

Context effects in judgment of frequency*

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The Ss made absolute frequency judgments of words presented in short-phrase contexts. Judgments were highest when the entire phrase was repeated intact, next highest when the context changed but the critical word retained the same meaning, and lowest when both the context and meaning changed on each presentation. Recognition memory was not systematically affected by the context variable. The results provide further support for the view that frequency judgment and recognition memory are not equivalent processes.

Rowe (1973) examined the consequences for absolute frequency judgments of repeating the to-be-judged words in short phrase contexts designed to elicit the same or a different semantic encoding on each presentation. With the same phrase repeated one to five times, the judged frequency of the critical word was the same as when the word was presented without the accompanying context. Repeating each word in a different phrase but with the meaning held constant (e.g., *doctor's bill*, *grocery bill*) resulted in lower judgments, but not as low as when both the context and the meaning varied (e.g., *doctor's bill*, *duck's bill*). In addition, the slope of the function relating judged and presented frequency was lower for the different-meaning items, suggesting an attenuation of frequency estimation ability by the changed semantic context. Furthermore, recognition memory, as measured both by the number of nonzero frequency estimates and by confidence ratings in a separate experiment, was unaffected by the three context conditions, suggesting that frequency judgments and recognition memory are mediated by different psychological processes. Following the model of Anderson & Bower (1972), it was proposed that frequency judgments were based on the number of discriminable memory traces set up by a presented item, while recognition responses depended on whether the contextual association for at least one trace surpassed some required threshold value.

One aspect of the frequency judgment data presented by Rowe (1973) detracted from a completely unambiguous interpretation of the obtained context effects, in that there were significant differences among the experimental conditions for items presented only once in the study list, with repeated words and repeated phrases producing higher estimates than the two changed-context conditions. Since the four types of lists were administered to different groups of Ss, the obtained differences for once-presented items were attributed to generalized set effects, such that the tendency to give higher estimates in some conditions for

multiple presentations generalized to items which had been presented only once. The presence of this type of effect is obviously undesirable, as there is no way of knowing the extent to which it might have systematically affected the frequency judgments of items presented more than once. The experiment to be reported here attempted to correct this deficit in the previous study by examining context effects as a within-Ss variable.

METHOD

Lists

The items consisted of 120 homonyms embedded in short phrases designed to evoke either the same (SM) or a different meaning (DM) reaction to the homonym on each presentation (see Rowe, 1973). Twenty-four homonyms were each assigned to frequency levels of one, two, three, four, and five in each of these two context conditions and in a repeated-phrase (RP) condition, where each phrase was repeated intact. The phrases were typed on 3 x 5 in. white index cards. Two separate sets of cards were constructed, with 12 items from each condition in one set and the remaining 12 in the other. Three different decks of cards were then drawn up from each set, such that four items represented each condition (RP, SM, DM) at each frequency level in each deck, with all 12 items occurring once in each condition across the three decks for any given frequency level. Thus, for example, the twice-presented word *beam* might occur as a RP item (*headlight beam*, *headlight beam*) in the first deck, as a SM item (*headlight beam*, *beam of sunshine*) in the second deck, and as a DM item (*headlight beam*, *beam with satisfaction*) in Deck 3. The resulting six decks were each presented to six different Ss in the course of the experiment. Within each deck, the cards were assigned to positions by a modified block-randomized procedure to insure that items representative of each context condition and frequency level would be evenly distributed. This was accomplished by dividing each deck into five sections and assigning items to sections on the basis of their frequency, with repetitions occupying all possible adjacent sections. Thus, each item of Frequency Level 5 occurred once in each section, half of the items of Frequency Level 4 occurred in Sections 1-4, and the other half in Sections 2-5, and so on. Each section of the deck was then shuffled, to give an average lag of 34 between successive repetitions of all item types.

Procedure

The Ss went through the deck of cards in time with the clicks from an electronic metronome, which sounded every 3 sec. They were told to read the words on each card to themselves in preparation for a later memory test, but the nature of the test was not specified. Practice in going through the cards at the 3-sec rate was provided by a set of 10 cards containing three-digit numbers. Immediately after going through the deck, the Ss were given an answer booklet containing four pages, with 20 words per page. Fifteen of the words on each page were the homonyms from the study deck and five were new (zero-frequency) words. The homonyms representing the various experimental conditions were distributed randomly throughout the test booklet. The Ss were instructed to write a number in the blank beside each word to indicate how often the word had occurred in the deck of cards. The same booklets were used for the three decks representing each of the two sets of items, but of course different booklets were used for the two different sets. Thirty-six paid volunteers, all of whom were undergraduates at Memorial University, participated in the experiment. The Ss were tested individually or in groups of two or three.

*This research was supported by Grant A8580 from the National Research Council of Canada. Madonna Tracey and Gary Coleridge assisted in the data collection and analysis.

