Magnitude of incentive contrast as a function of amount of verbal reward change*

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In Experiment 1 a decrease in incentive magnitude resulted in negative incentive contrast effects, which were a positive function of the amount of verbal reward reduction. In Experiment 2 an increase in amount of reward produced positive incentive contrast effects, which were, as in Experiment 1, a monotonic function of the amount of reward change.

Negative incentive contrast effects are obtained when the performance of Ss exposed to a decrease in amount of reward drops significantly below the level of performance of control Ss exposed to only the single lower reward magnitude, while positive incentive contrast effects are defined when an increase in amount of reward results in performance that rises significantly above the level of a high reward control group. While it is not entirely clear which variables determine negative and positive incentive contrast effects, magnitude of reward decrement is one variable that has been demonstrated to affect the magnitude of negative contrast effects with infrahuman organisms. DiLollo & Beez (1966) and Gonzalez, Gleitman, & Bitterman (1962) have reported that the size of negative contrast effects is a positive function of the amount of reward reduction. Few studies have examined the effect of magnitude of reward increment on positive contrast effects with animal Ss. Little information is available concerning how human Ss respond to the variable of magnitude of reward change. Experiment 1 investigated the magnitude of negative incentive contrast effects as a function of the amount of reward decrement with human Ss. Experiment 2 attempted to determine how human Ss respond to the variable of amount of reward increment.

EXPERIMENT 1

Subjects

The Ss were 17 male and 18 female undergraduate students enrolled in an introductory psychology course at the University of Melbourne, Australia. The Ss were assigned randomly to each of five equal groups.

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Materials

The materials consisted of a Kodak Carousel 750 slide projector 5½ ft from a 6-in. square piece of cardboard that served as a screen, 2 x 1¾ in. slides with digits printed on them (i.e., 856 x 8), and a stopwatch.

Procedure

Each S worked a different sequence of the same 20 mental multiplication problems. One answer or 60 sec (whichever came first) was allowed for each problem, and there were 9 sec between problems.

Table 1 summarizes the experimental procedure. The problems were worked in five situations. Ss received no reinforcement after their answers (N). Other Ss, in the control group (C), received 5 points after answering the 1st, 3rd, 4th, 6th, 9th, 10th, 12th, 14th, 17th, and 19th problems; and finally some individuals received a low (L) reward–10 points, a medium (M) reward–20 points, or a high (H) reward–40 points, through Problem 15 and then experienced a decrease in incentive magnitude to 5 points after the 15th problem.

Subjects who received L, M, H, or C were read the following instructions: "This is an experiment in abstract problem solving, the ability to work rapidly problems involving abstract reasoning. You will be given some problems to work. Each one consists of a three-digit number multiplied by a one-digit number. You are, without pencil and paper, to multiply mentally the numbers as quickly as you can and then tell me your answer. You will receive from 0 to 40 points after each answer; the speed and accuracy with which you answer will earn you more points. You will be told periodically how you are doing."

Table 1
Summary of Experimental Procedure: Amount of Reward Received for Each Phase and Group

	N	C	L	M	H
Preshift	–	5	10	20	40
Postshift	–	5	5	5	5

In the instructions to the N Ss, reference to receiving points was omitted.

RESULTS

Latency means (the time between slide onset and the first response) were examined in the analysis of the results. From Fig. 1 it seems that for Problems 1-15 the H Ss took less time to answer than any other individuals; the M group responded faster than the L, C, or N Ss; the L individuals took less time to answer than the C or N group; and finally, the N group took longer to answer than the C group.

The mean latency per problem from Problems 1-15 differed significantly among the five groups by analysis of variance [$F(4,30) = 2.85, p < .05$].

By Duncan's comparisons, Group H took less time to answer than did any other Ss ($p < .05$), the M individuals responded faster than L, C, or N Ss ($p < .05$), the differences between L and C, L and N, and N and C were each statistically significant ($p < .05$).

Figure 1 indicates that on Problem 16 the L, M, and H Ss each suddenly increased their mean latency to a level above the C individuals (negative incentive contrast effects). From Fig. 1 it also appears clear that on Problem 16 the H Ss took more time to respond than the M or L group, while the M individuals took more time to answer than the L Ss.

The mean latency per problem from Problems 16-20 differed significantly between the C, L, M, and H groups by an analysis of variance [$F(3,24) = 5.21, p < .01$].

By Duncan's multiple comparisons, the

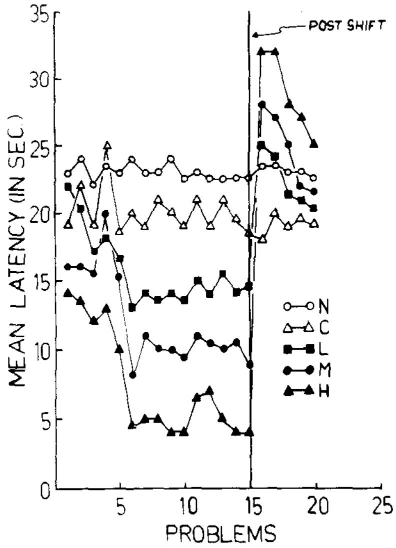

Fig. 1. Mean latency in seconds per problem. Groups L, M, and H shifted after Problem 15, denoted by arrow.

