

Adult Age Differences in Memory for Verbs and Nouns*

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ABSTRACT

Younger and older adults were asked to remember noun pairs (e.g., head – cap), verb pairs (e.g., bounce – throw), and verb-noun pairs (e.g., break – stick). For half of the pairs, participants used imagined objects and performed an action or series of related actions for each pair. For the other half of the pairs, participants read but did not perform the pairs. Free recall and cued recall tests revealed that age differences in memory for both performed and nonperformed items were larger for verbs than for nouns. The recall advantage of nouns over verbs was larger for older than for younger adults. Verbs are hypothesized to be more difficult for older adults to remember because they are more abstract and less specific than nouns and because it is more difficult to integrate verbs with other words than to integrate nouns with other words.

It is well established that older adults do not remember nouns as well as do younger adults (Smith & Earles, 1996). Thus, older adults can be expected to have more difficulty than younger adults remembering such things as a list of groceries. Much less is known, however, about the effects of age on memory for verbs. Some recent research has provided evidence that older adults may have difficulty recalling verbs (Earles, Kersten, Turner, & McMullen, 1999). In fact, Earles et al. (1999) suggested that age differences in memory for verbs might be even larger than age differences in memory for nouns. The purpose of the current study was to compare age differences in memory for verbs and nouns.

Both verbs and nouns are needed to describe an event. The action in an event is described by the verb, and memory for an event may be best indexed by memory for the verb used to describe the action. Changing a verb can change the meaning of an event. For example, in Loftus and Palmer (1974) participants remembered a viewed car accident differently if they were told that the cars *smashed* into each other than when

they were told that the cars *bumped* into each other. Thus, memory for the verb affected participants' memories of a previously seen event. If older adults have difficulty remembering verbs, this may prevent or alter their memories for events.

Memory for Verbs and Nouns

Verbs are less concrete and tend to have more varied meanings than do nouns (Gentner, 1981). The same verb often has different meanings when accompanied by different nouns (Kerstein, 1998). For example, the meaning of the verb *run* differs when accompanied by a dog, a politician, or a car. Perhaps because of this abstractness and variation in potential meanings, verbs are often not recalled as well as nouns (Engelkamp, Zimmer, & Mohr, 1990; Gentner, 1981; Huttenlocher & Lui, 1979). In sentence recall, subject nouns have been found to be recalled best, followed by object nouns and then verbs (Clark, 1966). Subject nouns have also been found to make the best retrieval cues for a sentence, followed by object nouns and then verbs (Horowitz

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& Prytulak, 1969). In the current study, it was expected that both younger and older adults would recall more nouns than verbs.

There is some evidence that older adults suffer more of a disadvantage compared to younger adults when trying to recall verbs than when trying to recall nouns. Earles et al. (1999) found that when presented with verb-noun pairs, older adults often could not recall the verbs. Verbs may be difficult for older adults to remember because they are more abstract and less specific than nouns. In the current study, the difference between recall of nouns and recall of verbs was expected to be larger for older than for younger adults. Thus, the age difference in recall was expected to be larger for verbs than for nouns. In addition to examining memory for verb-noun pairs, as in Earles et al. (1999), the current study examined age differences in memory for verb-verb pairs and noun-noun pairs.

Englekamp et al. (1990) suggested that although verbs are more abstract and referentially vague than nouns, performance of verbs should increase their concreteness and make them easier to remember. Performance was hypothesized to increase the item-specific processing of verbs. Item-specific processing increases item distinctiveness by emphasizing those features of the item that help discriminate that item from other items (Hunt & Einstein, 1981). Thus, by performing the verb-noun pair *break stick* the verb *break* is made more concrete and specific, differentiating this meaning of *break* from other potential meanings (e.g., break the window, break up a fight, or break the news). Older adults may be more dependent than younger adults on the item-specific processing of verbs that is enforced by performance. Performance was not expected to increase the concreteness of the nouns because, unlike in Earles et al. (1999), in the current study, no object was provided when participants performed the action described by a verb-noun pair. It was expected that performance would enhance memory for verbs more than memory for nouns and that this difference would be larger for older than for younger adults.

