SUPPLEMENTARY REPORT

SUPPLEMENTARY REPORT: DISCRIMINATION LEARNING WITH PROBABILISTIC REINFORCEMENT SCHEDULES

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This study deals with discrimination learning in a verbal conditioning situation and is an extension of research reported by Popper and Atkinson (1958). The study differs from theirs in that a new set of parameter values and a more rigorously controlled experimental procedure were employed. Two stimuli, $T_1$ and $T_2$, were used and two responses, $A_1$ and $A_2$, were available to S. Each trial began by the presentation, with equal probability, of either $T_1$ or $T_2$. On a $T_1$ trial, $A_1$ was correct with the probability $\pi_1$ and $A_2$ was correct with probability $1 - \pi_1$. For a $T_2$ trial, $\pi_2$ was identically defined.

Method.—Five groups were used. For all groups $\pi_1 = .9$. The groups differed with respect to the $\pi_2$ parameter which assumed the values of .9 (G-I), .7 (G-II), .5 (G-III), .3 (G-IV) and .1 (G-V). The Ss were given 400 trials. However, on the first 40 trials all groups were given $\pi_1 = \pi_2 = .5$. The Ss were 180 undergraduates, 36 per group. The experimental design was identical to that of Popper and Atkinson (1958) except that Ss were run in subgroups of three, each S placed in a private booth after instructions. The apparatus, viewed from within S's booth, consisted of two keys attached to the base of a panel, upon the panel were mounted four small lights. Two lights were in a column centered above the keys and served as the $T_1$ and $T_2$ stimuli. Each of the two remaining lights (the reinforcing signals) was mounted directly above one of the keys. On all trials the signal light ($T_1$ or $T_2$) was lighted for 1.5 sec.; the signal light went off simultaneously with the onset of a reinforcing light. The reinforcing light remained on for 1.8 sec., and was followed by an intertrial

\[ \text{FIG. 1. Observed mean values of } p(A_1|T_1) \text{ and } p(A_1|T_2) \text{ in successive blocks of 40 trials. Each point is based on approximately 20 observations per S.} \]

\[ \text{REFERENCES} \]


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interval of 4 sec. Trials were run without interruption and S made his response while the signal light was on. Instructions were similar to those presented in Atkinson and Suppes (1958) except that they were modified to describe the $T_1$ and $T_2$ stimuli as in Popper and Atkinson (1958).

Results.—Figure 1 presents mean response curves over all trials of the experiment. In this figure the proportion of $A_i$'s made on $T_1$ trials, $p(A_i|T_1)$, and the proportion of $A_i$'s made on $T_2$ trials, $p(A_i|T_2)$, are plotted in successive 40-trial blocks. The corresponding $\pi$ values are indicated on the far right. The asymptotic and pre-asymptotic characteristics of these curves are identical to those found by Popper and Atkinson (1958). One aspect of these results to be emphasized is the relation between the observed $p_x(A_i|T_1)$ and $\pi_x$. A convex function was found by Popper and Atkinson when $\pi_1$ varied from .85 to .15 (for a fixed $\pi_2 = .85$) and the same relation holds for this study. Specifically, if the proportions computed over the last 120 trials are used as estimates of $p_x(A_i|T_1)$, the obtained values are .930, .867, .808, .856, and .895 for Groups I to V, respectively. The convexity was found significant by evaluation of the quadratic component of the treatment sum of squares, $F = 18.2$.

The significance of these findings with regard to stochastic theories of discrimination learning is discussed by Atkinson (1958). In particular, the demonstrated convex relation between $\pi_2$ and $p_x(A_i|T_1)$ suggests that the Burke and Estes (1957) component model for discrimination learning is not applicable in this type of situation.

References


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