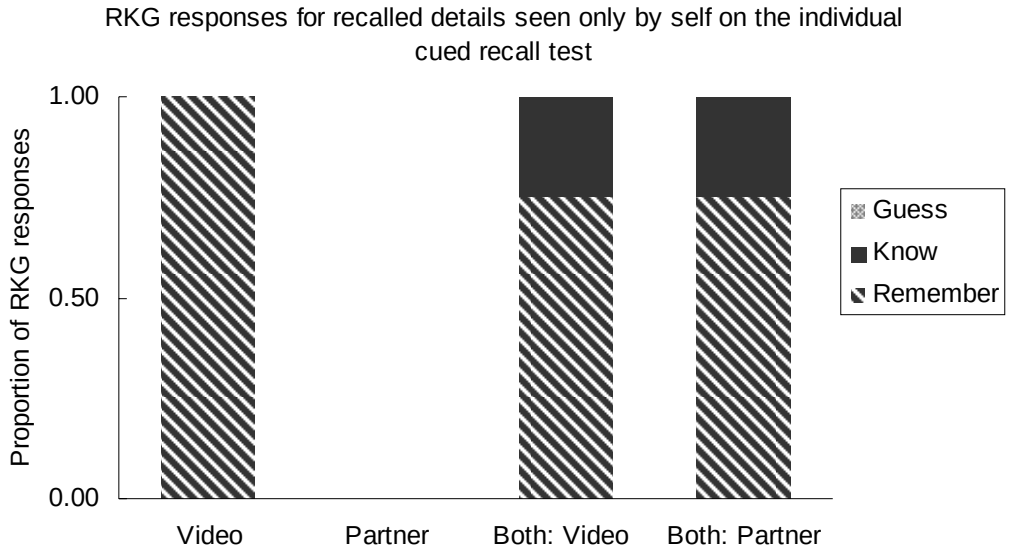

Figure 6. Proportion of remember/know/guess responses for critical details seen only by self.

Seen only by partner. Of particular interest is the proportion of remember and know responses accompanying source decisions for critical details that were not seen by the subject, but by the subject's partner (see Figure 7). Despite the low rate of falsely attributing critical details to the *video* only source, the subjective experience associated with that source was always illusory "remembering" (1.00). This outcome suggests that a small proportion of the time, the partner's suggested responses not only influenced what subjects reported but also tainted their subjective recollections. For the most part, however, subjects' false reports to suggested details mentioned by the partner were correctly remembered as having come from the partner (0.83), rather than knowing or guessing that they did (0.05 vs. 0.11, respectively).

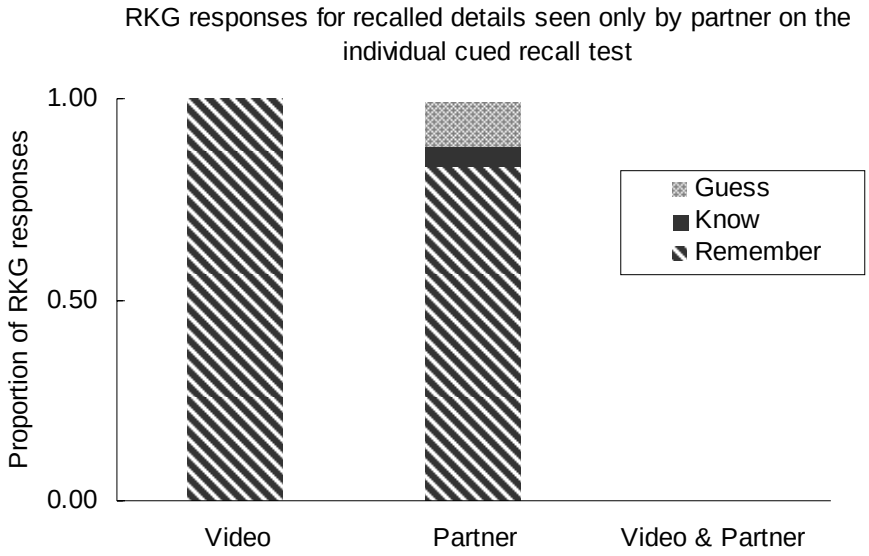

Figure 7. Proportion of remember/know/guess responses for critical details seen only by partner.

Collaborative inhibition. Research shows that collaborative recall often impairs memory performance relative to the combined performance of individuals recalling independently, a phenomenon known as *collaborative inhibition* (e.g., Basden, Basden, Bryber & Thomas, 1997). Although this study was not designed to test hypotheses about collaborative inhibition, the pattern of results suggested that this phenomenon might be present. One way to test collaborative inhibition is to compare (a) performance of pairs of subjects on recall of details seen by both members of that pair with (b) the performance one would expect of such pairs based on each pair-members' recall of seen-by-self-only details using the following independence equation: [A + (1-A)*B]. Using this equation, one can estimate what proportion of details seen by both members would be recalled had subjects completed the initial recall test independently and then pooled their responses (i.e., if there was no collaborative inhibition). In the equation, A represents the probability of recalling critical details seen by only one member of the pair; 1-A represents the probability when A fails to recall critical details seen only by one

member of the pair; and B represents the probability of recalling critical details seen by the other member of the pair. The probability of recalling details seen by only one member of the pair was based on the recall rate of details seen-only-by-the-self for each subject. If subjects are performing independently of one another then the rate of reporting critical details seen by both members of the pair yields an estimated joint recall of .83 for each pair. Those values were then compared, in a one-way within-subjects ANOVA, to the pairs' actual rates of recalling details seen by both members of the pair, .65[2]. Although the mean predicted by the independence equation was directionally greater than the actual obtained rate of report for details seen by both members of the pair, the difference did not approach statistical significance, $F(1,9) = 2.44$, $MSE = .06$ $p = .15$.

A second way to test if collaborative inhibition impaired memory is to compare performance on the joint versus individual cued-recall memory tests. For this analysis, recall was *not* contingent on prior exposure to the details during collaboration. A one-way within-subjects ANOVA comparing proportion of details recalled on the joint cued-recall test versus on the individual cued-recall test was conducted on critical details seen only by the self. Statically significant differences did not emerge on recall of critical details during collaboration ($M = .59$, $SD = .29$) versus on the individual test ($M = .56$, $SD = .28$), $F(1,21) = 1.00$, $MSE = .006$, $p = .33$. Overall, the pattern of data is suggestive of collaborative inhibition but statistically significant findings did not emerge.

Discussion

[2] This rate of report is lower than the original 0.71 reported in the first paragraph of the Results section because it is restricted to subjects who are paired. As previously mentioned, only two subjects in the data set are not paired, although their data are still included in the study and hence included in the 0.71 rate of report for details seen by both members of the pair.

