Age Differences in Eyewitness Memory for a Realistic Event

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**Objectives.** To better understand the effects of misinformation on eyewitnesses of different ages, older and younger adults experienced an event under intentional and incidental learning conditions in a naturalistic experiment using multiple memory tests.

**Method.** Following exposure to the event, which was a brief interruption of a group testing session, participants completed several memory tests. For half of the participants, misinformation was embedded in the first cued recall test. On subsequent free recall and cued recall tests, basic scores and misinformation-based memory errors were examined.

**Results.** As expected, younger adults had higher recall scores than older adults. Older and younger adults made the same number of misinformation errors in free recall and in cued recall with intentional learning. However, in the incidental condition, younger adults made more misinformation errors likely due to the information processing strategies they employed after incidental learning.

**Discussion.** Misinformation effects were quite strong, even with a realistic scene and intentional learning. Older adult suggestibility was no worse than that of younger adults. When misinformation was combined with incidental learning, younger adults may have used strategic processing to encode misinformation to their detriment.

**Key Words:** Aging—Eyewitness—Incidental learning—Memory.

People of all ages are involved in the criminal justice system as witnesses. Thus, it is important to understand how witness skills and limitations may be affected by age. Past research clearly shows that older adults are poorer at lineup identification than young people, showing a tendency toward more false alarms (Memon, Gabbert, & Hope, 2004). Extensive work has also shown that older adult eyewitnesses are viewed as less believable than younger witnesses (Allison, Brimacombe, Hunter, & Kadlec, 2006). But the research on aging is mixed with respect to the impact of misinformation at different ages (cf. Dodson & Krueger, 2006; Roediger & Geraci, 2007). It “remains unclear if older witnesses are generally more vulnerable to suggestions than young witnesses” (Mueller-Johnson, 2009, p. 163). The purpose of this research was to address some critical gaps in the eyewitness aging literature, by examining misinformation under incidental and intentional encoding conditions, using a naturalistic experiment.

**Aging and Misinformation**

It is well established that the accuracy of memory can be significantly compromised by misleading post-event suggestion (Loftus & Palmer, 1974; Loftus, Miller, & Burns, 1978). When this happens, participants recall or recognize details they never saw (the misinformation effect). Brief descriptions of false details or imagination of fictional events are sufficient to cause later memory distortion (Nash, Wade, & Lindsay, 2009). This is likely due to weak initial encoding (Loftus, Levidow, & Duensing, 1992), reconstruction of the memory trace to include new information (Reyna & Brainerd, 1995), and/or failure to encode or retain the correct source of the information (Mitchell, Johnson, & Mather, 2003). All of these hypothesized influences have some support in the literature (Loftus, 2005).

Regardless of the reason, the impact of misinformation represents a powerful false memory effect that occurs across all ages. Traditional laboratory studies of false memory with word lists clearly show age-related declines, with more false memory errors on the part of older participants (Jacoby, 1999), and source memory tests reveal age declines as well (Johnson, Hashtroudi, & Lindsay, 1993; Dodson, Bawa, & Slotnick, 2007; Vakil, Hornik, & Levy, 2008), but such studies are not focused on the more complex task of recalling a witnessed scene. Using more complex scenes, aging is sometimes associated with significantly stronger misinformation effects (cf. Bulevich & Thomas, 2012; Cohen & Faulkner, 1989; Loftus et al., 1992; Schacter, Koutstaal, Johnson, Gross, & Angell, 1997). Older adults have sometimes been more suggestible than younger adults, and confident of their false memories, with both short and long delays between the event and the critical misinformation test (Karpel, Hoyer, & Toglia, 2001; Mueller-Johnson & Ceci, 2004; Roediger & Geraci, 2007). Mitchell and colleagues (2003) specifically argued that these effects were related to source memory difficulties; older adults, more so than young adults, indicated that they “saw” things that were merely “suggested.”
Other scholars have not reported age differences in suggestibility after planting misinformation (Bornstein, Witt, Cherry, & Greene, 2000; Chan, Thomas, & Bulevich, 2009; Coxon & Valentine, 1997; Dodson & Krueger, 2006; Searcy, Bartlett, & Memon, 2000). In a study by Gabbert, Memon, and Allan (2003), a significant proportion of both old and young participants reported seeing things that they had only heard about in a postvideo discussion session, but older adults were no more prone to such memory errors than younger adults (Gabbert et al., 2003). In other research using a legal testimony format, when witnesses received a direct examination (concerning the main details seen in a video) and a cross-examination (designed to get them to endorse misinformation), there was no interaction of age with type of examination—all age groups were less accurate on cross-examination (Brimacombe, Jung, Garrioeh, & Allison, 2003). In some cases, younger adults have even reported more misinformation than older adults (Gabbert, Memon, Allan, & Wright, 2004; Marche, Jordan, & Owre, 2002).

