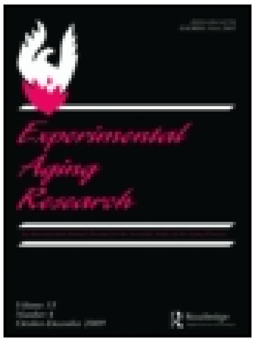

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CONFIDENCE MODERATES THE ROLE OF CONTROL BELIEFS IN THE CONTEXT OF AGE-RELATED CHANGES IN MISINFORMATION SUSCEPTIBILITY

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Background/Study Context: *The present experiment investigated the role of confidence and control beliefs in susceptibility to the misinformation effect in young and older adults. Control beliefs are perceptions about one's abilities or competence and the extent to which one can influence performance outcomes. It was predicted that level of control beliefs would influence misinformation susceptibility and overall memory confidence.*

Methods: *Fifty university students (ages 18–26) and 37 community-dwelling older adults (ages 62–86) were tested. Participants viewed a video, answered questions containing misinformation, and then completed a source-recognition test to determine whether the information presented was seen in the video, the questionnaire only, both, or neither. For each response, participants indicated their level of confidence.*

Results: *The relationship between control beliefs and memory performance was moderated by confidence. That is, individuals with lower control beliefs made more errors as confidence decreased. Additionally, the relationship between confidence and memory performance differed by age, with greater confidence related to more errors for young adults.*

Conclusion: *Confidence is an important factor in how control beliefs and age are related to memory errors in the misinformation effect. This may have implications for the legal system, particularly with eyewitness testimony. The confidence of an individual should be considered if the eyewitness is a younger adult.*

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Rather than remembering information veridically, we reconstruct events based on our experiences in the world. One type of memory vulnerability stems from encountering misinformation. In a typical misinformation experiment, participants view an event (e.g., a man breaking into a car and stealing items from it), are presented with misleading postevent information in the form of a narrative or questions (e.g., the man puts the stolen wallet in his *pants* pocket when he actually put it in his *jacket* pocket), and then complete a memory test about the original event. Misleading postevent information negatively affects memory for the original event, with participants incorrectly reporting postevent details when questioned about the original event (see Loftus, Miller, & Burns, 1978). The present study investigates how a sense of control over one's cognitive abilities (control beliefs) may affect the occurrences of memory errors, how the relationship between control beliefs and misinformation susceptibility changes with age, and how confidence in and about memory may impact these relationships.

Control beliefs are perceptions about one's abilities or competence (self-efficacy) and the extent to which an individual feels he/she can influence performance outcomes (Abeles, 1990; Bandura, 1997; Miller & Lachman, 1999; Rodin, 1990; Rodin, Timko, & Harris, 1985; Skinner, 1995, 1996). Numerous studies have documented the link between better memory performance and higher levels of control beliefs, specifically in older adults (e.g., Dixon & Hultsch, 1983; Lachman, Ziff, & Spiro, 1994; Miller & Lachman, 1999, 2000), which may be due to older adults with high control beliefs better monitoring their memory performance (Riggs, Lachman, & Wingfield, 1997). However, previous studies focused on accurate memory and the amount of information remembered, such as the finding that high control beliefs are associated with better memory for word lists (Lachman & Andreoletti, 2006). In contrast, we wanted to explore the relationship between control and memory in a paradigm that systematically biased memory by introducing misinformation. We also sought to examine the role of age in the relationship between control beliefs and misinformation susceptibility, given that age differences emerge in susceptibility to misinformation, with older adults more likely to be susceptible as compared with younger adults (Bulevich & Thomas, 2012; Cohen & Faulkner, 1989).

Although control beliefs have not been studied in the context of the misinformation paradigm, related research supports a negative relationship between control beliefs and susceptibility to the misinformation effect, at least in young adults. When examining locus of control (a component of control beliefs) and suggestibility as measured by an increase in confidence that an imagined event was real, researchers found that young adults with an external locus (i.e., outside oneself, such as believing environmental factors or chance determines outcomes) as opposed to an internal locus of control were more likely to commit errors (Paddock et al., 1998, 2000). Paddock et al. (1998, 2000) used a guided visualization technique that increased susceptibility to suggestion and argued that guided visualization promoted a reliance on sources of information outside the self, rather than on personal experience. Participants with an external locus of control were more likely to rely on external sources of information, which resulted in an increase in memory suggestibility (Paddock et al., 1998; Paddock, Terranova, Kwok, & Halpern, 2000). Consistent with these findings, we predicted that higher control beliefs (internal locus) would be related to reduced susceptibility to postevent misinformation, whereas lower control beliefs (external locus) would be related to increased susceptibility. Further, we predicted that this pattern would be stronger in older as compared with younger adults.

