First-trial guessing and verbal-discrimination learning¹

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Several sets of data from verbal-discrimination learning experiments were analyzed to determine if guessing right or wrong on Trial 1 affected performance on the following trials. In some analyses, correct guessing facilitated subsequent performance. The results were related to a frequency theory of verbal-discrimination learning.

In the typical verbal-discrimination task, S is presented a series of pairs of verbal units, one member of each pair having been arbitrarily designated as correct by E. On each trial, S chooses one member of each pair, after which he is told which item is correct. On the first trial, S is usually instructed to guess; by chance, half of these guesses are expected to be correct. The present paper is concerned with the effects of this guessing on subsequent performance.

Ekstrand, Wallace, & Underwood (in press) have recently proposed a frequency theory of verbal-discrimination learning. This theory states that an important cue for learning the discrimination is the subjective difference in frequency of occurrence between the correct item and the incorrect item in each pair. A prediction of the theory is that increasing this difference (in favor of the correct item) should facilitate learning, by allowing S to use the simple rule of choosing the more frequent item in each pair.

For pairs in which S guesses the correct item on the first trial, the frequency difference is increased in favor of the correct item, compared to pairs in which S guesses the incorrect item. Correct guessing should therefore facilitate performance on the following trials. Although Ekstrand et al make no specific prediction concerning the effect of guessing, comparison of performance for pairs guessed differently provides a stringent test of their theory.

For data from two previously published studies, and for new data, the effects of Trial 1 guessing on performance on Trials 2 and 3 were analyzed. Only these trials were used because learning is very rapid with this task.

Method

Underwood, Jesse, & Ekstrand (1964).² In this study, six groups of 16 Ss each learned two successive verbal-discrimination tasks. Only the first task was used for the present analysis. Each list contained 16 pairs of low-frequency words. The procedure was to present the pair for 2 sec. for anticipation, followed by another 2-sec. presentation of the pair with the correct item underlined. In making the analysis, one protocol was not clearly marked, thus data from 95 Ss were used.

Spear, Ekstrand, & Underwood (1964).² In two of the experiments reported, Ss learned a verbal-discrimination task as a first task. In Experiment 2, two groups of 20 Ss each learned a list of 12 pairs of low-frequency words. The pair was presented for anticipation for 2 sec., followed by a 2-sec. presentation of the correct item alone.

In Experiment 3, seven groups of 15 Ss each learned a list of 12 pairs of low-frequency words. There was one change in procedure from Experiment 2. After the 2-sec. anticipation interval, S was shown both items for 2 sec. with the correct item underlined.

New data. A list of 18 pairs of low-frequency words was presented for five trials, with a different random order of the pairs on each trial. Construction of the pairs and determination of the correct word in each pair was random, with the restriction that no two words with the same first letter could be in the same category. On each trial, the correct word was on the left for half of the pairs, on the right for the other half, with position otherwise randomly determined. The pair was presented for 2 sec., during which S made his choice, followed by a 2-sec. presentation of the correct item alone.

There were 15 introductory psychology students in each of two conditions. In the Control condition, the pairs remained the same for all trials, as in the other studies. In the Scrambled condition, correct items and incorrect items were re-paired on each trial, with the restriction that no pair occur more than once in the five trials. These two conditions did not differ in terms of overall performance ($F < 1$), and only those data relevant to the present analysis are presented.

Results and Discussion

Trial 2 performance. For each S, the proportion of correct responses on Trial 2 was determined for pairs guessed correctly on Trial 1 and for pairs guessed incorrectly. These proportions were then used as entries in the analysis of variance.