One possible explanation for this variability across studies is that researchers have used a number of different methodologies to examine misinformation effects—incidental or intentional memory during initial exposure to a scene, different memory assessments (recognition, free recall, cued recall), and variations in misinformation presentation, including participant discussion (Gabbert et al., 2003), cued recall (Coxon & Valentine, 1997), and written narratives (Cohen & Faulkner, 1989). Few researchers have systematically investigated these methodological differences. In one exception, Gabbert and colleagues (2004) compared misinformation presented in discussion with misinformation presented in a written narrative. They found that the discussion format led to more memory errors for both older and younger adults, but no age interaction occurred (Gabbert et al., 2004). Systematic examination of methodological variations is essential to discover the factors that predict suggestibility across age. Here, we compared incidental and intentional conditions for initial exposure to the to-be-remembered event and assessed misinformation errors in free recall and cued recall.

The aging literature indicates that learning conditions often make a difference (Hess & Ennis, 2012). Younger adults typically have an advantage with intentional learning (Block, 2009), due to their greater ability to activate and benefit from skilled memory strategies (Hertzog & Hultsch, 2000), including successful use of perceptual details (Koutstaal, 2003). In contrast, age differences can be reduced with incidental learning, depending on the encoding and retrieval context (Crook, Larrabee, & Youngjohn, 1993; Naveh-Benjamin et al., 2009). Nevertheless, no one to our knowledge has directly compared incidental and intentional encoding for a witnessed event in an aging study. Scholars have described intentional or incidental learning conditions or have simply instructed participants to watch a video (cf. Chan et al., 2009; Gabbert et al., 2003; Karpel et al., 2001; Mueller-Johnson & Ceci, 2004; Searcy, Bartlett, & Memon, 1999).

It is not clear, with older adults, whether misinformation will vary as a function of encoding conditions. In a typical paradigm, the witness views a brief scene and then reads faulty information from a narrative or questionnaire. To be affected by misinformation, the witness must encode and retrieve briefly presented misinformation. Given older adults’ memory deficits, one could argue that they might have difficulty encoding details from the to-be-remembered event (and would thus be susceptible to misinformation) or they might have difficulty encoding the misinformation (which would then have a weaker impact). At the same time, we know that older adults make errors in identifying sources, and many scholars have suggested that source memory is the basis for the misinformation effect (Mitchell et al., 2003; Roediger & Geraci, 2007). However, there is also evidence that adult misinformation errors are reduced when attention is focused on the memory task (Roediger & Geraci, 2007), which might occur with intentional learning. Thus, it is important to explicitly test the extent to which older and younger adults are susceptible to misinformation errors under different learning conditions.

