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PERFORMANCE IN MULTIPLE SCHEDULES

A thesis presented to the University of Auckland
in partial fulfilment of the requirements
for the degree of Doctor of Philosophy
in Psychology

by

Lesle Frances Charman

1983

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ABSTRACT

Four experiments are reported. Each experiment investigated a different variable which at sometime has been thought to influence performance in multiple schedules. Variable-interval schedules were used in all experiments and twelve pigeons served as subjects, six in the first two experiments and six in the third and fourth. The parametric data provided by each experiment were analysed using the generalized matching law and comparisons with findings in concurrent-schedule research were made. In Experiment 1 the effects of component durations and component reinforcer rates on multiple-schedule performance were investigated. Component duration did not affect sensitivity to the ratios of reinforcer rates. In Experiment 2 the effects of food deprivation and component reinforcer rates on multiple-schedule performance were investigated. Sensitivity to the ratios of reinforcer rates increased as deprivation was reduced. However, the data could only be explained by a model which assumed no direct component interaction. In Experiment 3 the discriminability of the stimuli customarily used in multiple-schedule research was investigated. The stimuli were perfectly discriminable. It was shown that the undermatching of response and reinforcer ratios typical of multiple-schedule performance was not the result of a failure to discriminate the stimuli signalling the components. In Experiment 4, a procedure for investigating time allocation in multiple schedules was introduced. The birds could switch in to the component in effect, and the components alternated at three minute intervals.

Each switch in to a component gave access to the schedule in effect for fixed brief periods. Ratios of component response rates showed typical multiple-schedule undermatching. However, a commonality in concurrent and multiple-schedule performance was revealed in respect to local or switched-in response rates. In both types of schedule, it appears that pigeons allocate time so as to equalize the local response rates. It is apparent that the differences reported between concurrent and multiple-schedules with respect to the sensitivity with which responses are distributed between the components as a function of the distribution of reinforcers are a result of the constraints imposed on the subjects' allocation of time in multiple schedules.

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5.23

Summary of \underline{a} values (Equation 1.2) in
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1.1
$$\frac{\frac{P}{r}}{\frac{P}{r} + \frac{P}{g}} = \frac{\frac{R}{r}}{\frac{R}{r} + \frac{R}{g}}$$
 5

1.2a
$$\left(\frac{\frac{B}{r}}{\frac{B}{g}} \right) = c \left(\frac{\frac{R}{r}}{\frac{R}{g}} \right)^a$$
 10

1.2b
$$\log \left(\frac{\frac{B}{r}}{\frac{B}{g}} \right) = a \log \left(\frac{\frac{R}{r}}{\frac{R}{g}} \right) + \log c$$
 10

1.3
$$\left(\frac{\frac{P}{r}}{\frac{B}{g}} \right) = \left(\frac{\frac{R}{r}}{\frac{R}{g}} \right)^a$$
 14

1.4
$$\frac{P}{r} = \frac{\frac{kR}{r}}{\frac{R}{r} + \frac{mR}{g} + \frac{R}{o}}$$
 15

$$1.5a \quad \frac{P_r}{P_g} = \frac{\frac{kR}{r} \cdot \frac{R_r + mR_g + R_o}{kR}}{\frac{R_r + mR_g + R_o}{g}}$$

16

$$1.5b \quad \frac{P_r}{P_g} = \frac{\frac{R_r}{r} \cdot \frac{R_g + mR_r + R_o}{R_g + mR_r + R_o}}{\frac{R_r}{g} \cdot \frac{R_g + mR_r + R_o}{R_g + mR_r + R_o}}$$

16

$$1.6 \quad \frac{\frac{B_r}{r}}{\frac{B_r + B_{or}}{r \quad or}} = \frac{\frac{R_r^a}{r}}{\frac{R_r^a + bR_{or}^a}{r \quad or}}$$

17

$$1.7 \quad \frac{B_r}{r} = \frac{\frac{kR^a}{r}}{\frac{R_r^a + bR_{or}^a}{r \quad or}}$$

18

$$1.8 \quad \frac{B_r}{B_g} = \left(\frac{R_r}{R_g} \right)^a \cdot \frac{R_g^a + bR_{og}^a}{R_r^a + bR_{or}^a} \quad 18$$

$$2.1 \quad a = \log\left(\frac{B_r}{B_g}\right) / \log\left(\frac{R_r}{R_g}\right) \quad 31$$

$$3.1 \quad B_r = \frac{kR_r}{\frac{R_r + mR_g}{1+m} + R_o} \quad 59$$

$$3.2 \quad B_r = \frac{k'R_r}{\frac{R_r + mR_g + R_o}{r}} \quad 60$$

$$3.3 \quad \frac{B_r}{B_g} = \frac{R_r}{R_g} \cdot \frac{R_g + mR_r + R_o}{R_r + mR_g + R_o} \quad 60$$

$$5.1 \quad \frac{P_r / T_{ir}}{P_g / T_{ig}} = c \left(\frac{R_r}{R_g} \right)^{-.2} \quad 88$$

$$5.2 \quad P_i = \frac{kR_i}{n \sum_{i=0} R_i} \quad 89$$

$$5.3 \quad P_r = \frac{kR_r}{R_r + mR_g + R_{or} + mR_{og}} \quad 128$$

$$6.1 \quad B_r = \frac{kR_r (1 + m)}{R_r + mR_g + R_o + mR_o} \quad 144$$

$$6.2a \quad \left(\frac{P_r}{P_{or}} \right) = c \left(\frac{R_r}{R_{or}} \right)^a \quad 146$$

$$6.2b \quad \left(\frac{P_g}{P_{og}} \right) = c \left(\frac{R_g}{R_{og}} \right)^a \quad 147$$

$$6.3 \quad P_r = \frac{\frac{kR}{r}}{\frac{R}{r} + \frac{mR}{g} + \frac{R}{o}} \quad 149$$

$$6.4 \quad P_r = \frac{\frac{kR}{r}}{\frac{R}{r} + \frac{R}{o}} \quad 150$$

$$6.5a \quad \frac{P_{r \text{ post}}}{P_{r \text{ pre}}} = Co = \frac{\frac{\frac{kR}{r}}{\frac{R}{r} + \frac{R}{o}}}{\frac{\frac{kR}{r}}{\frac{R}{r} + \frac{mR}{g} + \frac{R}{o}}} \quad 150$$

$$6.5b \quad \frac{P_{r \text{ post}}}{P_{r \text{ pre}}} = Co = \frac{\frac{R}{r} + \frac{mR}{g} + \frac{R}{o}}{\frac{R}{r} + \frac{R}{o}} \quad 150$$