

The role of the verb in sentence memory

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Investigators have frequently found that nouns are more important than verbs in the memory representation of sentences. This pattern of results is incompatible with recent theories of sentence memory that have emphasized the verb and with the results of sentence comprehension studies that have demonstrated the importance of the verb. The four experiments reported here were designed to reexamine the role of the verb in sentence memory. Linguistic variables other than sentence function were held constant in three studies. Verbs were recalled as well and were as effective retrieval cues as nouns in these experiments. The to-be-remembered sentences were presented in the context of paragraphs in the fourth experiment. This reduced the difference in level of recall between subjects, verbs, and objects. The conclusion was drawn that the verb is no less important than sentence nouns in the memory representation.

Much recent research in psycholinguistics has focused on the nature of the memory representation of sentences. It has been demonstrated repeatedly that the long-term representation of a sentence is not a verbatim copy of the original (see, e.g., Anderson, 1974; Bransford, Barclay, & Franks, 1972). Rather than remembering the original form of a sentence, we tend to remember an abstracted representation of the semantic information in the sentence.

All sentence components may not be equally important in this abstracted semantic representation. Clark and Card (1969), for example, have argued that the object noun is more important to the meaning of a sentence than the other sentence components because the subject noun is the theme or focus of the sentence. (The question of whether the word itself or some abstract representation of its meaning is stored in memory will not be addressed here. Phrases like "the subject noun" will be used throughout the paper instead of "the concept underlying the subject noun" for the sake of simplicity. No theoretical statement is intended.) Therefore, they reason that the subject noun should be remembered better than the other sentence components. There is ample experimental support for Clark and Card's position. Several investigators (e.g., Clark, 1966; Horowitz & Prytulak, 1969; Wearing, 1974) have observed that subject nouns are recalled more frequently than object nouns or verbs and that object nouns are recalled more frequently than verbs.

Perfetti and Goldman (1974) have extended this reasoning and have argued that the subject noun should be a more effective retrieval cue than the other sentence

components because its theme function makes it central to the meaning of the sentence. They assume that a sentence component that is important to the meaning will be important in the memory representation. Thus, it will be more likely to facilitate recall of the remainder of the sentence than a component that is less important. There is empirical support for this argument. Horowitz and Prytulak (1969) and Thios (1975) found that subject nouns were the best retrieval cues, object nouns were the next best retrieval cues, and verbs were the poorest retrieval cues for individually presented sentences.

In summary, the argument that the subject noun is central to the meaning of a sentence is supported by the evidence that the subject noun is remembered better and is a more effective retrieval cue than the object noun or the verb. Furthermore, the object noun is perhaps more central to the meaning of the sentence than the verb since the object is remembered better and is a more effective retrieval cue than the verb.

It is difficult to reconcile this pattern of results with two recent theoretical accounts of the nature of the abstract memory representation of sentences. Kintsch (1974) and Rumelhart, Lindsay, and Norman (1972) have proposed representational systems derived from Fillmore's (1968) case grammar. Both Kintsch and Rumelhart et al. have retained the essential notion of Fillmore's theory that a sentence is represented as a relational concept (usually the sentence verb) plus the related concepts (usually the sentence nouns). They refer to this representation as a proposition. If the verb specifies the relationship that ties the other sentence components together, it should be as important as the sentence nouns in the proposition, since the relationship must be remembered if we are to make any sense of the other components in the sentence. The results of the previous sentence retention research are incompatible with this theoretical prediction.

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However, there are two issues that must be examined before the conclusion is reached that the verb is not as important as the sentence nouns in the memory representation. First, there is a possible source of confounding in all of the previous studies. Subject nouns, verbs, and object nouns may have differed not only in sentence function but perhaps also on a number of other linguistic dimensions, such as frequency of occurrence, ease of imagery formation, and so on, in these studies. These extraneous variables are known to affect performance in other memory tasks (see, e.g., Paivio, 1971). Experiments 1-3 were designed to assess the relative importance of verbs in the propositional representation of sentences by examining free recall (Experiment 1) and retrieval cue effectiveness (Experiments 2 and 3) of sentence components when linguistic variables other than sentence function were held constant.

