Some evidence supporting Nuttin's explanation of spread of effect[1]

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Sixty-six Ss were individually presented a series of 40 slides showing stimuli each with five possible responses and instructed to learn the correct responses to the stimuli. During the second presentation of the slides half the Ss were informed that the slides for which they had previously given "right" answers would be marked by a red X, as in fact they were. In comparison with Ss who did not see red Xs which denoted stimuli previously responded to correctly, informed Ss made significantly fewer repetitions of errors for positions both before and after rewarded S-R pairs. The results support Nuttin's explanation of the spread of effect.

Greenwald (1966) recently argued that the work of Joseph Nuttin (1947, 1949, 1953) has been neglected by American psychologists who have attempted to explain the spread of effect phenomenon. Thorndike demonstrated spread of effect using a series of stimulus words each having only one of a number of alternative responses as correct. The first time a series of stimuli was presented S guessed which one of a fixed set of alternative responses was correct and was immediately informed that he was right or wrong. On subsequent presentations of the series of stimuli S's task was to state the correct response for each stimulus. In such situations Thorndike demonstrated spread of effect, i.e., the fact that on subsequent trials there is a higher probability of repeating wrong responses close to a right response in a series of S-R pairs than distant from that right response.

Joseph Nuttin's experiments employed such a Thorndikian procedure during the first presentation of a series of stimuli and their alternative responses, but required on subsequent trials that S state whether the response he previously gave to each stimulus was called "right" or "wrong" by E. Nuttin observed a recall of reinforcement gradient similar in form to the repetition of errors gradient which is generally labeled the spread of effect gradient. Since Nuttin's dependent variable was the number of responses recalled as having been called right by E, his evidence is not appropriate for directly testing the law of effect, a point which Postman (1966) has noted.

Nevertheless, it may be the case that spread in recalling success produces the spread of effect phenomenon. Nuttin argued that in the typical spread of effect experiment S becomes confused about the position of each previous success, i.e., rewarded S-R pair, in an ordered series of S-R pairs being learned. Such confusion may lead to the repetition of responses previously called wrong because those responses are incorrectly remembered as having been called right. Confusion about where in a series a rewarded response occurred should be greater at positions in the series which are close to the rewarded response than at positions distant from it. This cognitive explanation of spread of effect is an interesting alternative to Thorndike's vague theory of direct and automatic strengthening of adjacent connections. As Postman (1966) and particularly Marx (1967) have pointed out, what is needed now is more evidence to determine the value of each theory. This paper describes an experiment which tests different predictions of the two theories.

METHOD

Subjects

Sixty-six introductory psychology students volunteered to participate in this experiment in order to satisfy a course requirement.

Materials

Stimulus material consisted of 40 slides presented on a Kodak Carousel projector. At the top of each slide was a two-syllable noun serving as a stimulus word. At the bottom of each slide were five bigrams randomly selected with the restriction that no two bigrams on any single slide would begin with the same letter.

Procedure

Each S was instructed that his task was to learn which bigram was the correct response for each stimulus word. Ss were told that correct answers had been randomly chosen, so that during the first presentation of the series of slides S would simply be guessing correct answers. S was informed that he would be told "right" or "wrong" after each of his answers. After S was given instructions the series of 40 slides was presented. Each slide was shown for 4 sec and approximately 1 sec was required for slides to be automatically changed.

For all Ss responses to slides in Positions 5, 15, 25, and 35 were called "right," and all other responses were called "wrong" by E, who recorded S's responses. After the series of slides was presented once a randomly determined half of the Ss in a control group were informed that during the second presentation of the series the task would be the same, but that E would not inform them if a response was right or wrong. The other half of the Ss comprised an experimental group which was informed that each of the four slides for which a correct response had been given would be identified by a large red X during the second presentation. These Ss too were told that the task was the same except that E would not inform them if a response was right or wrong. The 40 slides were again shown in the same order, differing only by the addition of a red X on slides 5, 15, 25, and 35 for the experimental group.

Design

It was assumed that during the second presentation of the slides Ss in the experimental group would not be confused about which slides had been responded to correctly during the first presentation, since those slides were clearly identified by a red X. The Ss in the control group, receiving the kind of treatment typically producing spread of effect, should have been confused about exactly which positions in the series they had given correct responses for during the first presentation. Since the greater confusion in the control group should lead to greater spread of recall by the control group, and since Nuttin's theory predicts that spread of recall produces spread of effect, Nuttin's theory leads to a prediction of greater spread of effect for the control group. Thorndike's conception of spread of effect leads to a prediction of equal degrees of spread of effect in both groups. The prediction was made from Nuttin's theory that significantly more wrong responses would be repeated by the control group for both fore- and after-gradients.

RESULTS AND DISCUSSION

For each S the mean number of repetitions of errors during the second presentation of the list was determined for all slides in the four positions preceding any slide for which a response was called correct. Likewise the mean number of repetitions of responses called wrong during the first presentation was determined for each S for all slides in the four positions following any slide containing a rewarded response. The mean percentage of repetitions for the fore-gradient was 21.0 for the control group and 16.3 for the experimental group. For the

after-gradient the mean percentage of repetitions was 25.4 for the control group and 19.7 for the experimental group. T-tests showed that the control group did make a significantly greater number of repeated errors for both fore-gradient scores ($p < .05$, one-tailed, $df = 64$) and after-gradient scores ($p < .025$, one-tailed, $df = 64$). These results clearly support the predictions made from Nuttin's theory. It should be emphasized that these results were obtained with the dependent variable appropriate for testing predictions derived from Thorndike's conception of spread of effect.

Another result was that the percentage of repetition during presentation 2 of the responses which had been rewarded during presentation 1 was 60 for the experimental group and 41 for the control group. This finding rules out the interpretation of the after-gradient superiority of the control group in this experiment by a guessing sequence hypothesis. This conclusion confirms similar conclusions of Postman (1961) and Alfert (1963). The number of sequences of responses following a particular rewarded response which could have been repeated following that rewarded response the second time through the list should have been greater for the experimental group. To trigger a chain of responses twice a response rewarded in Series 1 must be repeated in Series 2. One and a half times as many rewarded responses were repeated by the experimental group.

A final point should be mentioned. Any isolation effect of the type reported by Zirkle (1946) would tend to produce error repetition results opposite to those obtained in the present experiment. Zirkle observed greater spread of effect with increased isolation of rewarded items. The isolation of rewarded items produced by adding a red X decreased spread of effect in this experiment.

In summary, the reduction of confusion about where previous successes occur produced significantly less repetition of previous errors at positions adjacent to previously rewarded items than was observed when no such reduction was made. This conclusion supports Nuttin's explanation of the spread of effect.

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NOTES

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2. Presently at the University of Mississippi.