THE EFFECT OF VERBAL ENCODING ON THE RETENTION OF A MOTOR TASK

by

Parthena Marie Martin

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STATEMENT BY AUTHOR

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SIGNED: Parthena M. Martin

APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

Cecil A. Rogers
CECIL A. ROGERS
Professor of Psychology

18 June 1973
Date

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ABSTRACT

This experiment examined the effect of verbal encoding on the retention of discrete motor responses. Forty-eight college students were randomly assigned to three groups. Information was presented to the subjects by illumination of a sequence of ten keys. In one group the information was presented as a verbal task. The other groups were presented the information as a discrete motor task having either a large verbal component or a minimal verbal component. The data indicated that this verbal component facilitated learning and recall of a discrete motor task. It was suggested that the verbal cue aids in discriminating between discrete motor responses thus supporting Adam's hypothesis that verbal encoding is important in learning a discrete motor response.

INTRODUCTION

Adams (1971) has suggested that during motor learning the acquisition of motor responses is under the influence of verbal control. As learning progresses, this verbal component drops out. It is therefore possible that in discrete motor tasks, where the amount of practice is low, it is this verbal component which produces rapid forgetting similar to that found in verbal retention studies.

While it has been reported in several studies (Elwell and Grindley, 1938; Trowbridge and Cason, 1932; Newmann and Ammons, 1957) that subjects use verbal cues during motor learning, few studies have looked directly at the effects of verbal cues in motor learning. McAllister (1953) and Trumbo, Ulrich and Noble (1965) used verbal pretraining to build in a verbal component for motor responses. Both studies found that verbal pretraining facilitates motor learning. So far no attempt has been made to measure the degree of verbal influence in motor task acquisition and forgetting.

It was the purpose of the present study to vary the amount of verbalization in a discrete motor task and examine its relation to retention. This was done by

presenting subjects with a sequence of information which could be learned and recalled as a verbal task, as a discrete motor task with a large verbal component or as a discrete motor task with a minimal verbal component. If forgetting of discrete motor tasks were due to a verbal component, the more the retention curve should resemble that of a verbal task.

METHOD

Subjects

The subjects were forty-eight introductory psychology students from The University of Arizona. They were randomly assigned, sixteen each, to three groups, as indicated below.

Apparatus

The apparatus consisted of a panel placed on a table twenty-nine and a half inches high. On the panel was mounted a row of ten adjacent one inch square plastic keys. For one group of subjects the keys were blank; for the other two groups each key had a digit on its face. The digits were zero through nine and were arranged in random order. Information was presented to the subject by lighting each key for one second in the sequence the subject was to learn. Each key could be depressed and each depression of a key was recorded on an event recorder. Above the squares were three signal lights, a yellow "ready" light, a green "begin" light and a red "stop" light. The ready and begin lights came on immediately before the sequence and the stop light came on at the end of the sequence.

Procedure

Subjects were randomly assigned to one of three groups. After reading the instructions each subject was presented a sequence of information by illumination of the ten keys in random order. Subjects in the motor and verbal-motor groups were instructed to press each key as the light came on, then, after a retention interval, repeat their performance. The verbal group was instructed to watch the lights come on, then, after the retention interval, verbally recite the sequence that had been presented. For the verbal and verbal-motor groups the keys were labeled with digits while the keys were blank for the motor group. There were four retention intervals of 2, 7, 12, and 17 seconds. Each subject was presented four random sequences with four retention intervals.

At the beginning of each trial the ready and begin signals were each presented for one second. These were immediately followed by the ten second sequence of information. At the end of the retention interval the subject was signaled to begin recalling the information. The total times, from the beginning of the trial to the beginning of the recall period for the four sequences were 14, 19, 24, and 29 seconds.

RESULTS AND DISCUSSION

The retention curves for the three groups are shown in Figure 1. An analysis of variance revealed one main effect, amount of verbal labeling, to be significant, $F(2,45) = 17.325$, $p < .01$. A Scheffé test showed that the groups using labeled keys did significantly better ($p < .05$) than the group using unlabeled keys. This finding supports Adam's hypothesis that a verbal component is important early in practice. A possible reason for the verbal component facilitating performance in this particular task is that the labels help the subject discriminate between the keys. If labeling made discrimination between the keys easier, any other cues should facilitate performance.

A second Scheffé test indicated that the two groups making a motor response did significantly worse ($p < .05$) than the group making only the verbal response. The superiority of the verbal group could be attributed to pre-experimental transfer. Most people have had some experience learning and reciting sequences of digits but less experience pushing a sequence of buttons.