Second, the pattern of results observed in these sentence retention studies conflicts with the results of sentence comprehension studies. The verb has been shown to be more important than the sentence nouns in a variety of sentence comprehension tasks (Gladney & Krulee, 1967; Glucksberg, Trabasso, & Wald, 1973; Healy & Miller, 1970, 1971; Wearing, 1974). Wearing (1974) has argued that this contradictory pattern of results supports Fillenbaum's (1970) speculation that the typical sentence retention task is not a good measure of normal sentence processing. Fillenbaum (1970) noted that presenting sentences for retention without presenting context "may result in something much closer to parrotting of words than a complete structural analysis of sentences" (p. 236). In other words, the propositional representations formed for sentences presented individually may be different from the representations that would be formed for sentences presented in context. Experiment 4 was designed to assess the relative importance of verbs in the proposition when the to-be-remembered sentences are presented in context.

EXPERIMENT 1

Linguistic variables other than sentence function were controlled in the first experiment by generating sentence triplets using the same word as the subject of one sentence, as the verb of a second sentence, and as the object of the final sentence. For example, the word "design" was used to generate the following three sentences: (1) His design completed the project. (2) His architect designed the project. (3) His architect completed the design. If the verb is less important than the subject or object in the propositional representation because of its sentence function, the word "design" (and the other words, called critical words, used to generate triplets) should be recalled less often in a free recall task when it serves as a verb in the to-be-remembered sentences than when it serves as a noun. If,

however, the verb has been shown to be less important than the nouns in previous free recall research because of other linguistic variables, the word "design" (and the other critical words) should be remembered equally often in all three sentences. The other nouns and verbs in the triplets varied both on sentence function and on other linguistic dimensions. (Since all of the sentences employed were active sentences, the term "subject noun" refers to the noun that served as both the surface structure and the deep structure subject.)

Method

Subjects. The 64 subjects in the word selection portion of the experiment (described below) were volunteers from Vassar College psychology courses. The 36 subjects in the free recall portion of the experiment were Vassar College students who participated to fulfill an introductory psychology course requirement.

Materials. The sentence triplets were generated in two steps. First, 140 words with both noun and verb forms were selected from *The Random House Dictionary of the English Language* (1967). The words were randomly divided into two sets of 70 words. Thirty-two subjects rated each set. Each subject was given one of the sets typed on a page and was requested to indicate whether each word was more likely to be used as a noun or as a verb in everyday English. Sixteen words were judged to occur about equally often as nouns or as verbs. The distribution of responses for these words ranged from 18 noun judgments and 14 verb judgments to 14 noun judgments and 18 verb judgments. Second, each of these 16 words was then used to generate a triplet of sentences. Each word was used as the subject noun of the first sentence (a subject-critical sentence), as the verb of the second sentence (a verb-critical sentence), and as the object noun of the third sentence (an object-critical sentence). The three sentences in each triplet had the same surface structure. (The complete set of triplets is listed in Appendix 1.)

Procedure. Subjects participated in the experiment in groups that ranged in size from two to six. A total of 12 subjects were randomly assigned to the three conditions defined by type of sentence. The 16 sentences of each type were randomly divided into two groups of 8. The subjects saw one group of sentences, attempted to recall as many as possible, saw the second group of sentences, and then attempted to recall them. There were two random assignments of sentences to the presentation groups. Half of the subjects in each sentence-type condition saw each assignment. The sentences were presented as slides at a rate of one sentence every 10 sec. The subjects were given standard free recall instructions that encouraged guessing.

Results and Discussion

The subjects' recall protocols were scored for verbatim recall and with a lenient scoring procedure. Under the lenient procedure, subjects were given credit for correct word recall when they substituted a word into a sentence that two judges agreed was synonymous with the original word. The total numbers of subject nouns, verbs, and object nouns recalled verbatim or scored as correctly recalled with the lenient procedure for each subject served as the data in all analyses. Two-way analyses of variance with types of word and types of sentence as fixed effects and with subjects and sentences as random effects (Clark, 1973) were used to analyze the results. (In all of the experiments reported

here, F_1 will refer to the F ratio obtained with subjects as the random variable, F_2 will refer to the F ratio obtained with sentences as the random variable, and $\min F'$ will refer to the lower bound of the appropriate quasi-F ratio.) Only the lenient scoring results will be reported, since the verbatim results produced identical patterns of statistical significance.