As Paddock and colleagues (1998) measured suggestibility by increased confidence levels, confidence may play a critical role in how control beliefs affect memory. People who are more confident in their memory tend to be more optimistic about finding strategies for improvement and view effort as a means to improve, whereas those with less confidence feel more helpless when it comes to finding ways to improve (Lachman, Bandura, Weaver, & Elliott, 1995). Finding strategies for improvement is important, as Miller and Lachman (2000) posit that the relationship between control beliefs and memory performance may be due to more sustained effort, implementation of more adaptive strategies, and a reduction in anxiety associated with cognitive testing. Thus, we expected that high control beliefs would be associated with greater confidence because strategy use would result in better performance in distinguishing suggested from actual events.

In contrast to the idea that greater confidence leads to finding more strategies, which, in turn, improves memory, Tousignant (1984) found that people who reported having good memories were more influenced by misinformation than people who reported having bad memories. This suggests that greater general confidence in memory is related to greater susceptibility to the misinformation effect. Therefore, the role of confidence in the relationship between control beliefs and memory errors is worth studying because the relationship is not clear and may be dependent on how memory accuracy is assessed. Furthermore, aging may modify this relationship. Much research has shown that older adults demonstrate greater overconfidence in errors than young adults (Bulevich & Thomas, 2012; Dodson, Bawa, & Krueger, 2007; Fandakova, Shing, & Lindenberger, 2013; Karpel, Hoyer, & Toglia, 2001; Kelley & Sahakyan, 2003; Shing, Werkle-Bergner, Li, & Lindenberger, 2009). Likewise, Dodson and Krueger (2006) found age differences when examining suggestibility errors and confidence. Whereas young adults were more likely to commit these errors when they were uncertain about the accuracy of their responses, older adults were more likely to commit these errors when they were more confident in their responses. Given the research showing that older adults are more confident than young adults in misattribution errors (e.g., Bulevich & Thomas, 2012), it remains unclear how both confidence and control beliefs interact to influence misattribution errors, and whether this differs by age. It may be the case that confidence modifies the relationship between control beliefs and memory errors, specifically in older adults, such that those older adults with higher levels of control beliefs will make fewer misattribution errors. But when they do commit errors, they will be more confident in them. This would reflect the overall effectiveness of memory strategies for this group, leading to higher confidence in their memory, which mistakenly extends to errors in this case. The present study will probe the effects of confidence on the relationship between control beliefs and memory performance.

Finally, we were interested in how the relationships between confidence, control beliefs, and memory errors differed by misattribution type. Specifically, we examined misattributions to the original event only (video) and misattributions to both the original event and postevent suggestions (video and questionnaire) to assess whether the effect of control beliefs or confidence changes based on different sources of information. One possibility is that those who rely on outside sources to a greater extent may be more likely to attribute misinformation to only the video, whereas those with higher control beliefs are more likely to attribute the misinformation to both the video and questionnaire, given that their internal focus allows for better monitoring of their memory. This pattern is predicted based on the better memory monitoring for individuals with high control beliefs; by misattributing misinformation to the video and questionnaire, they will be partially correct, as the misinformation did originate from the questionnaire. Furthermore, confidence ratings should mirror these relationships, with high control belief individuals expressing more confidence in their misattributions.

METHODS

Participants

Fifty young adults (age: $M = 19.79$, $SD = 2.00$) were recruited from Brandeis University and 40 community-dwelling older adults were recruited from the Greater Boston area; three were dropped due to scoring below chance on average across all conditions on the memory test. This left a final older adult sample of 37 (age: $M = 74.40$, $SD = 6.87$). Young adults received class credit or payment, whereas older adults received payment for their participation. Inclusion criteria included being fluent in English, having self-reported normal or corrected-to-normal vision and hearing, and being between the ages of 18 and 30 for young adults or between 60 and 90 for older adults, as well as scoring above a 26 on the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) for older adults.

Design

The experiment was a 2 × 2 between-participants design, with level of control beliefs (high vs. low) and age (young vs. old) as factors. The dependent variable was the misinformation effect, defined as the proportion of misattributed misleading items (responded with video or both video and questionnaire, when should have been questionnaire), controlling for the proportion of misattributed control items (responded with video or both video and questionnaire, when should have been new), as done in previous studies (Lee, 2004; Mitchell, Johnson, & Mather, 2003; Zaragoza & Lane, 1994).