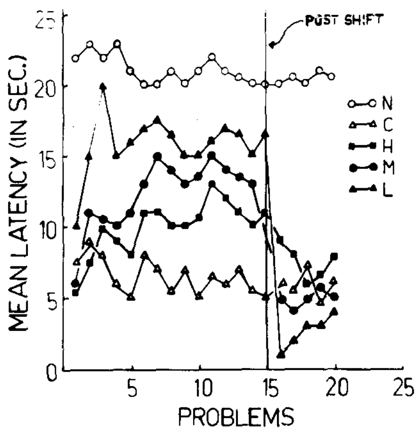

Fig. 2. Mean latency in seconds per problem. Groups L, M, and H shifted after Problem 15, denoted by arrow.

differences between H and C, M and C, L and C, H and M, H and L, and finally M and L were each statistically reliable ($p < .05$).

EXPERIMENT 2

Experiment 1 indicated that saying "5," "10," "20," or "40" after an answer are appropriate levels of reward to produce graded negative incentive contrast effects. In Experiment 2 these levels were selected to examine the influence of the amount of reward increment on the magnitude of positive incentive contrast effects.

Subjects, Materials, and Procedure

The Ss were 15 male and 15 female undergraduate students. The details of the Ss, materials, and procedure were the same as in Experiment 1, except that six Ss were assigned randomly to each of five groups, and the C individuals received 40 points, L Ss experienced 5 points, M Ss received 10 points, and finally, the H group experienced 20 points. The Ss in the L, M, and H conditions experienced an increase in amount of reinforcement to 40 points after Problem 15.

RESULTS

The same measure of Experiment 1 was examined in Experiment 2.

From Fig. 2 it appears that for Problems 1-15 the C group took less time to answer than any other group, the H Ss responded faster than the L, M, or N individuals, the Ss in the M condition answered faster than the Ss in the L or N situation, and finally, the L group took less time to answer than the N group.

The mean latency per problem from Problems 1-15 differed significantly between the five groups by analysis of variance [$F(4,25) = 3.01$, $p < .05$].

By Duncan's multiple comparisons, Group C took less time to answer than any other group ($p < .05$), the H individuals responded faster than the L, M, or N Ss ($p < .05$), and the differences between M and L, M and N, and L and N were each statistically reliable ($p < .05$).

From Fig. 2 it seems clear that on Problem 16 L and M groups each abruptly decreased their mean latency to a level below the C individuals (positive incentive contrast effects), while the H group reached the level of the C Ss. From Fig. 2 it also appears that on Problĕm 16 the L Ss responded faster than the M individuals.

The mean latency per problem from Problems 16-20 differed significantly among the C, L, M, and H groups by analysis of variance [$F(3,20) = 3.68$, $p < .05$].

By Duncan's multiple comparisons, the differences between L and C, M and C, and L and M were each statistically significant ($p < .05$), while the H Ss took as long to answer as the C group ($p > .05$).

DISCUSSION

The findings in Experiment 1, that for Problems 1-15 (1) the N group took significantly more time to answer than the C Ss and (2) response latency was a negative function of the amount of reinforcement, indicate that (a) saying "5" after an answer served as a reinforcing event where a reinforcement is defined as an event which produces a significantly higher level of performance than a control group that is not exposed to the event, and (b) four discriminably different levels of reinforcement were used where different magnitudes of incentive are defined in terms of whether or not they produce significantly different levels of behavior.

Experiment 1 demonstrated negative incentive contrast effects with a decrease in amount of reward. This result is consistent with most studies that have decreased incentive size with animal Ss (e.g., Black, 1968); these findings are also in accord with the few studies that have decreased incentive magnitude with human Ss (e.g., Weinstein, 1970).

Experiment 1 clearly indicated that negative incentive contrast effects are a positive function of the amount of reward decrement in human Ss. This result agrees with most studies with infrahuman organisms (e.g., DiLollo & Beez, 1966; Gonzalez, Gleitman, & Bitterman, 1962).

In Experiment 2, for Problems 1-15, the same relationship was obtained between incentive magnitude and response latency as in the preshift phase in Experiment 1. In other words, saying "5" after an answer served as a reinforcing event, and four discriminably different amounts of reinforcement were used.

Experiment 2 clearly demonstrated that positive incentive contrast effects are a monotonic function of the amount of reinforcement increment in human Ss.

It would appear that the magnitude of incentive contrast effects in human Ss is a positive function of the variable of magnitude of reward change.

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