**Present Study**

To our knowledge, no studies of aging and eyewitness memory have compared intentional and incidental learning. To make a believable scenario for incidental learning, we employed a realistic stimulus—early in the testing session, a research assistant interrupted the experimenter to discuss a problem. Half of the participants experienced this event after instructions to remember it and half observed it without knowing about the memory test. Free recall, cued recall, and face recognition tests were administered, with confidence assessed for the last two measures. For half of the participants, misinformation was embedded in the first cued recall test. Scores on a free recall test and a second cued recall test revealed the suggestibility of participants.

Based on past research, we expected misinformation participants to have lower overall memory scores and to make more misinformation-based errors (on free recall and the second cued recall test) than those not receiving misinformation. Due to weaker encoding of the initial event, we expected the misinformation effect to be more prominent in the incidental condition than the intentional condition.

Given age-related memory deficits, we expected that the younger adults would have higher scores on all memory tests. It was also expected that intentional memory conditions would result in higher recall than incidental memory conditions; however, age differences were expected to be reduced with incidental learning, as is often the case. With respect to aging and misinformation, no predictions were made. Source memory deficits might increase age effects. On the other hand, as is typical in eyewitness research, the misinformation was not strongly emphasized. If older adults do not retain this misinformation, it might have little or no impact on their memory.
Method

Participants
Data were collected from 99 undergraduates and 77 community-dwelling older adults ($M = 72.30, SD = 5.17$). Older adults ($M = 16.4$ years, $SD = 2.8$) had more education than younger adults ($M = 13.0, SD = 1.1$), $F(1,173) = 118.92$, $p < .001$, $\eta^2_p = .41$. Both age groups reported above average self-rated health ($10 = Excellent Health; 0 = Very Poor Health$; younger: $M = 8.77, SD = 1.10$; older: $M = 8.29, SD = 1.81$). Participants were excluded for potential cognitive problems (anticholinergic medications, dementia diagnosis, stroke, or difficulty following instructions) or significant hearing or vision problems; only one younger person was excluded (for a significant hearing deficit).

Procedures and Materials
To begin the testing session, all participants, regardless of encoding condition, were given a story to read and remember, as a filler task. Half of the participants (intentional condition only) were then warned about an upcoming interruption and were told to remember that event. After the event, a demographic questionnaire (questions about age, gender, race, health, and education) was followed by administration of memory tests. Finally, health questions and control questions were presented (see Figure 1).

All instructions were provided in writing. Participants completed memory tests and questionnaires at their own pace. Each session lasted 20–30 min. Participants were tested in groups of 1–7 people (younger: $M = 4.10, SD = 1.40$; older: $M = 4.77, SD = 1.36$); participants in each group were of same age and were all assigned to the same condition for encoding and misinformation (assigned in advance, using counterbalancing).

Filler task.—For the filler task, all participants read a story of 24 sentences, written at a seventh-grade reading level (Dixon, Hultsch, & Hertzog, 1989). All participants were asked to study and remember the story, but no such memory test was administered. Participants spent approximately 20 s reading the filler story before the interruption and then spent another 20 s reading after the confederate departed.

To-be-remembered event.—Shortly after the filler task story was distributed, a research confederate knocked on the door and entered the testing room. The experimenter and research confederate engaged in a 1-min scripted conversation developed for this experiment. In general, the interrupter reported that she was on the phone conducting an interview and the respondent was having difficulty. She wanted to know what to do. The experimenter offered two possible solutions to the problem, and then the interrupter left.

Three young women with similar appearance served as interrupters. All wore the same color and type of clothing. Counterbalancing of confederate assignment to conditions ensured that each one had an equal chance of serving as interrupter in each condition, and confederates were blind to condition. Seats were arranged in the testing room so that all participants had a clear view of the door (no more than 6 feet away) and the interrupter, who stepped fully into the room. Clear speech techniques were implemented to ensure that the event was heard and understood; specifically, the interrupter and experimenter enunciated each word clearly, especially consonants, paused before key phrases, and spoke at a slightly lower pitch (see Kricos, 2003).