Materials

Control Beliefs

The Personality in Intellectual Contexts (PIC) Inventory—short form (Lachman, 1986) assessed the level of control beliefs, as it is used to measure the extent to which an individual feels a sense of control over his cognitive abilities (Lachman, Andreoletti, & Pearman, 2006). More specifically, it assesses beliefs and attributions related to a person's intellectual functioning (Lachman, Baltes, Nesselroade, & Willis, 1982). This questionnaire consists of three subscales: Internal, Chance, and Powerful Others. The Internal scale measures the extent to which participants believe they have control over outcomes in their lives, whereas the Powerful Others scale reflects the degree to which they believe powerful others have control. The Chance scale indicates the degree to which outcomes in their life are determined by chance or fate. Higher scores on the latter two subscales come from endorsing disagreements with the given statements, thereby denoting higher control beliefs (e.g., "It's inevitable that my intellectual functioning will decline as I get older."). Lower scores on the Internal subscale come from endorsing agreements with the given statements (e.g., "It's up to me to keep my mental faculties from deteriorating"), so the Internal subscale is reverse scored. Scores from all three subscales were summed to create a single score, with higher scores denoting higher control beliefs.

We used a median split of scores on the PIC to create groups with high and low control beliefs. The values corresponding to the median were specific to each age group (<178 was low control for young, <177 was low control for old), such that 25 young and 18 older participants were assigned to the *high control beliefs* group and 25 young and 19 older participants to the *low control beliefs* group.

Cognitive Measures

The Shipley Vocabulary test (Shipley, 1940) was used to assess participants' verbal abilities and the Digit Comparison task was used to measure speed of processing (Hedden et al., 2002). For the older adults, we also administered the Mini-Mental State Examination (MMSE; Folstein et al., 1975) to screen for cognitive impairment. These measures were used to characterize the cognitive abilities of our participants.

Demographics

We used this questionnaire to assess information such as age, gender, and years of education to characterize our participants and to ensure comparable samples across groups.

Original Event

As in Lindsay, Allen, Chan, and Dahl (2004), participants viewed an 8.5-minute scene from the movie *The Return of the Pink Panther* in which a man committed a burglary in a museum.

Misinformation

Participants completed a postevent questionnaire, in which some of the questions were misleading (i.e., they presupposed the existence of objects or events not in the video, although they were plausible, such as asking about a blowgun being used when it was actually a crossbow). A 36-item questionnaire included 12 misleading suggestions (e.g., burglar slips on spill when the burglar never slipped in the video, and the jewel is referred to as square shaped when it was actually egg shaped), whereas the remaining 24 questions asked about events and objects that were actually in the video. All questions were presented on a computer screen, and participants answered by selecting "yes" or "no" on labeled keys.

Source-Recognition Test

Participants read 36 statements and had to determine the source of the item. Specifically, they had to indicate whether the item was in the video (original event), whether it was in the questionnaire (misinformation), whether it was in both (information from the original event that was also presented in the questionnaire), or whether it was a new item they had not seen before. The test probes consisted of the 12 suggestions intermixed with 24 filler items from other sources (video only, both video and questionnaire, new). Participants were told that some of the questions they had answered in the questionnaire contained information that was not in the video.

Confidence

For each response on the recognition test, participants indicated their confidence in the source, ranging from 1, representing "100%/definitely yes" to 5, representing "0%/guess," with 3 representing "50%." Confidence scores were transformed for analyses such that higher values indicated higher levels of confidence. Responses assessed participants' degree of certainty in their response (completely certain to completely uncertain).

Procedure

Participants gave informed consent and filled out the PIC and demographics. They then watched the film clip, being told to pay careful attention because they would be asked questions about what happened in the clip. Immediately after viewing the film, participants completed a postevent questionnaire that included misinformation (information that was not part of the video). They were told to select "yes" or "no" for each question and could not ask the experimenter any questions. After a delay of 10 minutes (during which participants completed cognitive measures, such as the Shipley Vocabulary test and Digit Comparison task), they received a source-recognition test. Participants read 36 statements concerning items from the video, the questionnaire, both, or neither and decided the source of the item. They wrote *V* if they believed it was from the video, *Q* if they believed it was only in the questionnaire, *VQ* if it was seen in both, or *N* if it was new and not seen previously. They also gave their confidence rating after each source memory judgment. After completing the source-recognition test, participants filled out any questionnaires not finished during the 10-minute delay. Older adults also completed the MMSE. All participants were then debriefed, compensated, and thanked for their time.