The mean numbers of subject nouns, verbs, and object nouns recalled for each sentence type are shown in Table 1. Level of recall varied with type of word when all sentence types were combined; more subject nouns were recalled than verbs or object nouns. The main effect of type of word was significant [$F_1(2,66) = 18.98$, $F_2(2,90) = 11.79$, $\min F'(2,165) = 7.27$, all $ps < .01$]. Newman-Keuls analyses using error terms from either the F_1 or the F_2 analyses indicated that the mean number of subject nouns recalled was significantly higher than the mean numbers of verbs or object nouns recalled. Although recall was higher from the subject- and verb-critical sentences than from the object-critical sentences, this effect was not significant with the language-as-a-random-effect statistic [$F_1(2,33) = 4.25$, $p < .05$; $F_2(2,45) = 1.95$, $p > .10$; $\min F'(2,74) = 1.34$, $p > .10$]. The interaction was not significant [$F_1(4,66) < 1$, $F_2(4,90) < 1$, $\min F'(4,155) < 1$].

The pattern of results was different, however, for recall of the critical words. The mean numbers of critical subjects, verbs, and objects recalled are shown on the major diagonal in Table 1. Subjects recalled more subject nouns and verbs than object nouns. The significance of this effect was assessed with a one-way analysis of variance. There was a marginally significant effect of type of word for these critical words [$F_1(2,33) = 6.41$, $p < .01$; $F_2(2,45) = 3.71$, $p < .05$; $\min F'(2,77) = 2.35$, $p < .10$]. Newman-Keuls analyses of the difference between the means using either F_1 or F_2 variance estimates indicated that subjects and verbs were recalled significantly more often than objects.

In summary, when linguistic variables other than sentence function were held constant in a sentence free recall task, the difference between subject noun recall and verb recall was not significant. The recall of object nouns was somewhat lower than the recall of the other sentence components but this may have reflected the fact that recall of object-critical sentences was somewhat lower than recall of subject- or verb-critical

sentences. The implication of these results is that memory differences between subject nouns and verbs in previous free recall research may have been caused by linguistic variables other than sentence function.

EXPERIMENT 2

This experiment was designed to extend the free recall results of Experiment 1 to a cued recall task. Nine of the 16 sentence triplets used in Experiment 1 were used in this experiment. The nine conditions in the experiment were defined by the location of the generating word in the sentence (subject-, verb-, or object-critical sentences) and by the type of retrieval cue provided at recall (subject, verb, or object cue). The same words served as subject, verb, and object cues in three of the conditions (subject-critical sentence, subject cue; verb-critical sentence, verb cue; and object-critical sentence, object cue). These three conditions will be called the critical sentence-cue conditions. If verbs are less important in the propositional representation than subject and object nouns because of sentence function, verbs should be poorer retrieval cues than subject and object nouns in these three conditions. If, on the other hand, verbs are not less important than subject nouns in the propositional representation (Experiment 1), they should be as good retrieval cues as subject nouns. The retrieval cues in the other six conditions, the control sentence-cue conditions, varied on linguistic dimensions other than sentence function. Therefore, the cued recall results in these conditions should mirror the results of previous cued recall studies. That is, verbs should be poorer retrieval cues than subject or object nouns.

Method

Subjects. The 162 subjects in the experiment were Vassar College students who participated to fulfill an introductory psychology course requirement.

Materials. A subset of 9 of the original 16 sentences was selected for use in this experiment since the effect of sentence type had been significant with F_1 in Experiment 1. The three sentences in the triplets that were chosen had been about equally easy in free recall. There were no significant differences in level of verbatim recall of the subject-critical, verb-critical, or object-critical sentences in the nine triplets [$F_1(2,33) < 1$]. (The nine triplets employed are noted with asterisks in Appendix 1.)