Cued recall (CR1 and CR2).—In the two cued recall tests (11 items each, with new items for each test), participants were asked questions about the interruption (e.g., After the experimenter greeted the interrupter, what problem did she report? What was the name of the interrupter?), and these questions were presented in the same order that the details occurred in the event. The participants assigned to misinformation had a false detail embedded into 5 of the 11 questions on the first cued recall test (CR1), following procedures used by Zaragoza and Lane (1994). All participants received the same 11 new questions on the second cued recall test (CR2), regardless of condition assignment; 5 of these 11 items were critical target items asking about details related to the misinformation presented in CR1. For CR1 and CR2, the total number of correct answers was the primary dependent measure. Analyses of the five critical items were conducted separately to examine errors based on misinformation.

For example, a question in CR1 for participants who were not misinformed was When the interrupter opened the door, did she appear anxious? That same question was reworded for the misinformation group: When the interrupter opened the door and looked at her watch, did she appear anxious? (This information was false because the interrupter wore no watch.) All participants later received this item on CR2: Was the interrupter wearing a watch? If a participant answered yes, it was scored as a misinformation error, regardless of condition assignment (participants with no misinformation sometimes guessed incorrectly).

Free recall.—Free recall was tested by asking participants to write a detailed description of the interruption, with no time limit. Recall protocols were transcribed and compared to a template. To develop this template, the event script was used to generate details about the conversation. In addition, the to-be-remembered details were recorded by an independent group of 22 coders who described the event in writing as the scripted event occurred. The event was acted out three times for the coders (using all three interrupters), and a new list of details was generated by each coder for each re-enactment to create a complete list of all possible to-be-remembered details about the event (details about
the conversation, the appearance of the interrupter, etc.). Each correctly reported detail, out of a possible score of 39 details, was assigned one point. For example, for the recalled statement, *The interrupter knocked twice on the door and then opened it*, the participant received three points; one point each for *knocked on door*, *twice*, and *opened it* (following the methods of Sutherland & Hayne, 2001). Text analysis software (SPSS Text Analysis for Surveys 2.0) was utilized to compare the participants’ recalled text to the template developed by coders. The number of details correctly recalled was the primary dependent measure. Intrusions based on misinformation were also recorded.

**Control questions.**—All participants were asked whether they (a) were expecting a memory test on the interruption, (b) were trying to remember the interruption, (c) noticed any incorrect information while answering questions, (d) could see the interruption clearly, and (e) could hear the interruption clearly. Participants responded on a 7-point scale from 1 = No, not at all to 7 = Yes, definitely for the first three items and from 1 = Could not hear/see at all to 7 = Could hear/see clearly for the last two items. Participants were also asked to report the number of seconds they spent paying attention to the event.

**Results**
To determine whether group size had an effect on memory performance, an Encoding condition (incidental or intentional memory) × Misinformation (misleading or no misleading information) × Group size analysis of variance (ANOVA) was examined for all memory tests with group size entered as a random effect. This preliminary analysis showed no significant main effects or

![Diagram](image-url)

*Figure 1. Participant flow chart showing the order of procedures used in this research.*
interactions—group size did not affect free recall or cued recall. Preliminary analyses also indicated that there were no age differences for reported ability to clearly see or hear the interruption or for time spent attending to the interruption. Results for confidence and face recognition measures are not reported here and are available from the authors. Primary hypotheses were tested using Age (younger, older) × Encoding condition (incidental or intentional memory) × Misinformation (misleading or no misleading information) analyses, with multivariate tests conducted where appropriate.

Cued Recall

Age, encoding, and misinformation effects were examined in a multivariate analysis of variance using scores from CR1 and CR2. This multivariate analysis allowed us to examine main effects across both tests, and univariate follow-up testing revealed the results for each individual test. There was a significant multivariate effect of encoding condition, $F(2,167) = 24.07$, $p < .001$, $\eta_p^2 = .22$, with participants in the intentional condition scoring significantly higher than those in the incidental condition, as expected. There was a significant multivariate effect of age, as older adults scored lower than younger adults, $F(2,167) = 22.8$, $p < .001$, $\eta_p^2 = .22$, and a main effect of misinformation, $F(2,167) = 7.75$, $p = .01$, $\eta_p^2 = .09$. Participants who received misinformation scored significantly lower overall than those who did not receive misinformation.

