

Part-Set Cuing Effects in Younger and Older Adults

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In 3 experiments, the authors examined part-set cuing effects in younger and older adults. Participants heard lists of category exemplars and later recalled them. Recall was uncued or cued with a subset of studied items. In Experiment 1, participants were cued with some of the category names, and they remembered fewer never-cued categories than a free-recall condition. In Experiment 2, a similar effect was observed for category exemplar cues. There was also an age difference: By some measures, a small number of cues impaired older adults more than younger. Experiment 3 replicated this result and found that older adults were disproportionately slow in the presence of cues. Across experiments, older adults showed robust part-set cuing effects, and sometimes, they were disproportionately impaired by cues.

Providing a portion of to-be-remembered items as test cues often impairs retrieval of the remaining uncued items compared with performance in a no-cue (free-recall) control condition (Slamecka, 1968, 1969). Such an effect is intriguing because normally we expect cues to aid recall (e.g., Tulving & Pearlstone, 1966). The part-set cuing effect is not specific to a particular type of to-be-remembered material. Rather, inhibitory effects of part-set cues have been observed for both categorized (e.g., Roediger, 1978) and noncategorized word lists (e.g., Roediger, Stellan, & Tulving, 1977). The effect is not limited to word lists; it also occurs when individuals are cued with a subset of semantic knowledge such as U.S. states (e.g., J. Brown, 1968). In fact, similar inhibitory effects have been observed outside the memory domain, such as when participants searching for differences between pairs of highly similar pictures were cued with a subset of the to-be-located differences (Peynircioğlu, 1987).

The part-set cuing effect also occurs across a variety of retrieval conditions. Although traditionally observed in free recall, it has been obtained with recognition tests (e.g., Neely, Schmidt, & Roediger, 1983; Todres & Watkins, 1981) and on a cued-recall test involving word fragment completion (Peynircioğlu, 1989). It is not limited to a particular type of retrieval cue. Part-set cuing effects have been obtained when the cues take the form of category exemplars (e.g., Slamecka, 1968) or category labels (Roediger, 1978). The part-set cuing effect even persists when the cues are extralist rather than intralist (Watkins, 1975).

Nickerson (1984) labeled the part-set cuing effect as “a persisting enigma in memory research.” This statement is still true today. Researchers remain interested in both the underlying mechanisms and such varied applications as part-set cuing effects in the false memory domain (e.g., Kimball & Bjork, 2002; Marsh, McDermott, & Roediger, 2004; Reysen & Nairne, 2002). In the current research program, we are interested in extending work on part-set cuing to older adults. It is important to know whether or not part-set cues impair older adult performance because similar situations may arise in daily life. For example, a physician or family member may prompt an older adult to remember prescriptions and help by suggesting a few medications. Would these cues help the older adult to remember the entire set of medications, or would they impair recall of the remaining uncued medications? In a similar vein, much research has been aimed at reducing age-related deficits in cognition through environmental support in the form of external cues or well-learned habits (e.g., Craik & Anderson, 1999). For example, older adults are less impaired on memory tests that provide cues (e.g., recognition) than those that require internal generation of retrieval cues (e.g., free recall; see Light & La Voie, 1993). Given this emphasis on the benefits of cues, it is important to know whether there are any situations in which cues have negative effects on the performance of older adults. However, our review of the literature revealed only three relevant studies on part-set cuing effects in older adults (two of which have been

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Elizabeth J. Marsh was supported by National Institute of Mental Health National Research Service Award 1F32MH12567. Patrick O. Dolan was supported by Training Grant 55690 from the National Institute on Aging. David A. Balota was supported by Grant P01 AG03991 and Henry L. Roediger III was supported by Grant R01 AG17481-01 from the National Institute on Aging. We thank Kurt Roediger, Kristina Olson, Meredith Lopez, Jane Hsin, Nicole Falbo, Elisabeth Ploran, and Elana Graber for their assistance with data collection, scoring, and input. We also thank Martha Storandt and the Washington University in St. Louis Aging and Development Program for helping us to recruit older adults. We are grateful to Barbara Basden, Moshe Naveh-Benjamin, and Keith Payne for their helpful comments on an earlier version of this article.

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published); each of these has found a different pattern of data. We now review these studies and discuss different predictions of how part-set cues might affect older adults' performance.

First, consider the possibility that older adults might show the reverse of the part-set cuing effect. At first, this might appear far-fetched, given the effect's robustness in studies with young adults. However, in some circumstances, even young adults benefit from part-set cues. Part-set cues help (instead of hinder) retrieval when the number of subjective (or higher order) units is too large to be recalled spontaneously (e.g., Penney, 1988; Roediger, 1974). One might imagine this to be the situation faced by older adults, given their well-documented age-related deficits in episodic memory. Thus, there might be situations in which the same cues aid older adults but impair performance in younger adults. As noted, older adults often benefit from external cues and reminders (e.g., Craik & Jennings, 1992); thus, it seems reasonable that the part-set cues might support rather than impair performance of older individuals. Data from Foos and Clark (2000) support this hypothesis. Their participants recalled U.S. states and movie stars' names either with no cues or with 25 exemplars as cues. No part-set cuing effects were obtained with U.S. states, but for young adults only a part-set cuing effect was obtained for movie stars' names. Older adults showed the opposite effect. Older adults benefited from the presence of the cues, recalling more new movie stars' names if they had been cued ($M = 42.3$) than if they had not been cued ($M = 34.6$). However, one concern with this experiment is that the to-be-remembered materials were pre-experimentally learned, and there might be cohort effects in this type of knowledge. For example, older adults have richer structures for older movie stars such as Gregory Peck because they lived through the media coverage of these people's careers. Thus, in this experiment, cues might have tapped higher order units for older adults that were not available for younger adults.

A second possibility is that older adults will show a part-set cuing effect similar to that observed in young adults. Just like young adults, older adults might be impaired by part-set cues for such reasons as response competition from the cues (Rundus, 1973) or strategy disruption (Basden & Basden, 1995). Moulin (2000) observed this pattern of data. In his study, younger and older adults memorized 20 nonwords purported to be regions of the planet Uranus. Later, they were either tested with free-recall instructions or cued with 10 studied locations; of interest was the recall of the remaining 10 never-cued regions. The part-set cuing effect was obtained in both age groups; that is, both groups of participants remembered more of the 10 never-cued regions when they had not just read the names of 10 other regions. The impairment from the cues was equivalent in the two age groups.

A third possibility is that the part-set cuing effect will be larger in older than younger adults. Although this pattern of data has not yet been observed, we believe it is a reasonable prediction based on the performance of older adults in other high-interference situations. In slightly different forms, J. Brown (1968) and Rundus (1973) both characterized the part-set cuing effect as involving interference from response competition. The presence of cues at test strengthens these items in memory, such that they are repeatedly sampled or retrieved during the recall period, interfering with the retrieval of uncued items. Similar blocking processes have been proposed for part-set cuing and tip-of-the-tongue states (e.g., Roediger, 1974; Roediger & Neely, 1982), and age effects have

been observed in the latter (e.g., A. S. Brown & Nix, 1996). To avoid interference from the cues, older adults would have to inhibit or otherwise ignore them after extracting any useful information. This is potentially problematic because older adults have difficulty ignoring irrelevant information (see Hasher & Zacks, 1988). In fact, there is evidence that older adults show increased interference in the Stroop task (e.g., Spieler, Balota, & Faust, 1996) and in working memory tasks (e.g., Hedden & Park, 2001). They have problems ignoring irrelevant text while reading (Connelly, Hasher, & Zacks, 1991; Duchek, Balota, & Thessing, 1998) and show less of a directed-forgetting effect (e.g., Zacks, Radvansky, & Hasher, 1996). These results suggest that older adults might have a harder time ignoring the cues and thus predict a greater part-set cuing effect.