Procedure. Eighteen subjects served in each of the nine conditions defined by sentence type and cue type. Subjects participated in groups that ranged in size from 3 to 18. Groups of subjects were randomly assigned to one of three sentence conditions. Individual subjects within a sentence-type condition were assigned to one of the three cue-type conditions by randomly distributing the test booklets containing the retrieval cues.

Each group of subjects saw the nine sentences presented one at a time on slides for 10 sec each. Two random presentation orders of the slides were used. Half of the subjects in each condition saw each order. Subjects were given standard free recall instructions that encouraged guessing before the presentation of the sentences. They were told that additional instructions would be given later. After the slides had been presented, the

Table 1
Mean Numbers of Sentence Components Recalled in
Experiment 1 (Lenient Scoring)

| Sentence Type | Word Type | | | Mean |
|------------------|-----------|------|--------|------|
| | Subject | Verb | Object | |
| Subject Critical | 11.1 | 9.9 | 10.3 | 10.4 |
| Verb Critical | 11.2 | 10.2 | 10.2 | 10.5 |
| Object Critical | 9.8 | 8.1 | 8.3 | 8.7 |
| Mean | 10.7 | 9.4 | 9.6 | |

subjects were told to open their test booklets, to read the additional instructions, and then to begin recall. In the additional instructions, they were informed that the subjects (or verbs or objects, depending on the cue condition) of the sentences were listed on the page and that these words should be used to help them recall the rest of the sentence. Three different cue presentation orders were used for each condition.

Results and Discussion

The subjects' recall protocols were scored for verbatim recall and with a lenient scoring procedure. Under the lenient scoring procedure, three judges rated all recall attempts as verbatim recalls (the sentence was recalled verbatim or with a tense change, article change, or singular/plural shift), paraphrases (the sentence retained the idea of the original sentence), or partial recalls (only a portion of the original sentence was recalled). A score of 3 was given for a verbatim recall, 2 was given for a paraphrase, and 1 was given for a partial recall. Each subject was then given a composite score that was the sum of the values for the sentences recalled. The total number of sentences recalled verbatim or the composite lenient score for each subject served as the data in all analyses. Two-way analyses of variance with types of retrieval cue and types of sentence as fixed effects and with subjects and sentences as random effects were used to analyze the results. Only the lenient scoring procedure results will be reported, since the verbatim results produced identical patterns of statistical significance.

The results are summarized in Table 2. When all of the conditions are considered together, there appears to be no effect of cue type or of sentence type. The main effects of cue type [$F_1(2,153) < 1$, $F_2(2,48) = 1.62$, $\min F'(2,183) < 1$, all $ps > .10$] and of sentence type [$F_1(2,153) = 2.42$, $F_2(2,24) = 1.31$, $\min F'(2,55) < 1$, all $ps > .10$] were not significant, nor was the interaction [$F_1(4,153) = 1.39$, $F_2(4,48) = 2.33$, $\min F'(4,183) < 1$, all $ps > .10$].

The same words were used as the subject, verb, and object cues in the three critical sentence-cue conditions. Different words, which may have varied along linguistic dimensions other than sentence function, were used as retrieval cues in the control sentence-cue conditions. The pattern of recall for these two conditions is shown in the last two rows of Table 2. Verbs were better

retrieval cues than subjects or objects in the three critical conditions. Subjects were better retrieval cues than objects or verbs, and objects were better retrieval cues than verbs in the control conditions. In other words, verbs were the best retrieval cues in the critical conditions and the poorest in the control conditions. This pattern of results produced a significant interaction between sentence-cue condition and cue type in a two-way analysis of variance [$F_1(2,156) = 3.37$, $p < .05$]. The main effects of sentence-cue type [$F_1(1,156) = 2.67$, $p > .10$] and of cue type [$F_1(2,156) < 1$] were not significant. (F_2 and, thus, $\min F'$ were not computed for this analysis since the sentences in the control sentence-cue conditions were not independent nor completely repeated.) The nature of the interaction was evaluated by examining the effect of cue type for each type of sentence-cue condition separately. The difference between verb, subject, and object cues was not significant in the critical conditions [$F_1(2,51) < 1$, $F_2(2,24) < 1$, $\min F'(2,69) < 1$]. The differences among the three types of cues were significant in the control conditions [$F_1(2,105) = 3.74$, $p > .05$].