RESULTS

Demographics and Cognitive Abilities

Characteristics of the samples are displayed in Table 1a (young adults) and Table 1b (older adults). As a manipulation check of the division of participants into high and low control beliefs groups, we compared control belief scores. For young adults, as expected, there was a significant difference between high and low control beliefs groups in their PIC scores, $t(48) = 8.92$, $p < .001$, $d = 2.57$. The PIC scores ranged from 146 to 212, with a mean of 178.08 and a standard deviation of 12.05. The groups were comparable on all other measures. As expected, older adults in the high and low control beliefs groups also differed in their PIC scores, $t(35) = 9.28$, $p < .001$, $d = 3.13$. The PIC scores ranged from 137 to 207, with a mean of 177.04 and a standard deviation of 19.29. To ensure that our samples did not differ systematically on measures other than control beliefs, we compared the remaining measures within each age group and found that the high and low control beliefs groups were comparable on all other measures.

To ensure that our samples were consistent with typical samples of cognitively normal older adults from the community, we compared younger and older adults on cognitive and demographic measures. Older adults ($M = 16.43$, $SD = 2.12$) had more years of education than young adults ($M = 13.23$, $SD = 1.78$), $t(85) = 7.66$, $p < .001$, $d = 1.66$, and older adults ($M = 36.23$, $SD = 3.66$) had higher scores on the Shipley Vocabulary test than young adults ($M = 32.54$, $SD = 3.34$), $t(83) = 4.82$, $p < .001$, $d = 1.06$. Young adults ($M = 75.76$, $SD = 15.10$) had higher speed of processing scores on Digit Comparison than older adults ($M = 56.03$, $SD = 10.76$), $t(85) = 6.77$, $p < .001$, $d = 1.47$. There were no significant differences on PIC scores between young ($M = 178.08$, $SD = 13.05$) and older ($M = 177.04$, $SD = 19.29$) adults, $p = .778$.

The following analyses were conducted to test our hypotheses.

Misinformation Effect

We hypothesized that participants with high control beliefs would be less susceptible to the misinformation effect than those with low control beliefs, and that the relationship between control beliefs and the misinformation effect would be stronger in older than younger adults. We tested this hypothesis by using a 2 (age) × 2 (control) analysis of variance (ANOVA) with the misinformation effect as the dependent variable. No significant effects emerged with control beliefs in the ANOVA, *ps* > .70. There was, however, a significant main effect of age, $F(1, 86) = 4.60$, $MSE = .149$, $p = .035$, $\eta_p^2 = .052$, due to young adults ($M = .39$, $SD = .16$) showing a greater misinformation effect than did older adults ($M = .31$, $SD = .20$). See Table 2. Examining correct attributions revealed no significant effects, *ps* > .70.

As a more sensitive measure of control beliefs, we chose to use the range of PIC scores rather than the median split used in the ANOVA. Looking at the correlations across young and older adults combined, there was not a significant correlation between control beliefs and the misinformation effect, $r(85) = -.012$, $p = .91$. Examining correlations separately for each age group to test for age differences revealed no significant correlation for older adults, $r(35) = .15$, $p = .39$, but there was a marginally significant negative correlation between control beliefs and misinformation effect for young adults, $r(48) = -.26$, $p = .074$, such that those with higher control beliefs were less susceptible to the misinformation effect. The Fisher *r*-to-*z* transformation showed a marginally significant difference between the correlations for young and old, $p = .07$. Thus, having higher control beliefs may be somewhat related to decreased susceptibility to the misinformation effect as hypothesized,

Table 1a. Young adults' mean scores (*SD*) on demographic and cognitive measures

Measure	Low control (n = 25)	High control (n = 25)
Age	19.39 (1.51)	20.20 (2.38)
Gender	7 M, 18 F	11 M, 14 F
Years of education	12.84 (1.46)	13.62 (2.00)
Digit Comparison	73.56 (15.01)	77.96 (15.17)
Shipley Vocabulary	32.16 (3.60)	32.92 (3.08)
PIC score**	167.88 (7.44)	188.28 (8.68)

*$p < .05$; **$p < .01$.

Table 1b. Older adults' mean scores (*SD*) on demographic and cognitive measures

Measure	Low control (n = 19)	High control (n = 18)
Age	73.12 (7.39)	75.76 (6.19)
Gender	10 M, 9 F	6 M, 12 F
Years of education	16.21 (2.07)	16.67 (2.20)
Digit Comparison	55.32 (9.25)	56.78 (12.38)
Shipley Vocabulary	36.42 (2.69)	36.00 (4.65)
PIC score**	161.42 (11.10)	193.53 (9.87)
MMSE	28.68 (1.34)	28.78 (1.17)

*$p < .05$; **$p < .01$.