A final possibility is that older adults will show no cost or benefit from the part-set cues, a pattern of data obtained by Hultsch and Craig (1976). Their participants studied lists of 12 category exemplars; half the lists were recalled without cues, and half were recalled with 6 studied exemplars present as cues. Recall of the 6 never-cued exemplars was worse in the cued condition than the uncued condition. However, this part-set cuing effect did not occur for older adults. Hultsch and Craig (1976) published a very short report (shorter than 2 pages) and did not report the observed means. They did, however, note "the relatively low levels of recall exhibited by the older subjects" (p. 84). It is possible that the older adults were at floor in recalling the 96 category exemplars, making it impossible to observe the part-set cuing effect. From the details included in the report, it is unclear whether scaling issues were problematic. However, if this result were to replicate, this null result might suggest the combination of positive cuing effects with negative interference effects.

In summary, the prior literature does not provide a firm answer to the question, "Do older adults show part-set cuing effects?" Three different patterns of results have been found, and research in other domains predicts yet a fourth pattern: greater interference in older adults. In the current series of studies, we sought to provide a more conclusive answer. In Experiment 1, we demonstrated that older and younger adults were similarly impaired at remembering never-cued categories when they were cued with the names of a subset of the studied categories. In Experiments 2 and 3, we extended these findings to a slightly different paradigm and examined the circumstances under which part-set cues cause disproportionate impairment in older adults.

Experiment 1

The goal of Experiment 1 was to determine whether older adults would show the standard part-set cuing effect. Participants studied three sets of nine categorized lists for later recall. At recall, they were provided with zero, three, or six of the category labels as cues. Of interest was whether these cues interfered with individuals' ability to recall the critical never-cued categories. Using this paradigm, Roediger (1978) showed that younger adults recalled fewer of the never-cued categories when cued with increasing numbers of category names. Recall of some categories impaired ability to access the other categories.

Method

Participants. Twenty-seven younger adults and 27 older adults participated in the experiment. Younger adults were Washington University undergraduates who participated in the experiment for partial fulfillment of a course requirement. Their mean age was 20.2 years (range = 18–23 years; $SD = 1.4$). Older adults were volunteers from the Washington University Aging and Development Pool and were paid \$10 for their participation. Their mean age was 72.9 years (range = 61–80 years; $SD = 5.7$). Older adults had slightly higher Mill-Hill Vocabulary scores ($M = 19.6$, $SD = 5.1$; maximum = 33; Raven, 1965) than did younger adults ($M = 17.4$, $SD = 3.9$); however, this difference did not reach significance, $t(52) = 1.75$, $p > .08$.

Materials. Twenty-seven categories were selected from the Battig and Montague (1969) norms. Nine exemplars were chosen from each of the 27 categories, excluding the three most typical exemplars from a category. Category labels were modified to be short singular nouns (e.g., “a type of vehicle” was changed to “vehicle”). Two additional Battig and Montague categories were used during the practice phase.

Three different study sets were created, and their order was counterbalanced across participants. Each study set consisted of nine category names and their exemplars. Care was taken to minimize similarity among categories within the same set (e.g., “fruits” and “vegetables” were in separate sets). A female read all materials aloud at a rate of 2 s per word. For each category, the speaker stated “new category” followed by the name of the category and then read the nine exemplars. Each participant then received a single sheet of 88 subtraction problems, which they worked on after each of the three audiotapes.

Recall was recorded in a single booklet (measuring approximately 8.5 in. \times 17 in.). The first page corresponded to the practice phase; printed on the top of the page was the category label from one of the two studied practice lists. For each of the three experimental blocks, the booklet contained a single sheet for free recall of studied exemplars. Zero, three, or six of the nine studied category labels were printed at the top of each page. Below were three columns of lines on which to write recalled words. Three studied categories were designated as the critical target categories and were never cued across conditions; thus, they served as a basis for comparison across cue conditions. The cues in the six-cue condition obviously were the six noncritical category labels. In the three-cue condition, participants received three of the category labels from the six-cue condition.

Design. The experiment had a 2 (age) \times 3 (number of test cues) design. The number of test cues (zero, three, or six category labels) was manipulated within subjects across study sets.

Procedure. Young adults were tested in small groups, and older adults were tested individually or in pairs. The experiment began with a practice block involving study and recall of two categories. During this study phase, the experimenter adjusted the volume of the tape player if a participant indicated this was necessary (because some older adults have impaired hearing, volume was individually chosen rather than set across sessions). As with the experimental study sets, participants solved math problems immediately after completion of the practice audiotape and then completed the practice recall page (with one of the two category labels printed at the top of the page).

There were three experimental blocks, each of which began with presentation of a study set; during this time, the booklet was closed. Immediately after study, participants solved subtraction problems for 90 s to minimize short-term memory effects. The test phase then began, with each person working at his or her own pace through the appropriate page in the recall booklet. The page provided zero, three, or six of the nine studied category labels “as hints to help you remember the words.” Participants had 9 min in which to complete this task. When the recall page included category labels (the three- and six-cue conditions), participants were instructed to begin recalling from those categories first. It was emphasized, however, that the overall goal was to recall as many of the studied words as possible. Participants were not required to write down category labels,

and they were free to move across categories. They were instructed to begin recall in the left-most column and move down the column as they recalled additional words. As each minute passed, the experimenter instructed the participants to draw a line below the last-recalled word. Instructions against guessing were given.

Participants completed a total of three experimental blocks, each consisting of study, math, and recall. They then completed the Mill-Hill Vocabulary Scale (Raven, 1965) and a brief demographics form. The experiment took approximately 1 hr.

Results

All results are significant at the .05 level unless otherwise noted.

Recall of critical never-cued categories. Of primary interest was the effect of category cues on participants’ ability to recall the critical never-cued categories. Because participants were not instructed to recall category labels, we interpreted recall of at least one word from a studied category as indicating recall of that category (Cohen, 1963).

After calculating the proportion of the critical never-cued categories recalled, we submitted them to a 2 (age) \times 3 (number of test cues) mixed-factor analysis of variance (ANOVA). The relevant data are presented in Table 1. Older adults recalled a smaller proportion of never-cued categories than did younger adults, $F(1, 52) = 27.57$, $MSE = 0.09$. The standard part-set cuing effect was obtained; providing some of the studied category labels interfered with participants’ ability to recall the remaining categories, $F(2, 104) = 6.14$, $MSE = 0.07$. The interaction between age and number of test cues was not significant ($F < 1$). The part-set cuing effect was obtained for older adults as well as young adults. Additional analyses were carried out to ensure that the lack of age differences was not due to differences in initial base rates (the zero-cue condition). It may appear from the table that the deficit was greater for older adults in the six-cue condition; however, analyses conducted at the subject level revealed no Age \times Number of Test Cues interaction. The deficit in the cued conditions was no greater for older adults even when the deficit was expressed as a relative difference from the baseline ($F < 1$) or as a proportion change from the baseline ($F < 1$).