In summary, there were no significant differences among verb, subject, and object cues when linguistic variables other than sentence function were held constant (critical sentence-cue conditions). However, cue type was a significant variable when extraneous linguistic variables were not held constant (control conditions). The implication of these results is that any observed memory differences between sentence nouns and verbs in previous cued recall research may have been caused by linguistic variables other than sentence function.

EXPERIMENT 3

Subject nouns and verbs were not recalled differentially in Experiment 1 when linguistic variables other than sentence function were held constant by employing the same words as subjects, verbs, and objects in sets of three sentences. Subjects, verbs, and objects were equally effective as retrieval cues in Experiment 2 when linguistic variables other than sentence function were similarly held constant.

Experiment 3 was designed to examine the effects of two extraneous linguistic variables, ease of image formation and frequency of occurrence, on sentence memory. The aim of the experiment was to extend the results of Experiments 1 and 2 to a new sample of sentences in which these variables were directly controlled in each to-be-remembered sentence.

The subject, verb, and object of each of the to-be-remembered sentences in the matched sentence condition were equated for frequency of occurrence in written English (Kučera & Francis, 1967) and for ease of image formation (Paivio, Note 1). If a disparity between sentence components on these two variables

Table 2
Mean Lenient Sentence Recall Scores in Experiment 2

| Sentence Type | Cue Type | | | Mean |
|------------------|----------|------|--------|------|
| | Subject | Verb | Object | |
| Subject Critical | 15.3 | 13.7 | 14.3 | 14.4 |
| Verb Critical | 16.3 | 17.4 | 15.6 | 16.4 |
| Object Critical | 16.2 | 12.6 | 15.7 | 14.8 |
| Mean | 15.9 | 14.6 | 15.2 | |
| Mean Critical | 15.3 | 17.4 | 15.7 | 16.1 |
| Mean Control | 16.2 | 13.2 | 14.9 | 14.8 |

accounted for the differences in cue effectiveness reported for nouns and verbs in previous research, controlling for them within each sentence should eliminate any differences. In other words, verb cues should be as effective as noun cues in the matched sentences. The frequency and imagery values of the subjects, verbs, and objects were not held constant in the control sentences. Subject and object nouns from the Thios (1975) and Wearing (1974) studies were combined with the verbs used in the matched sentences to form the sentences for the control condition. The results of this condition should replicate the results of the previous research; subject and object cues should be more effective than verb cues.

Method

Subjects. The 48 subjects who participated were Vassar College students fulfilling an introductory psychology course requirement.

Materials. The subject, verb, and object of each of the eight sentences in the matched sentence condition were approximately equal in ease of image formation (Paivio, Note 1) and in frequency of occurrence in printed English (Kučera & Francis, 1967). Over all eight sentences, the mean imagery rating for subject nouns was 3.2, for verbs, 3.1, and for objects, 3.3. (Verbs with the highest possible imagery values were chosen, but imagery ratings for verbs are quite low in general. Since the nouns had to match the verbs in imagery, the sentences in the matched condition were quite low in imagery.) There was no significant difference between the imagery ratings for the three sentence components with a one-way analysis of variance using imagery ratings as the raw scores [$F_2(2,21) < 1$]. The mean frequencies of occurrence for the nouns in the to-be-remembered sentences were higher than the mean frequency for the verbs. The mean frequency for the subject nouns was 111.2, for the verbs, 25.9, and for the objects, 64.5. The difference in mean frequency across the three sentence components was not, however, statistically significant [$F_2(2,21) = 1.96, p > .10$].

The eight sentences were chosen from a set of 40 sentences. The 40 sentences were generated by selecting words that can serve only as verbs in English and by then selecting words that can serve only as nouns for the subjects and objects. Three judges then rated whether or not the sentences might occur in reading material. The eight sentences chosen for the experiment were judged to be likely to occur by all three judges.

