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Truth and Character: Sources That Older Adults Can Remember

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Abstract

Are age differences in source memory inevitable? The two experiments reported here examined the hypothesis that the type of source information being tested mediates the magnitude of age differences in source memory. In these studies, participants listened to statements made by two different speakers. We compared younger and older adults' source memory in a traditional perceptual source task (memory for voice) and in two affective, conceptually based source tasks (truth of the statements, character of a person in a photo). In both studies, the perceptual and conceptual source information were conveyed in the same manner, as one speaker was associated with one type of information (e.g., female voice speaks truth). Age differences were robust for decisions regarding who said each statement but were negligible for truth or character decisions. These findings are provocative because they suggest that the type of information can influence age-related patterns of performance for source-conveyed information.

Source memory broadly refers to memory for the context in which information was conveyed or experienced (e.g., the physical setting, emotional context, or speaker). Empirical investigations of source memory have examined a range of source memory decisions, including the distinctions between ideas that were thought versus spoken, between actions that were imagined versus performed, and between events that were simply heard about or were directly observed, as well as between different speakers and presentation modes (see Johnson, Hashtroudi, & Lindsay, 1993, for a review). The findings in this tradition have shaped theoretical understanding of human memory, in particular because of a distinction drawn between item memory (e.g., memory for a news fact) and source memory (e.g., memory for the origin of that fact). By this view, item and source memory represent separate forms of memory that are differentially dependent on specific brain regions, with item memory primarily reflecting medial-temporal lobe functioning and source memory largely dependent on frontal lobe functioning (e.g., Glisky, Polster, & Routhieaux, 1995; Shimamura & Squire, 1987, 1991; but see Degl'Innocenti & Baeckman, 1996).

Given the suggestion that there is greater age-related decline in frontal function than in the functioning of other regions (see Raz, 2000), one would expect to see greater deficits in source relative to item memory in older than younger adults, which should lead to relatively large differences in performance for older versus younger adults when source memory is assessed. Indeed, behavioral data suggest differential age-related impairments on source relative to item recognition tasks (e.g., Ferguson, Hashtroudi, & Johnson, 1992; McIntyre & Craik, 1987; Schacter, Kaszniak, Kihlstrom, & Valdiserri, 1991). Consistent with the notion

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that older adults' source memory impairments are mediated by frontal deficits is the binding explanation of source memory (Chalfonte & Johnson, 1996), which holds that successful binding of contextual cues or features to their items involves frontal functioning. According to that view, deficits in frontal functioning hinder the initiation and control of reactivation, processes necessary to bind information together, and binding problems, in turn, result in poor source memory.

Despite the strong empirical and theoretical support for the suggestion that older adults are impaired in source memory relative to younger adults, and for a neural basis for this age-related deficit, there is at least one important limitation of existing work on age differences in source memory that should be addressed. Although sources have been broadly defined to include perceptual, contextual, semantic, and affective information (e.g., Johnson, 1997), the majority of source memory studies have assessed only perceptual and contextual information, such as the distinction between different speakers (e.g., who said it?) or presentation modes (e.g., was it visual or auditory?).

It is possible that the bias toward perceptual source tests is responsible for the robust age deficits typically observed in source memory experiments. The nature of the source task may be important in aging studies because there is evidence that younger and older adults focus on different dimensions of the same ostensive event, with younger adults placing relatively more emphasis on perceptual details than older adults, and older adults conversely focusing more on affective and value-based information than younger adults (e.g., Hashtroudi, Johnson, & Chrosniak, 1989; Labouvie-Vief & Blanchard-Fields, 1982). Johnson (1997) has recently argued that “at least some age-related deficits in source monitoring may reflect differences in what interests older and younger individuals” (p. 157). In addition, there is some evidence that older adults have difficulty encoding perceptual information distinctively and in reconstructing perceptual detail from memory (e.g., Degl'Innocenti & Baeckman, 1996). It is not surprising, then, that older adults generally perform poorly on traditional, perceptually based source tasks. It is possible that the demonstrated age deficits in source memory are not necessarily indicative of global deficits in source processing or in binding contextual information per se, or of inefficient frontal functioning, but instead reflect age-related changes in the emphasis placed on different attributes of an event (Underwood, 1969). If so, age-related deficits in source processing or memory might be diminished or even eliminated were more conceptually based attributes tested.