Next we analyzed the time course of recall for the critical never-cued categories. As described earlier, after each minute participants drew a line under the last-recalled word; these lines were used to assess recall over time. One younger adult failed to draw lines; thus, only 26 young adults were included in the following analyses. Figure 1 depicts the cumulative recall function for the critical never-cued categories. Note the relation of these data to Table 1; both show recall of critical categories. Figure 1 depicts recall of these critical categories over time, whereas the table reports cumulative recall after 9 min. We submitted the data in Figure 1 to a 2 (age) \times 3 (number of test cues) \times 9 (minutes of recall) ANOVA. In addition to the previously reported effects of age and number of test cues, this analysis revealed a significant Age \times Minute of Recall interaction, $F(8, 408) = 11.97$, $MSE = 0.02$. At Min 1, performance was similar across groups. However, young adults made much larger gains in Min 2 to 5 than did older adults. Thus, by the end of the recall session, young adults had recalled a greater proportion of never-cued categories than had older adults. The three-way interaction did not approach significance, $F(16, 816) = 1.07$, $MSE = 0.03$, $p > .30$. The part-set cuing

Table 1
Proportion of Critical Never-Cued Items Recalled as a Function of Number of Cues Present at Test

Experiment and group	No. of test cues							
	0		1		3		6	
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)
1								
Young adults	.74	(.21)	—	—	.64	(.31)	.59	(.33)
Older adults	.51	(.25)	—	—	.42	(.33)	.30	(.23)
2								
Young adults	.60	(.15)	—	—	.57	(.19)	.47	(.20)
Older adults	.52	(.15)	—	—	.44	(.14)	.37	(.13)
3								
Young adults	.61	(.14)	.61	(.15)	.61	(.14)	—	—
Older adults	.52	(.12)	.49	(.11)	.45	(.12)	—	—

Note. In Experiment 1, the dependent measure was category access; in Experiments 2 and 3, it was category exemplars. Dashes indicate that cue condition was not run. For example, only the zero-, three-, and six-cue conditions were included in Experiment 1; the one-cue condition was not tested.

effect was obtained across the entire recall period for both older and younger adults.

Recall of exemplars from critical never-cued categories. Figure 2 shows the cumulative recall of the 27 exemplars from the critical never-cued categories. These data were analyzed with a 2 (age) \times 3 (number of test cues) \times 9 (minutes of recall) ANOVA. Results paralleled those for the critical never-cued categories. Older adults recalled a smaller proportion of critical exemplars than did younger adults, $F(1, 51) = 31.42$, $MSE = 0.21$, and fewer exemplars were recalled when more category cues were provided, $F(2, 102) = 17.70$, $MSE = 0.12$. The interaction between age and minute of recall was significant, $F(8, 408) = 14.15$, $MSE = 0.01$. Again, performance in the two groups was quite similar at Min 1, and final recall differences were driven mostly by the large gains of young adults in Min 2 to 5. The three-way interaction did not reach significance ($F < 1$).

Was the effect of part-set cues on recalling critical exemplars (as shown in Figure 2) due to difficulty in accessing the critical categories (as shown in Figure 1)? Or did the effect carry over and

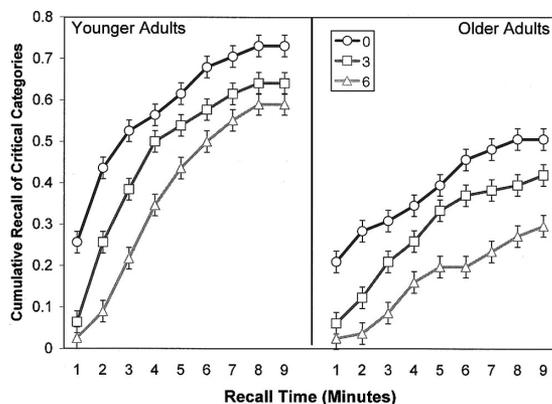


Figure 1. Mean cumulative recall of never-cued categories as a function of number of cues provided at test: Experiment 1. Data for younger adults are shown on the left; data for older adults are shown on the right.

impair memory for the critical exemplars, even once the category had been accessed? A 2 (age) \times 3 (number of test cues) ANOVA was computed on mean proportion of exemplars recalled per accessed critical category. This analysis eliminated many participants ($n = 20$) who did not recall at least one critical category in each of the test conditions. There was no main effect of age ($F < 1$), nor did age interact with test cue condition, $F(2, 64) = 1.34$, $MSE = 0.02$. There was, however, a main effect of cues, $F(2, 64) = 3.36$, $MSE = 0.02$. To include more participants, we repeated the analysis collapsing over the cuing conditions (this analysis only excluded 4 participants). That is, we examined the effect of receiving zero versus three or more cues on recall of exemplars per category. There was a main effect of age, $F(1, 48) = 4.62$, $MSE = 0.04$. Once the category had been accessed, younger adults recalled more exemplars than did older adults. There was also a main effect of cuing, $F(1, 48) = 11.47$, $MSE = 0.01$. Once the category had been accessed, participants who had not received cues recalled 60% of the critical exemplars whereas those in the part-set cue conditions recalled only 52% of critical exemplars. That is, a part-set cuing effect remained even after the category had been accessed. Participants not only had a harder time accessing the never-cued categories, but they were impaired at recalling its exemplars even after the category had been retrieved. This effect of cuing did not interact with age, $F(1, 48) = 1.84$, $MSE = 0.01$, $p = .182$.

Benefits from cuing. Two different analyses supported the conclusion that older adults sometimes benefited from the cues. First, we examined recall of exemplars from cued categories and compared this with recall of exemplars from the uncued categories (in the baseline zero-cue condition). Participants recalled more exemplars from the cued categories, $F(1, 52) = 66.51$, $MSE = 0.01$. Compared with recall of exemplars in the zero-cue condition (29%), older adults recalled many more exemplars from the cued categories (48%). Similarly, younger adults recalled more exemplars from the cued categories (58%) than from the categories in the zero-cue condition (46%). The interaction between age and cuing was significant; older adults benefited from cues more than did young adults, $F(1, 52) = 4.19$, $MSE = 0.01$.