In univariate follow-up tests, the effects of encoding condition and age were significant on both CR1 and CR2 (see Table 1), as expected. The misinformation groups showed no difference, as expected, for CR1 ($p > .25$), but the misinformation group performed worse than the non-misinformation group on CR2, $F(1,168) = 14.4$, $p < .001$, $\eta_p^2 = .08$. Univariate tests also revealed an Encoding condition × Misinformation interaction significant for CR2 only, $F(1,168) = 3.70$, $p = .05$, $\eta_p^2 = .02$; the intentional not-misinformation participants performed significantly higher on CR2 than the intentional misinformation group. There were no other significant interactions.

Free Recall

A three-way ANOVA examined the effects of encoding condition, misinformation, and age on the number of correct details recalled. Encoding condition had a significant effect on recall, $F(1,176) = 23.15$, $p < .001$, $\eta_p^2 = .12$, with intentional memory better than incidental memory (see Table 2). Younger adults performed significantly more details than older adults, $F(1,176) = 32.71$, $p < .001$, $\eta_p^2 = .16$. The presence of misinformation had no significant effect on recall, $F(1,176) = 2.08$, $p > .10$. No interactions were significant.

<table>
<thead>
<tr>
<th>Group</th>
<th>CR1</th>
<th>CR2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Older adults</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intentional</td>
<td>5.78</td>
<td>5.42</td>
</tr>
<tr>
<td>Not misinformed</td>
<td>6.00</td>
<td>6.32</td>
</tr>
<tr>
<td>Misinformed</td>
<td>5.58</td>
<td>4.53</td>
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<tr>
<td><strong>Incidental</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not misinformed</td>
<td>4.60</td>
<td>4.15</td>
</tr>
<tr>
<td>Misinformed</td>
<td>4.00</td>
<td>3.53</td>
</tr>
<tr>
<td><strong>Younger adults</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intentional</td>
<td>6.69</td>
<td>6.98</td>
</tr>
<tr>
<td>Not misinformed</td>
<td>6.82</td>
<td>7.29</td>
</tr>
<tr>
<td>Misinformed</td>
<td>6.50</td>
<td>6.55</td>
</tr>
<tr>
<td><strong>All adults</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intentional</td>
<td>6.28</td>
<td>6.29</td>
</tr>
<tr>
<td>Not misinformed</td>
<td>6.47</td>
<td>6.89</td>
</tr>
<tr>
<td>Misinformed</td>
<td>6.05</td>
<td>5.56</td>
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</tbody>
</table>

Notes. The maximum score on each cued recall test was 11. The table provides accuracy (number correct) scores in relation to age and condition for each test across all 11 items (CR1 = the first cued recall test; CR2 = the second cued recall test).

Misinformation-Based Errors

Cued recall.—We examined the five critical items on CR2 to see whether specific misleading details had been provided by the misinformation participants. Compared with the not-misinformation group, those who were misinformed responded incorrectly more often to the critical items (see Table 3). $F(1,175) = 58.91$, $p < .001$, $\eta_p^2 = .26$. Younger adults made more specific misinformation errors than older adults, $F(1,175) = 12.70$, $p < .001$, $\eta_p^2 = .07$, which was qualified by a significant age by learning condition interaction. Younger adults made more misinformation errors than older adults in the incidental condition, $F(1,168) = 15.40$, $p < .001$, $\eta_p^2 = .08$, but both age groups made an equal number of misinformation errors with intentional encoding (see Table 3). As expected, the lowest accuracy scores on the five critical items were obtained by the misinformation older adults in the incidental condition ($M = 0.79$, $SD = 0.22$), and the highest accuracy scores were obtained by younger adults in the intentional condition who were not misinformed ($M = 2.75$, $SD = 0.18$). Out of concern for the possibility that older adults were simply saying “I don’t know” when unsure, while younger adults were providing a response, we also examined an output-bound measure (Pansky, Goldsmith, Koriat, & Pearlman-Avnion, 2009). Using an output-bound measure—number of specific misinformation errors/number of specific responses given (not including “don’t know” or blank responses)—younger adults still made significantly
more errors in the incidental condition ($M = 0.486$) than older adults in that condition ($M = 0.396$).

