Probability learning in a context of transient stimuli

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The standard methodology of probability-learning research was applied for the first time to a recently developed task involving "new" and "old" stimuli, all eventually transient. Matching behavior was exhibited, but not dependably.

The literature on probability learning has grown quite large in the wake of the well known Estes & Straughan (1954) and Estes (1959) papers, as has the somewhat more specialized literature devoted to probability learning in discrimination situations. The interested reader may wish to see the review article by Estes (1964). Despite the high level of activity, however, further investigation seems necessary because human discrimination methodology is changing and now includes novel tasks that have never been examined from the probability learning point of view. One such task, first reported by Fleming (1964) and later employed by Goldstein & Fleming (1967) and Rosenberg (1968), is considered here.

METHOD

The task of interest is generally called the "new-old transient" task and differs from ordinary two-choice discrimination procedure only in that one of the two stimuli is discarded after each trial and replaced by a completely new stimulus. A sample display sequence is conveniently available in the paper by Rosenberg (1968). Up to now, reinforcement has been assigned either 100% of the time to the old stimulus or 100% of the time to the new stimulus. We shall here use the old stimulus as the reference and describe the foregoing as the $\pi(0) = 1.00$ and $\pi(0) = 0$ conditions. The present study added the $\pi(0) = .80, .60, .40$, and $.20$ conditions while repeating the $\pi(0) = 1.00$ and $\pi(0) = 0$ conditions, making six treatments in all. Each treatment was assigned to a separate group of 10 Ss. Since the groups differed only with respect to reinforcement probability, all groups used a common sequence of 300 displays which provided 300 trials. Displays were obtained by pasting printed nonsense forms onto 4 x 6 in. file cards and the cards were then arranged in 15 "Flip-File" trays that housed 20 cards apiece. S sequenced from trial to

trial by turning cards, and from tray to tray as needed. He indicated his choice by pointing. E said "correct" or "wrong" and made a record of the response. Designations of "correct" and "wrong" were determined in accordance with the probability learning treatment assigned to S's group. Each S performed separately. There was no time limit but performance times typically ran about 20 min for the $\pi(0) = 1.00$ and $\pi(0) = 0$ conditions, and about 40 min for the others. The Ss were 60 undergraduates at Long Island University.

RESULTS AND DISCUSSION

The performance data are plotted in Fig. 1, which is roughly consistent with the earlier literature in that the curves spread out as an approximate function of $\pi(0)$. Significance tests of the overall differences between treatment effects were obtained by calculating a $\rho(0)$ for each S across the last five blocks (100 trials) and then applying median test methodology. The resultant chi square was significant at the .001 level when all six treatments were evaluated jointly, and at the .01 level when only the four treatments from $\pi(0) = .20$ to $.80$ were considered.

Matching behavior was exhibited, more or less, by the Ss under the $\pi(0) = .80, .60$, and $.40$ treatments with $\rho(0) = .78, .59$, and $.45$, respectively, across the last five blocks. Matching did not occur under the $\pi(0) = .20$ treatment, whose corresponding $\rho(0)$ was $.43$, and the authors have no explanation for this asymmetry relative to the complementary condition of $\pi(0) = .80$. The extremes of $\pi(0) = 1.00$ and 0 also yielded departures from matching, but are subject to deterministic solutions and not clearly critical to probability learning arguments. It may be useful to note that $\rho(0)$ departed from $\pi(0)$ in the direction of chance (.50) for all six treatments, so that talk of "regression" towards the chance line seems generally appropriate.

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Fig. 1. Proportionate choices of the old stimulus as a function of blocks of trials (20 trials per block). The parameter, $\pi(0)$, represents proportionate reinforcements of the old stimulus.