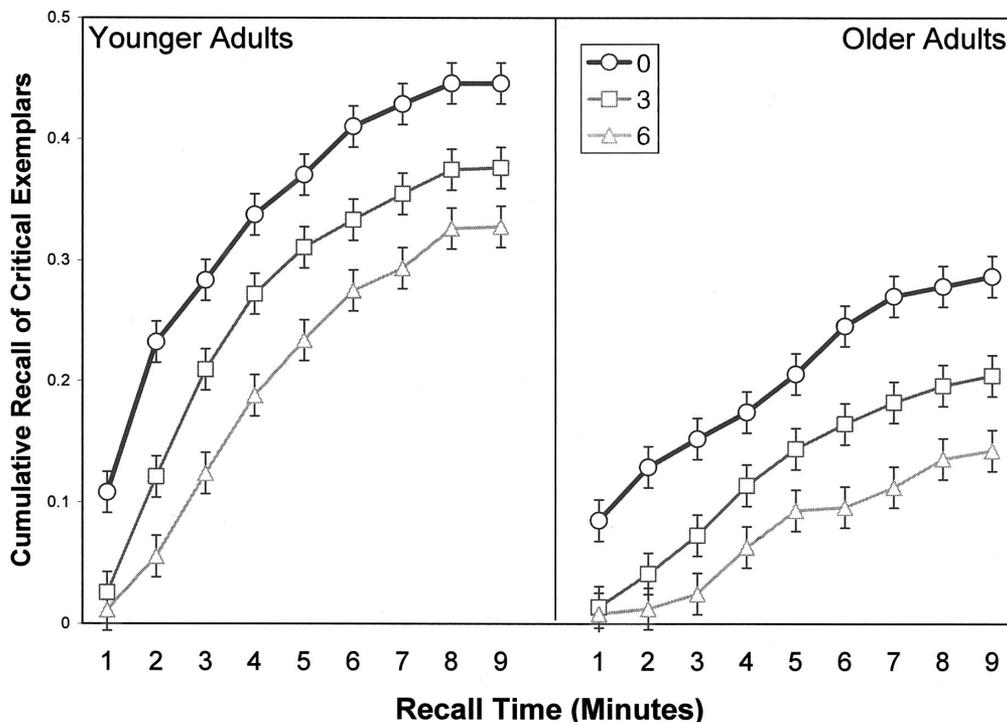


Figure 2. Mean cumulative recall of exemplars from never-cued categories as a function of number of cues provided at test: Experiment 1. Data for younger adults are shown on the left; data for older adults are shown on the right.

A similar conclusion was reached when the dependent measure was the proportion of total number of exemplars recalled (regardless of whether they came from the cued or critical never-cued categories). Of interest was the main effect of cues, $F(2, 104) = 7.78$, $MSE = 0.01$. For young adults, recall increased from .42 in the zero condition to .44 with three cues and .48 with six cues. For older adults, recall was higher with six cues (.36) than with zero (.32) or three cues (.31). Thus, although the part-set cues inhibited access to never-cued categories, overall participants recalled more exemplars if they had received cues. There was no evidence of an interaction between age and number of cues.

Intrusions of nonstudied exemplars. Although we were primarily interested in part-set cuing effects, our design effectively created a false memory paradigm. Participants studied lists of related words but did not study the most common exemplars (e.g., similar to the associative false memory paradigm of Roediger & McDermott, 1995; see Smith, Gerkens, Pierce, & Choi, 2002, for a comparison of these two paradigms). Although all participants were warned against guessing, nearly all of them recalled words that were never studied. Of interest was the average number of words intruded per list in the cases in which participants received the category labels (either three or six). We focused on the instances in which participants were cued with the category labels because these results did not depend on whether or not the participants retrieved the category. In addition, these conditions are most comparable to the experiments to follow. Although older adults produced more intrusions per list (.95) than did younger adults (.74), this difference did not reach significance ($t < 1$). We report

it nevertheless because this age difference reaches significance in the experiments to follow, and the result is consistent with age differences in suggestibility observed in several different false memory paradigms (e.g., Balota et al., 1999; Norman & Schacter, 1997).

Discussion

In Experiment 1, the standard part-set cuing effect was obtained for both younger and older adults. Recall of never-cued categories was greatest when no cues were present, next greatest in the three-cue condition, and worst in the six-cue condition. These effects occurred in both younger and older adults. Contrary to previous research (Foos & Clark, 2000; Hultsch & Craig, 1976), older adults were not able to ignore the cues after extracting the relevant information. Rather, the cues continued to reduce their recall of the never-cued information.

For both age groups, the part-set cues had two effects. Replicating Roediger (1978), the part-set cues impaired access to the never-cued categories. Reading the names of some of the studied categories reduced retrieval of the other uncued categories. In addition, the part-set cues impaired recall of category exemplars, even once participants had access to that category. Although Roediger (1978) found no impact of the cues once participants had accessed the categories, our results are consistent with other studies demonstrating output interference in recall of items in categories (see Roediger, 1973; Roediger & Schmidt, 1980; Smith,

1971). This output interference in items recalled occurred for both younger and older adults.

Finally, we note that there were positive effects of the category names. Both younger and older adults recalled exemplars from cued categories at a higher rate than exemplars in the zero-cue condition (cf. Tulving & Pearlstone, 1966). Replicating Roediger (1978), they also recalled more of the entire study set in cued conditions.

Experiment 2

In Experiment 2, we sought to replicate our effects using a slightly different paradigm. In Experiment 1, the test cues were the names of studied categories. In Experiment 2, we cued recall of each category with zero, three, or six studied exemplars. Young adults are known to show reliable part-set cuing effects in both situations. Of interest is the behavior of older adults. Category label cues are unrelated to the remaining to-be-remembered categories. In contrast, category exemplar cues are related to the remaining to-be-remembered exemplars. This closer relationship between cues and critical items may make the cues more difficult to inhibit. Thus, in Experiment 2, we wished not only to replicate the part-set cuing effect in older adults but also to examine whether they would be disproportionately impaired in a situation with related cues.

Method

Participants. Twenty-seven younger adults and 27 older adults from the same pools as in Experiment 1 participated. Younger adults' mean age was 19.7 years (range = 18–22 years; $SD = 1.2$), and their mean score on the Mill-Hill Vocabulary Scale was 18.3 ($SD = 3.1$). Older adults' mean age was 75.5 years (range = 61–82 years; $SD = 4.6$), and their mean score on the Mill-Hill Vocabulary Scale was 19.7 ($SD = 4.2$). These groups did not differ in their vocabulary scores, $t(52) = 1.45, p > .15$.

Materials. The same study materials were used as in Experiment 1. The test materials were modified. Recall was recorded in a single booklet (measuring approximately 4 in. \times 11 in.). For each of the three experimental blocks, the booklet contained a blank page, a page of subtraction problems, and nine recall pages. Each of the recall pages corresponded to one of the categories studied in that set, rearranged from study order. A category label was printed on the top of each page, followed by zero, three, or six of the nine studied words. Below were blank lines for recall of up to nine words (depending on cue condition). The exemplars from Serial Positions 3, 6, and 7 were never used as cues; thus, recall of these exemplars was the basis for comparison across cue conditions.

Design. The experiment had a 2 (age) \times 3 (number of test cues) design, with recall of never-cued exemplars as the dependent variable. The number of test cues was a within-subjects variable. Both test cue condition and study set order were rotated across participants, requiring 9 participants for a complete counterbalance.

Procedure. Participants were tested individually or in pairs. The study phases were exactly as in Experiment 1. While the tape was playing, recall booklets were open to a blank page. Immediately after study, each participant turned the page and solved subtraction problems for 90 s. The test phase then began, with each person working at his or her own pace through the next nine pages in the booklet. Each page provided one of the nine studied category labels, and zero, three, or six of the nine studied words "as hints to help you remember the remaining words." Participants were instructed to write down the words for each category in any order, and they could move freely between the nine categories corresponding to that study set. Instructions against guessing were given. The recall phase lasted 7.5 min, with a warning 1.5 min prior to its end.

Participants completed a total of three experimental blocks, each consisting of study, math, and cued recall. They then completed the Mill-Hill Vocabulary Scale and a brief demographics form. The experiment took approximately 1 hr.

