Affect and short-term retention¹

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The effects of motivation on retention were investigated. Using a short-term memory technique, stimuli were cued for different incentives. At a short time interval there were no differences in recall as a function of the incentive condition. However, after a longer interval, stimuli associated with a five cent reward or shock were recalled significantly more than stimuli for which neither shock nor money was a potential outcome. It was argued that motivation did not affect the strength of original learning, but did influence the temporally subsequent process of trace storage.

There are a number of major methodological inadequacies in studies relating motivation to memory. Among these shortcomings are a confounding of the degree of original learning with the amount of retention, and a lack of control of the behavior (e.g., rehearsal) between the onset of the to-be-remembered event and the time of recall (see Rapaport, 1942; Weiner, in press). A recent study by Weiner & Walker (in press) has overcome these difficulties by using the short-term memory technique devised by Peterson & Peterson (1959). In the Weiner and Walker study consonant trigrams cued for different incentives were used as stimuli. During the interval prior to recall Ss read digits in time to a metronome. The investigators found that following a short period of interpolated activity there were no significant differences in recall. However, after a longer interpolated interval, stimuli for which recall was rewarded with five cents and stimuli for which nonrecall was punished with shock were recalled significantly more than control stimuli. In the Weiner and Walker study the behavior between stimulus onset and later recall was controlled. Further, since no differences in immediate recall were found, the investigators concluded that motivation affected retention and not original learning.

The Weiner and Walker study is subject to some methodological criticisms. In their study recall at the short time interval was above 80% when responses were dichotomized as correct or incorrect. Underwood (1964) and Keppel (1965) have emphasized that actual differences in learning may be masked when performance is near asymptote and relatively insensitive measures of learning are used. The present investigation attempts to replicate the basic findings of Weiner and Walker, employing two methodological changes to insure that potential differences in learning are not masked. To decrease the overall level of performance four letter consonant stimuli rather than trigrams are the to-be-remembered units. And, to increase the sensitivity of the response indicator, each response is evaluated on an eight point scale of approximation to the correct response.

Procedure and Results

Four letter consonants cued for four different incentives were used as stimuli. The background colors on which the stimuli were flashed provided the discriminative signals. The four incentives were: one cent reward for correctly recalling the stimulus; five cents reward; shock for incorrectly recalling the stimulus; and a control condition. The shock was in the order of 200 volts with an exponentially decaying oscillation function which decreased to near zero in 3 msec. Each stimulus was projected for 1 sec. and read aloud by the S. There were three recall intervals: 2.8 sec., 9.35 sec., and 17 sec. During this interval the Ss read digits in time to a metronome beating 3.2 times per second. The recall period was 12 sec.

Ss first learned the color-incentive pairings. This was followed by six practice and 72 test trials. Within the first and last 36 trials each of 12 conditions (three time intervals by four incentives) appeared three times. The order of presentation was randomized but constant across Ss. The design was counterbalanced so that the color-incentive pairings varied across Ss. Ss were 20 male students.

Responses were scored one point for each consonant recalled and two points for each consonant recalled in its correct position. The maximum score of eight was received for perfect recall. The mean response score for each incentive condition at the three time intervals is shown in Fig. 1. An analysis of variance reveals a significant main effect due to the incentives, $F(3,57) = 8.70$, $p < .01$. A Newman-Keuls paired-mean test reveals that there are no significant differences in recall at the short time interval. At the intermediate interval stimuli associated with shock are retained significantly more than the control stimuli ($p < .05$). At the long interval stimuli associated with shock are recalled significantly more than stimuli associated with a one-cent reward ($p < .05$) and the control stimuli ($p < .01$). Stimuli paired with a five-cent reward also are recalled significantly more than the control stimuli ($p < .05$) at the long time interval.

Discussion

The general pattern of results replicates the findings of Weiner & Walker. Although a more difficult task and a more sensitive response indicator were used in the present study, there were no differences revealed in recall at the short time interval. This strongly suggests that Weiner & Walker had not masked possible learning differences. In a subsequent study this pattern of results again was replicated when the incentive cue was presented just prior to the onset of the stimulus.

There are several possible interpretations of the different rates of forgetting. It might be reasoned that

Fig. 1. Mean retention score at three time intervals as a function of the incentive condition.

there was differential rehearsal of the stimuli. However, the speed and difficulty of the interpolated task limits

the feasibility of this explanation. Further, Peterson & Peterson (1959) report that instructions to silently rehearse do not facilitate retention when this procedure is used. Finally, differential rehearsal would not explain the interaction found between the incentive conditions and the time intervals.

The present authors believe that the motivational manipulations in this experiment influenced the subsequent storage of the stimulus. It is suggested that heightened motivation during the perception of an event decreases the likelihood that the trace of that event will be subject to retroactive interference.

References

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Note

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