Table 1 indicates that Trial 2 performance was only slightly affected by Trial 1 guessing, although an interesting pattern of results was obtained. There were

Table 1. Mean Proportion Correct on Trial 2 for Pairs Guessed Correctly and Incorrectly on Trial 1

Data	Trial 1 Guessing	
	Correct	Incorrect
Underwood et al	.72	.64
Spear et al, Exp. 2	.81	.80
Spear et al, Exp. 3	.78	.73
Control	.67	.72

two experiments in which information was given by presenting both items with the correct item underlined. For these data, guessing correctly on Trial 1 facilitated Trial 2 performance, significantly in one case (Underwood et al, 1964; $F=5.51$, $df=1/89$, $p<.05$), not significantly in the other (Spear et al, 1964, Experiment 3; $F=2.30$, $df=1/98$, $p<.20$). In contrast, when information consisted of presenting the correct item alone (Spear et al, Experiment 2; Control), there was no suggestion whatever of a guessing effect ($F<1$ in each case). It thus seems possible that the immediate effect of guessing might depend on the manner in which information is given.

For the Spear et al (1964) data, performance in Experiment 2 was superior to that in Experiment 3 ($F=4.30$, $df=1/136$, $p<.05$). These investigators reported no difference between experiments, in terms of trials to criterion. This measure might have been insensitive because of very rapid learning. The present analysis indicates that presenting the correct item alone produces better immediate performance than presenting both items. This difference is consistent with frequency theory, since the first technique provides greater frequency for the correct item.

In the Scrambled condition, four different pair types occurred on Trial 2, consisting of all possible combinations of correct items guessed and not guessed with incorrect items guessed and not guessed. Performance on pairs in which both items had been guessed on Trial 1 (.55 correct) was significantly inferior ($F=16.65$, $df=1/14$, $p<.01$) to average performance on other types of pairs (.77 correct). It should be noted that when both items have been guessed, there is a frequency difference of +1 in favor of the correct item (because it is presented twice), which is identical to the difference when neither item has been guessed. The result obtained thus suggests that pronunciation frequency is more important than presentation frequency in determining difficulty, when both have occurred.

Trial 3 performance. For the first two trials, there are four possible patterns of being correct (C) and incorrect (I), CC, CI, IC, and II. For two sets of data, the proportion of correct responses on Trial 3 for pairs in each category was determined for each S. Performance in the Spear et al (1964) experiments was too high to allow this analysis.

In the Underwood et al (1964) experiment, 20 Ss were lacking at least one entry, and they were excluded from the analysis. For the remaining Ss, there was a nonsignificant difference ($F=3.66$, $df=1/69$, $p<.10$) in favor of pairs (guessed) correct on Trial 1 (.81

correct), compared to pairs incorrect on Trial 1 (.75 correct). This difference is probably underestimated, since the partial data from the 20 Ss not used supported facilitation by guessing correctly (8 differences in favor, 2 opposed, 10 no difference). In the Control condition, the mean proportion correct for pairs correct on Trial 1 (.84) was significantly higher ($F=13.49$, $df=1/14$, $p<.01$) than that for pairs incorrect on Trial 1 (.60). For both sets of data, performance on pairs correct on Trial 2 was significantly better than that for pairs incorrect on Trial 2, as expected in a learning situation, and there was no interaction ($F<1$ in each case).

In the Scrambled condition, sixteen types of pairs were possible, with many categories having few entries. Each type of pair was characterized by the difference between the pronunciation frequency of the correct item and that of the incorrect item. For differences of +2, +1, 0, -1, and -2, the proportions of correct responses were .97, .86, .80, .69, and .78. The last point is based on only nine responses and should be given little emphasis. In the Control condition, differences of +2, 0, and -2 yielded proportions of .97, .73, and .46. It is therefore quite clear that Trial 3 performance is directly related to the difference in pronunciation frequency between the correct item and the incorrect item in a pair.

In general, the results provide moderate support for frequency theory. Correct guessing on Trial 1 was found to facilitate performance on Trial 2 or Trial 3 in some instances, and the opposite was never found. It appears that the manner in which information is given might influence both total performance (in a way consistent with the theory) and the effect of guessing. Analyses of the Scrambled condition suggest that pronunciation frequency is of greater importance than frequency of presentation in determining difficulty.

References

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Notes

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