In the present studies, we compared younger and older adults' source performance for cues that were perceptual (voice) and for cues that were largely conceptual (truth and character). To do so, we incorporated conditions in which the two types of information (voice and truth in Experiment 1, voice and character in Experiment 2) were conveyed from the same source, a male or female speaker. Research in social psychology suggests that validity information is an important component of wisdom (Sternberg, 1985), and that wisdom carries great personal significance for older adults (e.g., Feather, 1978; Rokeach, 1973). Other work suggests that emotional or value-rich information is differentially important to older adults (e.g., Fredrickson & Carstensen, 1990). Because the perceptual and conceptual information was conveyed by the same speakers, any differences in performance across tasks could be due only to the type of information (perceptual vs. conceptual) retrieved. Our hypothesis was that the typical age-related difference in source memory would be evident for the voice-source task, but would be attenuated when the task involved the more emotional or conceptual source cues of truth and character.

Experiment 1

In this study, younger and older adults listened to trivia statements read by one of two speakers, either John or Mary. Before listening to the statements, participants were told that one of the speakers (e.g., John) always spoke the truth, and therefore every statement read by that speaker was true. By contrast, the other speaker (e.g., Mary) always said false things, and consequently every statement read by that speaker was false. After a brief filled interval, participants were instructed about the test phase and given a list of old and new statements. Half the participants were assigned to the voice-source condition and asked to complete a voice-source task by reporting the voice that had read each statement (John, Mary, or new). The other half were assigned to the truth-source condition and asked to complete a truth-source task by reporting the validity of each statement (true, false, or new).

Method

Participants—Forty-eight younger (ages 19–25 years) and 48 older (ages 61–75 years) adults participated in this experiment. The younger adults were college students from Duke University who participated as one way of fulfilling a course requirement. The older adults were well-educated, community-dwelling volunteers who were reimbursed for their time.

Design—The experiment used a 2 × 2 × 3 mixed factorial design, with age (young vs. old) and test type (truth-source test vs. voice-source test) manipulated between participants, and item type (old-true vs. old-false vs. new) manipulated within subjects.

Materials—Eighty moderately plausible trivia statements (e.g., “About 4 hours are required to boil an ostrich egg”) were selected from a pool developed by Bacon (1979) and revalidated by Rahhal, Hasher, and Colcombe (2001). A false version of each statement had been created by changing one detail from the true statement (e.g., “About 6 [rather than 4] hours are required to boil an ostrich egg”).

Of these 80 trivia statements, 72 were used as critical items and 8 were used as buffer items. In the learning phase, participants saw a list of 48 critical statements (half true and half false), along with the 8 buffer items (4 at the beginning and 4 at the end of the list). The remaining 24 critical items served as new items during the test phase (and hence were not presented during the learning phase). Items were counterbalanced across participants so that each of the 72 critical items appeared equally often as a true, false, or new item. Finally, two versions of each list were recorded on audiotape; a male speaker read all of the true statements and a female speaker read all of the false statements for one version, and vice versa for the other version.

For the source test, all 72 critical items (48 old and 24 new) were typed on a sheet of paper, with the restriction that no more than 2 items of any kind (true, false, or new) appeared consecutively. Two versions of each test booklet were prepared: one for the voice-source test and one for the truth-source test. The two booklets were identical except for the response options that were typed to the right of each statement. The options for the voice-source test were “John,” “Mary,” and “New”; those for the truth-source test were “True,” “False,” and “New.”

Procedure—Because older and younger adults have different optimal times of day (e.g., Intons-Peterson, Rocchi, West, McLellan, & Hackney, 1998; May & Hasher, 1998; May, Hasher, & Stoltzfus, 1993; Yoon, 1997), and because performance at different times of day can influence behavior substantially (Intons-Peterson et al., 1998; May et al., 1993; Yoon, 1997), persons from each age group were tested during their respective age group's mean optimal time (12:00–5:00 p.m. for younger adults; 8:00–11:00 a.m. for older adults).

Participants were randomly assigned to either the voice or the truth test. Regardless of condition, all participants in the learning phase were told that they would listen to a recording of a list of sentences spoken by a man named John and a woman named Mary. Participants were told that all of the statements read by one person (e.g., John) were true and that all of the sentences read by the other person (e.g., Mary) were false, and that they should pay attention to all of this information for they would be tested on it later. All participants then listened to the statements on a tape recorder, after first being given the opportunity to adjust the volume for comfort.