Ease of image formation and frequency of occurrence of the subject, verb, and object of the eight sentences in the control condition varied freely. The sentences were generated by combining the verbs from the matched condition with nouns used in sentences in the Thios (1975) and Wearing (1974) studies. Five subject-object pairs were from the Wearing sentences and three were from the Thios sentences. In general, the nouns of these sentences were higher in imagery and more frequent in occurrence than the verbs. (See Appendix 2 for a complete listing of the sentences.)

Procedure. Eight subjects served in each of the six conditions defined by sentence type (matched or control sentences) and by cue type (subject, verb, or object cues). Subjects participated in groups that ranged in size from 2 to 10. Groups of subjects were randomly assigned to one of the two sentence-type conditions. Individual subjects within a sentence-type condition were assigned to one of the three cue-type conditions by randomly distributing the test booklets containing the retrieval cues. The procedure for this experiment was identical to the procedure described for Experiment 2 in all other respects except that only two different cue presentation orders were used for each condition.

Results and Discussion

Both levels of verbatim recall and the lenient scoring procedure described in Experiment 2 were used to assess the subjects' recall attempts. Only the lenient scoring procedure results will be reported. The pattern of statistical significance was identical for verbatim recall results. The results are summarized in Table 3. There was a clear effect of sentence type; the control sentences were recalled more accurately than the matched sentences. Surprisingly, verbs were better retrieval cues than subject or object nouns with both types of sentences. A two-way analysis of variance with sentence types and cue types as fixed effects and with subjects and sentences as random effects was used to test the significance of these relationships. The effect of sentence type was significant [$F_1(1,42) = 43.05, F_2(1,14) = 18.59, \text{min } F'(1,32) = 12.98, \text{all } ps < .01$], but the effect of cue type was not [$F_1(2,42) < 1, F_2(2,28) = 1.70, \text{min } F'(2,69) < 1, \text{all } ps > .10$]. The interaction was not significant [$F_1(2,42) < 1, F_2(2,28) < 1, \text{min } F'(2,69) < 1$].

In summary, verb cues were as effective as noun cues in both the matched and the control sentences. This pattern of results in the matched condition replicates the results of Experiment 2. When linguistic variables other than sentence function are held constant, the three types of retrieval cues are equally effective. The pattern of results in the control condition was unexpected. It had been predicted that the subject and object nouns would be superior to the verbs in cue effectiveness. One possible explanation for the pattern is that the verbs chosen for this experiment were high in imagery relative to all verbs. The three types of retrieval cues may be equally effective when sentences have relatively high-imagery verbs.

EXPERIMENT 4

Sentence verbs and nouns were recalled equally well and were equally effective retrieval cues in the first three experiments when linguistic variables other than sentence function were held constant. Another variable, amount of context, might also affect the recall of sentence components. Fillenbaum (1970) and Wearing (1974) have argued that sentence comprehension tasks and the typical sentence retention task in which sentences are presented without context produce different patterns of results because subjects process the sentences differently in the two situations. Since

Table 3
Mean Lenient Sentence Recall Scores in Experiment 3

| Sentence Type | Cue Type | | | |
|---------------|----------|------|--------|------|
| | Subject | Verb | Object | Mean |
| Matched | 5.5 | 7.2 | 4.5 | 5.7 |
| Control | 15.4 | 15.5 | 13.8 | 14.9 |
| Mean | 10.4 | 11.4 | 9.2 | |

the verb has been frequently shown to be central in sentence comprehension tasks, the importance of the verb in a memory task should be increased if the memory task can be made to be more like a typical comprehension task. One way to make a sentence retention task more like a comprehension task is to provide context with the to-be-remembered sentences (Fillenbaum, 1970). Experiment 4 was designed to determine if the previously reported difference between noun and verb recall would be eliminated or reversed if context were provided with each to-be-remembered sentence. The issue was examined by presenting individual sentences to half of the subjects and sentences in paragraphs to the other subjects.

