The effect of overlearning on relearning following a confusion phase¹

H. WAYNE LUDVIGSON

THE UNIVERSITY OF TEXAS SOUTHWESTERN MEDICAL SCHOOL

After either criterion learning or overlearning of a concept, 77 male college students, in two experiments, received a series of "confusion" trials designed to induce them to abandon their learned mode of response. Following this phase without break, S was required to relearn the concept. Overlearning facilitated relearning.

As compared with achieving a minimal criterion of errorless performance, overlearning (OL) an initial concept has been found to facilitate college students' learning of a subsequent concept, when conceptual problems are shifted without warning. Furthermore the facilitation appears independent of the number of available response categories as well as the type of shift, reversal or nonreversal (Ludvigson & Caul, 1964).

Two quite different interpretations of this facilitation might be entertained. The facilitation might be of the nonspecific, learning-set variety, involving processes which affect the learning of most, if not all, concepts. Alternatively, OL might benefit performance by affecting quite specific response tendencies.

An example of the latter type of effect is suggested by data which show that OL decreases the persistence ("R persistence") with which Ss maintain their old mode of response following the onset of the shift to the second concept (Caul & Ludvigson, 1964; Ludvigson & Caul, 1964). That is, OL reduces the number of trials S takes in making his first response different from that which was appropriate to the initial concept. While this apparent hastening of the extinction of the initial mode of response should speed S toward learning a new concept, the magnitude of the effect appears small relative to the reduction in trials to criterion resulting from OL. Thus, although contributing to the OL effect the lowered resistance to extinction revealed in decreased R persistence seems insufficient to account for the major part of the facilitation. However, OL might result in more complete extinction of the first concept in the sense that it reduces its spontaneous recovery during the trials in which S is searching for the solution to the new conceptual problem. Such an effect might be beneficial to an extent not indicated by the R persistence measure.

The present study was designed to test this possibility. Following the learning or OL of the first concept a "confusion series" was administered to induce S to change his mode of response. This was immediately followed by a shift back to the initial concept instead of to a new concept as in the previous work. If the effect of OL is to result in more complete extinction

of the initial concept in the confusion series, OL should, if anything, interfere with the relearning.

Method

The materials and procedure were basically the same as those used by Ludvigson & Caul (1964). The task required S to sort 16 cards into two categories. In the first of two experiments half of the 48 male volunteers from psychology and biology classes learned the Horizontal-Vertical (HV) concept while the other half learned the Straight-Oblique (SO) concept. Within each of these groups 12 Ss were required to achieve a criterion of 10 successive correct responses (Group CL) while the remaining 12 Ss, after meeting this criterion, were given 48 additional trials before the confusion series was begun (Group OL). Similarly in the second study 15 Ss learned the reverse of the HV concept (RHV) and 14 learned the RSO, with eight of the RHV and seven of the RSO Ss given the CL treatment and the remainder given the OL treatment.

The confusion series consisted of 10 trials in which knowledge of results was given as follows. Regardless of S's response E told S he was "wrong" on the first three trials, "right" on the fourth trial, wrong on the next two, right on the seventh, and wrong on the last three. The same sequence of cards was used for all Ss in this series.

Immediately following the tenth trial of the confusion series E returned to reinforcing the concept learned prior to the confusion series. The relearning phase was continued until a criterion of 15 successive responses was reached.

Results and Discussion

The mean, median, and range of the number of trials to reach criterion (excluding criterial trials) in the initial learning and the relearning phases are presented in Table 1. In Experiment I, preliminary comparisons of the HV and SO concepts with the Mann-Whitney U test yielded values of $z=0.84$ and 0.82 ; $p>.40$ for initial and relearning phases, respectively. Pooling the data into CL and OL groups, initial learning was slightly but not significantly faster among CL Ss as compared with OL Ss according to the Mann-Whitney test, $z=0.97$; $p=.33$. Contrary to the hypothesis under test OL facilitated relearning, $z=2.103$; $p=.036$ for the comparison between CL and OL relearning scores. As may be seen in Table 1 this same conclusion was suggested by the average values of the difference scores (initial minus relearning). Wilcoxon signed-ranks analyses indicated that relearning was significantly easier in the OL but not the CL group, $t=64$; $df=22$, $p<.05$, and

Table 1. Mean, Median, and Range of Number of Trials to Criterion in Initial Learning and Relearning, and of the Difference (Initial minus Relearning) in Number of Trials.

Exp.	Group	Initial Learning		Relearning		Difference	
		Mean	Mdn.	Mean	Mdn.	Mean	Mdn.
		Range		Range		Range	
I	CL	HV	22.6 0 to 83	4.3 0 to 37	13.9 0 to 37	8.8 -30 to 70	-1.0
		SO	8.5 0 to 54	1.1 0 to 21	9.9 0 to 21	-1.5 -21 to 46	-6.8
	OL	HV	30.8 0 to 52	11.0 0 to 21	7.2 0 to 21	23.3 -15 to 123	7.5
		SO	16.0 0 to 125	6.0 0 to 29	6.6 0 to 29	9.4 -28 to 39	2.5
II	CL	RHV	78.5 16 to 126	82.0 4 to 111	43.1 4 to 111	35.4 -37 to 122	26.5
		RSO	21.1 2 to 51	20.0 2 to 64	25.6 2 to 64	-4.4 -44 to 18	-2.0
	OL	RHV	41.0 9 to 72	46.0 2 to 18	9.1 2 to 18	31.9 -5 to 59	37.0
		RSO	39.1 5 to 76	39.0 0 to 16	4.6 0 to 16	34.6 4 to 76	32.0

$t=129$; $df=24$, respectively. However, the Mann-Whitney test indicated that the difference between the difference scores for the CL and OL groups was significant only at the .10 level, $z=1.69$. Additional analyses, in which selected scores were omitted to ensure that the CL and OL groups were equated on the initial learning, further substantiated the conclusion that OL facilitated relearning.

The Experiment II preliminary analyses with the Mann-Whitney test revealed that the reversed concepts, RHV and RSO, differed in ease of learning in the initial phase, $U=47$; $df=14/15$; $p<.02$, but not in the relearning phase, $U=72$; $df=14/15$. The pooled CL and OL Ss did not significantly differ in the initial learning, $U=91$; $df=14/15$. Similar to Experiment I the relearning scores for the CL and OL groups were different, $U=36$;

$df=14/15$; $p<.02$, indicating that OL again facilitated relearning. Also as in Experiment I the difference between initial and relearning scores was significant for the OL group, $t=5$; $df=14$; $p<.01$, but not the CL group, $t=43$; $df=15$, while the difference between the differences was not significant, $U=67.5$; $df=14/15$.

These data lend no support to the notion that OL suppresses recovery of the initial mode of response. If OL does have such an effect, it is small relative to other more potent effects beneficial to relearning, and, in any case, cannot account for the usual facilitation of OL in reversal and nonreversal shifts.

Despite the lack of evidence for the recovery suppression hypothesis, there was some indication that, similar to the previous studies, OL Ss more quickly abandoned the original concept following the onset of the confusion series than did the CL Ss. The mean R persistence scores were 2.42 and 2.67 for the CL groups of Experiments I and II, and 2.25 and 1.21 for the OL groups of the respective experiments, yielding a $z=1.70$; $p<.05$ for the comparison across both studies with the Mann-Whitney test. The groups did not differ, however, in the number of responses in the confusion series which were incorrect with respect to the concept learned, $z=0.04$. The means were 3.46 and 2.87 for the CL groups of Experiments I and II, and 2.83 and 3.57 for the OL groups.

References

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