Table 2. Mean proportions (*SD*) of misinformation effect by age and control level

Age	Control level	Misinformation effect
Young	Low	.39 (.14)
	High	.39 (.17)
Old	Low	.29 (.22)
	High	.32 (.20)

Note. The misinformation effect is calculated by subtracting the proportion of misattributed control items (responded *V* or *VQ* when should have been *N*) from the proportion of misattributed misleading items (responded *V* or *VQ* when should have been *Q*). *V* = video; *VQ* = video and questionnaire; *N* = new; *Q* = questionnaire.

but only for young adults. This relationship did not emerge for older adults, contrary to our prediction.

Misattributions

To examine the relationship between confidence and memory errors, we explored how confidence in misattributions was related to misattribution type, as well as control beliefs. We predicted that those who rely on outside sources to a greater extent may be more likely to attribute misinformation to only the video, whereas those with higher control beliefs may be more likely to attribute the misinformation to both the video and questionnaire. In addition, it may be that those with higher control beliefs are more confident and thus more confident in their misattributions to the video and questionnaire (as we expected them to make a greater number of this type of error). Confidence ratings in misattributions are presented in Table 3 illustrating the pattern of means.

We expected that higher control beliefs would be related to more misattributions to the video and questionnaire. We also expected that higher control beliefs would be related to greater confidence in video and questionnaire misattributions. Moreover, we expected that higher control beliefs would be related to fewer misattributions to the video alone. Correlations overall showed that higher control beliefs were related to greater confidence in misattributions to the video and questionnaire, $r(81) = .37$, $p < .001$, as expected, as well as greater confidence in misattributions to the video, but this was only marginally significant, $r(52) = .27$, $p = .053$. Higher control beliefs were related to fewer

Table 3. Mean proportions (*SD*) and confidence ratings (*SD*) for misattributions by age and control level

Age	Control level	Video misattributions	Video misattributions confidence	Video and questionnaire misattributions	Video and questionnaire misattributions confidence
Young	Low	.10 (.08)	3.50 (1.04)	.30 (.18)	4.24 (0.54)
	High	.04 (.06)	3.59 (1.38)	.37 (.18)	4.22 (0.74)
Old	Low	.13 (.13)	3.84 (1.13)	.26 (.15)	3.85 (0.99)
	High	.10 (.10)	4.18 (0.85)	.25 (.15)	4.25 (0.94)

Note. 5 = most confident; 1 = least confident. Mean proportions show how many misattributions were made to the video alone, and to the video and questionnaire, out of the total number of possible misattributions.

misattributions to the video alone, $r(85) = -.27$, $p = .011$, which was consistent with our expectations. See Table 4.

We examined correlations separately for each age group, as we expected stronger relationships for older adults, given that control beliefs exert a stronger effect on memory with age. In terms of confidence, higher control beliefs were related to greater confidence in misattributions to the video and questionnaire for young adults, $r(48) = .33$, $p = .019$, as well as older adults, $r(31) = .41$, $p = .018$, as expected. For young adults, higher control beliefs were related to fewer misattributions to the video, $r(48) = -.40$, $p = .004$, consistent with our hypothesis. For older adults, higher control beliefs were also marginally related to more confidence in the misattributions to the video alone, $r(26) = .37$, $p = .054$. This is consistent with our expectation that those with higher control beliefs would be more confident in the type of error they were more likely to make. See Table 4 (including the footnote explaining the sample sizes across different analyses). Significant correlations were not related to outliers.

Regression

Although the preceding correlations allowed us to explore relationships amongst variables (e.g., how confidence is related to control beliefs), we used multiple regression to examine the nature of interactions involving age, control beliefs, and confidence and their influence on types of misattributions. We ran two separate models, one with misattributions to the video as the outcome variable and one with misattributions to the video and questionnaire as the outcome variable, to assess whether the effect of control beliefs or confidence changes based on different sources of information. Age (as a categorical variable: young/old), control beliefs, and confidence were entered as the predictors, as well as their interactions, in a hierarchical manner. The results of this model-building approach are

Table 4. Correlations between misattributions, control beliefs, and confidence ratings

Variable	Overall (N = 87)	Young (n = 50)	Old (n = 37)
Misattribution type and control score			
Vmis and PIC	−.27*	−.40**	−.19
VQmis and PIC	−.03	−.03	−.06
Control score and confidence in misattribution type			
PIC and Vconf[a]	.27	.11	.37
PIC and VQconf[b]	.37**	.33*	.41*
Misattribution type and confidence in the misattribution			
Vmis and Vconf[a]	−.20	−.22	−.24
VQmis and VQconf[b]	.08	.32*	−.29

Note. Vmis = misattributions to the video; VQmis = misattributions to the video and questionnaire; PIC = PIC score of control beliefs; Vconf = confidence in misattributions to the video; VQconf = confidence in misattributions to the video and questionnaire.