After a 10-min maze-completion filler task, participants completed the test phase, in which the 72 critical sentences were presented individually in written form. Half the participants in each age group received the voice-source test, and the other half received the truth-source test. The test phase was self-paced. At the end of the study, all participants completed the Extended Range Vocabulary Test (ERVT; Educational Testing Service, 1976) and were debriefed.

Results and Discussion

Participants—The significance level for all statistical tests was $p < .05$. Younger adults (M age = 20.8 years) had an average of 15.0 (SD= 1.3) years of education, and a mean score of 26.2 (SD = 8.0) on the ERVT. Older adults (M age = 69.4 years) had significantly more years of education (M = 16.3, SD = 2.3), $F(1, 92) = 10.56$, MSE= 3.54, and a significantly higher mean score on the ERVT (M = 33.6, SD = 7.9), $F(1, 92) = 20.82$, MSE = 63.86. Education and verbal ability did not differ across source (test-type) conditions for either age group (all Fs < 1.11).

Memory performance—Table 1 displays younger and older adults' hit rates, false alarms, and source memory scores for each of the source conditions. To assess source memory, we examined whether participants could identify the correct source of an item (i.e., John vs. Mary or true vs. false), given that they knew the item was in fact old. Thus, source-monitoring scores were calculated, as is often the case, by dividing the total number of old items correctly attributed to the appropriate source by the total number of old items correctly identified as old (hits; e.g., Ferguson et al., 1992;Johnson, De Leonardis, Hashtroudi, & Ferguson, 1995). This measure was analyzed in a 2 × 2 analysis of variance (ANOVA) with age (young vs. old) and test type (voice-source vs. truth-source test) as between-participants variables.

No main effects of age or test type emerged for source memory performance (all Fs < 1.6). However, a significant Age × Test Type interaction, $F(1, 92) = 7.33$, MSE = 0.006, indicated that although the young adults were reliably more accurate on the voice-source test (92%) than were the older adults (85%), $F(1, 46) = 7.45$, MSE = 0.007, the younger and older adults' source-monitoring scores did not differ on the truth-source test (88% and 90%, respectively), $F(1, 46) < 1.15$.

The data for the voice-source task replicate numerous other studies in which younger adults have shown a reliable advantage over older adults in source memory (see Brown, Jones, & Davis, 1995, for a review). This age effect was eliminated in the truth-source condition. In this case, older adults' performance did not differ from that of younger adults. Note that the heightened performance for older adults in the truth-source condition cannot be attributed to an increase in either perceptual detail or cognitive cues, as these were identical during the learning phase for the truth-source and voice-source conditions. Instead, the pattern seen here may reflect the fact that older adults can perform well on a source-monitoring task when the decision involves conceptual or value-based information rather than perceptual information.

Experiment 2

In this conceptual replication, younger and older adults viewed photographs while listening to verbal descriptions of the individuals in the photos. Each description was given by one of two speakers, either John or Mary, and included information about the person's name, home state, and occupation. Before listening to the descriptions, participants were told that one of the speakers (e.g., John) was evil, and that everyone described by that speaker was also evil. By contrast, the other speaker (e.g., Mary) was good, and everyone described by that speaker was also good. After the learning phase, all participants again viewed the photographs, this time with the verbal descriptions (name, home state, and occupation) printed below. Half the participants were to report the voice that had described the photo (John or Mary), and the other half were to report the nature of the character depicted in the photo (good or evil).

Method

Participants—Forty-eight younger (ages 18–24 years) and 48 older (ages 60–75 years) adults participated in this study. The younger adults were students at the University of Arizona who participated as one way of completing course credit. The older adults were healthy, community-dwelling volunteers who were reimbursed for their time.

Design—The experiment used a 2 × 2 × 3 mixed factorial design, with age (young vs. old) and test type (character-source test vs. voice-source test) manipulated between participants, and item type (old-good vs. old-evil vs. new) manipulated within subjects.

