The relative contribution of nouns and verbs to sentence acceptability and comprehensibility*

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Twenty-four Ss rated the comprehensibility and acceptability of English sentences with either the subject noun or the main verb deleted. Twenty-four different Ss guessed the word missing from those sentences and rated their confidence in their guesses. The three different ratings resulted in comprehensibility, acceptability, and corrigibility scores for each sentence. Sentences with the verb deleted had lower acceptability scores and fewer word location errors than did sentences with the noun deleted, but were judged as comprehensible as sentences with the noun missing. Attempts to explain this latter finding were based on the observed significant correlation between sentence comprehensibility and corrigibility.

It has been commonly held that the main verb of a sentence is that part of the sentence which is most influential in determining sentence meaning. Nevertheless, little experimental evidence has been put forth to support this notion. The present authors (Healy & Miller, 1970) have presented evidence that the main verb of a sentence influences the meaning of the sentence more than does the noun used as agent. Subsequently, Rossiter & Jackson¹ confirmed their findings. In the experiment by Healy and Miller, Ss were instructed to sort simple active sentences, which differed only in their agents and verbs, on the basis of similarity of meaning; most Ss placed together sentences that had the same verb but different agents. Similarly, in a developmental study by Hornby, Hass, & Feldman (1970), kindergarten and second-grade Ss were asked to choose the most important word in each of a number of sentences; the older Ss, unlike the younger ones, showed a strong tendency to select the verb as the most important word of each sentence. Although the results of these experiments have been clear, additional experimental elucidation of the relative roles of the agent and verb in determining sentence meaning is obviously necessary.

The aim of the present investigation is to gain further insight into the relative importance to sentence meaning of the noun acting as subject and of the main verb. English sentences with equally long subject and predicate phrases were constructed as experimental sentences. The authors were interested in seeing if deleting the main verb of a sentence

would impair the meaningfulness of the sentence more than would deleting the noun acting as subject. The present investigation made use of the recent finding by Wang, Deese, and their associates (Wang, 1970a, b; Schwartz, Sparkman, & Deese, 1970), that sentence comprehensibility can be reliably judged by Ss. As in the study by Schwartz, Sparkman, & Deese (1970), Ss made judgments as to the comprehensibility of individual sentences and gave confidence ratings for each judgment.

Pilot studies showed no difference between the judgments of comprehensibility or meaningfulness of sentences with the noun removed and with the verb removed. Yet pilot work also indicated that when Ss made their judgments on the basis of sentence grammaticality or "acceptability" rather than strictly on the basis of comprehensibility, differences could be seen between judgments of the sentences with the noun omitted and with the verb omitted. Therefore, in the present study, as in the study by Maclay & Sleator (1960), Ss made judgments of the grammaticality of each sentence as well as judgments of each sentence's meaningfulness. However, unlike the Maclay and Sleator study, the present study avoids direct judgments of grammaticality in favor of the less controversial judgments of acceptability (Quirk & Svartvik, 1966). In addition to their judgments of comprehensibility and acceptability, the Ss in the present experiment gave ratings as to their confidence in these judgments.

Moreover, in order to obtain an independent calibration of the experimental sentences, a preliminary experiment was conducted, using a paradigm not unlike the cloze procedure (Taylor, 1953). Ss guessed

the words deleted from each test sentence and rated their confidence in their choice of words.

EXPERIMENT 1

Subjects

Twenty-four male and female young adults served as Ss in this experiment conducted at The Rockefeller University. All Ss were native speakers of English.

Materials

Thirty English sentences were constructed as base sentences. They had the following constraints: (1) each sentence was 12 words long; (2) each sentence contained a 6-word subject phrase and a 6-word predicate phrase; (3) all main verbs were transitive and in the active voice; (4) no noun was used as the subject in more than one sentence, and no verb was used as the main verb in more than one sentence. From these base sentences, 60 11-word-long word strings or "incomplete sentences" were constructed. The main verb was omitted in each of the 30 base sentences to form 30 incomplete sentences, and the subject noun was omitted in each of the 30 base sentences to form an additional 30 incomplete sentences. The base sentences were then arbitrarily divided into three sets of 10 sentences each.