This thesis examined the extent to which subjects' *reports* of misleading suggestions following co-witness discussion reflected in subjective experiences of "remembering" and "knowing" that suggested details had been witnessed. Consistent with previous findings in the memory conformity literature, 76% of the time subjects reported at least one critical detail they did not personally witness but learned about during discussion with another person (Bodner et al., 2009; Gabbert et al., 2003, Garry et al., 2008). However, subjects rarely reported illusory memories of such details. Rather, they typically correctly attributed details derived from their co-witness to that source. Although memory conformity is a robust phenomenon and discussion among witnesses is highly prevalent in real-world scenarios (e.g., 85% among a sample of undergraduate students who witnessed a crime in Paterson & Kemp, 2006; 56% among crime witnesses in Skagerberg & Wright, 2008), preliminary investigation into this matter using a new paradigm suggests that discussion may not necessarily lead to illusory beliefs or memories.

Examining memory conformity using source judgments

In many situations, people may not closely scrutinize their memories unless specifically told to do so. In the current study, despite having read instructions that they would be queried about the source of their memories, subjects' answers to cued-recall questions included critical details that were *not* personally witnessed but obtained from their partners. There are two possible explanations. Subjects may have felt compelled to provide an answer to each question on the test and did not consider the different sources until faced with the requirement to source monitor. However, subjects in the present study made source judgments *immediately* after each cued-recall question, an approach different from most previous studies because subjects are typically asked to first complete a memory test and then adjudicate source judgments after the

test *or* take a separate source memory test altogether (e.g., Bodner et al., 2009; Gabbert et al., 2007; Meade & Roediger, 2002; Paterson et al., 2009).

A more plausible explanation is that subjects in present study approached the memory task as an opportunity for them to report *everything* they knew about the witnessed events (regardless of whether or not the information was actually witnessed by them). Indeed, Bodner et al. (2009) reasoned that instructions to subjects to merely think back to the video may not "effectively guard participants against reporting nonwitnessed details" (p. 19), for they obtained a 74% memory conformity rate with standard test instructions and a significantly lower rate of 35% with post-warning instructions. Their instructions explicitly told subjects to not report information they obtained from their partner unless they also remembered seeing it in the video. The SMF posits that source decisions are influenced by the rememberer's goals (Lindsay, 2007). Thus, based on the current findings, if subjects interpreted the memory task as a goal to report everything then they may have initially disregarded source information. Similarly, subjects may have also reasoned that they could report information they believed came from their partner.

Even if subjects' goals were to report everything they knew they nonetheless accurately and effectively tuned to the origins of their memories. When subjects' attention was drawn to the sources of their memories, most of the falsely reported critical details (that were *not* seen by the subject but seen by the subject's partner) were attributed to their actual source - the partner. Again, these findings accord well with the SMF: Encouraging subjects to more closely consider the origins of their mental experiences can allow them to engage in more effective decision criteria at test. Furthermore, the quality of the memory for suggested details may have also been subject to careful scrutiny under SM instructions than they otherwise would have. Specifically, it is likely that the perceptual content of memories associated with the witnessed event were

much stronger, clearer, and more vivid than any perceptual qualities evoked during discussion about the suggested details (Johnson et al., 1993). During discussion, the partner's report of the suggested detail likely did not elicit a detailed image of the fictitious information, especially if the discussion was short and vague (see Drivdahl & Zaragoza, 2001, regarding the role of perceptual elaboration in misinformation effects). Consequently, during attempts to adjudicate the source of the suggested detail subjects may have realized that their memory for the detail lacked perceptual details characteristic of memories of the video, leading them to conclude that the information must not have been witnessed in the video. Also, the joint collaboration was a recent and salient event, so subjects could likely recollect at test information that helped them attribute memories of their partner's utterances to the correct source. Indeed, only 10% of the time critical details were attributed to the video while the remaining 90% of the time subjects made correct source attributions. That subjects can sometimes accurately retrieve and differentiate between sources of information when provided with a source memory test is echoed in two classic studies by Lindsay and Johnson (1989) and Zaragoza and Koshmider (1989) using the standard misinformation paradigm.

Other factors, such as the characteristics of the co-witness discussion and the delay between the first and second memory tests, may have also influenced the high rate of correct source attributions for suggested details. Although the present thesis did not examine discussion factors among subject pairs, prior research into these factors allow for speculations in relation to source memory. Recently, Garry et al. (2008) examined how prior agreement during co-witness discussion modulates memory conformity. When disputes occurred regarding misleading details, subjects were significantly less likely to be misled than when there was agreement. In the present study, disputes were infrequent but when they did occur it may have increased

accurate source memory. From the SMF perspective, if subjects remembered the detail that stirred disagreement then this may have contributed to the memorability of the source of that detail, thus providing more perceptual information (i.e., that the partner mentioned it if one explicitly remembered saying that he/she did not agree with a detail).

In terms of delay, it is well known that delay heightens the misinformation effect and that memory for source declines with increasing retention intervals (Frost, 2000, 2002; Higham, 1998; Lindsay & Johnson, 1989; Loftus et al., 1978; Zaragoza & Koshmider, 1989). Following a post-event misleading narrative, Frost (2002) had subjects complete a yes/no source memory test 10 minutes or 1-week later. At the short delay, subjects were less likely to claim to have seen the suggested details in the slides relative to the narrative, for they had just learned about the information prior to the memory test. At the long delay, however, suggested information was more likely to be attributed to the slides compared to the narrative whereas control details were correctly attributed to the slides (albeit the proportion was smaller compared to the short delay condition). Because source memory is likely to have faded after a week and since memory for the witnessed event and the suggested details become comparable in terms of their perceptual content (i.e., both are lacking in detail), subjects likely experienced greater source confusion for the suggested information after a long delay. The data pattern evident in Frost's (2002) short delay condition is consistent with the current findings: after a 10-minute delay, subjects correctly attributed misleading details to their partner rather than to the video. Bodner and colleagues (2009) also obtained accurate source judgments for misleading details after a delay of only 5 minutes between the discussion and the final memory test. Future memory conformity studies should manipulate delay to determine how long before source memory becomes dissociated from suggested information (cf. delay and the misinformation effect in Loftus et al., 1979).

Although subjects in the current study benefited from a source memory test, source-monitoring may not always allow individuals to accurately edit out memories for erroneous details. For example, among subject-confederate pairs, Meade and Roediger (2002) demonstrated that a confederate's erroneous responses biased subjects' memory reports on a recognition source judgment test even when warning instructions were used (Experiment 1) and regardless of whether or not prior recall preceded the test (Experiment 2). As remarked by Meade and Roediger (2002), the tenacious memory conformity effect obtained on their SM test is likely due to the strong association between suggested items and the scenes in which the items appeared, for they also obtained relatively high rates of false recall for control items (for similar findings using a delayed source monitoring task, see Paterson et al., 2009). In support of this suggestion, when critical stimuli are relatively distinct from the scene in which they appear, as in Bodner and colleagues 2009), source-monitoring discriminations following memory conformity are successful. Because critical details in this study were not as highly schema consistent as those used in the Roediger and Meade studies, subjects may not have been easily swayed into mistaking details they heard from their partner for details they saw in the video.