Another explanation for the better verbal performance is that response execution time for the motor response

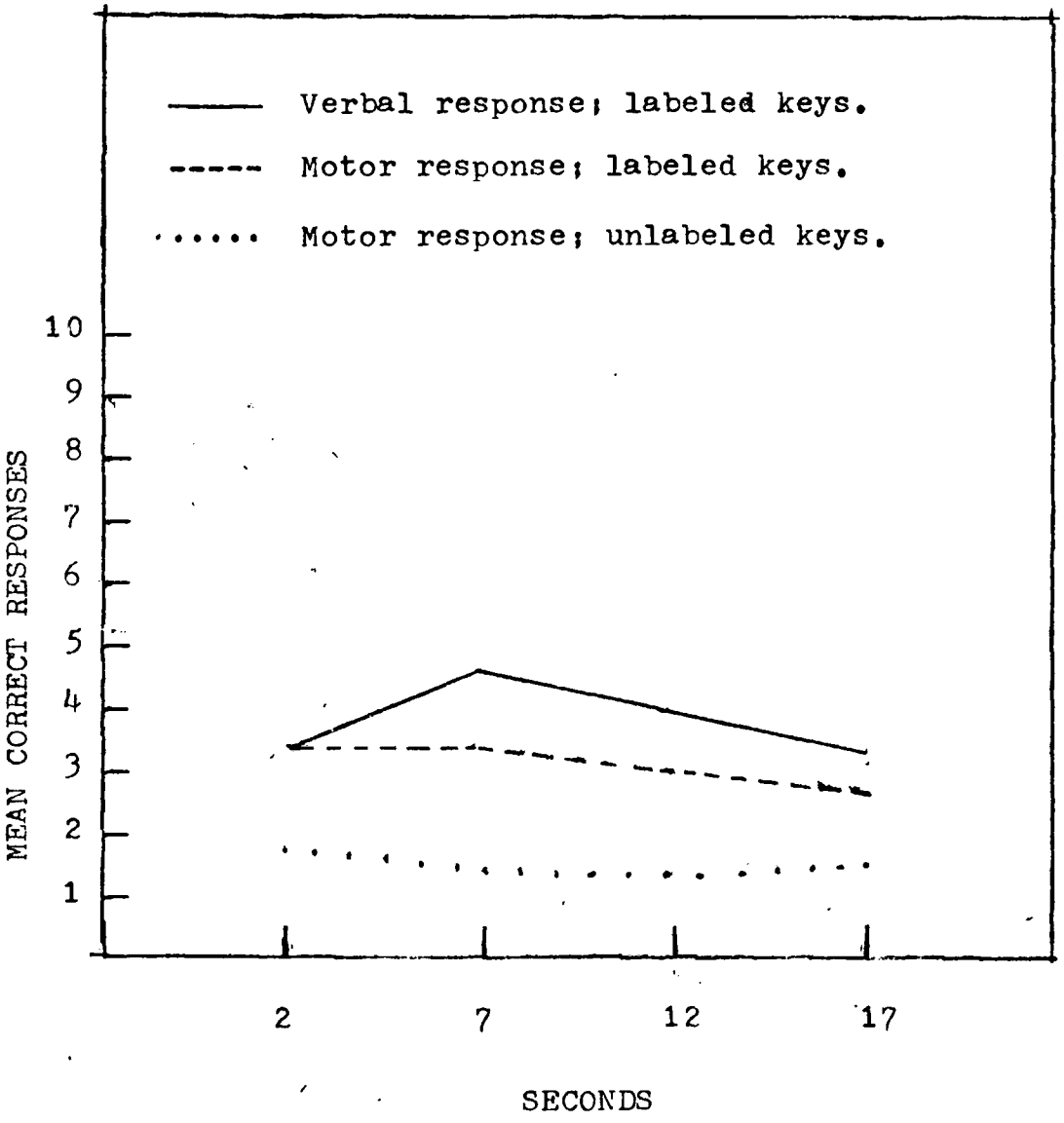

Figure 1. Mean Number of Correct Responses for Each Group and for Each Retention Interval.

was generally longer than response execution time for the verbal response, thus allowing more time for forgetting in the motor groups. Retention intervals are usually measured from the offset of the stimulus to the onset of the response. However, forgetting can occur while the information is being presented, during the retention interval and during the time the responses are being made. A more accurate measurement of the retention interval would be from the offset of the stimulus to the offset of the response.

The analysis of variance showed neither retention interval nor an interaction between labeling and retention to be significant. Bilodeau and Levy (1964) proposed a two-stage curve of forgetting in which forgetting first occurs rapidly, then becomes negatively accelerated so that little forgetting occurs in stage two. It is possible that all the measurements of retention in this experiment occurred in stage two.

It has been shown (Bartlett, Bartz and Wait, 1962; Bartz, 1962) that it takes subjects from 700 to 900 milliseconds to locate and recognize digits depending upon where they are located in his visual field. Since in this task each digit was presented for one second, little time was allowed for subjects to rehearse the information, making this study a reasonably pure test of immediate memory.

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