Results

For each participant, we calculated the proportion of words from Study Serial Positions 3, 6, and 7 (the never-cued words) that were recalled when cued with none, three, or six of the remaining study words. Younger adults recalled a greater proportion of critical exemplars than did older adults, $F(1, 52) = 6.70, MSE = 0.06$. However, for both older and younger adults, as reported in Table 1, providing cues at test impaired recall of the remaining words, $F(2, 104) = 30.31, MSE = 0.01$. The interaction between age and number of cues did not reach significance ($F < 1$).

Thus, it appeared that both younger and older adults were impaired by the part-set cues. Interestingly, a closer examination of the means (see Table 1) suggests an interesting further pattern. That is, older adults appeared to be more impaired in the three-cue condition than were younger adults. In the three-cue condition, older adults dropped .08 from baseline, a relative change of 15%. Young adults dropped .03 from baseline in the three-cue condition, a relative change of only 5%. Based on these observations, a series of further analyses were undertaken. Two additional post hoc analyses also suggest that older adults were more impaired in the three-cue condition than were young adults. First, t tests revealed that the difference in performance for zero versus three cues was significant for older adults, $t(26) = 3.09, SEM = .008$, but not younger adults, $t(26) = 1.30, SEM = .009$. Second, further support for this age-related change resulted from an analysis using recall of all uncued exemplars as the dependent measure, not just the critical never-cued exemplars. In the preceding analyses, the proportion of words recalled reflected only participants' performance for the three critical study words and disregarded recall performance of the remaining uncued words in the zero- and three-cue conditions. We repeated these analyses on proportion recalled of all uncued words. We again found better memory in young adults, $F(1, 52) = 9.49, MSE = 0.07$, and that cues impaired recall performance, $F(2, 104) = 46.72, MSE = 0.01$. Now, however, the interaction between age and cues was significant, $F(2, 104) = 3.99, MSE = 0.01$. That is, performance only dropped by 4% in the three-cue condition of young adults but by 10% in the three-cue condition of older adults.

Before discussing the part-set cuing results, we note the consequences of our design on false memory creation. Although participants were warned against guessing, nearly all of them recalled words that were not studied. We submitted the average number of words intruded per list to a 2 (age) \times 3 (cue) ANOVA. The relevant data are shown in Table 2. In this experiment, the age difference was significant. Older adults intruded never-studied exemplars more frequently than did younger adults, $F(1, 52) = 10.90, MSE = 0.53$. Intrusions decreased when cues were provided, possibly because of the decreased number of spaces provided for recall, $F(2, 104) = 13.48, MSE = 0.06$. There was a trend toward an interaction, $F(2, 104) = 2.58, MSE = 0.06$, which appeared to be driven by the relatively low level of intrusions for younger adults (independent of number of cues).

Table 2
Mean Number of Nonstudied Exemplars Intruded Per Category as a Function of Number of Category Exemplar Cues Presented at Test

Experiment and group	No. of category exemplar cues				<i>M</i>
	0	1	3	6	
2					
Young adults	.31	—	.21	.16	.23
Older adults	.74	—	.65	.42	.60
3					
Young adults	.37	.42	.31	—	.37
Older adults	1.07	.95	.91	—	.98

Note. Dashes indicate that one condition was not run. For example, only zero, three, or six cues were used in Experiment 2; the one-cue condition was not tested.

Discussion

Using a different procedure than in Experiment 1, we replicated the finding of strong part-set cuing effects in both older and younger adults. That is, presentation of a subset of studied exemplars interfered with recall of the remaining exemplars compared with the uncued baseline. Some analyses suggested that older adults were more impaired by three cues than were young adults.

Of interest is whether or not the part-set cues had more of an impact on older adults. Younger and older adults were similarly impaired in the six-cue condition; the presence of six cues reduced recall by 15% in young adults and 13% in older adults. In contrast, the three-cue condition suggested an age difference. Young adults showed only a 3% deficit in the three-cue condition, whereas older adults showed an 8% difference. Put another way, performance in the three-cue condition was 15% below baseline for older adults but only 5% below baseline for young adults. Two post hoc analyses revealed a significant age effect in the three-cue condition, although the standard analysis of never-cued exemplars did not.

Experiment 3

One of the goals of Experiment 3 was to further assess whether or not older adults were disproportionately impaired in the three-cue condition. Thus, we focused on the zero-cue and three-cue conditions, which were included in Experiment 3. A third condition was also introduced: the one-cue condition. This condition was included to investigate the possibility that the presence of any test cues (regardless of their number) will impair the performance of older adults. For young adults, a single cue would be expected to have minimal effects on recall of categories of this size (e.g., Roediger, 1973).

One additional change was made in Experiment 3. We wanted to more carefully measure response latency during recall. Thus, we recorded time to begin recalling each exemplar to address whether part-set cues differentially slowed younger and older adults' retrieval of remaining exemplars.

Method

Participants. Twenty-seven younger and 27 older adults were drawn from the same pools used previously. Younger adults' mean age was 20.5

years (range = 18–26 years; $SD = 1.6$), and older adults averaged 74.6 years (range = 61–80 years; $SD = 4.1$). In this study, older adults' vocabulary scores ($M = 21.6$, $SD = 4.7$) were significantly higher than those of young adults ($M = 19.3$, $SD = 2.8$), $F(1, 52) = 4.65$, $MSE = 0.15$.

Materials. The same study materials were used as in Experiments 1 and 2. The test booklets were constructed in the same fashion as for Experiment 2 and modified so that the recall pages contained zero, one, or three cues. When only one cue was provided, it was the exemplar from Study Serial Position 5. When three cues were provided, they were again taken from Study Serial Positions 1, 5, and 9. The remaining exemplars were never used as cues and thus served as the basis for comparison of recall across cue conditions.

A computer program recorded experimenter keypresses on a PC-based computer. For each category, the first keypress initiated the timer, and the program recorded the timing of additional keypresses (each upon the participant recalling another word). The experimenter was able to erase keypresses when he or she had incorrectly anticipated the participant writing a word or when the participant crossed out the just-recorded word.

Design. As in the previous experiment, this study used a 2 (age) \times 3 (number of test cues) design. The number of test cues was a within-subjects variable. As in Experiment 2, both test cue condition and study set order were rotated across participants.

Procedure. The experiment began with a practice block that was critical for familiarizing both the participant and the experimenter with the timing procedure. The participant was fully aware of the timing procedure, and practice served to reduce awareness of the experimenter watching one's recall. The experimenter used the practice session to ensure close proximity and ability to easily see the participant's writing.

The study phase was exactly as in Experiment 2; in each of the three experimental study sessions, participants listened to an audiotape of nine categories. The procedural changes all occurred in the test phase. Rather than being free to move across categories, the participant was required to recall exemplars from one category at a time, in the order they appeared in the booklet. This change was required so that the experimenter could accurately record the time needed to recall each exemplar. The experimenter started the timer at the beginning of each category, and pressed a key each time the participant wrote down another word on the page. A 60-s duration was given for recall of each category. Unless the participant recalled all of the remaining uncued study words, he or she was required to wait the full 60 s before moving on to the next category.