**Free recall.**—The number of misinformation-based errors made during free recall was relatively low (0–3) and was not normally distributed, so Kruskall–Wallis tests were employed. The misinformation group made significantly more errors ($M = 0.70, SD = 0.92$) than those who did not receive misinformation ($M = 0.23, SD = 0.55$), $\chi^2 (1, N = 176) = 16.68, p < .001$. The presence of misinformation-based errors in free recall did not vary as a function of age group or encoding condition. Potential interactions of age, encoding, and misinformation were also examined with Kruskall–Wallis tests, and none were found to be significant.

**Control questions.**—Further analyses examined the misinformation effect in relation to two questions: (a) *Were you expecting a memory test on the interruption?* and (b) *Did you notice any incorrect information...?* Those who expected a memory test or noticed the misinformation were defined as having a score of 5 or higher (with 7 being *Yes, a lot*). Only 14% of the participants in the incidental condition expected a memory test compared with 78% of participants in the intentional condition, $F(1,168) = 6.40, p < .01, \eta^2_p = .04$. In addition, 65% of the misinformed younger adults compared with 37% of misinformed older adults reported noticing it, $F(1,168) = 11.80, p < .001, \eta^2_p = .07$.

A two-way ANOVA using these two independent variables (a) expectation of a memory test and (b) detection of false information, run only on those participants who were misinformed, revealed that expectation of a memory test and detection of false information did not significantly predict the number of misinformation-based errors. That is, those who noticed false information were just as likely to report it as those who did not notice it, and those who were expecting a memory test were also just as likely to report misinformation as those who were not expecting a memory test. These results did not vary with age.

**DISCUSSION**

There is a large literature on aging and recognition for faces in lineups (Goodsell, Neuschatz, & Gronlund, 2009) and on the credibility of older adult witnesses (Kwong See, Hoffman, & Wood, 2001), but research on aging and suggestibility to misinformation shows mixed findings. This study filled gaps in the literature by examining two methodological factors that might shed light on past research: learning condition (intentional and incidental learning) and type of misinformation test (free and cued recall). The basic findings of this research were consistent with previous
evidence: participants in the intentional encoding condition had higher scores on most memory measures than those in the incidental condition; participants who were misinformed made more memory errors than those who were not misinformed; and older adults recalled less than younger adults. These are all well-established findings from past research.

Going beyond past research, this study provided some of the first evidence on misinformation effects in relation to different encoding conditions. For cued recall, overall score varied with encoding condition but number of misinformation errors did not. Misinformed participants were successfully misled, regardless of encoding condition. These results emphasize the power of the misinformation effect, validating past research with videos using a similar paradigm, where false information was presented in a cued recall context (Brimacombe et al., 2003; Coxon & Valentine, 1997; Sutherland & Hayne, 2001; Zaragoza & Lane, 1994). Additionally, younger adults in the incidental condition reported more misinformation than younger adults in the intentional condition, providing some support for the hypothesis that misinformation could be more problematic in incidental conditions. On free recall, however, the number of remembered details did not vary as a function of misinformation and few incorrect details were reported overall, suggesting some resistance to misinformation for that testing format. Given that the free recall test occurred after the critical target items were presented on CR2, it is not surprising that some nonmisinformed individuals included erroneous details; these participants may have thought, for example—*they asked me about a watch, so maybe I should mention a watch*. Considering these points together, police interviewers may want to assess free recall first to avoid the potential for planting misinformation during direct questioning. When later questioning begins, interviewers should be careful to avoid misinformation, especially when a scene was initially viewed without any intent to remember (Gabbert, Hope, Fisher, & Jamieson, 2011). Useful aids may be the Cognitive Interview, which uses open-ended items that encourage free recall (cf. Mello & Fisher, 1996; Searcy, Bartlett, Memon, & Swanson, 2001), or the Self-Administered Interview, a standardized protocol that gathers detailed witness accounts before that information becomes lost or distorted (Gabbert, Hope, & Fisher, 2009).