[a]Because some participants did not make video only misattributions, the number of subjects for overall, young adults, and older adults are 54, 26, and 28, respectively.

[b]Because some participants did not make video and questionnaire misattributions, the number of subjects for overall, young adults, and older adults are 83, 50, and 33, respectively.

*$p < .05$; **$p < .01$.

presented in Table 5, with misattributions to the video as the outcome variable, and Table 6, with misattributions to the video and questionnaire as the outcome variable.

For the regression model with misattributions to the video as the outcome variable, we expected that those with lower control beliefs would make more errors than those with higher control beliefs, and would be more confident in these errors, due to their greater reliance on external sources. Because control beliefs exert a stronger influence with age, this relationship was expected to be stronger for older adults than young. Age was entered as the first predictor, followed by control beliefs, and then confidence in misattributions to the video. Each variable was kept in the model as interactions were tested, starting with our main interaction of interest, Age × Control. As this interaction was nonsignificant, $p = .66$, it was removed before the next interaction, Age × Confidence was added. As this interaction was nonsignificant, we removed it before adding the next interaction, Control × Confidence. This interaction was significant, so we kept it in the model as we tested the remaining interactions. As each interaction was added (see Table 5, in the order listed), each was nonsignificant, $ps > .20$, whereas the Control × Confidence interaction remained significant. Therefore, we trimmed the model to remove interactions that did not make a contribution and chose Model 6 as the best model, $R^2 = .17$, $F(4, 49) = 2.52$, $p = .053$. This included the significant Control × Confidence interaction, $\beta = .33$, $p = .017$, graphed in Figure 1. We presented the graph in this way to highlight the interaction. As the graph shows, for those participants with higher control beliefs, confidence did not drastically change the proportion of misattributions made to the video. However, for those individuals with lower control beliefs, confidence predicted misattribution errors such that those with higher confidence made fewer misattributions to the video than those with lower confidence. Moreover, those with lower control beliefs who had less confidence made more misattributions to the video.

For the regression model with misattributions to the video and questionnaire as the outcome variable, we expected that those with higher control beliefs would make more errors and would be more confident in their errors because of their greater confidence in their memory strategies. Again, these relationships would be stronger for older than young adults. We approached the analyses in the same way. Age was entered as a predictor in the first model, followed by control beliefs, and then confidence in misattributions to the video and questionnaire. Interactions were approached in the same manner, starting with Age × Control, which was nonsignificant, $p = .60$, and so was removed before testing the next interaction with all variables remaining in the model. When the Age × Confidence interaction was tested, it was significant, $p = .007$, and therefore remained in the succeeding models as the other interactions were tested. Each subsequent interaction entered was nonsignificant, $ps > .30$, so we selected Model 5 as the best model (see Table 6), $R^2 = .15$, $F(4, 78) = 3.30$, $p = .015$, which revealed the significant Age × Confidence interaction, $\beta = .40$, $p = .007$, and was trimmed to exclude all interactions that did not contribute to the model. As the graph in Figure 2 shows, the relationship between confidence and proportion of misattributions made to the video and questionnaire differs based on age. For older adults, confidence did not drastically affect the proportion of misattributions made to the video and questionnaire. However, for young adults, those with higher confidence made more misattributions to the video and questionnaire.

Table 5. Estimated unstandardized coefficients for the regression models predicting proportion of misattributions to the video ($N = 87$)

Predictor	M1	M2	M3	M4	M5	**M6**	M7
Intercept	.115*** (.016)	.120***(.015)	.145*** (.019)	.145*** (.019)	.146*** (.019)	**.131*** (.018)**	.128*** (.019)
Young = 1, Old = 0	−.049*(.021)	−.047* (.020)	−.026(.027)	−.025(.027)	−.026(.027)	**−.015(.026)**	−.010(.027)
Control		−.002* (.001)	−.001(.001)	−.001(.001)	−.001(.001)	**−.001(.001)**	−.001(.001)
Confidence			−.017(.013)	−.017(.013)	−.024(.020)	**−.013(.012)**	−.012(.012)
Age æ Control				.001(.002)			
Age æ Confidence					.012(.025)		
Control æ Confidence						**.002*(.001)**	.002*(.001)
Age æ Control æ Confidence							−.002(.002)
R^2	.061	.131	.068	.071	.072	**.171**	.189
$F(df1, df2)$	5.48* (1, 85)	6.32** (2, 84)	1.21 (3, 50)	.94 (4, 49)	.95 (4, 49)	**2.52 (4, 49)**	2.24 (5, 48)
RMSE	.096	.093	.097	.098	.098	**.092**	.092

Note. Numbers in parentheses are standard errors. Selected model in bold.
*p ‹ .05; **p ‹ .01; ***p ‹ .001.