Integration of Verb Pairs and Noun Pairs

Verbs and nouns not only differ in level of concreteness and specificity, but also in their semantic organization (Huttenlocher & Lui, 1979; Kersten & Billman, 1997). Huttenlocher and Lui (1979) suggested that nouns are organized in hierarchies, whereas verbs are organized in matrices. Thus, a given noun will tend to be strongly related to a small group of other nouns, whereas a given verb will be weakly related to a number of different verbs. Verbs may, in fact, be more strongly related to nouns they often accompany than to other verbs. Thus, verbs may be difficult to integrate with other verbs (Helstrup, 1991). In fact, whereas cued recall is better than free recall of noun pairs, cued recall of verb pairs can sometimes be worse than free recall of verb pairs (e.g., Engelkamp, 1986). Because they are more difficult to integrate, verb pairs were expected to be more difficult to recall than noun pairs. Also, memory for one word in a pair given recall of the other member of the pair was expected to be more likely for nouns than for verbs.

Because it is difficult to integrate verbs in a pair, older adults were expected to have more difficulty remembering verb pairs than were younger adults. Craik and Jennings (1992) suggested that if items are difficult to integrate, integration requires self-initiated processing. They suggested that older adults have difficulty using memory strategies that require self-initiated processing.

If, on the other hand, items are well integrated for participants, Craik and Jennings (1992) suggested that older adults may benefit from this integration as much as, or even more than, younger adults. Older adults have in fact been found to benefit as much as younger adults from integration that is provided (Earles, Smith, & Park, 1994; Earles, Smith, & Park, 1996). Smith, Park, Earles, Shaw, and Whiting (1998) found that older adults do have more difficulty than do younger adults producing integrations between to-be-remembered items. When participants were asked to generate sentences to integrate unrelated pairs of simple pictures, this integration helped the memory performance of younger adults more than older adults. On the

other hand, when pairs of related pictures were used, age differences in memory performance were smaller, suggesting that older adults benefit from relatedness that is provided for them (Smith et al., 1998). Park, Smith, Morrell, Puglisi, and Dudley (1990) also found that when integrations were provided to participants, age differences in memory for simple pictures were smaller than when participants had to generate their own integrations.

One way to help participants to integrate verb pairs would be to have participants perform an action or series of actions to relate the words. For example, if the verbs were *bite* – *chew*, a person could pretend to take a bite out of a sandwich and chew it. Helstrup (1989) found that performance enhanced cued recall of both verb pairs and noun pairs if younger adults were given instructions to integrate the words in each pair. However, if participants had to self-generate integrations between the words in each pair, younger adults would be expected to be able to do this better than would older adults. In the current study, it was expected that it would be more difficult to generate integrations between verb pairs than noun pairs. Performance should help participants with integration. Thus, in the current study, performance was expected to benefit memory for verb pairs more than memory for noun pairs. This may be especially true for older adults. However, there is also evidence to suggest that older and younger adults show equal benefits from enactment (see Earles, 1996).

In the present study, both younger and older adults were expected to remember nouns better than verbs. This was tested in two ways. First, recall of verbs from verb-noun pairs was compared to recall of nouns from the same pairs. Second, recall of noun pairs was compared to recall of verb pairs. Because verbs are more abstract than nouns and are more difficult to integrate, age differences were expected to be larger for verbs than for nouns and for verb pairs than for noun pairs.

METHOD

Participants

Participants were 30 undergraduate students (aged 18 – 32) who received course credit for participation and 30 community-dwelling older adults (aged 60 – 82) who received \$10 each. Participant characteristics are in Table 1.

Materials

Word Pair Lists

There were four lists of 30 word pairs. Each list contained 10 verb-noun pairs (e.g., break-stick), 10 noun-noun pairs (e.g., skin-lotion), and 10 verb-verb pairs (e.g., sniff-blow). There was one random presentation order for each list, and the order of lists was the same for each participant. The verbs ($M = 85.77$) and nouns ($M = 84.23$) used to create the pairs were of approximately equal frequency (Francis & Kucera, 1982), $t(240) < 1$.

Table 1. Participant Characteristics.

	Younger		Older	
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)
Age	19.77	(2.64)	70.93	(6.67*)
Ed	13.80	(1.06)	15.77	(3.34*)
Health	8.47	(1.59)	8.07	(1.98)
Meds	0.30	(0.53)	1.37	(1.52*)
Voc	31.30	(2.94)	32.83	(5.58)

Note. Ed = number of years of education; Health = self-reported health rated on a scale of 1 (*very poor*) to 10 (*very good*); Meds = number of prescription medications currently being taken; Voc = score out of 40 on the Shipley (1986) Vocabulary Test.