Method

Subjects. Ninety-six Vassar College students participated to fulfill an introductory psychology course requirement.

Materials. The 48 sentences used in the experiment were selected from magazines, books, and encyclopedias. They were chosen with the following restrictions: (1) they were six to eight words long; (2) they included a subject noun, a verb, and an object noun; and (3) they began after the first 50 to 100 words in the paragraph. The sentences were presented on slides. Subjects in the no-context condition saw one sentence per slide. Subjects in the context condition saw the same sentences presented as the final, underlined sentences in paragraphs. (The final sentence was always the to-be-remembered sentence. Any sentences that had occurred after the to-be-remembered sentence in the original paragraph were deleted.) Half of the sentences were assigned to Replication A and the other half were assigned to Replication B.

Procedure. Subjects served in the experiment in groups that ranged in size from two to four. Twelve subjects were randomly assigned to the four conditions defined by context and replication. The 24 sentences assigned to each replication were presented to the subjects in three blocks of 8. There were three randomly generated presentation orders for each replication condition.

The subjects were given 4 min for recall after each block had been presented. Each sentence in the no-context condition was presented for 15 sec and each paragraph in the context condition was presented for 30 sec. (The results of pretesting sessions with Vassar College students who did not participate in the experiment indicated that the 30-sec rate gave all of them time to read the entire paragraph and then to reread the to-be-remembered sentence.)

The subjects were given standard free recall instructions. They were urged to recall both complete sentences and any portions of sentences that they could remember. Subjects in the context condition were encouraged to read the entire paragraph. They were told that reading the paragraph would facilitate sentence recall but that they were responsible for recalling only the final, underlined sentence.

Results and Discussion

The subjects' recall protocols were scored for verbatim recall and with the lenient procedure described in Experiment 1. The total number of subject nouns, verbs, and object nouns recalled verbatim or scored as correctly recalled with the lenient procedure for each subject served as the data in all analyses. Three-way analyses of variance with types of word, context conditions, and replications as fixed effects and with

subjects and sentences as random effects were used to analyze the data. Only the results from the lenient scoring procedure will be reported here. The patterns of significance were identical with the verbatim criterion.

The mean numbers of subject nouns, verbs, and object nouns recalled for each context condition in each replication are reported in Table 4. Overall, more subject nouns were recalled than object nouns and both types of nouns were recalled more often than verbs. The main effect of word type was significant [$F_1(2,184) = 54.79$, $F_2(2,92) = 17.13$, $\min F'(2,151) = 13.05$, all $ps < .01$]. However, the superiority of subject nouns over object nouns and verbs was reduced when sentences were presented in context. The interaction between context condition and type of word was significant [$F_1(2,184) = 5.80$, $F_2(2,92) = 7.45$, $\min F'(2,263) = 3.26$, all $ps < .05$]. No other main effects or interactions were significant. In summary, if the sentence retention task is altered such that it is more like a sentence comprehension task, the memory superiority of subject nouns relative to object nouns and verbs is reduced.

GENERAL DISCUSSION

Previous investigations of sentence retention have shown that sentence verbs are recalled less frequently than sentence nouns in free recall tasks and that sentence verbs are poorer retrieval cues than sentence nouns in cued recall tasks. This pattern of results is incompatible with at least two models of the memory representation of sentences that emphasize the role of the verb (Kintsch, 1974; Rumelhart et al., 1972) and with the results of sentence comprehension research. The results of Experiments 1-3 demonstrated that verbs and nouns were recalled equally well and were equally effective as retrieval cues when linguistic variables other than sentence function were held constant. The results of Experiment 4 demonstrated that the differences between subject, object, and verb recall were reduced when sentence comprehension was emphasized in a sentence memory task. Thus, the conclusion can be

Table 4
Mean Numbers of Sentence Components Recalled in
Experiment 4 (Lenient Scoring)

| Replication | Word Type | | | Mean |
|---------------|-----------|------|--------|------|
| | Subject | Verb | Object | |
| No Context | | | | |
| A | 14.8 | 11.2 | 12.9 | 13.0 |
| B | 14.1 | 11.3 | 11.9 | 12.4 |
| Mean | 14.5 | 11.3 | 12.4 | |
| Context | | | | |
| A | 13.0 | 11.5 | 12.2 | 12.2 |
| B | 12.5 | 10.2 | 12.3 | 11.7 |
| Mean | 12.8 | 10.9 | 12.3 | |
| Combined Mean | 13.6 | 11.1 | 12.3 | |

drawn from these four experiments that the verb can be as important as the subject or object in the memory representation of a sentence.