In addition to delay and the nature of the stimuli, empirical research suggests that there are other manipulations that influence source monitoring abilities. In a study that manipulated perceived encoding duration, Gabbert et al. (2007) had subject pairs separately view slightly different versions of pictures containing a number of critical objects. These critical objects were schema-consistent, for example, a kitchen scene with objects like cups and a plate near a sink seen by one member of the pair versus cups and a teapot near a sink seen by the other member. Subjects viewed the pictures for the same amount of time, yet each member of the pair was informed that they had viewed the pictures for *twice the time* or *half the time* of their partner.

For subjects in the half-the-time condition, there was a trend to erroneously attribute to the pictures those reported objects not seen but learned from the other. In contrast, subjects who were led to believe they saw the pictures for twice the time as their partner were equally likely to attribute falsely reported details to the picture and partner sources. Presumably, if subjects perceived their memory to be better than their partner then they were less willing to attribute objects they did not see to having been in the picture, e.g., "I saw this picture longer than my partner so I would have remembered if it was in the picture." Thus, under some co-witnessing conditions, source-monitoring can prevail and allow individuals to more carefully monitor the origin of their (erroneously) reported details. If all of the subjects in the present study believed they were in the "good" lighting condition then they, too, may have behaved like the *twice the time* subjects in Gabbert and colleagues (2007) study, e.g., "I had a good view of the video with my glasses so I probably would have remembered seeing it if it was in the video." In future research, pairs of participants will be informed that they are in the same lighting condition.

In a recent study examining memory conformity, source monitoring errors were obtained on a free-recall test administered to subject's 1-week after they had witnessed a target event, even after subjects were given an immediate or delayed instructional warning (Paterson et al., 2009, Experiment 2). Because the authors combined instances where subjects attributed misleading suggestions to the witnessed event *and* instances when the details were attributed to both sources (the witnessed event and the partner), the contributions made to each source were not reported; thus, the rate of incorrect source attributions may have been overestimated. Like the current findings, Bodner et al.'s (2009) memory conformity effects were manifest as a greater tendency to attribute suggested details to the partner rather than to the witnessed event. However, in the current study as well as that of Bodner and colleagues, it is not clear whether

subjects actually remembered their partner mention the detail or "knew" that it came from the partner. These findings highlight claims about responses on a source judgment test not being entirely indicative of the subjective experiences accompanying those responses (Higham, 1998; Zaragoza & Koshmider, 1989). Even if suggested details are erroneously attributed to the witnessed event (which occurred a small proportion of the time in the current study) or if they are attributed to the witnessed event and also said to have come from the partner, it is not clear whether that erroneous source attribution reflects an illusory *belief* or a *memory*. Compared to prior procedures, the modified source memory test used in this study enables a more direct assessment of the subjective experience accompanying reports of suggestions.

Examining memory conformity using subjective experiences

In the current study, when a subject falsely reported and attributed suggested details their partner actually witnessed, they usually accurately *remembered* their partner uttering these details during discussion. These findings are not consistent with prior studies that have examined subjective experiences accompanying memory conformity following co-witness discussion. In studies by Roediger and Meade (e.g., Meade & Roediger, 2002; Roediger et al., 2001), more "know" than "remember" judgments accompanied subjects' false recall of household objects that were incorrectly mentioned by a confederate during collaboration, suggesting that subjects experienced an illusory belief. Contrasting their findings, Paterson and colleagues (2009, Experiment 1) found that although more remember than know responses accompanied subjects' recall of accurate details, equivalent remember and know responses were obtained for misleading details. These different findings are likely attributable to factors such as a short retention interval and free recall task used in the Roediger and Meade studies and a 1-

week retention interval and an open-ended style recall task (mimicking a real-world interview procedure) used in the studies by Paterson and colleagues.

The inconsistency of the various findings can be explained by drawing on a basic tenet of the SMF, which states that individuals may set a higher criterion for accepting experiences as memories for recent events than for long-ago past events (Johnson et al., 1993; Johnson, Foley, Suengas, and Raye, 1988). In the present study, one criterion subjects may have adopted for accepting memories of suggested details as a "remembered" experience within the context of the witnessed event is amount of perceptual information. Certain factors may have contributed to the amount of perceptual information associated with the suggested details, and the nature of the discussion is one such factor. Often, co-witness discussions were brief. A consequence of this is that in response to a question about a critical detail, if a subject's partner provided the critical detail and did not elaborate on that detail then the subject (who did not see that detail in the video) may simply have been exposed to the answer. Merely being exposed to the suggested detail during discussion may not have induced subjects to spontaneously elaborate on the perceptual qualities of the detail, thereby contributing to only a vague mental representation of the suggested information (cf. Drivdahl & Zaragoza, 2001).

Collaborative inhibition could have contributed to the brevity of co-witness discussions. Response criterion is a likely candidate influencing the occurrence of this phenomenon, given that the joint-recall task may have increased the likelihood that subjects monitored their own performance when in the presence of an unknown subject. That is, subjects may have adopted a conservative bias since most appeared to have been fairly reticent when talking to each other. Such behaviour may have occurred if subjects chose to err on the side of caution when reporting critical details during the joint-recall task, for they may have reasoned that it is better to not say

anything at all than attempt being wrong. However, as discussed at length in the Results, collaborative inhibition was not evidenced in the present study since (a) rate of reporting details seen by both members of the pair based on the independence equation was not significantly different from the actual performance of pairs of subjects on these details and (b) performance on the joint versus individual cued-recall tests did not differ significantly for details only seen by the self. Even if collaborative inhibition was evidenced, it would have been a rather unusual finding since all of the data (i.e., rate of reporting) are from the joint recall phase and this deviates from how the phenomenon is typically described in the literature.

The short retention interval also may not have been sufficient to blur the memories of the witnessed event and the discussion, hence not leading to false remembering or believing (but regarding the misinformation effect see Frost, 2000). Because people typically rely on the qualities of their memories to infer the status of a memory, subjects may have realized that their memory of having witnessed the suggested detail is lacking in certain details that otherwise would be present to infer that a memory is real. Consistent with the present findings, suggested details likely evoked perceptually detailed memories of the conversation that subsequently benefited accurate source memory, and in turn preserved accurate remembering experiences. Of course, exceptions occurred when subjects who falsely reported suggested details attributed those details to the video *and* indicated having "remembered" seeing those details in the video (see Figure 5). It is likely that in these cases subjects may have spontaneously imaged the suggested detail during discussion and/or the final test phase.

