Effects of incentive and incentive-cue position on short-term retention[1]

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Ss recalled CCC trigrams differing in incentive value, temporal position of incentive cue, and length of retention interval. Recall varied as a function of incentive and retention interval, but was unrelated to cue position. Additional evidence suggested that differential learning and covert rehearsal may mediate the facilitative effects of incentive.

Two recent studies (Kernoff, Weiner, & Morrison, 1966; and Weiner & Walker, 1966) have shown that differential incentive conditions affect recall performance in a short-term retention task. Using CCC trigrams, recall under high incentive conditions was superior to recall under low incentive conditions. Weiner and Walker had their Ss recall trigrams (designated, by color background, as worth 5 cents, 1 cent, no shock, nothing) after either a 4.6 or 15 sec. interval, during which time Ss recited digits to the beat of a metronome. They obtained a significant incentive effect at 15 but not at 4.6 sec., and concluded that the incentive manipulation had affected the storage process, but not the original learning. It is possible, however, that the incentive cue, presented simultaneously with the stimulus, resulted in differences in original learning. The purpose of the present study was to replicate Weiner and Walker's findings under two conditions: with the incentive cue presented simultaneously with the to-be-remembered stimulus item, and with the incentive cue following the presentation of the to-be-remembered item. In the latter condition, differential learning as a function of incentive is precluded.

Subjects.

Twenty undergraduate and graduate students at Princeton University served as paid Ss. None had any prior knowledge of the experiment.

Stimuli.

The stimuli were 72 CCC trigrams of 25% association value (Underwood & Schulz, 1960). Following Weiner and Walker, trigrams having "V" or "W" were excluded from the list. No trigram began with the same letter less than four or more than five times. Incentive information was cued by background color. Thirty-six trigrams had a white background, 18 a red, and 18 a blue background. The accompanying 72 stimuli of 60 random digits each had similarly colored backgrounds. Trigrams on the white background were paired with colored digit stimuli, and vice-versa. Thus, each stimulus pair consisted of a trigram and digit slide, one of which was colored red or blue. Stimuli were presented by means of a Kodak Carousel slide projector. Sequences were programmed and timed automatically.

Procedure

The Ss were informed that their task was to remember the syllable presented, and that additional money could be earned depending upon the incentive condition for that syllable. For 10 Ss, correct recall associated with red was worth 5 cents; with blue, 1 cent. The incentive conditions were reversed for the other 10 Ss. The 2 by 2 by 2 design consisted of High and Low incentive, Pre-(trigram colored) and Post-(digit slide colored) item cue positions, and recall after 4.7 or 14.7 sec. of interpolated activity. The nine stimulus pairs for each of the eight conditions were presented randomly.

The Ss were first shown all the possible stimulus-incentive combinations and informed of the value for each color. This was followed by four practice trials in which Ss rehearsed the color values and counting procedure. All Ss were able to specify the incentive conditions both immediately before and after the experiment.

Each trigram was shown for .76 sec., and Ss read the letters aloud once. Following an interval of .76 sec., the digit slide was presented for either 4.7 or 14.7 sec., and Ss recited the digits aloud, from right to left starting at the bottom, to the beat of a metronome 3.3 beats per sec.). Finally, the screen went blank and Ss tried to recall the trigram presented. The intertrial interval was approximately 10 sec.

Results and Discussion

No significant differences were found between the red-high, blue-low and the blue-high, red-low incentive conditions ($t = 1.2$, $p > .05$) and these data were therefore grouped. Mean number correct for each experimental condition is presented in Table 1.

An analysis of variance indicated significant effects of retention interval ($F = 70.5$, $df = 1/152$, $p < .001$) and incentive ($F = 3.8$, $df = 1/152$, $p < .05$). No effect of cue position was obtained, and none of the interactions was significant.

Since the variance in tne data for any one cell is comprised of between S and within S factors, each S's

Table 1. Mean Number of Trigrams Recalled

Delay (sec.)		Incentive Value and Cue position: Low Pre	Low Post	High Pre	High Post
4.7	M	7.20	6.90	7.35	7.65
	SD	1.67	1.67	1.83	1.94
14.7	M	4.80	4.00	5.35	4.90
	SD	1.78	2.28	2.16	2.14

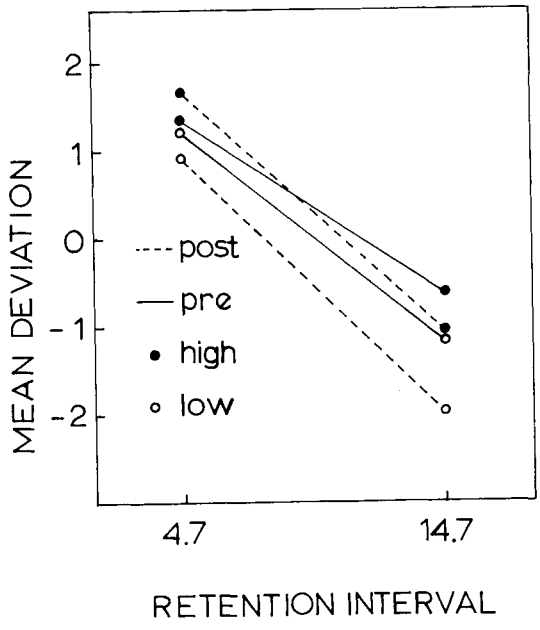

Fig. 1. Mean difference scores as a function of incentive and cue position.

score was expressed in terms of deviations from his individual over-all mean recall score. These data are presented in Fig. 1. Again, an analysis of variance indicated significant effects of retention interval ($F = 165.0$, $df = 1/152$, $p < .001$) and of incentive ($F = 9.0$, $df = 1/152$, $p < .001$). The effect of cue position and the interaction between position and interval, while not significant, were in the predicted directions.

Further analysis of the deviation scores at the 4.7 and 14.7 sec. intervals separately, yielded significant effects of incentive ($F = 6.8$, $df = 1/76$, $p < .001$) and cue position ($F = 4.7$, $df = 1/76$, $p < .05$) at the 14.7 sec. interval, but not at the shorter interval.

It is clear from these findings that incentive does have an effect upon retention. Recall for high incentive trigrams was superior to recall for low incentive trigrams. These data agree, in general, with those of Kernoff et al (1966), and Weiner & Walker (1966). However, the data of the present study do suggest that the effect of incentive on retention may be, in part, a function of differential learning. At the 14.7 sec. retention interval, the incentive cue position reliably affected recall performance. Trigrams cued during learning were better recalled than those cued at the beginning of the interpolated activity where differential learning was impossible.

It is also possible that incentive effects may be mediated by differential rehearsal during storage, that is, during interpolated activity. Two observations in the present study suggest this possibility. First, on ten separate occasions, some Ss verbally substituted a trigram consonant for a digit while reading the digits. This happened three times for low incentive stimuli and seven times for high incentive stimuli. Second, if covert rehearsal were occurring, improvement in recall performance would be expected as a function of practice. The design of the present study precluded detailed analysis of practice effects as a function of incentive value and incentive cue position. However, over-all recall performance was significantly superior during the second half of trials, suggesting that Ss were learning some skill relevant to the task. The direct effect of incentive upon a memory trace during storage would not be expected to vary systematically with practice. Therefore, experimental designs permitting detailed analyses of performance as a function of practice should shed light on this issue.

References

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