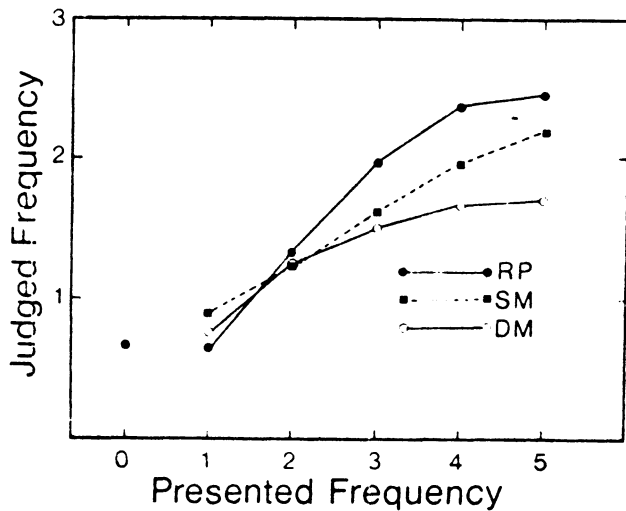


Fig. 1. Mean frequency judgments for repeated phrases (RP), same-meaning (SM) phrases, and different-meaning (DM) phrases as a function of presented frequency.

RESULTS AND DISCUSSION

The mean frequency judgment for the items in each experimental condition is shown in Fig. 1. Judged frequency increased as a direct function of presented frequency in all three context conditions, but the rate of increase was lower for DM and SM items than for RP. The most noticeable differences among the curves occurred at frequencies of 3 or greater. These observations were in general confirmed by a 5 by 3 within-S analysis of variance, which produced significant main effects of frequency, $F(4,140) = 64.9$, and context, $F(2,70) = 13.9$, and a significant Frequency by Context interaction, $F(8,280) = 3.94$ (all $ps < .001$). The differences among the context conditions were tested

separately at each frequency level by one-way analyses of variance, followed by correlated t tests. The .05 level of significance was used throughout. At frequencies of 3 and 4, Conditions SM and DM both differed significantly from RP but not from each other, while at Frequency Level 5, RP and SM both differed from DM. There were no significant differences at Frequency Level 2, but for once-presented items, RP words were given significantly lower estimates than were SM. Since all items were represented equally in the three context conditions across decks, this difference is not readily interpretable.

Recognition memory scores (Fig. 2) were derived from the frequency estimates by calculating the mean proportion of nonzero estimates assigned to the words in each condition. In contrast to the frequency judgments, these data did not reflect any consistent context effects. An analysis of variance yielded a significant effect of frequency, $F(4,140) = 36.4$, $p < .001$, and a significant Frequency by Context interaction, $F(8,280) = 2.19$, $p < .01$, but no effect of context, $F(2,70) = 2.04$. Follow-up comparisons at each frequency level, as described above, showed that significant differences were present only at Frequency Level 1, where RP and DM items were both recognized more poorly than SM but did not differ from each other. The latter result, which probably accounts for the significant interaction, is similar to that observed in the frequency estimates for once-presented items, but again is not interpretable in the context of the present design.

These data replicate and strengthen the results reported by Rowe (1973), who found the same ordering of the three context conditions in an identical judgment task where context was manipulated between-Ss, and a similar null effect on recognition scores. The overall conclusions drawn from that study are further supported here. Since frequency judgments are sensitive to changes in the semantic context of repeated words, while recognition memory is not, the findings are difficult to reconcile with the point of view that frequency judgments and recognition memory share equivalent processes, as is proposed by the frequency theory of recognition memory (Underwood, 1971).

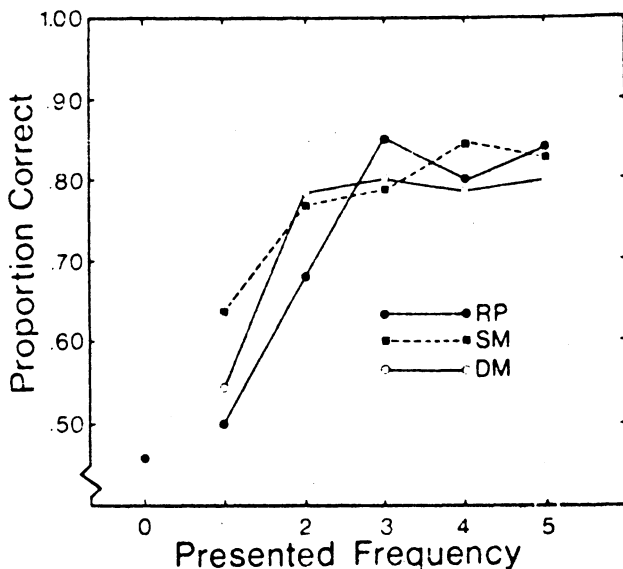


Fig. 2. Recognition memory for repeated phrases (RP), same-meaning (SM) phrases, and different-meaning (DM) phrases as a function of presented frequency.

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(Received for publication July 13, 1973.)