The modified source and subjective memory test also revealed that sometimes peoples' *accurate* source judgments may not always be accompanied by a recollection. Although 84% of the time critical details that were not seen by the subject but by the subject's partner were

correctly *remembered* as having come from the partner, 5% of the time correct source attributions were accompanied by *knowing* while *guessing* accounted for the remaining 11%. What this latter result highlights is that similar to how guessing may contaminate erroneous source attributions (cf. Higham, 1998), guessing may also account for accurate source decisions. Of course, accurate source guessing may also be influenced by various biases (e.g., Newman & Lindsay, 2009), but the issue is that even if most of the subjects in the current study indicated that suggested details were mentioned by their partner, they did not always have a recollective experience of their partner saying so.

Limitations and Future Directions

One unfortunate consequence of using the MORI technique with videos that contain very different images that are superimposed was that it was necessary to seat subjects some distance away from the viewing screen. If subjects sat too close to the viewing screen then it became more apparent that there were two images playing simultaneously. However, the distance came at a cost, as it led to some critical details being difficult to identify. In particular, in the condition in which details were viewed by both subjects, the iPod in the video was only reported by one subject and the Seven Up button was never reported by any subject. The difficulty of identifying these two details was confirmed during the discussion, as some subjects explicitly indicated that they could not clearly identify the stolen item (i.e., the iPod) or the vending machine button the thief pressed.

The videos became apparent to subjects at a shorter distance because the MORI technique cannot properly overlay images that greatly differ. Since the images were filmed from two different camera angles, a complete overlay was not possible. Further adding to the problem of the images not overlapping completely are factors such as moving images (such as the thief

putting on a pair of gloves) and contrasting backgrounds (such as a dark object set against a light background). As a result, a combination of these factors led to certain parts of the other video being noticeable when only seeing the one video. Only one other study in New Zealand conducted by Garry and colleagues (2008) has used the MORI technique, and their videos overlapped successfully when using static images (e.g., one video featured a blue baseball cap while the other a black one) and when the videos were filmed from the same camera angle. However, the other video becomes noticeable during scenes in which a moving image appears (e.g., flipping through a magazine).

Given these limitations, a new video is currently being designed that seeks to address these aforementioned problems. The advantage of showing subjects videos from two different camera angles is that it nicely simulates actual scenarios in which witnesses may observe a crime from different vantage points and *not* be aware that another witness may have observed the event from a different view. Thus, the goal with the new video is to reduce the number of moving images (by using more static images) and avoid contrasting backgrounds to determine if the MORI technique can correctly display different camera angles after first resolving these two issues.

One factor that may have increased the accuracy of source attributions and subjective experiences accompanying those attributions is the ambiguity of the critical details. Critical details were included that would "fit" the stereotypical image of a thief or at least signal evidence that points to the thief (hence the inclusion of a Seven Up button on a vending machine to obtain fingerprint evidence). However, as remarked by Meade and Roediger (2002) and Roediger et al. (2001), subjects are most likely to falsely recall items that are strongly expected to be present in a given scene (e.g., a screw is more expected to be present in a toolbox than a ruler). In the

present study, it is likely that subjects did not falsely "remember" or "believe" in the occurrence of critical details seen only by the partner because they may have been relatively unexpected to occur in the scenes they appeared. For example, a skull and bones tattoo on the thief's arm is not expected to occur in a scene in which the thief is simply conversing on his phone while sitting on a bench.

The principle of *discrepancy detection* states that misinformation effects are related to one's ability to notice discrepancies between the witnessed event, the video, and the post-event, the partner's suggestions (Davis & Loftus, 2007). In applying this explanation to the current study, subjects may have reasoned that they would have remembered seeing these unexpected details mentioned by their partner (such as a prominent tattoo). That is, the critical details used in this study may have heightened discrepancy detection, which in turn led to successful source monitoring and remember/know/guess responses relative to other, more potentially ambiguous details. To resolve this issue when designing the new video, a pilot study will be conducted where subjects are asked to list the details they expect to see in different parts of a high school building as well as details of a stereotypical thief.

Certain characteristics of the co-witness discussion may have influenced the extent to which subjects in the present study correctly attributed memory for source and subjective experiences. To date only a few studies have specifically examined discussion factors, like response order and disputes and their relation to memory conformity (e.g., Gabbert et al., 2006, 2007; Garry et al., 2008). In their recent empirical work, Gabbert and colleagues proposed that a subject who reported a critical detail first was more likely to influence the partner's responses in the direction of that errant critical detail (but see Lindsay, 2007). Even so, Garry et al. showed that prior agreement and disputes more reliably predict memory conformity than order of

speaking. Whether subjects in this study spontaneously reported critical details first or reported them subsequent to their partner's report is not known, for discussions were not audio-taped. It would be particularly interesting for future studies to examine response order in relation to disputes, i.e., a potential interaction between agreement (yes, no) and response order (spoke first, spoke second) independently for memory conformity, source memory, and subjective remember and know experiences.

Related to audio-taping the discussion is examining the confidence of the members of the pair during collaboration. In most studies on the memory conformity effect, confidence was assessed by examining whether the person exhibiting higher confidence during collaboration influenced the second person's likelihood of reporting suggested details at test (e.g., Schneider & Watkins, 1996, Experiment 2; Ost et al., 2008; Wright et al., 2000, Experiment 2). However, to date, confidence ratings *as a pair* have not been assessed during collaboration. In designing future studies, one idea that is currently being pursued is to ask subjects as a pair to provide a collaborative confidence rating to critical details at the time of discussion. Of particular interest is a collaborative confidence rating for details witnessed by only one member of the pair. If a subject is certain about witnessing a detail then would the subject's partner (who did not see that detail) come to agree on a high confidence rating? It is predicted that if the partner also expresses high confidence during discussion then he/she may also commit a source monitoring error at test: the partner may remember having expressed high confidence for the suggested detail during the discussion as evidence that the detail was "remembered" in the video or at least "believed" to have occurred in the video. On the other hand, it is also possible that the partner may accurately recall that the other person expressed high confidence but they themselves did

not, and as a result correctly attribute the source of the detail to having been mentioned by their partner. Further research awaits this conclusion.

On a related point, subjects in this study were not forced to guess any of the answers and occasionally indicated on the collaborative memory test that they did not remember a particular detail, regardless of the type of detail. In future experiments, subjects will be asked to attempt their best guess to answer questions about details they are unsure about. Prior studies on the standard misinformation effect have shown that guessing or confabulating suggested details leads to false memories (Ackil & Zaragoza, 1998). Relative to a group of subjects who were not forced to confabulate responses to suggested details, those who were asked to confabulate were significantly more likely to later claim that the confabulated details had actually been witnessed. For future studies, the aim is to extrapolate this finding to the domain of co-witness memory.