* $p < .05$.

The words in each pair were related in that they could easily be combined into one action or a series of related actions. In order to be sure that the words in each pair were related, 15 younger adults were asked to rate how easy it was to combine the two words in each pair into a single action or pair of related actions on a scale of 1 (*very difficult*) to 7 (*very easy*). The verb pairs, noun pairs, and mixed pairs were given an average rating of 5 (*easy*) or higher.

Distractor Task

A distractor task was performed following the presentation of each list of word pairs in order to reduce the potential effects of rehearsal on memory performance. The distractor task was adapted from the Letter Comparison task developed by Salt-house and Babcock (1991). Pairs of letter strings that contained 3, 6, or 9 letters were presented on a computer screen. Participants pressed a button marked *s* if the letter strings were the same and *d* if they were different.

Design

There were two within-subject variables, type of word pair (noun, verb, or mixed) and encoding method (performed or nonperformed). Age (younger or older) and test type (free or cued recall) were the between-subject variables.

Procedure

Participants were tested in individual cubicles. Each participant was presented with four lists of word pairs and was told that he or she would be asked to recall the words from each list. Each word pair was presented on a computer screen for 8 s. As each pair was presented, it was labeled as a verb pair, noun pair, or verb-noun pair. For two lists, participants were asked to combine the two words in each pair and perform a single action or a

series of related actions for the pair. No objects were provided for the participants. If an action required an object, participants were asked to imagine the object. For the other two lists, participants read the word pairs but did not perform an action with them. Within each age group, nine of the participants performed Lists 1 and 3 and read Lists 2 and 4, and six of the participants read Lists 1 and 3 and performed Lists 2 and 4.

Following the presentation of each list, participants performed the Letter Comparison task for 1 min. Half of the participants were then given a free recall test in which they had 4 min to write down all of the word pairs that they could remember. The other half of the participants were given a cued recall test. During the cued recall test, one word from each previously presented pair appeared on the screen for 8 s, and the participants were asked to recall the word that had previously been paired with this word. For half of the items the word that had been on the right was presented, and for half of the items the word that had been presented on the left was presented during recall.

RESULTS

Free Recall of Verbs and Nouns from Verb-Noun Pairs

First, recall of verbs was compared to recall of nouns within verb-noun pairs. For participants who received the free recall test, the total proportion of verbs and the total proportion of nouns recalled from the verb-noun pairs were recorded. The average proportion of nouns and verbs recalled for each condition is shown in Table 2. A 2 (Age Group: Younger or Older) \times 2 (Word Type: Verb or Noun) \times 2 (Encoding

Table 2. Average Proportion of Verbs and Nouns Recalled from Verb-Noun Pairs.

	Free recall				Cued recall			
	Younger		Older		Younger		Older	
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)
Nouns								
Performed	.45	(.12)	.21	(.12)	.66	(.23)	.46	(.23)
Nonperformed	.34	(.12)	.17	(.12)	.60	(.27)	.34	(.20)
Verbs								
Performed	.45	(.12)	.18	(.10)	.73	(.19)	.38	(.22)
Nonperformed	.34	(.13)	.14	(.10)	.63	(.20)	.36	(.24)

Method: Performed or Nonperformed) ANOVA was conducted. The alpha level was set at .05 for all analyses.

Younger adults recalled significantly more words than did older adults, $F(1, 28) = 53.75$, $MSE = .03$, $p < .001$, $\eta^2 = .66$, and nouns were recalled significantly better than verbs, $F(1, 28) = 5.34$, $MSE = .001$, $p = .028$, $\eta^2 = .16$. As predicted, however, there was a significant interaction of age and word type, $F(1, 28) = 4.22$, $MSE = .001$, $p = .049$, $\eta^2 = .13$. This interaction is shown in Figure 1. Post hoc comparisons revealed that younger adults recalled the same proportion of nouns and verbs, $F(1, 14) < 1$. Older adults, on the other hand, recalled significantly more nouns than verbs, $F(1, 14) = 8.00$, $MSE = .001$, $p = .013$, $\eta^2 = .36$. Thus, the age difference was larger for verbs than for nouns.

