

Response sequences in rats and pigeons

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In the absence of external stimulus control, rats and pigeons typically show median response runs equivalent to the ratio requirement before switching to a second operandum. Attempts to interrupt the ratio run only temporarily disrupted the number of responses prior to a switch. Neither novel stimuli (pigeon) nor electric shock (rat) produced lasting disruption in the "count" of ratio behavior.

In 1959, Mechner reported data from rats that demonstrated median length response runs on one bar prior to a response on another bar occurred near the ratio requirement value. Sidman (1960) suggests that Mechner's data could reflect "counting" in lower organisms. Attempts to account for the internal cohesiveness of fixed-ratio behavior have taken the form of inferred stimulus functions (Kelleher, 1966). The present study was an attempt to assess whether or not fixed-ratio behavior could be interrupted without simultaneously disrupting the median number of responses prior to a switch to a second operandum. Presumably an interruption of the ratio run would disrupt any stimulus function that each response would serve for the execution of the next response.

Subjects

Six Sprague-Dawley rats and two pigeons were maintained at 80% of their ad libitum weight throughout the experiment.

Apparatus

A Lehigh Valley model 1519C two key pigeon chamber and a Lehigh Valley model 1316 two bar rat chamber served as the experimental environments. Programming and recording were accomplished through relay circuitry from both Lehigh Valley and Grason-Stadler Electronics Companies. Cumulative recordings were taken by a CR 2D from Scientific Prototype Electronic Company.

Procedure

The response on Operandum B was first shaped in the presence of a light above the bar or a green light behind the key. Then the response was added on Operandum A in the presence of a light above the bar or a red light behind the key. Once each S would respond to A then B, the ratio requirement (15 responses) was introduced on Operandum A under stimulus control. Once light-on either above Bar A or behind Key A would set the occasion for ratio responding and light-on either above Bar B or behind Key B for the consequent response, both lights were illuminated simultaneously. A response to Operandum B prior to the execution of 15 responses on Operandum A would reset the ratio requirement.

When the entire sequence of 15 responses and a switch occurred 90% of the possible times, the fol-

lowing procedures were introduced. During the execution of the ratio requirement, a specific response (either 8 or 13) was followed by an electric shock (rat) or a white light behind the key (pigeon). The intensity of the shock was increased in the first sessions until the rat left the bar. No responses occurred during the 1 sec white light presentation behind Key A. Both the shock and white light were presented on only 50% of the total ratio opportunities. The effect of these procedures was evaluated in terms of changes in the median number of responses on Operandum A.

Results

Figure 1 presents the data from one rat across all experimental manipulations. During the first 27 days, the median number of responses on Bar A ranged from 16 to 20. During shock presentations on the 13th response, median responses on Bar A on the nonshocked ratios ranged from 3 to 18 and on the shocked ratios from 9 to 24. Once the shock was removed, the median number of responses on Bar A ranged from 9 to 18. The relationship between shock and nonshock ratios can be seen by directly comparing the rise and fall of median number of responses on Bar A in the middle section of Fig. 1.

Figure 2 presents the relationship between median number of Key A pecks across all experimental manipulations. During initial stability sessions, the median number of Key A pecks ranged from 15 to 21 finally stabilizing at 16. When the white light was introduced following the eighth response (second section) the median number of Key A pecks ranged from 14 to 18 on the nonlight ratios and from 13 to 21 on the light ratios. The third section shows the development of recovery from the white light introduction after the eighth response. After 37 days, the median number of Key A pecks was 15. The white light was then introduced following the 13th response. The

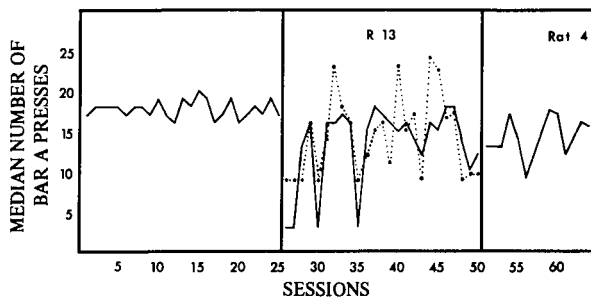


Fig. 1. Median number of Bar A presses during nonshock (solid line) and shocked (dotted line) ratios for rat.

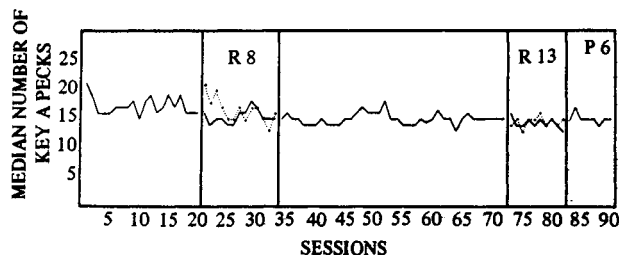


Fig. 2. Median number of Key A pecks during nonlight (solid line) and light (dotted line) ratios for pigeon.

median number of responses ranged from 12 to 16 on the nonlight ratios and from 12 to 16 on the light ratios. The last section shows the recovery of median number of responses on Key A at 15 pecks.

Discussion

If each response does acquire some stimulus properties for the execution of the next response in a sequence of responses, the expectation would be that disruption of the sequence would have the effect of starting the ratio run from the beginning. Under the conditions of the present experiment, the median

number of responses on Manipulandum A should be equivalent to adding either eight responses (when the ratio was disrupted on response number 8) or 13 (when the ratio was disrupted on response number 13). The initial effect of introducing the white light on the eighth response was just such an effect, but the behavior recovered to baseline values after three days. When the same manipulation was introduced following the 13th response, no such disruption occurred. Certainly the data suggest that explanations in terms of stimulus functions in response sequences where only responses are observed are not sufficient to account for the maintenance of the entire sequence.

References

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Note

1. Now at Arizona State University.