Manipulating the extent to which individuals develop false memories or beliefs within a co-witness paradigm has not yet been explored. As such, the next series of future experiments using the new paradigm aim to implement techniques hypothesized to *increase* illusory experiences of remembering, or at least believing in falsely reported suggested details supplied by a co-witness. Two well known catalysts for false memory formation for suggested events are guided imagery and repeated recall (Drivdahl & Zaragoza, 2001; Henkel, 2004; Mitchell & Zaragoza, 1996).

In Study 1, following co-witness collaboration, subjects in an *imagery* condition will complete a mental imagery task intended to enhance the mental representation of critical details, including those only seen by one member of the pair; subjects in a *no-imagery* condition will be asked to only think about the critical details without imagining them. In Study 2, following co-witness collaboration, subjects in a *repeated recall* condition will undergo multiple individual

memory recall sessions with intervening distracter tasks prior to the final memory test. Subjects will be cued to recall details, including the critical details they did not see but learned from the other person, *without* consideration of the source of those details. A comparison group, the *single recall* condition, will only complete the final memory test.

From the SMF perspective, imagination (e.g., mental imagery) exercises allow the rememberer to internally generate a mental image about *how* suggested details could have occurred. For example, if I were to ask you to "imagine that a student wearing a black hoodie steals an iPod," it is likely that such an image would come to mind relatively easily and quickly. Furthermore, if I were to guide your image by asking you to imagine and describe what the iPod looked like, where it was stolen, when the theft occurred, and so forth, this would likely render an especially evocative image as opposed to merely thinking about the suggestion. Imagery, therefore, encourages one to elaborate on a suggestion in different ways so as to ultimately create a visually salient, perceptually detailed and concrete mental representation (Drivdahl, Zaragoza, & Learned 2009). When reconstructing memory for the suggested detail at a later time, the image associated with the suggestion that was created during the imagination exercise is likely to easily come to mind. If the image shares features that are typical of a real memory (or even if the image feels familiar and comes to mind quickly) then one may erroneously accept the image as a real memory. In this way, hearsay suggestions may, following guided imagery, be falsely believed or remembered.

Converging lines of evidence also suggest that while repeatedly recalling event details enhances accurate recall, source confusions become increasingly common (Henkel, 2004). According to the SMF, when subjects are not encouraged to consider source information repeated recall of suggested details should lead subjects to *blend* sources of witnessed and non-

witnessed information, resulting in a single memory. Like imagery, repeatedly attempting to retrieve a memory should lead to increased fluency such that the suggested details are recalled easily, quickly, and vividly. A potential consequence of repeated recall is that the individual eventually interprets such characteristics as evidence that the suggested information is an actually perceived memory.

Conclusion

In conclusion, the paradigm introduced in this thesis provides a novel, more sensitive and improved technique to study the effect of co-witness discussion on individual recollection. Findings confirm that people will incorporate elements of an event they did not personally see into their witnessed reports when conversing with another, potentially erroneous co-witness. Eyewitnesses to a crime may have different motives, and one motive that was evident among the current subject-witnesses is to report *everything* about a witnessed event – even inaccurate information that subjects knew they had not personally witnessed. Consistent with the SMF, the origins of memories and the subjective experiences accompanying those memories can be accurately identified when subjects are interviewed shortly after a witnessed event. In conclusion, false reports arising out of immediate co-witness discussion may not necessarily reflect false memories.

References

Ackil, J. K., & Zaragoza, M.S. (1998). Memorial consequences of forced confabulation: Age differences in susceptibility to false memories. *Developmental Psychology, 34*, 1358-1372.

Allen, B. P., & Lindsay, D. S. (1998). Amalgamations of memories: Intrusions of information from one event into reports of another. *Applied Cognitive Psychology*, *12*, 277-285.

Basden, B. H., Basden, D. R., Bryber, S., & Thomas, R. L. III. (1997). A comparison of group and individual remembering: Does collaboration disrupt retrieval strategies? *Journal of Experimental Psychology*: *Learning, Memory and Cognition, 23*, 1176-1189.

Betz, A. L., Skowronski, J. J., & Ostrom, T. M. (1996). Shared realities: social influence and stimulus memory. *Social Cognition, 14,* 113-140.

Bodner, G. E., Musch, E., & Azad, T. (in press). Reevaluating the potency of the memory conformity effect. *Memory & Cognition*.

Dalton, A. L., & Daneman, M. (2006). Social suggestibility to central and peripheral misinformation. *Memory, 14*, 486-501.

Davis, D. & Loftus, E.F. (2007) Internal and external sources of misinformation in adult witness memory. In M.P. Toglia, J.D. Read, D.F. Ross, & R.C.L. Lindsay (Eds). *Handbook of eyewitness psychology* (Vol l). Memory for events. (pp. 195-237)
Mahwah, NJ: Erlbaum.

Drivdahl, S.B., & Zaragoza, M. S. (2001). The role of perceptual elaboration and individual differences in the creation of false memories for suggested events. *Applied Cognitive Psychology*, *15*, 265-281.

Drivdahl, S. B., Zaragoza, M. S., & Learned, D. M. (2009). The role of emotional elaboration in the creation of false memories. *Applied Cognitive Psychology*, *23*, 13-35.

Frost, P., Ingraham, M., Wilson, B. (2002). Why misinformation is more likely to be recognized over time: A source monitoring account. *Memory, 10*, 179-185.

Frost, P. (2000). The quality of false memory over time: Is memory for misinformation "remembered" or "known"? *Psychnomic Bulletin & Review*, *7*, 531-536.

French, L., Gerrie, M. P., Garry, M., & Mori, K. (2009). Evidence for the efficacy of the MORI technique: Viewers do not notice or implicitly remember details from the alternate movie version. *Behaviour Research Methods*, *41*, 1224-1232.

Gabbert, F., Memon, A., & Allan, K. (2003). Memory conformity: Can eyewitnesses influence each other's memories for an event? *Applied Cognitive Psychology, 17*, 533-543.

Gabbert, F., Memon, A., Allan, K., & Wright, D. B. (2004). Say it to my face: Examining the effects of socially encountered misinformation. *Legal and Criminological Psychology*, 9, 215-227.

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

Garry, M., French, L., Kinzett, & Mori, K. (2008). Eyewitness memory following discussion: Using the MORI technique with a western sample. Applied Cognitive Psychology, 22, 431-439.

Henkel, L. A. (2004). Erroneous memories arising from repeated attempts to remember. *Journal of Memory and Language*, *50*, 26-46.

Higham, P. A. (1998). Believing details known to have been suggested. *British Journal of Psychology*, *89*, 265-283.

Hoffman, H. G., Granhag, P. A., Kwong See, S. T., & Loftus, E. F. (2001). Social influences on reality-monitoring decisions. *Memory & Cognition*, *29*, 394-404.