Performed items were recalled significantly better than nonperformed items, $F(1, 28) = 7.07$, $MSE = .176$, $p = .013$, $\eta^2 = .20$. There were no significant interactions involving encoding method, all F s < 1.21 . Thus, there was no evidence to support the prediction that performance would increase the item-specific processing of verbs more than nouns. The possibility that floor effects could have contributed to our results was

examined. The four participants who did not recall any verbs were eliminated from the analyses, and the results were essentially the same.

Cued Recall of Verbs and Nouns from Verb-Noun Pairs

Cued recall of verb-noun pairs was analyzed separately from free recall because half of the time the verb was used as a cue and recall of the noun was required, and half of the time the noun was used as a cue and recall of the verb was required. In free recall, on the other hand, both the noun and the verb from each pair could be recalled. The proportion of nouns recalled given a verb as a cue and the proportion of verbs recalled given a noun as a cue were recorded for each participant who was given a cued recall test. These proportions are shown in Table 2. A 2 (Age) \times 2 (Word Type) \times 2 (Encoding Method) ANOVA was conducted.

Younger adults recalled significantly more words than did older adults, $F(1, 28) = 18.83$, $MSE = .116$, $p < .001$, $\eta^2 = .40$. In contrast to the results of the free recall test, there was no significant difference in cued recall of nouns and verbs, $F(1, 28) < 1$. The interaction of age and word type approached significance, $F(1, 28) =$

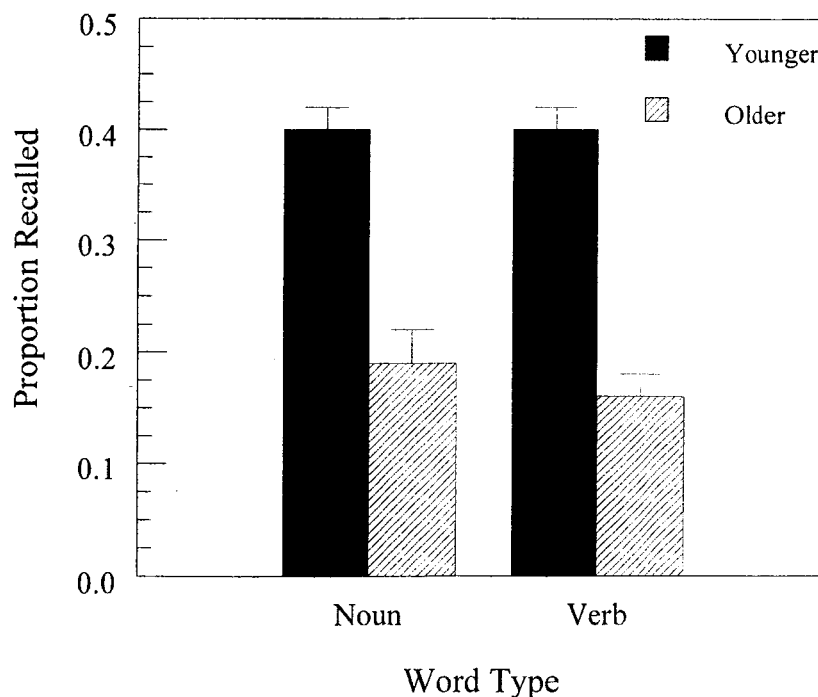


Fig. 1. Average proportion of verbs and nouns recalled from the verb-noun pairs in the free recall test. Bars represent standard errors.

2.97, $MSE = .017$, $p = .096$, $\eta^2 = .10$. Older adults but not younger adults tended to remember nouns better than verbs.

Performed items were recalled significantly better than nonperformed items, $F(1, 28) = 4.78$, $MSE = .038$, $p = .037$, $\eta^2 = .15$. There were no significant interactions involving encoding method, all F s < 1.29 .

Recall of Verb Pairs and Noun Pairs

Memory for verbs was also compared to memory for nouns by comparing recall of verb pairs with recall of noun pairs. Cued recall and free recall could be directly compared in this analysis because memory for an entire word pair was tested in both cases. The average proportion of verb and noun pairs recalled in each condition is shown in Table 3. A 2 (Age) \times 2 (Word Pair Type) \times 2 (Encoding Method) \times 2 (Test Type: Free or Cued Recall) ANOVA was conducted.