Some studies have reported that older adults are more prone to misinformation (Cohen & Faulkner, 1989; Karpel et al., 2001; Loftus et al., 1992; Mueller-Johnson & Ceci, 2007; Roediger & Geraci, 2007), whereas others found no age increase in the misinformation effect or mixed results for different measures (Bornstein et al., 2000; Brimacombe et al., 2003; Bulevich & Thomas, 2012; Coxon & Valentine, 1997; Dodson & Krueger, 2006; Gabbert et al., 2003, 2004; Marche et al., 2002; Schacter et al., 1997; Searcy et al., 2000). Our results—compared with older adults, younger adults were just as susceptible to misinformation on free recall and cued recall—were consistent with much of this past research.

It has been suggested that older adults are prone to misinformation because they recall the main event more poorly (Mueller-Johnson & Ceci, 2004). In this case, older adults were clearly less accurate overall in free and cued recall but did not make more misinformation errors. That finding suggests that poor recall of the initial event cannot be the only factor influencing misinformation errors. It is also unlikely that our findings were due to greater suggestibility for the young, given the extensive evidence for greater susceptibility to false memory among older adults (Backman et al., 2001). Instead, our results may be related to the production of specific misinformation details. Older adults may be less prone to spontaneously report false information on a cued recall or free recall test if they do not encode or retrieve the misinformation and younger adults, causing its impact to be lessened (Roediger & Geraci, 2007). In fact, these older adults were much less likely than the younger adults to even notice the misinformation, suggesting that they were not fully processing the details on CR1.

In contrast, the younger adults may have paid special attention to the CR1 questionnaire for strategic reasons, treating it as a postevent review and hoping to pick up details to aid their memory (see Chan & Langley, 2010). Most misinformation studies showing equal or greater suggestibility for young adults were studies in which misinformation was embedded in a cued recall or narrative format, and the subsequent questions were cued recall items requiring participants to report remembered details (Chan et al., 2009; Coxon & Valentine, 1997; Gabbert et al., 2004; Marche et al., 2002; Mitchell et al., 2003), rather than a forced choice testing format where general familiarity or gist-based responses might lead older adults to respond yes to misinformation (cf. Karpel et al., 2001; Mitchell et al., 2003; Schacter et al., 1997). In situations such as this experiment, where initial exposure to the event was relatively brief and specific responses were required on a cued recall test, younger adults (especially after incidental encoding) might have searched through any available information to bolster a weak memory trace. Ordinarily, a single postevent review would aid recall for younger adults more than older adults (Koutstaal, 2003; Gabbert, Hope, & Fisher, 2003, 2004; Gabbert et al., 2003, 2004; Marche et al., 2002; Schacter et al., 1997; Searcy et al., 2000). Our results—compared with older adults, younger adults were just as susceptible to misinformation on free recall and cued recall—were consistent with much of this past research.