Hollin, C. R., & Clifford, B. R. (1983). Eyewitness testimony: The effects of discussion on recall accuracy and agreement. *Journal of Applied Social Psychology, 13,* 234-244.

Hope, L., Ost, J., Gabbert, F., Healey, S., & Lenton, E. (2008). "With a little help from my friends…": The role of co-witness relationship in susceptibility to misinformation. *Acta Psychologica, 127,* 476-484.

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

Johnson, M. K., Foley, M. A., Suengas, A. G., & Raye, C. L. (1988). Phenomenal characteristics of memories for perceived and imagined autobiographical events. *Journal of Experimental Psychology: General, 117,* 371-376.

Liebmann, J. I., McKinley-Pace, M. J., Leonard, A. M., Sheesley, L. A., Gallant, C. L., Renkey, M. E., & Lehman, E. B. (2002). Cognitive and psychosocial correlates of adults' eyewitness accuracy and suggestibility. *Personality and Individual Differences, 33,* 49-66.

Lindsay, D. S. (2008). Source monitoring. In H. L. Roediger, III (Ed.), *Cognitive psychology of memory. Learning and memory: A comprehensive reference (Vol. 2),* (pp. 325-348). Oxford: Elsevier.

Lindsay, D. S. (2007). Autobiographical memory, eyewitness reports, and public policy. *Canadian Psychologist, 48,* 57-66

Lindsay, D. S. (2007). Order effects in collaborative memory contamination? Comment on Gabbert, Memon, & Wright (2007). *Psychonomic Bulletin & Review, 14,* 1010.

Lindsay, D. S. (1990). Misleading suggestions can impair eyewitnesses' ability to remember event details. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 16,* 1077-1083.

Lindsay, D. S., Allen, B. P., Chan, J. C. K., & Dahl, L. C. (2004). Eyewitness suggestibility and source similarity: Intrusions of details from one event into memory reports of another event. *Journal of Memory and Language, 50*, 96-111.

Lindsay, D. S. & Johnson, M. K. (1989). The eyewitness suggestibility effect and memory for source. *Memory & Cognition*, *17*, 349-358.

Loftus, E. F. (1979). Eyewitness testimony. Cambridge, MA: Harvard University Press.

Loftus, E. F. (2008). Planting misinformation in the human mind: A 30-year investigation of the malleability of memory. *Learning and Memory*, *12*, 361-366.

Loftus, E. G. & Greene, E. (1980). Warning: Even memory for faces may be contagious, *Law and Human Behaviour*, *4*, 323-334.

Loftus, E. F., Miller, D. G., & Burns, H. J. (1978). Semantic integration of verbal information into a visual memory. *Journal of Experimental Psychology: Human Learning and Memory*, *4*, 19-31.

Loftus, E. F., & Palmer, J. C. (1974). Reconstruction of automobile destruction: an example of the interaction between language and memory. *Journal of Verbal Learning and Verbal Behavior, 13*, 585-589.

Loftus, E. F. & Pickrell, J. E. (1995). The formation of false memories. *Psychiatric Annals*, *25*, 720-725.

Loftus, G. R., & Masson, M. E. J. (1994). Using confidence intervals in within-subject designs. *Psychonomic Bulletin & Review, 1*, 476-490.

Lüüs, C. A. E., & Wells, G. L. (1994). The malleability of eyewitness confidence: co-witness and perseverance effects. *Journal of Applied Psychology*, *79*, 714-724.

McCloskey, M., & Zaragoza, M. (1985). Misleading postevent information and memory for events: Arguments and evidence against memory impairment hypotheses. *Journal of Experimental Psychology: General, 114*, 1-16.

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

Memon, A. & Wright, D. (1999). The search for John Doe 2: Eyewitness testimony and the Oklahoma bombing. *The Psychologist*, *12*, 292-5.

Mitchell, K. J., & Zaragoza, M. S. (1996). Repeated exposure to suggestion and false memory: The role of contextual variability. *Journal of Memory and Language*, *35*, 246-260.

Mori, K. (2007). A revised method for projecting two different movies to two groups of viewers without their noticing the duality. *Behavior Research Methods, 39*, 574-578.

Newman, E. J. & Lindsay, D.S. (2009). False memories: What the hell are they for? *Applied Cognitive Psychology*, *23*, 1105-1121.

Ost, J., Ghonouie, H., Cook, L., & Vrij, A. (2008). The effects of confederate influence and confidence on the accuracy of crime judgments. *Acta Psychologica*, *128*, 25-32.

Paterson, H. M., & Kemp, R., I. (2006). Comparing methods of encountering post-event information: The power of co-witness suggestion. *Applied Cognitive Psychology*, *20*, 1083-1099.

Paterson, H. M., Kemp, R., I., & Ng, J. R. (2009). Combating co-witness contamination: Attempting to decrease the negative effects of discussion on eyewitness memory. *Applied Cognitive Psychology*.

Pickrell, J. E., Bernstein, D. M., & Loftus, E. F. (2004). The misinformation effect. In R. F. Pohl (Ed.), *Cognitive illusions: A handbook on fallacies and biases in thinking, judgment and*

memory (pp. 345-361). Hove, NY: Psychology Press.

Reysen, M. B. (2005). The effects of conformity on recognition judgments. *Memory*, *13*, 87-94.

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

Schneider, D. M., & Watkins, M. J. (1996). Response conformity in recognition testing. *Psychonomic Bulletin & Review*, *3*, 481-485.

Scoboria, A., Lynn, S. J., Hessen, J., & Fisico, S. (2007). So that's why I don't remember: Normalizing forgetting of childhood events influences false autobiographical beliefs but not memories. *Memory*, *15*, 801-813.

Shaw, J. S., Garven, S., & Wood, J. M. (1997). Co-witness information can have immediate effects on eyewitness memory reports. *Law and Human Behavior*, *21*, 503-523.

Skagerberg, E. M., & Wright, D. B. (2008). The prevalence of co-witnesses and co-witness discussions in real eyewitnesses. *Psychology, Crime & Law*, *14*, 513-521.

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

Wright, D. B., Mathews, S. A., & Skagerberg, E. M. (2005). Social recognition memory: The effect of other people's responses for previously seen and unseen items. *Journal of Experimental Psychology*: *Applied*, *11*, 200-209.

Zaragoza, M. S., & Koshmider, J. W., III. (1989). Misled subjects may know more than their performance implies. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 15*, 246-255.

Zaragoza, M. S., & Lane, S. M. (1994). Source misattributions and the suggestibility of eyewitness memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 20*, 934-945.

Figure Captions

Figure 1. Illustration of the MORI technique. Reprinted with permission from M. Garry.

