Position as a stimulus in verbal learning

ROGER L. MELLGREN¹
INDIANA UNIVERSITY

Nine nonsense syllables were presented in four perceptual arrays—horizontal, vertical, and two diagonals. The method of paced anticipation was used with a red patch as the stimulus and a nonsense syllable response. An analysis of variance showed significant differences between arrays, with the horizontal array showing the fewest errors, vertical and high-left to low-right diagonal next, and the low-left to high-right diagonal showing the greatest number of errors. In each array the middle item had the fewest number of errors, indicating a strong and unexpected isolation phenomena due to the nature of the apparatus.

Serial position effect (SPE) has recently been explained by Ebenholtz (1966) as the learning of a sensory or a conceptual position within a series. Previous studies have shown a bow-shaped error distribution using spatial position (Ebenholtz, 1963; Jensen, 1962b), line length, and different shades of grays (Ebenholtz, 1965). The present study expanded Ebenholtz' 1963 study, which had a single vertical array (V), by including three additional arrays: a horizontal (H); high-left to low-right (HL-LR) diagonal array; and a low-left to high-right (LL-HR) diagonal array (see Fig. 1). The LL-HR diagonal was thought to be of particular interest because presumably one of two established habits must be broken in order to "organize" this array. The tendency for left-right organization requires a bottom-top order, and the tendency for a top-bottom organization requires right-left order. Because the ways of viewing this array are in opposition, it was speculated that learning would be more difficult in this condition.

Method

A 28 x 22 in. white poster board with 1 x 5/8 in. apertures was used to present nine nonsense syllables in one of four arrays (Fig. 1). The LL-HR array is shown as it appeared at the beginning of the experiment. Unused openings were backed by stiff white paper of equal brightness to the poster board. The array in use had strips of stiff paper painted black appearing in all openings. E moved the strips one at a time in a random order, exposing a red patch for 3 sec., followed by the nonsense syllable for 2 sec., after which the black portion was again presented. Timing was done by a metronome with the inter-item interval being 1 sec., and the inter-list interval being 10 sec. When the red patch appeared, Ss anticipated the syllable by writing it on either a horizontal or vertical response sheet. Previous responses were covered by requiring Ss to slide a blank white index card down or across their response sheets. A total of 11 trials

were given with each S responding on 10 of them. Eighty Ss were used in groups of either five males or five females. This made a total of three independent variables—array, response sheet, and sex.

Results

Mean number of errors at each position for each array are shown in Fig. 2. An analysis of variance revealed a significant effect for the arrays at the .025 level ($F=3.57$, $df=3/64$). Mean number of errors for the four arrays were: H=25.8; V=35.7; HL-LR=34.8; and LL-HR=43.6. Item position was also highly significant ($F=67.05$, $df=8/512$, $p<.001$). A comparison between the middle item and the other eight items confirmed what is obvious from Fig. 2 ($F=27.16$, $df=1/512$, $p<.001$). A comparison of mean errors for the first four items (17.8) and the mean for the last four items (14.3) was also significant ($F=11.52$, $df=1/512$, $p<.01$). This finding is the opposite from the typical negatively skewed SPE. All other factors (sex, and type of response sheet, and interactions) were not significant.

Discussion

Disregarding the middle item in the present study, there is a positive skew in the error distributions. Inspection of the error curves for the 1966 study by Ebenholtz also shows a positive skew (e.g., Experiment 1, Experiment 2 NS, Experiment 3, and Experiment 5). Since the maximum number of errors occur toward the start of the dimension, this may be a

Fig. 1. Representation of the arrays, with the LL-HR diagonal shown as it appeared at the beginning of the experiment.

Fig. 2. Mean number of errors for the four arrays, at each position.

crucial difference between the traditional serial learning experiment and the present position-within-a-dimension experiments.

The most startling result of the present study was

the rapid learning of the middle item. Although the unused apertures were made as inconspicuous as possible, they still appear to have had the effect of converging on the middle item, apparently making it more discriminable than the other items. Order of learning (considering two successive correct anticipations as evidence of Ss having learned an item) was also checked; the middle item, for all displays, was learned first. The fact that the most errors were made on the items surrounding the middle one argues against an "anchor theory" such as that proposed by Jensen (1962a) as an explanation of the SPE. Order of learning data also failed to show any anchor effect for the middle item. This result may further stress a difference between traditional serial learning and position-within-a-dimension learning.

References

- Ebenholtz, S. M. Position mediated transfer between serial learning and a spatial discrimination task. *J. exp. Psychol.*, 1963, 65, 603-608.
- Ebenholtz, S. M. Serial-position effect of ordered stimulus dimensions in paired-associate learning. *J. exp. Psychol.*, 1966, 71, 132-137.
- Jensen, A. R. An empirical theory of the serial position effect. *J. Psychol.*, 1962a, 53, 127-142.
- Jensen, A. R. Temporal and spatial effects of serial position. *Amer. J. Psychol.*, 1962b, 75, 390-400.

Note

1. The experiment was carried out at the University of Kansas. The guidance, ideas and encouragement of Profs. William Bogartz and Edward L. Wike, and the assistance in construction of the apparatus by Karen Mellgren are gratefully acknowledged.