Results

Table 1 presents the proportion of critical never-cued exemplars recalled as a function of test cuing condition. Overall, younger adults recalled a greater proportion of critical exemplars than did older adults, $F(1, 52) = 13.90$, $MSE = 0.04$. A main effect of cues was found, indicating interference from part-list cues, $F(2, 104) = 4.04$, $MSE = 0.01$. This was qualified by a significant interaction, $F(2, 104) = 3.38$, $MSE = 0.01$; part-set cues impaired the performance of older, but not younger, adults. Thus, not only did older adults show the part-set cuing effect, but they did so in a situation in which younger adults did not. This age effect remained even when additional analyses assessed change relative to the zero-cue condition. That is, relative to the base rate, young adults showed no deficit in either cue condition. For older adults, a different picture emerged. Relative to their base rate, they dropped 4% in the one-cue condition and 12% in the three-cue condition.

Regarding the latency data, of interest was the time it took to recall each word. We examined latencies for the first four recalled words only to reflect the average number of words recalled by the older adults in the three-cue condition (the condition with the fewest words recalled). By limiting our analyses to the latencies of

the first four recalled words, we were able to include data from every participant. To account for individual differences in speed and for the general slowing found in older adults (e.g., Salthouse, 1985), we first z -transformed the values for each participant, scaling them against their own average latency (see Faust, Balota, Spieler, & Ferraro, 1999). The raw data are shown in Table 3, and the z -transformed data are shown in Table 4. The z -transformed data represent standardized deviations from each participant's average latency. In Table 4, negative values represent faster responses (shorter reaction times), whereas positive values represent slower responses (longer reaction times). The z -transformed data were analyzed with a 2 (age) \times 3 (number of test cues) \times 4 (output position) mixed-factor ANOVA. There was no main effect of age ($F = 1.9$), which may have been expected considering the z -transformation. A main effect was found for output position, $F(1, 156) = 145.56$, $MSE = 0.10$, reflecting the fact that recall slowed with subsequent words. There was also a main effect of number of test cues, $F(2, 104) = 94.42$, $MSE = 0.11$, indicating that the presence of cues slowed recall. Interestingly, the interaction between age and cues was significant, $F(2, 104) = 3.15$, $MSE = 0.11$, suggesting that cues slowed older adults more than younger adults. This finding, which nicely parallels the recall performance, is shown in Figure 3. In addition, age significantly interacted with output position, $F(3, 156) = 4.94$, $MSE = 0.10$. Older adults were significantly slower with later words than were younger adults. No other interaction reached significance.

As in Experiment 2, participants falsely recalled words that were never studied. The pattern was very similar across the experiments (see Table 2). Older adults made more intrusions than did younger adults, $F(1, 52) = 14.71$, $MSE = 1.03$, and cues had a marginal effect on intrusion rate, $F(2, 104) = 2.93$, $MSE = 0.06$. As in Experiment 1, the interaction was not significant ($F = 1.82$).

Discussion

In Experiment 3, clear age effects in part-set cuing were observed. That is, young adults' recall performance was virtually identical irrespective of the number of cues present at test. However, these test cues did impair the performance of older adults compared with the zero-cue baseline. This result remained significant even when the dependent measure was change relative to baseline. In addition, older adults were disproportionately slow in the three-cue condition, even after overall response latency was

Table 3
Raw Reaction Times (ms) for Experiment 3, as a Function of Age, Number of Cues Provided at Test, and Output Position

Group and no. of cues	Output position				<i>M</i>
	1	2	3	4	
Young					
0	2181	2973	3834	5540	3632
1	2268	3732	4412	6207	4155
3	3121	5675	6614	8093	5876
Old					
0	3003	4732	6870	8552	5789
1	3294	5181	8026	9805	6577
3	5458	9421	10779	13136	9699

Table 4
 z -transformed Reaction Times for Experiment 3, as a Function of Output Position, Number of Cues Provided at Test, and Age

Group and no. of cues	Output position				<i>M</i>
	1	2	3	4	
Young					
0	-.50	-.38	-.23	-.02	-.29
1	-.50	-.28	-.18	.08	-.22
3	-.36	.00	.18	.38	.05
Old					
0	-.67	-.44	-.17	.05	-.31
1	-.62	-.39	-.01	.22	-.20
3	-.34	.13	.33	.62	.18

adjusted for slowing by means of the z -score transformation. The cues had more of an effect on the behavior of older adults both in terms of speed and amount recalled.

General Discussion

In all three experiments, part-set cuing effects were obtained with older adults. Older adults recalled fewer never-cued categories when cued with a subset of studied category labels (Experiment 1). They also recalled fewer never-cued exemplars when cued with a subset of studied exemplars (Experiments 2 and 3). The part-set cuing effect in older adults was reliable regardless of whether the cues were category labels or studied exemplars and whether the dependent measure was accessing a category or retrieving exemplars and was obtained even with very small numbers of cues. Thus, we feel comfortable providing an affirmative answer to the question, "Do older adults show part-set cuing effects?"

The more difficult issue is to predict when older adults will show normal versus greater effects of the part-set cues than younger adults. In all experimental conditions, older adults showed at least as much impairment from part-set cues as did young adults. However, only in Experiments 2 and 3 were any of the part-set cuing effects significantly larger in older adults. In addition, in Experiment 3, older adults were disproportionately slowed in the

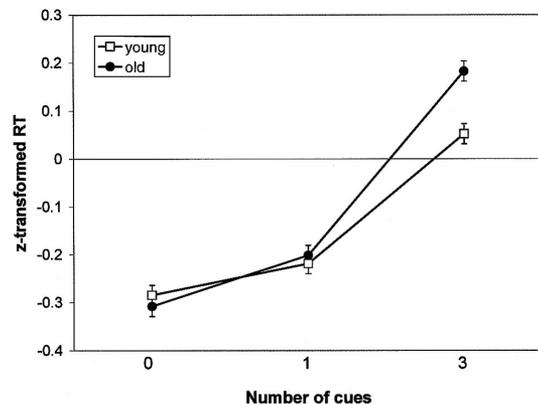


Figure 3. z -transformed reaction times (RT) for younger and older adults as a function of cue condition: Experiment 3.

three-cue condition, even after a z -transformation accounted for general age-related slowing. Thus, it appears that older adults are more affected by a small number of part-set cues.

It is easiest to explain age differences in the part-set cuing effect between Experiment 1 and later experiments. That is, in Experiment 1, test cues were unrelated to remaining never-cued categories. For example, the test cue “vegetables” was not related to the never-cued category “cloth.” In Experiments 2 and 3, test cues were related to remaining never-cued exemplars. For example, the test cues “broccoli,” “celery,” and “lettuce” were related to the remaining never-cued exemplars “potato,” “spinach,” and “cabbage.” Our finding of age-related deficits for related part-set cues parallels results obtained in the domain of reading (Connelly et al., 1991; Duchek et al., 1998). In Connelly et al.’s (1991) studies, older adults read text passages that contained to-be-ignored distractors printed in a different type font. Older adults had the hardest time ignoring distractors when they were meaningfully related to the target text compared with distractors that were either semantically unrelated or semantically nonsensical (e.g., a string of Xs). In both part-set cuing and reading experiments, older adults are the most impaired when they have to ignore semantically related information. This may occur because semantically related cues are more disruptive to participants’ natural retrieval strategies (e.g., Basden & Basden, 1995; Basden, Basden, & Galloway, 1977) or because interference from the test cues is greater when they are related to the remaining to-be-remembered material (see Anderson & Neely, 1996, for a review of interference theory).