Table 6. Estimated unstandardized coefficients for the regression models predicting proportion of misattributions to the video and questionnaire (N = 87)

Predictor	M1	M2	M3	M4	**M5**	M6	M7
Intercept	.256*** (.028)	.256*** (.028)	.272*** (.029)	.272*** (.029)	**.267*** (.028)**	.261*** (.029)	.267*** (.028)
Young = 1, Old = 0	.080*(.036)	.081*(.037)	.063(.038)	.063(.038)	**.064(.036)**	.067(.037)	.055(.038)
Control		.000(.001)	−.002(.001)	−.002(.002)	**−.001(.001)**	−.001(.001)	−.002(.001)
Confidence			.027(.027)	.027(.027)	**−.036(.034)**	−.029(.036)	−.033(.034)
Age æ Control				.001(.002)			
Age æ Confidence					**.134** (.048)**	.129*(.049)	.140** (.049)
Control æ Confidence						.001(.001)	
Age æ Control æ Confidence							.003(.004)
R^2	.054	.056	.059	.063	**.145**	.150	.154
$F(df1, df2)$	4.89* (1, 85)	2.50 (2, 84)	1,67 (3, 79)	1.31 (4, 78)	**3.30*(4, 78)**	2.71* (5, 77)	2.80* (5, 77)
RMSE	.168	.168	.168	.168	**.161**	.161	.161

Note. Numbers in parentheses are standard errors. Selected model in bold.
*p ‹ .05; **p ‹ .01; ***p ‹ .001.

Figure 1. Interaction of confidence and control for misattributions to the video (mean proportion). High and low values for control beliefs and confidence correspond to + and −1 *SD* around the mean. The proportion of misattributions to the video was highest for those with low confidence and low control. Confidence was not significantly related to misattributions to the video among those who had high control.

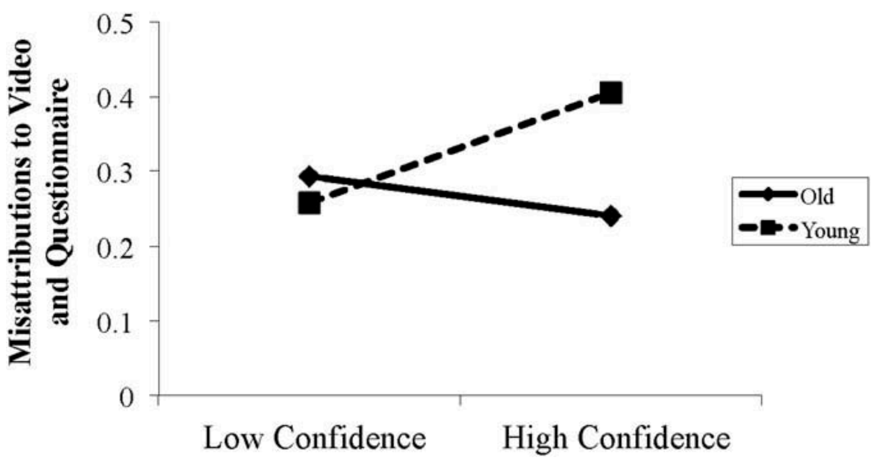

Figure 2. Interaction of confidence and age for misattributions to the video and questionnaire (mean proportion). High and low values for confidence correspond to +1 and −1 *SD* around the mean. Young adults with high confidence had a greater proportion of misattributions to the video and questionnaire compared with the young with low confidence. Confidence was not significantly related to misattributions to the video and questionnaire for older adults.

DISCUSSION

The aim of the current study was to examine how control beliefs and confidence interact to influence misinformation susceptibility, as well as misattribution errors, and whether this differs by age. Our results show that confidence moderates the control beliefs–memory performance relationship when examining different types of misattributions. Furthermore, the relationship between confidence and memory errors differs by age.

We expected that individuals with higher levels of control beliefs would be less susceptible to the misinformation effect, as this would extend Paddock et al.'s findings (1998, 2000) to the domain of control beliefs. Although the correlational analyses revealed a trend for the hypothesized relationship in young adults, it did not for older adults. Nor did it emerge in the ANOVA analyses, based on a median split of high and low control beliefs. The weaker effects in the present study, as compared with Paddock and colleagues' studies, may reflect the relatively select samples in the present study, who generally endorsed higher levels of control beliefs. Differences in the measures of locus of control and our measure of control beliefs could also contribute to the discrepancies across studies. We examined control beliefs in the cognitive domain, whereas previous studies examined a more general control construct. Whereas Paddock and colleagues' studies focused on incorporating suggestions into one's memory of experienced life events, our experiment used a typical misinformation effect paradigm that focused on viewing a video and incorporating postevent information into one's memory of the video. Memory for experienced life events draws on the self to a greater extent than memory of a video, and the latter event lacks the richness of details and importance that are often part of experienced life events.