Younger adults recalled significantly more pairs than did older adults, $F(1, 56) = 37.05$, $MSE = .070$, $p < .001$, $\eta^2 = .40$. Noun pairs were recalled significantly better than verb pairs, $F(1, 56) = 58.09$, $MSE = .012$, $p < .001$, $\eta^2 = .51$. As predicted, however, there was a significant interaction of age and word type, $F(1, 56) = 10.78$, $MSE = .012$, $p = .002$, $\eta^2 = .16$. Post hoc comparisons revealed that younger adults recalled more noun pairs, $F(1, 58) = 9.48$, $MSE = .041$, $p = .003$, $\eta^2 = .14$, and more verb pairs, $F(1, 58) = 27.36$, $MSE = .036$, $p < .001$, $\eta^2 = .32$, than did older adults. As shown in Figure 2, however, the age difference was larger for verbs than for nouns.

Performed pairs were recalled better than nonperformed pairs, $F(1, 56) = 24.41$, $MSE = .016$, $p < .001$, $\eta^2 = .30$, and cued recall was better than free recall, $F(1, 56) = 59.95$, $MSE = .070$, $p < .001$, $\eta^2 = .52$. There was a significant interaction of encoding method and test type, $F(1, 56) = 5.86$, $MSE = .016$, $p = .019$, $\eta^2 = .10$. Post hoc comparisons revealed that performed items were recalled better than nonperformed items both for the free recall test, $F(1, 29) = 4.42$, $MSE = .026$, $p = .045$, $\eta^2 = .13$, and for the cued recall test, $F(1, 29) = 21.17$, $MSE = .010$, $p < .001$, $\eta^2 = .42$. The effect of performance was, however, larger for cued than for free recall. Because cued recall involves remembering one member of a pair given the other member, this finding suggests that performance enhanced the integration of the members of a word pair.

There was also a significant interaction of word type and test type, $F(1, 56) = 7.27$, $MSE = .012$, $p = .009$, $\eta^2 = .12$. Post hoc comparisons revealed that cued recall of verbs was better than free recall of verbs, $F(1, 58) = 19.67$, $MSE = .039$, $p < .001$, $\eta^2 = .25$, and cued recall of nouns was better than free recall of nouns, $F(1, 58) = 56.79$, $MSE = .024$, $p < .001$, $\eta^2 = .50$. The benefit of the cue was larger, however, for nouns than for verbs. This suggests that verbs are more difficult to integrate than nouns. There were no other significant interactions, all F s < 1.02 .

Conditional Probabilities

Cued recall can be used as one measure of the integration of the two words in a pair. Integration can also be measured for free recall by de-

Table 3. Recall of Verb Pairs and Noun Pairs.

	Free recall				Cued recall			
	Younger		Older		Younger		Older	
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)
Noun pairs								
Performed	.39	(.15)	.20	(.14)	.71	(.19)	.56	(.22)
Nonperformed	.31	(.11)	.19	(.10)	.60	(.16)	.43	(.18)
Verb pairs								
Performed	.37	(.12)	.07	(.09)	.61	(.23)	.37	(.19)
Nonperformed	.31	(.17)	.06	(.07)	.48	(.22)	.25	(.18)

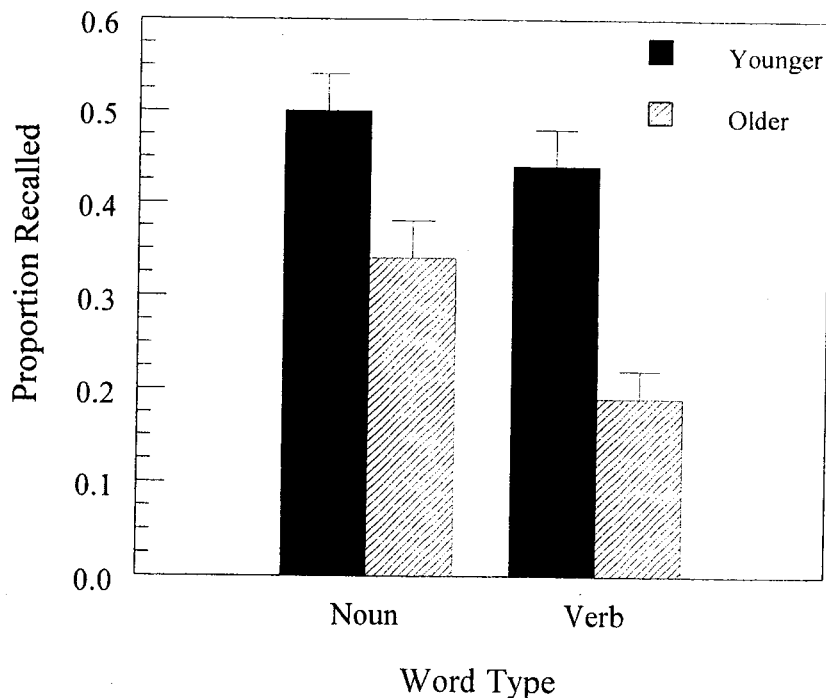


Fig. 2. Average proportion of verb pairs and noun pairs recalled in both the free and cued recall tests. Bars represent standard errors.

