Incentive shifts in a three-choice decision situation¹

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Abstract

The effects of changes in incentive conditions were examined in a three-choice, probability learning task. After 160 trials two groups of 10 Ss each were switched from low to high incentive conditions (No Payoffs to Payoffs) or vice versa, while two control groups of 10 Ss each performed under either low or high incentive conditions throughout. The switch from high to low incentives produced a decrease in the rate of predicting the most frequent event, but a corresponding increase was not observed for the group switched in the opposite direction.

Problem

Probability learning research indicates that $P(A)$, the proportion of trials on which Ss predict the most frequently occurring event, can be increased by the addition of either more events (Cotton & Rechtschaffen, 1958) or by monetary incentives (Siegel & Goldstein, 1959). Stochastic learning models which attempt to account for the latter phenomenon (Estes, 1962; Atkinson, 1962) implicitly assume $P(A)$ to be influenced by only the immediate reward structure.

Explanations for the increase in magnitude of $P(A)$ with monetary incentives have stressed their motivational effects (Siegel & Goldstein, 1959) and their implicit instructional properties (Edwards, 1961). Edwards argues that payoffs, among other functions, serve as instructions and remove ambiguity from the S's task by making a single strategy optimal. In a probability learning situation, payoffs may serve to make the optimal strategy, $P(A) = 1.0$, more salient.

If payoffs do subtly alter the task instructions, greater differences in $P(A)$ should occur among those Ss who are more sensitive to instructional set than among relatively insensitive Ss. The Crowne-Marlowe Social Desirability Scale (Crowne & Marlowe, 1960) may provide a means of identifying such individuals. The Crowne-Marlowe SD scale appears to measure "need for social approval" or, more generally, an individual's tendency to behave as he believes he "ought to" behave. Unpublished research indicates that high-scoring Ss are more sensitive to differences in instructions, which is how "appropriate" behavior is defined for the subject in an experimental situation.²

The present experiment focused upon two questions: (1) Is $P(A)$ influenced by the immediate reward structure alone, independent of previous incentive conditions? (2) Will the hypothesis that monetary incentives alter $P(A)$ through an instructional bias be supported by greater responsiveness of high SD Ss to variations in payoff conditions?

Method

The Ss were 40 male, university freshmen and sophomore volunteers. On every trial Ss were required to predict which of three lights would occur by turning on a switch under that light. There were two conditions during the first 160 trials: No Payoffs (NP), in which Ss were rewarded by the knowledge of "being correct" and a Payoff condition (P), in which Ss gained five cents for every correct prediction while losing five cents each time they were incorrect. Ss were instructed to remove a token from a tray on their left and place it into one on their right each time they were correct in their prediction (as indicated by which light actually occurred). When incorrect, they were to do the opposite. Under the payoff condition Ss were told that each token represented five cents.

After trial 160, each original group was split into two sub-groups of 10 Ss each. One of these sub-groups continued under the same incentive condition for the second 160 trials while the other was switched to the opposite condition. The occurrence of the lights was randomized in the proportion: $A = .60$, $B = .30$ and $C = .10$, within blocks of 40 trials. The sequence was identical for all Ss and all were told that no patterns could be found. After the 320 trials, Ss estimated the percentage of times the various lights occurred over the entire session and were then paid. Classification into high and low SD categories was made within each of the final four groups on the basis of whether S scored above or below his group median on the previously administered SD scale.

Results and Discussion

Separate analyses of variance were performed upon arcsin transformations of Ss' $P(A)$ per block of 40 trials for the first and last four blocks. Table 1 presents the average $P(A)$ in the Payoff and No Payoff conditions for blocks one through four. Aside from a general learning effect, the only significant result was an increasingly higher $P(A)$ in the Payoff condition than under No Payoffs. By block four this difference reached the .05 level of significance ($F = 4.58$ with 1,108 df).

Table 1. Proportion of Event A Predictions for the Payoff and No Payoff Groups over the First Four Blocks of Trials

Condition	Blocks of 40 Trials			
	1	2	3	4
No Payoffs	.398	.597	.624	.670
Payoffs	.402	.615	.696	.772

Table 2. Proportion of Event A Predictions over the Final Four Blocks of Trials and Event A Probability Estimates for Each Payoff Group

Group	Blocks of 40 Trials				Mean	Probability Estimates
	5	6	7	8		
NP - NP	.665	.665	.645	.642	.654	.649
NP - P	.702	.702	.672	.690	.692	.693
P - NP	.630	.655	.647	.667	.650	.555
P - P	.767	.787	.785	.807	.787	.663

Table 2 presents the mean P(A) values for the final four blocks of the experiment after the two original groups had been split and half of each switched to the opposite condition. It can be seen from the block values and the means over the final four blocks that, while the final incentive condition did affect P(A), this effect was highly dependent upon the prior incentive condition. When payoffs were removed (P-NP), P(A) declined but only a slight corresponding increase was observed in the group switched to the high incentive condition (NP-P). This result would indicate that, contrary to the present assumptions of stochastic learning models, the prior reward structure cannot always be safely ignored.

Table 3 presents the mean P(A) data of Table 2 separately for high and low SD Ss. The change in incentive conditions appeared to produce little effect among the low SD Ss; performance of the switched groups closely approximated that of the groups which continued under the initial incentive conditions. Among the high SD Ss, however, differences between the four final groups were large and significant well beyond the .05 level ($F = 3.82$ with 3,32 df). The overall differences in Table 2 appeared to result almost entirely from the performance of the high-scoring SD Ss. Removal of payoffs produced a strong decline in P(A), even below the prediction level of the constant No Payoff group, while the addition of payoffs had little effect.

The simplest explanation for the differential response of high and low need for approval Ss to the changes in reward structure seems to be a differential attentiveness to instructional biases and willingness to respond with what they perceive to be "appropriate" behavior. Aside from any motivational effects, variations in the reward structure of a task apparently instruct the subject when and how his behavior should be altered.

The far right column in Table 2 presents the post-session, Event A probability estimates for each of the four final groups. An analysis of variance was performed upon within-subject differences between arcsin transformations of the Ss' estimates and their mean P(A) for the final 160 trials. Probability estimates were con-

Table 3. Mean Proportion of Event A Predictions over the Final 160 Trials for High and Low SD Subjects within Each Payoff Group

Group	Group			
	NP - NP	NP - P	P - NP	P - P
Low SD	.644	.678	.716	.735
High SD	.665	.706	.584	.839

sistently lower than average final P(A) for the two groups given initial payoffs ($p < .001$; $F = 24.27$ with 1,32 df) but estimates and prediction rates did not differ in the groups given no initial monetary incentives.

Although the constant Payoff and No Payoff groups differed greatly in P(A), their estimates of the Event A probability were highly similar—both groups somewhat overestimated the actual Event A frequency. The change in incentive conditions, however, appeared to influence Ss' actual perception of the Event A frequency, as well as their choice behavior ($p < .05$; $F = 5.20$ with 1,32 df). This effect was especially noticable in the low average estimates for the group switched to No Payoffs, but the complimentary trend can be observed in the group switched to Payoffs. No differences were found between the estimates of high and low SD Ss, which is consistent with an interpretation of the SD scale as primarily a measure of response bias.

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Notes

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2. Personal communication from Dr. Mark W. Stephens, Purdue University, 1963.