Materials—Materials included 36 photographs, each 1.5 × 2 in. in size, selected from yearbooks obtained from academic institutions other than the University of Arizona. Half the photographs were of young adults (student photos; approximate age range: 18–30 years), and half were of middle-aged or older adults (faculty and staff photos; ages 50 years and older). Within each age group, half the photos were of females and half were of males. Each photo was assigned a name, occupation, and state of residence (e.g., Scott Strickland, a realtor from Vermont). All first and last names were easily pronounceable, and the first name assigned to each photo was selected to be age appropriate (e.g., Allison for a young woman and Mildred for an older woman). All last names were generated by selecting names at random from a telephone book. A unique occupation and home state was paired with each name.

Twenty-four of the photographs were used in the learning phase of the experiment, and each appeared individually on a single page of a notebook. Half of these photos depicted young adults and half depicted older adults, and within each age group half were females and half were males. The remaining 12 photographs (depicting equal numbers of young and older adults and of males and females) were used as new items in the test phase.

We made an audiotape in which two speakers, John and Mary, provided verbal descriptions of the individuals in the photographs for the learning phase. Each speaker described an equal number of photos of each gender and age group. Three different sets of materials were created so that each photo was described by John, was described by Mary, and served as a new item an equal number of times. In addition, two different instruction lists were created for each set of materials; one depicted John as evil and Mary as good, and the other depicted John as good and Mary as evil. Thus, each photo served as a good and evil item an equal number of times across participants.

For the test phase, all 36 photos (24 old and 12 new) along with their verbal descriptions were printed in a booklet, with the restriction that no more than 2 items of any type appeared

consecutively. Two versions of each test booklet were prepared, one for the voice-source test and one for the character-source test. The two booklets were identical except for the response options that were typed below each photo. The options for the voice-source test were “John,” “Mary,” and “New”; those for the character-source test were “Good,” “Evil,” and “New.”

Procedure—The procedure for this experiment was identical to that in Experiment 1 with the following exceptions: Participants were told that they would view photographs while listening to a verbal recording describing each person. They were told that the descriptions would be given by two different people, John and Mary, one of whom (e.g., John) was evil and would always describe evil people, and the other of whom (e.g., Mary) was good and would always describe good people.

After participants adjusted the tape player's volume, they viewed each photo for 5 s while listening to the taped verbal descriptions. The audiotape instructed participants when to turn the page. When the learning phase was completed, participants performed an unrelated distractor task for 4 min, and then completed the test phase. Half the participants in each age group received the voice-source test, and the other half received the character-source test. Both tests were self-paced.

Results and Discussion

Participants—Younger adults (*M* age = 18.9 years) had an average of 12.7 (*SD* = 1.1) years of education and a mean ERVT score of 14.0 (*SD* = 5.8). Older adults (*M* age = 67.1 years) had significantly more years of education (*M* = 15.0, *SD* = 2.4), $F(1, 92) = 31.9$, *MSE* = 3.77, and a reliably greater ERVT score (*M* = 31.2, *SD* = 7.5), $F(1, 92) = 135.0$, *MSE* = 52.8. There were no differences in education level or ERVT score across source (test-type) conditions for either age group (all *F*s < 1).

Memory performance—Hit rates, false alarms, and source memory scores for each age group and source condition are shown in Table 2. Source memory scores were analyzed in a 2 (test type) × 2 (age) ANOVA, which indicated no effect of test type ($F < 1$), but a reliable effect of age, $F(1, 92) = 6.1$, *MSE* = 0.01, that was qualified by a marginally significant Age × Test Type interaction, $F(1, 92) = 3.8$, *MSE* = 0.01, $p < .06$. Further analyses indicated that the pattern of source performance across conditions was identical to that in Experiment 1: The young adults made reliably better source decisions (78%) than the older adults (67%) in the voice-source condition, $F(1, 46) = 9.3$, *MSE*= 0.02, but there was no difference in performance across age groups in the character-source condition (75% vs. 73%, respectively), $F < 1$.

Consistent with the results of Experiment 1, these findings demonstrate that age differences in source memory can be either robust or negligible, depending on the type of information tested. When participants had to identify the speaker of an item, older adults were at a significant disadvantage relative to younger adults. However, when asked to identify the character of an item, older adults recalled the information as accurately as younger adults.

General Discussion

Two experiments assessed older and younger adults' source memory skills in tasks that had two fully redundant sources. In both experiments, when the test was a traditional, perceptually based source test (male vs. female speaker), age differences in performance occurred; however, when conceptual information (validity information in Experiment 1, character information in Experiment 2) was tested, age differences were eliminated.