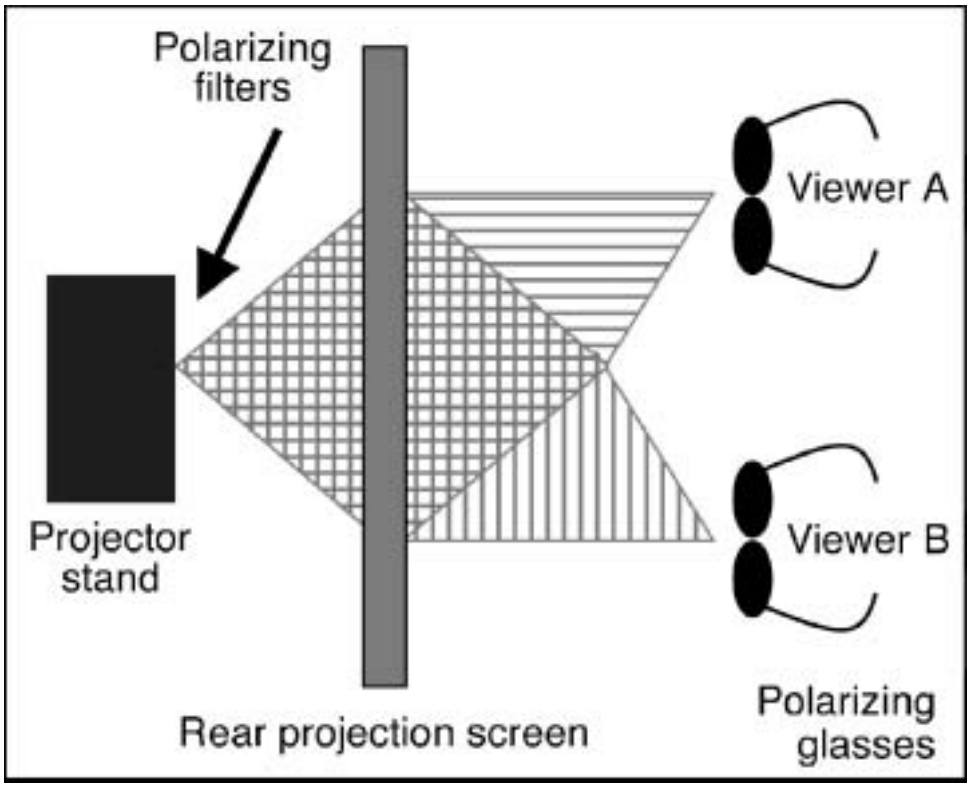
Polarizing
filters
Viewer A
Viewer B
Projector
stand
Rear projection screen
Polarizing
glasses

Figure 1

Appendix A: Joint Memory Test

Instructions: Please think back to the video and imagine the event in the video was something you had witnessed in real life. Imagine that you have both been asked to stay and wait for the police to arrive so that you can provide them with information about what you have seen. You are told they will be here in 5-10 minutes to take individual statements from you. Prior to their arrival, you have the chance to prepare for your statement by discussing your memories for the event with the other witness. As a pair, your task is to answer the questions on the next page about specific details in the video. You can discuss each question as much as you like until you reach an answer that you are both happy with. You need only provide a single written answer between the two of you. Please take turns writing the answer, as indicated in the label for each question (left witness vs. right witness). If the other witness was to your left, then you were the right witness; if the other witness was to your right then you were the left witness. The aim is to provide the most accurate collaborative notes possible, so please discuss each question before the designated witness writes the shared answer.

1. In the first scene, a girl enters the library while listening to her iPod. Can you describe what kind of entrance she came in through?

2. In the second scene, several beverage containers were shown on a table and the guy wearing the black hoodie was standing near that table with other students. Describe in as much detail as you can the beverage container from which he took a sip.

3. The third scene showed the black hoodie guy standing in front of a vending machine. Can you recall which two drink brands were advertised across the front of the machine?

4. In the fourth scene, a group of students were standing and chatting in front of a blue gymnasium door. The black hoodie guy stopped to sit down on a chair to fix his shoes. Can you describe in as much detail as you can what kind and color of socks he was wearing?

5. The next scene showed a female student, who was wearing a green hoodie, open her locker in the hallway. Can you recall what item of clothing she took out of her locker?

6. After the locker scene, the black hoodie guy (who was actually wearing a lab coat at the time) walked inside a science laboratory. Can you indicate the name of this science laboratory that appeared on the door?

7. Following the scene described in the previous question, can you describe what happened in the scene where students were sitting in a classroom and the teacher was talking to the black hoodie guy?

8. The next scene showed the black hoodie guy sitting down on a bench talking on his cell phone. Did you see anything on the skin of the guy's arm that might help the police identify him?

9. Think back to the scene where students were seated at a table, studying and chatting (with beverage containers and books on the table). Can you describe what kind of table the students were sitting on?

10. In the second last scene, the black hoodie guy was near the main entrance doors getting ready to leave the school. Describe in as much detail as you can the article of clothing he put on before he exited the building.

11. Think back to the fourth scene, where a group of students were standing near a blue door chatting. The black hoodie guy was also in this group, though he was leaned against a glass showcase and seemed uninterested in the group's conversation. Please describe in as much detail as you can the glass showcase, including the items that it contained.

12. Imagine the last scene in the video. The black hoodie guy was outside of the school building walking towards a red car. Please describe the bumper sticker on the back of the car in as much detail as possible.

13. To help the police identify which drink vending machine the black hoodie guy used, can you describe what kind of vending machine was next to the drink machine?

14. Think back to the first scene that took place in the library. The black hoodie guy was suspiciously staring at the purse on the table and left his computer station to approach the purse. Describe in as much detail as you can the item he took from the purse and slipped into his pocket. In an actual investigation of this theft this would obviously be a key piece of evidence.

15. Think back to the last scene with the car. Were there any other vehicles that may have passed by *or* that may have been parked near the red car the black hoodie guy was walking towards?

16. At the vending machine, the black hoodie guy was thinking about purchasing a drink. Please describe which drink button he selected as well as the way in which he pushed the button. This is another key piece of information that will assist the police gather fingerprint evidence.

Appendix B: Individual Memory Test

Instructions: Please think back to the video you watched. Imagine that the police have arrived and are now ready to take an individual statement from you about the events that you had witnessed earlier. You have been asked to give as full a statement as possible about the sequence of events that occurred in the video starting from the beginning. Please treat this task as if you had witnessed the events in real life and are now providing information to the police by giving a written statement. Try to be as thorough and accurate as possible when giving your statement. You do not have to fill the entire space.

*Please do not proceed to the next page until the experimenter tells you to do so.

Imagine that the police are now going to ask you questions concerning specific details in the video.