Further exploring the relationship between control beliefs and memory (specifically, errors and misattribution type), we found that higher control beliefs were related to fewer misattributions to the video, regardless of confidence, whereas those with lower control beliefs and lower confidence made a greater number of misattributions to the video than those with higher confidence. This is consistent with the previous finding that internals are better at monitoring their performance than externals (Lachman, 1991; Riggs et al., 1997). Likewise, field-independent individuals (those with a cognitive style that relies less on information provided by the outside world) tend to be highly self-focused, consistent with how we conceptualize those with high control beliefs. In an examination of eyewitness memory, Christiaansen, Ochalek, and Sweeney (1984) found that field-independent individuals were more confident in their correct answers, suggesting that this was due to their greater self-awareness. This may be similar to those with high control beliefs who remember that the misleading information was in the questionnaire. Attributing the information to the video and the questionnaire is considered more correct (partial memory) than attributing to the video alone because the information was, in fact, in the questionnaire. Thus, the finding that individuals with high control beliefs are less likely to misattribute misleading information to the video (which would be completely incorrect as it was in the questionnaire only) is consistent with previous literature supporting the relationship between having high control beliefs and better memory performance (e.g., Lachman & Andreoletti, 2006). In this study, individuals with high control beliefs exhibited superior memory performance by avoiding attributing misleading information solely to the video, whereas those with low control beliefs and low confidence were more likely to make this misattribution. In terms of age, young adults were more likely to make misattributions to the video and questionnaire as their confidence increased, which also shows that they are exhibiting partial memory, similar to those individuals with high control beliefs.

Overall, this study adds to our understanding of how age influences susceptibility to the misinformation effect by also examining control beliefs and confidence. Confidence has emerged as an important aspect of the misinformation effect, both in terms of control and age. Although individuals may believe they have control over their memory, their performance can be influenced by how confident they are. In addition, certain types of older adults' memory errors are less influenced by how confident they are, compared with a stronger effect for younger adults. This may have implications for the legal system, particularly with eyewitness testimony. The confidence of an individual should be attended to more or less, depending on the age of the eyewitness.

One unexpected finding was that older adults were *less* susceptible than young to the misinformation effect, contrary to prior findings (e.g., Jaschinski & Wentura, 2002; Loftus, Levidow, & Duensing, 1992). The use of a source-monitoring test may explain this unexpected finding, as some research (Lindsay & Johnson, 1989) has shown that the misinformation effect can be eliminated using a source-monitoring test, which encourages participants to examine specific details when deciding where they previously encountered information rather than responding based on familiarity. Furthermore, source-monitoring tests have been shown to reduce age-related deficits in memory (Multhaup, 1995).

A few limitations exist in the current study. Our older adults had a wide range of ages (62 through 86 years old), and we had a greater number of young adults in our sample than older adults. Such discrepancies in the age groups could explain lack of expected findings. For example, if our sample of older adults were older, they may have exhibited greater susceptibility to misinformation than young adults, as has previously been found. In addition, the order in which measures were completed could have introduced interference. For example, participants completed a measure of control and reported their ages prior to the memory task, which could have induced stereotype threat for older adults and influenced performance. Stereotype threat occurs when people worry about confirming a negative stereotype about themselves if they perform poorly, resulting in decreased performance, which then conforms to the stereotype. In the case of older adults, they are often stereotyped as having poor memory. When this stereotype is made salient (e.g., when reporting age), older adults then perform worse than they otherwise would have (Barber & Mather, 2014).

In addition to addressing these limitations, future studies should also employ designs and analyses that explore which variables exert causal effects on others. It would also be interesting to examine specific types of suggestions in a video (e.g., color of item vs. action performed by character) to determine if effects vary by suggestion type, as was found with age (Mueller-Johnson & Ceci, 2004). Such work could inform which aspects of eyewitness testimony are more prone to distortion.

In conclusion, confidence interacts with control beliefs and age to influence the type of errors made, such that confidence is more important for young adults, and predicts more errors for individuals with low control beliefs when they have low confidence. Thus, the present study elucidates the control beliefs–memory performance relationship by showing how confidence acts as a moderator. Furthermore, confidence has a differential relationship with memory errors depending on age. Thus, the age of an individual and confidence level should be taken into account when the legal system examines eyewitness testimony.

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