The finding of age differences in memory for voice replicates a substantial literature showing that older adults have greater difficulty remembering source information than younger adults when the sources are differentiated by minimal perceptual cues (e.g., sex of auditorily presented voice). Note that these general age-related source deficits have been successfully reduced or eliminated in a handful of recent investigations (e.g., Bayen & Murnane, 1996; Ferguson et al., 1992; Johnson et al., 1995; Multhaup, 1995), but only with the addition of perceptual cues or response options during learning or test. In the current experiments, however, we eliminated age deficits in source memory without providing any additional cues or response options at either learning or test. In fact, we specifically designed these studies so that the perceptual and conceptual information was carried by the same event. Thus, at learning, the number of sources, the perceptual and cognitive cues for the source, and the manner in which the source information was conveyed were identical; at test, the number of response options was identical across experimental conditions.

Because the only difference across source conditions was the nature of the test question, it appears that the pattern of age-related deficits in source memory may be directly related to the type of source information that is investigated, with reliable age differences for perceptual source material, but negligible age differences for conceptual or emotional source information. These findings are consistent with others showing that older adults place higher informational priorities on affective or value-rich material relative to perceptual material than do younger adults (Fredrickson & Carstensen, 1990; Hashtroudi et al., 1989; Labouvie-Vief & Blanchard-Fields, 1982), and that older adults' memory for emotional information is often equivalent to that of younger adults, despite age deficits in memory for neutral information (Carstensen & Turk-Charles, 1994).

One issue that arises in interpreting these findings is whether truth and character information should be thought of as source information, as we have introduced them, or instead as attributes that because of their importance quickly become integrated with the item itself. Given that both binding and source monitoring are widely believed to show age differences, the present findings are surprising from either perspective. If our data do reflect spared conceptual binding rather than spared source memory for valued information among older adults, they hold implications for understanding how details become integrated with item information, and suggest a reconsideration of the hypothesis that binding deficits increase with age. Other researchers have argued that older adults have difficulty binding contextual details to item information (Chalfonte & Johnson, 1996), and that improvements in binding require the addition of perceptual or cognitive cues. Our findings demonstrate that even with minimal cues, older adults can perform as well as younger adults on tasks involving memory for affective, value-based details. Thus, there may not be a general age-related deficit in binding per se, or in source memory per se, but there may instead be an age-related deficit in the type of information that is accessible at a test.

The present findings do not allow for a clear distinction between the source memory explanation and the binding-advantage account of our data. Regardless of the interpretation, however, several important points are clear. First, strong conclusions regarding the inevitability of age differences in attribute memory are premature. What attributes of an event (Underwood, 1969) are ultimately remembered may be determined at least in part by the value or utility of that information to the individual or group. In the instance of these two studies, whether an item was provided by a man or woman was better remembered by younger than by older adults. However, when the question asked was whether a statement was true or false or whether an individual was good or bad, older and younger adults' performance no longer differed. These data suggest to us that the importance of information to a group can influence what is remembered (or what is bound). Whatever the ultimate

explanation of these findings, they challenge both behavioral and neuropsychological views that inevitably predict age differences in memory for source-based information.

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Table 1

Mean scores (with standard deviations in parentheses) for younger and older adults in Experiment 1

	Source (test-type) condition	
Age group	**Voice source**	**Truth source**
Young		
Hits	89 (10)	91 (8)
False alarms	7 (15)	11 (16)
Source memory	92 (6)	88 (8)
Old		
Hits	84 (13)	91 (7)
False alarms	7 (10)	4 (9)
Source memory	85 (10)	90 (7)

Note. Hits = total percentage of old items correctly identified as old; false alarms = total percentage of new items identified as old; source memory score = total percentage of old items attributed to the correct source/total number of old items correctly identified as old (hits).

Table 2

Mean scores (with standard deviations in parentheses) for younger and older adults in Experiment 2

	Source (test-type) condition	
Age group	**Voice source**	**Character source**
Young		
Hits	92 (8)	90 (8)
False alarms	8 (8)	7 (8)
Source memory	78 (13)	75 (13)
Old		
Hits	89 (8)	92 (6)
False alarms	11 (9)	8 (8)
Source memory	67 (12)	73 (11)

Note. Hits = total percentage of old items correctly identified as old; false alarms = total percentage of new items identified as old; source memory score = total percentage of old items attributed to the correct source/total number of old items correctly identified as old (hits).