termining the likelihood of recalling the second member of a pair given recall of the first member of the pair. For the free recall of verb and noun pairs, we computed the conditional probability of recalling both members of a word pair given that one member of the pair was recalled. A 2 (Age Group) \times 2 (Word Type) \times 2 (Encoding Method) ANOVA was conducted.

Younger adults were more likely than older adults to recall both words given recall of one word from the pair, $F(1, 28) = 34.29$, $MSE = .14$, $p < .001$, $\eta^2 = .55$. Participants were more likely to recall the second noun from a pair when they recalled the first noun than they were to recall the second verb from a pair when they recalled the first verb, $F(1, 28) = 20.04$, $MSE = .047$, $p < .001$, $\eta^2 = .42$. There was also a significant interaction of age and word type, $F(1, 28) = 14.57$, $MSE = .047$, $p = .001$, $\eta^2 = .34$. This interaction is shown in Figure 3. Post hoc comparisons revealed that for younger adults, the conditional probabilities were not significantly different for the two types of word pairs, $F(1, 14) < 1$. For older adults, conditional probabilities were significantly lower for verb pairs than noun pairs, $F(1, 14) = 21.92$, $MSE = .037$, $p <$

$.001$, $\eta^2 = .61$. Thus, consistent with the analysis of cued recall performance, the age difference was larger for verbs than for nouns.

There was no significant main effect of encoding method, and there were no significant interactions involving encoding method, all F s < 1 . Thus, in contrast to the analysis of cued recall performance, the analysis of conditional probabilities does not provide additional support for the prediction that performance enhances integration of the members of a word pair.

DISCUSSION

As predicted, age differences in memory for verbs were larger than age differences in memory for nouns. When free recall of verb-noun pairs was examined, older adults recalled fewer verbs than nouns from the pairs, whereas younger adults recalled an equal number of nouns and verbs. When cued recall of verb-noun pairs was examined, there was a nonsignificant trend for older adults to remember more nouns than verbs. Finally, when recall of verb pairs was compared to recall of noun pairs, age differences

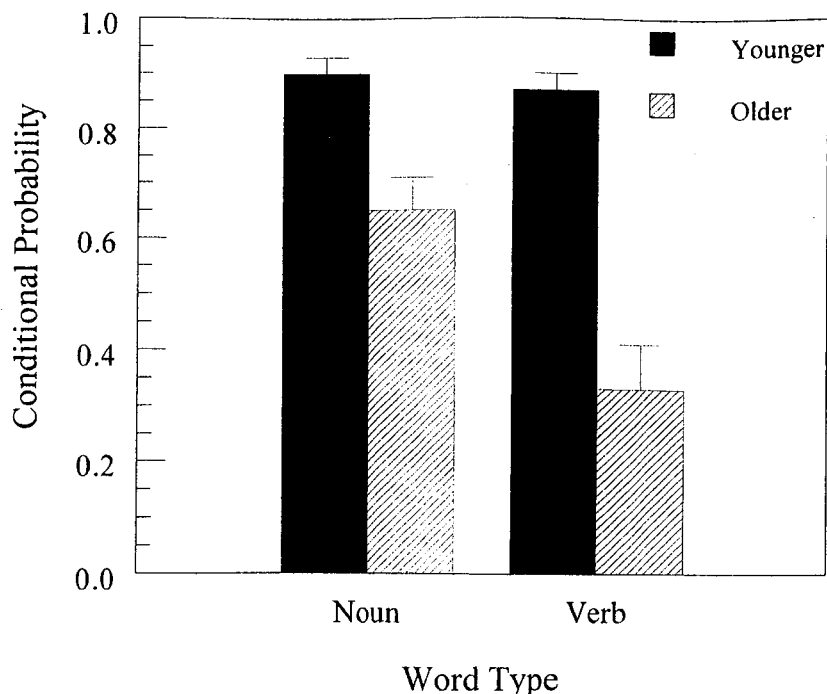


Fig. 3. Conditional probability of recalling one word in a pair given recall of the other word for both noun pairs and verb pairs. Bars represent standard errors.

for both free and cued recall were much larger for verb pairs than for noun pairs.