It is likely that you noticed and will remember many of the details mentioned below. However, there will probably be a few details that you didn't notice in the video and/or that you didn't pay attention to well enough to retain--you may no longer have memories of these details. For some of the details that you don't remember from the video, you may have memories of your partner saying something about that detail during the discussion with your partner. Also, there may be details that you noticed in the video and that your partner also mentioned during the discussion. For each detail mentioned below, please indicate whether it is something that you remember from the video and/or something you remember from your partner mentioning during the discussion.

Sometimes people can remember specific details about an event they have experienced—remembering this event can feel as though you are partially reliving it. This is sometimes called "mental time travel." Other times people know that they had a particular experience but they can't remember any specific details about it, they "just know" it happened. After deciding whether the detail was from the video and/or mentioned by your partner (as described above), please indicate whether you (1) remember encountering the detail in that source, (2) just know that you encountered the detail in that source, or (3) are not really sure whether or not you encountered the detail in that source (i.e., it's just a guess or a hunch). Only select (by placing an "x") one of these three options if you selected "Yes" for that source.

For example, if you were asked the following:

What led the girl to walk out of the room (leaving her purse behind)?

Memories from video: Yes	No	Memories from partner: Yes	No
___ Remember		___ Remember	
___ Just know		___ Just know	
___ Guess		___ Guess	

A good answer is that she got a call on her cell phone (and presumably wanted to talk to the caller in private or without disturbing others). So you might write down something like "Got a phone call – walked out talking on cell phone." Then you'd be asked to indicate whether or not you have memories of that detail from the video and whether or not you have memories of that detail from something your partner said.

1. In each of the scenes you viewed, a male student wearing a black hoodie was seen among a group of students. In the library scene, there were three students including the black hoodie guy, working at their computer. Can you describe where the girl wearing the blue sweater was sitting?

Memories from video: Yes No

___ Remember
___ Just know
___ Guess

Memories from partner: Yes No

___ Remember
___ Just know
___ Guess

2. In the second scene, the black hoodie guy takes a sip from a beverage container from a table that also has several other beverage containers. Please describe the container he took a sip from in as much detail as you can, as the police are looking for evidence that will help them obtain a saliva DNA sample.

Memories from video: Yes No

___ Remember
___ Just know
___ Guess

Memories from partner: Yes No

___ Remember
___ Just know
___ Guess

3. The third scene showed the black hoodie guy at the vending machine. The police are trying to obtain fingerprint evidence from the vending machine the black hoodie guy used to purchase his drink. Can you help indicate to the police what was next to the drink vending machine so that they can locate it?

Memories from video: Yes No

___ Remember
___ Just know
___ Guess

Memories from partner: Yes No

___ Remember
___ Just know
___ Guess

4. The fourth scene showed the black hoodie guy sitting on a chair to fix his shoe. During this time, he also pulled up his socks. Did you notice what kind of socks he was wearing and what color they were?

Memories from video: Yes No

___ Remember

Memories from partner: Yes No

___ Remember

___ Just know
___ Guess

___ Just know
___ Guess

5. The next scene showed a female student opening her locker to put on a lab coat. Can you remember what color sweater she was wearing before she put on the lab coat? Please describe this sweater in as much detail as you can.

Memories from video: Yes No

___ Remember
___ Just know
___ Guess

Memories from partner: Yes No

___ Remember
___ Just know
___ Guess

6. Think back to the scene where the black hoodie guy was sitting on a bench, talking on his cell phone. Can you think of any identifying marks that he may have had on his arm that will help the police with their search for him? Please describe this in as much detail as you can.

Memories from video: Yes No

___ Remember
___ Just know
___ Guess

Memories from partner: Yes No

___ Remember
___ Just know
___ Guess

7. In one scene, the black hoodie guy was leaned against a glass showcase during a conversation three other students were having while standing in front of a blue door. Please describe in as much detail as you can this glass showcase, including the items it contained.

Memories from video: Yes No

___ Remember
___ Just know
___ Guess

Memories from partner: Yes No

___ Remember
___ Just know
___ Guess

8. Think back to the scene when the black hoodie guy entered a room wearing a white lab coat. Can you describe what was written on the sign of the door of the science laboratory he entered?

Memories from video: Yes No

___ Remember
___ Just know

Memories from partner: Yes No

___ Remember
___ Just know

___ Guess ___ Guess

9. The police are entering information about the black hoodie guy in their database. Based on what you have witnessed, what information could you provide to the police about the personality of this black hoodie guy?

Memories from video: Yes No Memories from partner: Yes No

___ Remember ___ Remember
___ Just know ___ Just know
___ Guess ___ Guess

10. Think back to the scene where the black hoodie guy is standing in front of a vending machine. Please describe this scene in the order in which it occurred, starting from the beginning to the end of the scene, including the drink that he purchased.

Memories from video: Yes No Memories from partner: Yes No

___ Remember ___ Remember
___ Just know ___ Just know
___ Guess ___ Guess

11. In the last scene, the black hoodie guy leaves the school and walks toward a parked red car. The police are looking for other witnesses who may have seen the black hoodie guy approach this car. Can you think of whether any vehicle passed by or was parked near the red car so that the police can obtain additional witness evidence?

Memories from video: Yes No Memories from partner: Yes No

___ Remember ___ Remember
___ Just know ___ Just know
___ Guess ___ Guess

12. Think back to the library scene where a theft occurred. From what you have witnessed, would you say that the black hoodie guy is ***guilty*** or ***not guilty*** of having committed a theft? Please provide a reason for your verdict (e.g., why is he guilty or not guilty?).

Memories from video: Yes No Memories from partner: Yes No

___ Remember ___ Remember
___ Just know ___ Just know

___ Guess ___ Guess

13. Imagine the scene again when the black hoodie guy sits down on a chair to fix his shoe. Please describe in as much detail as you can the *type* and the *color* of chair he was sitting on.

Memories from video: Yes No Memories from partner: Yes No

___ Remember ___ Remember
___ Just know ___ Just know
___ Guess ___ Guess

14. In the second last scene, the black hoodie guy put on a particular item of clothing as he got ready to leave the school. Please describe this item of clothing in as much detail as you can.

Memories from video: Yes No Memories from partner: Yes No

___ Remember ___ Remember
___ Just know ___ Just know
___ Guess ___ Guess

15. Think back to the library scene again. Can you describe what kind of purse the girl, who was listening to the iPod, was carrying when she put the purse on the table?

Memories from video: Yes No Memories from partner: Yes No

___ Remember ___ Remember
___ Just know ___ Just know
___ Guess ___ Guess

16. At the very end of the video, the guy wearing the black hoodie was shown heading towards a red car. Can you think of any prominent features on the back of this car that could help the police identify the car?

Memories from video: Yes No Memories from partner: Yes No

___ Remember ___ Remember
___ Just know ___ Just know
___ Guess ___ Guess

Once you have completed the questions, please review your answers and ensure that you are satisfied with them, and that you have not skipped any answer.