Each of the 60 incomplete sentences was typed on the center of two sheets of white paper, 8½ x 2¾ in. The only irregularity was that all commas were omitted as internal sentence punctuation. Six different 20-page booklets were made from these sheets of paper. In each booklet were placed the 10 incomplete sentences with the noun omitted constructed from one of the three sets of base sentences and the 10 incomplete sentences with the verb omitted constructed from another of the three sets of base sentences. Three copies were made of each of the 6 booklets so that there were 24 booklets in all. All booklets were identical, except for the order of the sentences. The order of the sentences in each booklet was quasirandom and determined by shuffling.

PROCEDURE

Each S was given one of the 24 booklets, depending on his time of arrival for testing. S was told that there was a sentence with one word deleted on each of the 20 pages in his booklet. He was to read the sentence on each page of the booklet, to decide where in the sentence the one word was deleted, and then to indicate this spot by putting a caret (^) between the two words surrounding the spot. Next, S was to decide what the exact word deleted was and to indicate his choice of words by writing it above the sentence on top of the caret.

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sentences shows that this finding is largely caused by the unusually high mean acceptability score of 9 of the 30 sentences where the noun is omitted. With one exception, these 9 sentences seem to be characterized by the fact that all the subject nouns which were removed were directly modified by words which, in other contexts, could function alone as subjects.

As was indicated above, no Ss in Experiment 2 were told that words had been omitted from any of the sentences. Nevertheless, after the experiment, a number of Ss informally reported that they realized that words were missing in some of the sentences. Some Ss indicated further that they judged a sentence with a missing word comprehensible on the basis of how easy it was for them to "fill in" the missing word. It was therefore hypothesized that the mean comprehensibility score for each of the incomplete sentences would be related to its mean corrigibility score found in Experiment 1. On the other hand, there was no a priori prediction of a relation between the mean acceptability scores of this experiment and the mean corrigibility scores found in Experiment 1. Pearson product-moment correlation coefficients were computed, both using the mean comprehensibility and mean corrigibility scores for each of the 60 incomplete sentences and using the mean acceptability and mean corrigibility scores for each of the incomplete sentences. As expected, in the former case a small but significant positive correlation was found ($r = .3525$, $p < .01$), whereas in the latter case the correlation was essentially zero ($r = -.0300$). As was indicated above, the mean corrigibility scores were found to be related to the consensus scores. For that reason, Pearson product-moment correlation coefficients were also computed, using the mean comprehensibility and the consensus scores in one case and using mean acceptability and consensus scores in another case. Again, as expected, the correlation in the former was negative and barely significant ($r = -.2764$, $.05 < p < .02$), whereas the correlation in the latter was not significantly different from zero ($r = .2071$, $p > .10$).

DISCUSSION

The present experiments demonstrate that removing the verb from a sentence has grave effects on the sentence's integrity. Ss show that they know *whether* the verb is missing as well as *where* it is missing by their consistently low acceptability scores

on sentences with the verb omitted in Experiment 2 and their extremely low frequency of location errors on the same sentences in Experiment 1. On the other hand, in approximately one-third of the sentences considered, removing the subject noun does not have such a pronounced effect on sentence acceptability. In addition, Ss are less able to locate the missing word in a sentence with the noun omitted and show less of a consensus as to what the missing word was.

Yet the results of the present experiment do not support the contention that the verb is the more important determinant of the *meaning* of a sentence. Removing the subject noun of a sentence is no less critical to the judged comprehensibility of the sentence than is removing the main verb. Although these results at first glance seem to contradict previous research, upon further consideration the contradiction can be seen as more apparent than real. This investigation shows that the main verb is more essential to the grammatical integrity or acceptability of a sentence than is the subject noun but that the verb is not necessarily more essential to the meaningfulness or comprehensibility of the sentence. Previous research was neutral with respect to this point, since no differentiation between comprehensibility and acceptability was made; only one judgment was made, and it could have been made as easily on the basis of grammaticalness as meaningfulness.