Aging and Eyewitnessing

Consistent with previous research (Backman, Small, & Wahlin, 2001), older adults scored lower than younger adults on all tasks, under incidental and intentional conditions, providing fewer details on free and cued recall tests. Our key question was whether there would be age differences in the number of misinformation errors under different learning conditions and with different test formats. Some studies have reported that older adults are more prone to misinformation (Cohen & Faulkner, 1989; Karpel et al., 2001; Loftus et al., 1992; Mueller-Johnson & Ceci, 2007; Roediger & Geraci, 2007), whereas others found no age increase in the misinformation effect or mixed results for different measures (Bornstein et al., 2000; Brimacombe et al., 2003; Bulevich & Thomas, 2012; Coxon & Valentine, 1997; Dodson & Krueger, 2006; Gabbert et al., 2003, 2004; Marche et al., 2002; Schacter et al., 1997; Searcy et al., 2000). Our results—compared with older adults, younger adults were just as susceptible to misinformation on free recall and cued recall—were consistent with much of this past research.
Schacter, Johnson, Angell, & Gross, 1998) because older adults have difficulty encoding and using details related to the context of to-be-remembered information. In this case, however, when the details encoded in their review contained misinformation, younger adults were misled. Future studies could use a think-aloud protocol to determine whether particular participants focus carefully on postevent narratives or test questions to identify informative details about a to-be-remembered event. Participants who act strategically in this way may be more likely to report the specific details that they noticed in those misleading narratives or questions. Suggestibility may then be influenced by the strength of the memory traces for the misinformation as much, or more so, than memory traces for the initial to-be-remembered event (also see Bulevich & Thomas, 2012; Roediger & Geraci, 2007).

**Limitations**

Using a live event provided a unique perspective for examining age differences in the misinformation effect. Although the use of a live event served to make the experience more familiar to participants and more externally valid than most previous research, naturalistic experiments have the potential to reduce internal reliability. Precautions were taken to ensure that this was not an issue. All participants viewed the same event (e.g., the interruption script was rehearsed extensively, condition assignments were counterbalanced and preassigned, and the interrupter was blind to experimental condition). Nevertheless, it is possible that an unconscious bias on the part of the experimenter (who was necessarily aware of condition assignment) affected how the event unfolded. Furthermore, participants in the incidental condition were not instructed to attend to the event (similar to the approach of Loftus et al., 1992), which may have disadvantaged that group more than in other studies of incidental memory where researchers directed participants to notice some specific aspect of a to-be-remembered video (Brimacombe et al., 2003; Schacter et al., 1997).

**CONCLUSIONS**

Consistent with previous research (Loftus & Palmer, 1974; Sutherland & Hayne, 2001; Zaragoza & Lane, 1994), the current study has demonstrated how easily memory can be distorted. By simply suggesting that a false detail was present, participants believed they heard and saw details that did not exist. That result is not new. However, this is one of the first studies to examine the impact of misinformation under both intentional and incidental learning conditions (see Davies & Hine, 2007; Yarmey, 2004). Even when participants were paying attention to the event and trying to remember everything about it, they were still susceptible to believing false information. These results emphasize the power of misinformation to distort memory at all ages, even with a realistic stimulus. At the same time, free recall of basic details was not compromised by encoding condition. These data suggest that a free recall format or special interview process before detailed question-answering (with no opportunity for misinformation to be planted in people’s minds) might yield valuable information from witnesses.

With respect to aging, these results confirmed past research showing that older adults have more memory difficulties than young adults. At the same time, this research demonstrated that misinformation has a strong impact on memory for all adults, even under optimal encoding conditions. In fact, younger adult misinformation errors were comparable to older adult errors on free recall, and younger adults in the incidental condition showed a stronger misinformation effect on cued recall than the older adults. These findings are likely related to information processing skills in younger adults—either their ease of encoding the misinformation planted in the first cued recall questionnaire or strategic efforts they made to learn that information to aid subsequent retrieval. Further research in this area will help psychologists learn more about the processing of real world events, with the long-term goal of identifying ways to improve the accuracy of everyday memory for younger and older adults alike.

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