Journal of Experimental Psychology
1962, Vol. 64, No. 2, 123–125

THE VON RESTORFF ISOLATION EFFECT WITH MINIMAL RESPONSE LEARNING[1]

ARTHUR R. JENSEN

University of California

H. von Restorff (1933) found that when an "isolated" or perceptually emphasized item was included in a list of relatively homogeneous items, *S*s would learn the isolated item quickly as compared with nonisolated items. The experimental literature and the numerous theoretical attempts to explain this phenomenon have been reviewed in a series of articles by Newman and Saltz (1958; Saltz & Newman, 1959, 1960). They concluded that the primary effect of isolation is to accelerate the learning of the isolated item as a response (Saltz & Newman, 1959, p. 450). Their experiments showed that the isolated item was indeed learned more rapidly as a response than a nonisolated item in the same serial position; the isolated item was emitted more frequently and occurred more often as an intrusion.

Learning a serial list of words or nonsense syllables, as in the Saltz and Newman studies, involves two phases: response learning and learning the serial order of the items. Thus, we may ask whether or not the isolation effect is manifest in the serial learning phase as well as in the response learning phase. The facilitation of response learning, emphasized by Saltz and Newman, is possibly only one result of isolation, and by itself may be inadequate to explain the total phenomenon.

The present experiment examined the isolation effect under conditions in which (*a*) all the items in the list were already known to *S* so that all he had to learn was their serial order, and in which (*b*) *S* need not make a different response in the isolated than in the nonisolated condition, i.e., the isolated and nonisolated lists were identical in terms of the responses *S* was required to make.

METHOD

Subjects.—Twenty men and 20 women were recruited from an introductory course in educational psychology.

Procedure.—To eliminate or at least minimize response learning, the serial lists in the experimental and control conditions were composed of nine colored geometric forms: triangles (T), circles (C), and squares (S) colored red (R), yellow (Y), and blue (B). Each shape appeared once in each of the three colors; stimuli of the same shape or color were never adjacent to each other in the list. The nine-item series was always preceded by three small white dots which served as the signal for anticipating the first item.

The stimuli were automatically projected onto a ground glass screen 2 ft. square. The figures were approximately 4 in. in size on the screen and the colors were vivid. The rate of presentation was 3 sec. per item, with a 6-sec. intertrial interval. The *S* sat approximately 10 ft. directly in front of the screen.

The *S*s were tested individually. The experimental and control groups were given identical instructions. The *S* was told he would have to learn to a criterion of one perfect trial the order in which nine stimuli repeatedly appeared on the screen. The stimuli were named for *S*, who was then asked to repeat the names, e.g., RED TRIANGLE, etc. All *S*s were easily able to give all the necessary reponses before beginning the serial learning. The *S*s learned by the anticipation method, responding by saying RED SQUARE, etc. They were urged to begin guessing on the very first trial and to guess when in doubt on subsequent trials.

[1] This research was aided by a grant from the National Science Foundation to the Center for Human Learning.

TABLE 1

SUMMARY DATA FOR CONTROL AND EXPERIMENTAL GROUPS

Group	Trials for Mastery of List		Percentage Errors at Position 6		Order of Learning Position 6		Percentage Intrusions of Item 6	
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
C	22.75	7.58	15.92	3.25	7.50	1.62	22.69	9.65
E	23.30	9.87	10.31	3.63	4.55	2.35	18.96	7.12
	$t < 1$		$t = 5.02^*$		$t = 4.50^*$		$t = 1.36$	

* $P < .001$.

Experimental conditions.—The order of the stimuli for Group C (Control) ($N = 20$) was: RS, YC, BS, YT, RC, BT, YS, RT, BC.

Previous experiments have shown that in a nine-item list Position 6 is generally the most difficult to learn. Therefore in the present experiment the sixth item was "isolated" or emphasized in Group E (Experimental) ($N = 20$). The rest of the list was the same as that learned by Group C. For Group E, instead of an actual blue triangle in Position 6, the words BLUE TRIANGLE appeared, printed in letters 2 in. high on the screen. Thus, Group E was required to learn the same responses as Group C; only the stimulus properties of the item in Position 6 differed for the two groups. The names of the shapes and colors, which are high frequency words in the Thorndike-Lorge word count, are probably so high in terms of response availability that it seems safe to assume there would be no appreciable difference in the strength of the naming response to the actual blue triangle and to the words BLUE TRIANGLE, especially none that would be evident under the 3 sec. anticipation time allowed in the present experiment.