The remaining puzzle is as follows: If age effects are more apparent in situations in which the test cues are related to retrieval targets, why should that effect depend on the number of test cues? Phrased another way, why were older adults more impaired than young adults in the three-cue condition but not in the six-cue condition of Experiment 2? One possible answer is that when the ratio of cues to uncued events is high, all individuals are impaired. In the six-cue condition, we provided participants with 67% of the studied events. This may be a high interference situation for all individuals (or a situation that constrains all individuals’ retrieval strategies), and thus we did not find age differences in the part-set cuing effect. The more intriguing finding is that when participants received one or three cues, younger adults appeared to control the interference but older adults were clearly affected.

Relationship to Other Aging Literature

The results are generally consistent with age-related deficits that have been observed in a variety of interference paradigms. Compared with younger adults, older adults show greater interference in Stroop (Spieler et al., 1996) and working memory tasks (Hedden & Park, 2001) and have problems ignoring distracting information while reading (Connelly et al., 1991). Older adults experience more tip-of-the-tongue states (e.g., Heine, Ober, & Shenaut, 1999) and show less of a directed-forgetting effect (Zacks et al., 1996). Given that older adults have difficulties in these paradigms, all of which involve interference to some degree, it is consistent that they might also produce an exaggerated part-set cuing effect.

The difficult finding to reconcile is the effect of number of part-set cues. That is, we found older adults were impaired in the presence of few cues when younger adults were not. These results have some surface similarity to a study by Balota, Faust, and

Watson (1996). In their study, participants generated category exemplars, with different types of primes preceding exemplar generation. For example, participants were asked to generate a city beginning with the letter *D*. Four different types of cues preceded this task: unrelated (e.g., piano, cities: D—), phonologically related (e.g., drums, cities: D—), semantically related (e.g., Boston, cities: D—), and both phonologically and semantically related (e.g., Detroit, cities: D—). Participants were not allowed to give the prime as an answer (thus, being primed with “Detroit” required generation of another city beginning with the letter *D*). The results from two experiments indicated that older adults were disproportionately impaired in the both prime condition compared with younger adults. That is, they had the hardest time when they had seen an exemplar (e.g., Detroit) that was both semantically and phonologically related to the to-be-generated exemplar (e.g., Dallas). These results converge on the current finding of a single highly related cue being especially disruptive for older adults and extends this observation to a task that required generation from semantic memory (see Logan & Balota, 2003, for a similar pattern).

We have focused on the negative consequences of cues because our work was motivated by the part-set cuing literature. We remind the reader, however, that cuing also had benefits. In Experiment 1, participants recalled more exemplars from cued categories than from uncued categories (in the zero-cue condition, in which part-set cuing was not involved). Indeed, participants recalled more exemplars overall when they had received cues than when they had not! That is, although receiving category cues reduced memory for never-cued categories and exemplars, the presence of cues had such benefits for cued categories that overall recall was higher. We believe it is important to stress this point; we would not want our work on part-set cuing to be used as an argument against environmental support (e.g., Craik & Anderson, 1999).

Finally, we note the relationship between our work and other studies on false memories in older adults. A glance at Table 2 reminds the reader of the basic point: Older adults always intruded more nonstudied exemplars than did young adults. Thus, studying categorized lists of words leads to a similar age effect as is found with associative lists (e.g., Norman & Schacter, 1997). Our retrieval situation may have been particularly problematic for older adults. On average, older adults recalled fewer words than did young adults, and they may have felt a need to write down a word in each of the (up to nine) recall spaces provided for each category. There were more intrusions when more recall spaces were available (i.e., intrusions were greater in the zero-cue condition than in the six-cue condition), suggesting that this may have been a factor in older adults’ recording of false memories. Regardless of the underlying mechanism, the result remains the same: More false memories occurred in older than younger adults.

Relationship to the Part-Set Cuing Literature

In closing, we turn to the implications of our results for various theories of part-set cuing. Our studies were aimed at understanding the part-set cuing phenomenon in older adults rather than discriminating among theories of part-set cuing. However, given the backdrop of one perspective in cognitive aging, these results appear most compatible with a response-competition explanation of the part-set cuing effect (e.g., Rundus, 1973). That is, the

presence of cues at test increases the likelihood that they will compete with other to-be-retrieved events. When individuals search memory for the uncued events, the cues interfere, resulting in the part-set cuing effect. Situations that increase the interference from the cues lead to greater part-set cuing effects. For example, reading more test cues increases the likelihood that one or more of the cues will interfere with the retrieval of the uncued targets. Older adults appear to be especially vulnerable to interference and thus need fewer test cues present to show the part-set cuing effect.