Nevertheless, it would be premature to discard the notion that the verb is more important to sentence meaning. One reason for caution is that there is evidence that Ss in this experiment may have been acting peculiarly when they rated the comprehensibility of sentences with a word missing. The significant correlation between mean corrigibility and mean comprehensibility lends credence to the contention that, at least to some extent, Ss rate as comprehensible a sentence that has a missing word if they are confident they can successfully guess or "fill in" the missing word. It would seem plausible

Table 2
Frequency Above and At or Below Median Acceptability and
Comprehensibility Scores on Incomplete Sentences

Sentence Type	Acceptability Scores		Comprehensibility Scores	
	Above -6.2	At or Below -6.2	Above 0.75	At or Below 0.75
Noun Out	19	5	11	13
Verb Out	4	20	13	11

that critical to the sentence's corrigibility is the extent to which the context of the missing word, or the words surrounding it, specifies or limits the missing word. As noted above, all base sentences were constructed so that they had equally long (six-word) subject phrases and predicate phrases. The choice of the missing verb was constrained by just as much context as was the choice of the missing noun. It is not surprising, therefore, that in this experimental situation, sentences with the verb omitted have corrigibility scores as high as sentences with the nouns omitted. In light of the strategy that many Ss were using, it is not unreasonable that sentences with the verb omitted should have comprehensibility scores as high as sentences with the noun omitted. However, if Ss were instructed to interpret "comprehensibility" by some other strategy, the results could easily be different.

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NOTE

1. Rossiter, J. R., & Jackson, S. F. The verb as the main determinant of sentence meaning: Further examination. In preparation.

Underneath each sentence, S was then to write a number, from 1 to 7, expressing his degree of confidence in his choice of what word was deleted; the higher the number, the higher his confidence. No time limit was imposed on S. He was merely instructed to read each sentence carefully but rapidly, respond to it quickly, and then turn to the next page without rereading the sentence or changing his response.

Results

Mean corrigibility scores were computed for each incomplete sentence. The mean corrigibility score for each sentence was merely the mean confidence rating given to responses on that sentence by the eight Ss who were to guess the word deleted from the sentence. The median of the mean corrigibility scores for sentences with the verb missing was 6.1, while the median of the mean corrigibility scores for sentences with the noun missing was 5.9. Thus, no significant difference between incomplete sentences with the noun missing and those with the verb missing was observable using this measure. Yet a simple frequency count of the number of instances when a S was wrong about the location of the missing word did reveal a striking difference between the sentences with the noun omitted and those with the verb omitted. In only one of the 240 possible instances was the caret misplaced in sentences with the verb omitted. However, there were 43 out of 240 possible instances of misplaced carets in sentences with the noun omitted.

One more score was computed for each incomplete sentence on the basis of the Ss' responses. This score represented the consensus or communality of the Ss' responses. The consensus score was computed by counting the number of different words chosen as the missing word by the eight Ss who saw each incomplete sentence. Therefore, the consensus score ranged from one (all Ss agreed) to eight (every S used a different word). To some extent, this score also differentiates the sentences with the nouns omitted from those with the verb omitted. The mean consensus score for sentences with the noun omitted (4.5) is higher than that for sentences with the verb omitted (3.23).

A priori, one would expect that the corrigibility score of each incomplete sentence would be related to its consensus score. To test this hypothesis, the Pearson product-moment correlation coefficient r was computed, using the mean corrigibility score and the consensus score for each of the 60 incomplete sentences. As expected, a high negative correlation was found ($r = -.6016, p < .01$).