The evidence from this study thus suggests that older adults have particular difficulty recalling verbs. The results of this study are consistent with prior research by Earles et al. (1999) showing that older adults had difficulty recalling the exact verb from a verb-noun pair. This difficulty that older adults have in remembering verbs could be important in their memory for events because the verb describes the action in an event. Thus changing the verb can change the meaning of an event, as found by Loftus and Palmer (1974).

Two factors were suggested to be responsible for the difficulty older adults have in recalling verbs. First, verbs may be more difficult to integrate than are nouns as suggested by Helstrup (1991). Second, verbs are less concrete than nouns as suggested by Gentner (1981). The results of this study indicate that both factors may play a role in making verbs more difficult than nouns for older adults.

First, older adults may have more difficulty in recalling verbs than in recalling nouns because verbs are more difficult to integrate than nouns.

Consistent with this prediction, in the current study, older adults did have more difficulty integrating verbs than nouns. When older adults recalled one word from a noun pair, they recalled the other noun from the pair 65% of the time. On the other hand, when older adults recalled one word from a verb pair, they recalled the other verb only 33% of the time. Thus, they were almost twice as likely to recall the second member of a noun pair than to recall the second member of a verb pair. This suggests that older adults have difficulty integrating verbs.

Performance was hypothesized to help participants integrate the words in a pair. Helstrup (1989) found evidence that performance did increase cued recall performance. Because previous research had shown that the provision of integration often helps older more than younger adults (e.g., Park et al., 1990), it was expected that performance would help older more than younger adults in the current study. Performance did appear to increase integration of the words in a pair because performance had a larger effect on cued than on free recall. This increase in integration, however, was not more beneficial for older than for younger adults, as indicated by the

lack of an interaction between age and performance.

Although a difficulty with integration can explain some of the difficulties older adults had in recalling verbs, not all of the findings from this study can be explained in terms of integration. In particular, older adults had more difficulty recalling the verbs than the nouns from verb-noun pairs. This finding cannot be accounted for in terms of integration because integrating a verb with a noun would be expected to yield equal memory for both types of words. Thus, older adults had difficulty with verbs independently of their relations to other words.

One possible explanation for the difficulty older adults have in remembering the verbs from verb-noun pairs is that verbs are less concrete than nouns. Gentner (1981) has pointed out that the average verb has a greater number of dictionary entries than does the average noun. Thus, a given verb conveys a greater variety of meanings than does a given noun, suggesting that the common underlying meaning relating the different senses of a word is more abstract in the case of verbs than in the case of nouns.

Englekamp et al. (1990) suggested that performance of verbs should increase the concreteness of verbs, thus making verbs easier to remember. It was hypothesized, therefore, that performance may enhance memory for verbs more than memory for nouns. For both younger and older adults, however, performance enhanced recall of both nouns and verbs. There was no support for the hypothesis that performance enhances memory for verbs more than memory for nouns. Thus, if performance increases item-specific processing as suggested by Englekamp et al. (1990), it does so for both nouns and verbs.

Although there is no evidence that performance increases the concreteness of verbs more than it increases the concreteness of nouns, this does not rule out the hypothesis that the baseline level of concreteness is higher for nouns than it is for verbs. Thus, the greater difficulty older adults have in recalling verbs from verb-noun pairs may be a result of the lower concreteness of verbs. Verbs differ from nouns in a number of

different ways (e.g., morphological complexity, sentence position), however, and thus a number of different hypotheses are possible for this effect. It does not seem to be possible to account for this finding in terms of integration, however, and thus some additional explanation beyond integration must be necessary to account for the results of this study. Concreteness is one such possible explanation.

Age differences in memory for verbs thus appear to be larger than age differences in memory for nouns. There are two factors that may contribute to this effect. First, verbs are less concrete than nouns, and thus may be more difficult to recall independently of any other words. Second, verbs are more difficult to integrate with other words than are nouns. These two factors may combine to make verbs especially difficult for older adults to remember.

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