These results are compatible with the propositional theories proposed by Kintsch (1974) and by Rumelhart et al. (1972), and they are more similar to the results of sentence comprehension research than were the results of the previous sentence memory research. Sentence memory results might actually mirror the results of sentence comprehension tasks if the two techniques used in these four experiments were combined. That is, verbs might be recalled more often and might be more effective retrieval cues than nouns if linguistic variables other than sentence function were held constant in sentences presented in the context of paragraphs.

Since the verbs in Experiments 1-3 were specifically selected, the memory effects observed with these verbs may not accurately reflect the memory effects that would be observed with most verbs. For example, the verbs used in Experiment 3 were higher in imagery than most verbs ranked in the Paivio (Note 1) norms. As a result, they were as effective retrieval cues as the nouns in the control condition. This is not the typical result of cued recall research. The question obviously arises, then, as to the status of most verbs in the memory representation of sentences. The answer to the question will apparently vary with the nature of the memory task. The results of Experiment 4, in which naturally occurring sentences served as the memory material, indicated that the difference in level of recall between subjects, verbs, and objects will be a function of whether or not the to-be-remembered sentences are presented individually or in the context of a paragraph.

REFERENCE NOTE

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Appendix 1

Sentence Triplets Used in Experiments 1 and 2

- His design completed the project.*
His architect designed the project.
His architect completed the design.
- The jewelry display attracted an elegant crowd.
The elegant store displayed the expensive jewelry.
The elegant store presented a jewelry display.
- The frightening dream interrupted his sleep.*
The frightened child dreamed a nightmare.
The frightened child described his dream.
- The captain's fear prevented their rescue.*
The company's president feared their audit.
The criminal's escape increased their fear.
- The bright flash lit the room.*
The winning driver flashed his lights.
The camping lantern produced a flash.
- A large grant financed his research project.
A federal agency granted his research request.
A federal agency provided his research grant.
- The guard will notify the commander.
The police will guard the entrance.
The commander will replace the guard.
- The iron needed a new cord.
The woman ironed the new shirt.
The shop repaired the old iron.
- The distinguished judge awarded the prize.
The special panel judged the exhibit.
The prize winner thanked the judge.

The casino limits restricted the gambler's bets.*
 The brave firemen limited the fire's damage.
 The large bets exceeded the casino's limit.
 The order forced their retreat.
 The officer ordered their retreat.
 The officer announced his order.
 The new paint brightened the historic house.
 The eager student painted the historic house.
 The historical society supplied the house paint.
 The park contained a tennis court.*
 The attendant parked the sports car.
 The mayor dedicated the new park.
 The hay piles will feed the hungry cattle.*
 The tired farmers will pile the fresh hay.
 The hungry cattle will eat the hay piles.
 The arrow point ripped the target.*
 The young archer pointed the arrow.
 The young archer sharpened the point.
 The wooden post supported the sagging wall.*
 The station master posted the train schedule.
 The construction worker replaced the rotten post.

Appendix 2
 Sentences Used in Experiment 3

Matched Sentences

The theory described the event.
 The question examined his knowledge.
 His comparison improved the explanation.
 The order introduced their method.
 The investigation occupied the session.
 The rumor provoked his decree.
 The recess refreshed the delegates.
 Her devotion soothed his vanity.

Control Sentences

His uncle described the toy.
 The scientist examined the boulder.
 The hunter improved the cottage.
 The radical introduced his policy.
 The army occupied the mountain.
 The leader provoked the hostage.
 The ocean refreshed the traveller.
 The judge soothed the baby.

*Triplets used in Experiment 2.

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