EXPERIMENT 2

Subjects

Twenty-four native speakers of English served as judges. The experiment was first run at The Rockefeller University with 12 male and female young adults. It was then replicated using 12 male undergraduate students of Williams College. None of the Ss from Experiment 1 were used in this experiment.

Materials

Twenty-four booklets were constructed which were identical to those used in Experiment 1, except that 10 additional $8\frac{1}{2} \times 2\frac{3}{4}$ in. pages were included in each booklet. On the center of each of these additional pages was typed one of the 30 base sentences in its complete form. The 10 additional sentences for each booklet were chosen from the 30 possible sentences, so that each of the 30 base sentences was represented in each booklet either in its complete form, with its verb deleted, or with its noun deleted. Next, two control sentences, similarly typed on $8\frac{1}{2} \times 2\frac{3}{4}$ in. sheets, were added to each booklet. Both of these sentences were also 12 words long, with 6-word subject phrases and 6-word predicate phrases. They differed from the base sentences by being grammatical but semantically anomalous.

The order of the sentences in each booklet was quasirandom and determined by shuffling, except for a constraint on the order of the control sentences. In every booklet one of the control sentences was the 1st sentence and the other was the 17th.

Procedure

Each S was given one of the 24 booklets, depending on his time of arrival for testing.

The Ss were instructed to read the sentence on each page of their booklets and to make two judgments and give two confidence ratings for each sentence. First, they were to judge whether the sentence was acceptable or not—i.e., whether or not “the sentence is what a well educated speaker of English might say.” If they felt that the sentence was acceptable, they were to respond with the letter A; if unacceptable, they were to respond with the letter U. The Ss were then to make a confidence rating, from 1 to 7, indicating their degree of confidence in their judgments. Next, the Ss were to judge whether the sentence was comprehensible or not. If they felt that the sentence was comprehensible or meaningful, they were to respond with the letter C; if incomprehensible or meaningless, they were to respond with the letter I. The Ss then gave a rating indicating their degree of confidence in this latter judgment. No time limit was imposed.

S was merely instructed to read each sentence carefully, respond quickly, and not to reread a sentence or change a response. It is important to note further that, unlike Experiment 1, in this experiment Ss were not told that words had been omitted from some of the sentences.

Results

Comprehensibility scores and acceptability scores were computed for each S's response on each sentence. If S judged a sentence to be comprehensible, his comprehensibility score for the sentence was equal to his respective confidence rating; if S judged a sentence incomprehensible, his comprehensibility score for the sentence was equal to the negative of his respective confidence rating. Acceptability scores were similarly computed from the acceptability judgment and confidence rating.

Mean comprehensibility scores and mean acceptability scores were then computed for each sentence and for each of the 24 Ss. Table 1 gives the medians of the Ss' mean comprehensibility and acceptability scores. Clearly, the complete sentences are given much higher comprehensibility and acceptability scores by the Ss. To test whether or not the mean comprehensibility and the mean acceptability ratings differed for those sentences with the noun deleted and for those sentences with the verb deleted, the frequencies of mean comprehensibility and acceptability scores above and below the median scores on the incomplete sentences were computed (see Table 2). Chi-square tests were computed using the data from Table 2. The chi-square tests confirmed a significant difference between the Ss' mean acceptability scores on sentences with the verb deleted and those on sentences with the noun deleted ($\chi^2 = 18.8, p < .001$). On the other hand, no difference was found for Ss' mean comprehensibility scores between sentences with the noun missing and sentences with the verb missing ($\chi^2 = .33, p > .05$).

Sentences with the verb missing were thus judged to be less acceptable, but just as comprehensible, as sentences with the noun missing. Observation of the mean acceptability and comprehensibility scores by

Table 1
Medians of Ss' Mean Acceptability and Comprehensibility Scores

Sentences	Acceptability	Comprehensibility
All sentences	-5.7	2.9
Complete sentences	4.65	6.4
Noun missing	-5.55	0.55
Verb missing	-7.0	1.2
Noun or verb missing	-6.2	0.75