

Effects of % Reinforcement on Midsession Reversal Task Performance in Pigeons

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Introduction

In the midsession reversal task, in each session there is a simultaneous discrimination involving S1 and S2. For the first 40 trials of each session, S1 is correct. For the remaining 40 trials, S2 is correct. Optimal accuracy can be achieved by the adoption of a win-stay/lose shift strategy: Choose S1 until it stops being correct, then choose S2.

Instead, pigeons make many anticipatory errors as the reversal approaches and they continue to make perseverative errors after the reversal. They appear to use the passage of time as a cue to reverse.

We hypothesized that interference between choice of S1 and choice of S2, may be responsible for many of the errors.

To test this hypothesis, for the Experiments group, we devalued correct choice of S2 by reinforcing correct choices only 20% of the time.

For the Control group, correct responses to S1 and S2 were reinforced 100% of the time.

Experimental Design

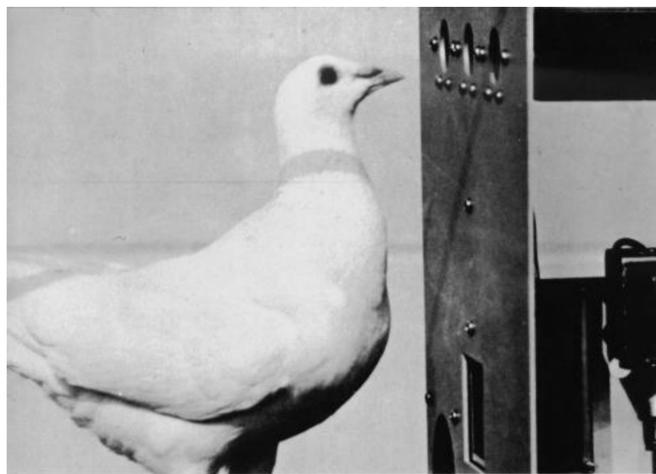


Figure 1. A picture of the subject and the apparatus

Methods

Subjects were 10 White Carneau pigeons (ages 5-12 years). A trial started with illumination of the right and left keys, one red the other green. One color was correct for the first 40 trials (S1). The other color was correct for the last 40 trials (S2). The colors were counterbalanced over subjects. For subjects in the Control group all correct responses were reinforced. For subjects in the Experimental group, all correct responses to S1 were reinforced but only a random 20% of the correct responses to S2 were reinforced. Each session was 80 trials long. Sessions were conducted 6 days a week and there were 50 sessions of training.

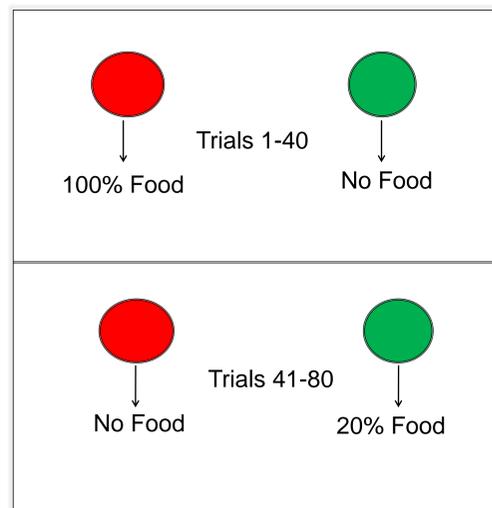


Figure 2. Design: One color was correct for the first 40 trials of each session the other color was correct for the remaining 40 trials of each session.

Results

The data from Sessions 41 to 50 plotted as a function of choice of the first correct stimulus (S1) are presented in Figure 3. An analysis performed on the first 41 trials, pooled over Sessions 41 to 50 indicated that the Experiment group ($M = 97.1\%$ correct) was significantly more accurate than the Control group (79.8% correct), $t(8) = 2.25$, $p = .05$, Cohen's $d = 1.59$. However, an analysis performed on the last 39 trials indicated that the Experimental ($M = 83.7\%$ correct) and Control groups ($M = 82.8\%$ correct) were not significantly different, $t < 1$.

To get a more sensitive measure of anticipatory versus perseverative errors, we conducted a mixed factor ANOVA on the four trials prior to feedback from the reversal (Trials 38 to 41) and the four trials after feedback from the reversal (Trials 42 to 45). The Experimental group (75.2% correct) was more accurate than the Control group (59.0% correct) but most of that difference can be attributed to the difference in anticipatory errors (96.4% correct for the Experimental group, 52.4% correct for the Control group).

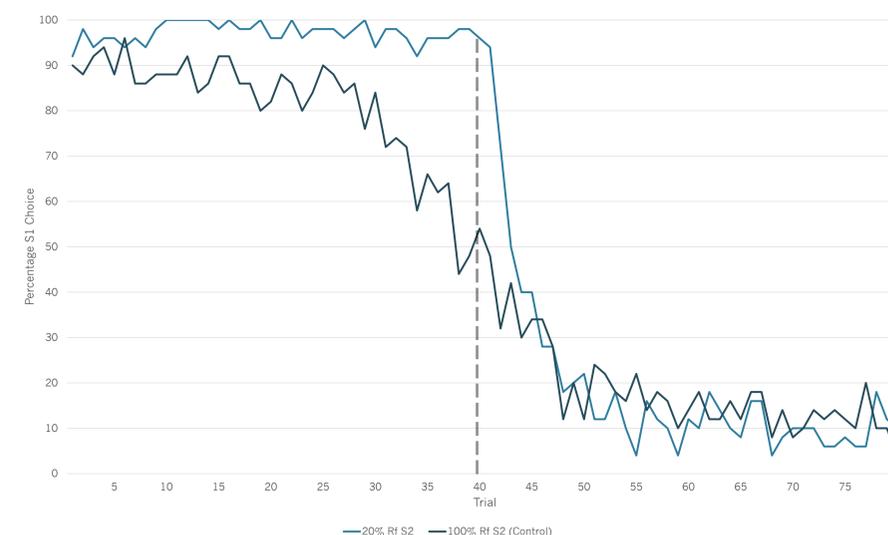


Figure 3. Percentage choice of S1 for pigeons in the Experimental group and the Control group, as a function of trial in the session, pooled over Sessions 41-50. Correct choice of S1 was reinforced 100% for both groups.

Discussion

Paradoxically, the reduction in the probability of reinforcement for correct S2 responses from 100% to 20% had a net positive effect on correct responses. There was a significant reduction in errors prior to the reversal and surprisingly, there was no increase in errors following the reversal. With only 20% reinforcement of correct S2 responses the pigeons attended exclusively to the outcome of choice of S1. When it provided reinforcement they stayed with it. When it no longer provided reinforcement they shifted to S2.