References

- Anderson, M. C., & Neely, J. H. (1996). Interference and inhibition in memory retrieval. In E. L. Bjork & R. A. Bjork (Eds.), *Memory* (pp. 237–313). San Diego, CA: Academic Press.
- Balota, D. A., Cortese, M. J., Duchek, J. M., Adams, D., Roediger, H. L., III, McDermott, K. B., & Yerys, B. E. (1999). Veridical and false memories in healthy older adults and in dementia of the Alzheimer's type. *Neuropsychology, 16*, 361–384.
- Balota, D. A., Faust, M. E., & Watson, J. M. (1996, April). *Priming lexical retrieval processes in healthy young and older adults*. Paper presented at the Cognitive Aging Conference, Atlanta, GA.
- Basden, D. R., & Basden, B. H. (1995). Some tests of the strategy disruption interpretation of part-list cuing inhibition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21*, 1656–1669.
- Basden, D. R., Basden, B. H., & Galloway, B. C. (1977). Inhibition with part-list cuing: Some tests of the item strength hypothesis. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 3*, 100–108.
- Battig, W. F., & Montague, W. E. (1969). Category norms of verbal items in 56 categories: A replication and extension of the Connecticut category norms. *Journal of Experimental Psychology, 80*, 1–46.
- Brown, A. S., & Nix, L. A. (1996). Age-related changes in the tip-of-the-tongue experience. *American Journal of Psychology, 109*, 79–91.
- Brown, J. (1968). Reciprocal facilitation and impairment in free recall. *Psychonomic Science, 10*, 41–42.
- Cohen, B. H. (1963). An investigation of recording in free recall. *Journal of Experimental Psychology, 65*, 368–376.
- Connelly, S. L., Hasher, L., & Zacks, R. T. (1991). Age and reading: The impact of distraction. *Psychology and Aging, 6*, 533–541.
- Craik, F. I. M., & Anderson, N. D. (1999). Applying cognitive research to problems of aging. In D. Gopher & A. Koriat (Eds.), *Attention and performance XVII: Cognitive regulation of performance: Interaction of theory and application* (pp. 583–615). Cambridge, MA: MIT Press.
- Craik, F. I. M., & Jennings, J. M. (1992). Human memory. In F. I. M. Craik & T. A. Salthouse (Eds.), *Handbook of cognition and aging* (pp. 51–110). Hillsdale, NJ: Erlbaum.
- Duchek, J. M., Balota, D. A., & Thessing, V. C. (1998). Inhibition of visual and conceptual information during reading in healthy aging and Alzheimer's disease. *Aging, Neuropsychology, & Cognition, 5*, 169–181.
- Faust, M. E., Balota, D. A., Spieler, D. H., & Ferraro, F. R. (1999). Individual differences in information-processing rate and amount: Implications for group differences in response latency. *Psychological Bulletin, 125*, 777–799.
- Foos, P. W., & Clark, M. C. (2000). Old age, inhibition, and the part-set cuing effect. *Educational Gerontology, 26*, 155–160.
- Hasher, L., & Zacks, R. T. (1988). Working memory, comprehension, and aging: A review and a new view. In G. H. Bower (Ed.), *The psychology of learning and motivation* (Vol. 22, pp. 193–225). San Diego, CA: Academic Press.
- Hedden, T., & Park, D. (2001). Aging and interference in verbal working memory. *Psychology and Aging, 16*, 666–681.
- Heine, M. K., Ober, B. A., & Shenaut, G. K. (1999). Naturally occurring the experimentally induced tip-of-the-tongue experiences in three adult age groups. *Psychology and Aging, 14*, 445–457.
- Hultsch, D. F., & Craig, E. R. (1976). Adult age differences in the inhibition of recall as a function of retrieval cues. *Developmental Psychology, 12*, 83–84.
- Kimball, D. R., & Bjork, R. A. (2002). Influences of intentional and unintentional forgetting on false memories. *Journal of Experimental Psychology: General, 131*, 116–130.
- Light, L. L., & La Voie, D. (1993). Direct and indirect measures of memory in old age. In P. Graf & M. E. J. Masson (Eds.), *Implicit memory: New directions in cognition, development, and neuropsychology* (pp. 207–230). Hillsdale, NJ: Erlbaum.
- Logan, J. M., & Balota, D. A. (2003). Conscious and unconscious lexical retrieval blocking in younger and older adults. *Psychology and Aging, 18*, 537–550.
- Marsh, E. J., McDermott, K. B., & Roediger, H. L., III. (2004). Does test-induced priming play a role in the creation of false memories? *Memory, 12*, 44–55.
- Moulin, C. (2000, April). *When it is good to forget: Evidence for intact retrieval inhibition in older adults*. Poster presented at the meeting of the Cognitive Aging Society, Atlanta, GA.
- Neely, J. H., Schmidt, S. R., & Roediger, H. L., III. (1983). Inhibition from related primes in recognition memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 9*, 196–211.
- Nickerson, R. S. (1984). Retrieval inhibition from part-set cuing: A persisting enigma in memory research. *Memory & Cognition, 12*, 531–552.
- Norman, K. A., & Schacter, D. L. (1997). False recognition in younger and older adults: Exploring the characteristics of illusory memories. *Memory & Cognition, 25*, 838–848.
- Penney, C. G. (1988). A beneficial effect of part-list cuing with unrelated words. *Bulletin of the Psychonomic Society, 26*, 297–300.
- Peynircioğlu, Z. F. (1987). On the generality of the part-set cuing effect: Evidence from nonmemory tasks. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 13*, 437–442.
- Peynircioğlu, Z. F. (1989). Part-set cuing effect with word-fragment cuing: Evidence against the strategy disruption and increased-list-length explanations. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 15*, 147–152.
- Raven, J. C. (1965). *Mill-Hill Vocabulary Scale*. London: H. K. Lewis.
- Reysen, M. B., & Nairne, J. S. (2002). Part-set cuing of false memories. *Psychonomic Bulletin & Review, 9*, 389–393.
- Roediger, H. L., III. (1973). Inhibition in recall from cuing with recall targets. *Journal of Verbal Learning & Verbal Behavior, 12*, 644–657.
- Roediger, H. L., III. (1974). Inhibiting effects of recall. *Memory & Cognition, 2*, 261–269.
- Roediger, H. L., III. (1978). Recall as a self-limiting process. *Memory & Cognition, 6*, 54–63.
- Roediger, H. L., III, & McDermott, K. B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21*, 803–814.
- Roediger, H. L., III, & Neely, J. H. (1982). Retrieval blocks in episodic and semantic memory. *Canadian Journal of Psychology, 36*, 213–242.
- Roediger, H. L., III, & Schmidt, S. R. (1980). Output interference in the recall of categorized and paired-associate lists. *Journal of Experimental Psychology: Human Learning and Memory, 6*, 91–105.
- Roediger, H. L., III, Stellan, C. C., & Tulving, E. (1977). Inhibition from part-list cues and rate of recall. *Journal of Experimental Psychology: Human Learning and Memory, 3*, 174–188.
- Rundus, D. (1973). Negative effects of using list items as recall cues. *Journal of Verbal Learning and Verbal Behavior, 12*, 43–50.
- Salthouse, T. A. (1985). *A theory of cognitive aging*. New York: Elsevier.
- Slamecka, N. J. (1968). An examination of trace storage in free recall. *Journal of Experimental Psychology, 76*, 504–513.

- Slamecka, N. J. (1969). Testing for associative storage in multitrial free recall. *Journal of Experimental Psychology*, *81*, 557–560.
- Smith, A. D. (1971). Output interference and organized recall from long-term memory. *Journal of Verbal Learning and Verbal Behavior*, *10*, 400–408.
- Smith, S. M., Gerkens, D. R., Pierce, B. H., & Choi, H. (2002). The roles of associative responses at study and semantically guided recollection at test in false memory: The Kirkpatrick and Deese hypotheses. *Journal of Memory and Language*, *47*, 436–447.
- Spieler, D. H., Balota, D. A., & Faust, M. E. (1996). Stroop performance in healthy younger and older adults and in individuals with dementia of the Alzheimer's type. *Journal of Experimental Psychology: Human Perception and Performance*, *22*, 461–479.
- Todres, A. K., & Watkins, M. J. (1981). A part-set cuing effect in recognition memory. *Journal of Experimental Psychology: Human Learning and Memory*, *7*, 91–99.
- Tulving, E., & Pearlstone, Z. (1966). Availability versus accessibility of information in memory for words. *Journal of Verbal Learning and Verbal Behavior*, *5*, 381–391.
- Watkins, M. J. (1975). Inhibition in recall with extralist 'cues.' *Journal of Verbal Learning and Verbal Behavior*, *14*, 294–303.
- Zacks, R. T., Radvansky, G., & Hasher, L. (1996). Studies of directed forgetting in older adults. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *22*, 143–156.

Received January 4, 2003

Revision received June 17, 2003

Accepted July 9, 2003 ■

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- To be selected, it is critical to be a regular reader of the five to six empirical journals that are most central to the area or journal for which you would like to review. Current knowledge of recently published research provides a reviewer with the knowledge base to evaluate a new submission within the context of existing research.
- To select the appropriate reviewers for each manuscript, the editor needs detailed information. Please include with your letter your vita. In your letter, please identify which APA journal(s) you are interested in, and describe your area of expertise. Be as specific as possible. For example, "social psychology" is not sufficient—you would need to specify "social cognition" or "attitude change" as well.
- Reviewing a manuscript takes time (1–4 hours per manuscript reviewed). If you are selected to review a manuscript, be prepared to invest the necessary time to evaluate the manuscript thoroughly.

Write to Demarie Jackson, Journals Office, American Psychological Association, 750 First Street, NE, Washington, DC 20002-4242.