RESULTS AND DISCUSSION

The results are summarized in Table 1 and Fig. 1. The serial-position curves in Fig. 1 were obtained by determining each *S*'s percentage of errors at each position and averaging these percentages for each group. Though response learning per se was practically eliminated by the method of the present experiment, the isolation effect was clearly manifested, the difference between Groups E and C in percentage of errors at Position 6 being significant ($P < .001$). The large percentage of errors at Position 7, immediately following the isolated item, contradicts the idea that isolation has the effect of breaking the list into two parts, each of which may be learned as a single list. This finding agrees with the conclusion of Newman and Saltz (1958) that the more rapid learning of the isolated item does not increase its effectiveness as a stimulus for eliciting the next item in the series.

As can be seen in Table 1, the groups did not differ significantly in the number of trials required to learn the list, which is also what Newman and Saltz (1958) found. Unlike the

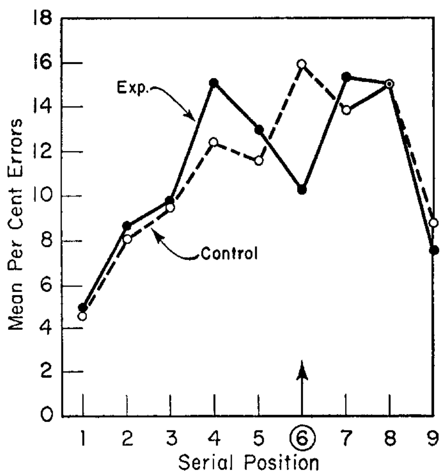

FIG. 1. Serial-position curves showing the isolation effect at Position 6 for Group E.

Newman and Saltz data, however, the conditions of the present study produced no significant differences between Groups E and C in the percentage of intrusions of Item 6 as an error in other positions. Saltz and Newman (1959) found that the isolated item was more likely to be emitted on the second trial, i.e., after a single presentation of the list. In the present study the total frequency with which BLUE TRIANGLE was given as a correct response on Trial 2 in Groups C and E was 2 each. The frequencies of BLUE TRIANGLE as an incorrect response on Trial 2 in Groups C and E were 10 and 13, respectively. The difference is nonsignificant.

The positions in the list were ranked for each *S* in the order that *S* learned them. The rank of a position was based on the number of the trial on which the last error occurred for that position. As shown in Table 1, the groups differed significantly in the mean rank order of learning Position 6. It has been found that when the items of a serial list are ranked in the order in which they are learned, the increment in errors on each item is a constant proportion of the total errors for all items (Jensen, 1962). A corollary is that for a given *S* the same number of trials (or reinforcements) is required to learn each item, once the previous item in the order of learning has attained the criterion of learning. In other words, it appears that all the items in a serial list are of equal difficulty as regards the learning of their serial positions. Since all the items cannot be learned in one trial (unless the whole list is within *S*'s immediate memory span) they are necessarily learned in a particular order. The serial-position curve would result from the high degree of unanimity among *S*s in the order of learning the items. Though isolation changes the order of learning, so that the isolated item is learned sooner, it does not seem to be any easier in relation to the previously learned item (regardless of its position) than is a nonisolated item. The differences between the percentage of errors on Item 6 and the previously learned item were 2.43 and 2.69 for Groups C and E, respectively. The hypothesis that isolation of an item changes only its order of being learned but not its difficulty is consistent with the general finding that isolation does not facilitate the learning of the list as a whole.

Summary

The von Restorff isolation effect was examined under conditions which minimized the role of response learning. Forty *S*s learned by the anticipation method the serial order of nine colored geometric forms, all of which *S*s could readily recall before having to learn their serial order. All *S*s learned the same *responses*; only the stimulus properties of the isolated item differed in the experimental condition.

The isolation effect was clearly manifested, showing fewer errors at the isolated position. The facilitation of response learning apparently is not the only effect of isolation and by itself cannot explain the total phenomenon. The number of intrusions of the isolated item did not differ significantly from that of the nonisolated item in the same position, nor did isolation facilitate learning the over-all list. It was suggested that when the effects of response learning per se are eliminated, isolation merely changes the order of learning the positions of the items in the serial list.

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(Received July 7, 1961)