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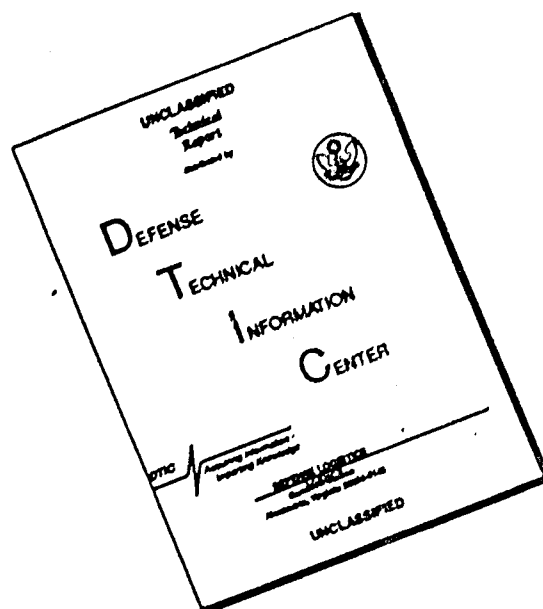
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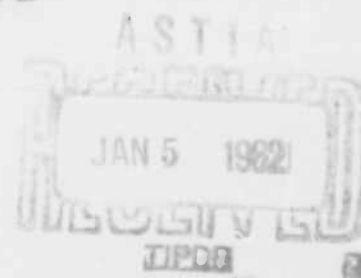
PERFORMANCE BY A RHESUS MONKEY ON A
TEMPORALLY REINFORCED
ODDITY PROBLEM

Frederick H. Rohles, Jr.



HOLLOMAN AIR FORCE BASE
NEW MEXICO

October 1961



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PERFORMANCE BY A RHESUS MONKEY ON A
TEMPORALLY REINFORCED
ODDITY PROBLEM

by

Frederick H. Rohles, Jr.

Aeromedical Field Laboratory
Deputy for Development and Test

AIR FORCE MISSILE DEVELOPMENT CENTER
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UNITED STATES AIR FORCE
Holloman Air Force Base, New Mexico

October 1961

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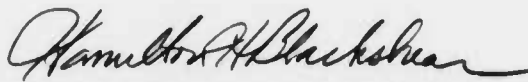
The animal experimentation performed in this study was conducted in accordance with the "Rules Regarding Animals" established by The American Psychological Association and The American Medical Association.

ABSTRACT

This report describes the performance of a rhesus monkey on four stimulus oddity problems with fixed interval reinforcement.

PUBLICATION REVIEW

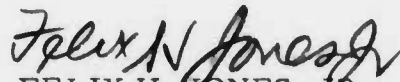
This Technical Report has been reviewed and is approved.



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PERFORMANCE BY A RHESUS MONKEY ON A TEMPORALLY REINFORCED ODDITY PROBLEM

I. INTRODUCTION

The placing of so-called cognitive problems on scheduled reinforcement programs (Ref. 1) has been studied only to a limited degree. Ferster (Ref. 2) investigated counting behavior in the chimpanzee in which the subject had to press one key three times and then press a second key for reward. Since the delivery of the reward was accompanied by the sound of a buzzer serving as a secondary reinforcer, it was possible to increase the number of repetitions of the response sequence on a FR reinforcement schedule. Ratios as high as 33 were achieved with this procedure. In another investigation, Kelleher (Ref. 3) employed different stimulus patterns as cues for a chimpanzee to perform either on a VR 100 schedule or under extinction conditions. In a similar investigation with pigeons Ferster (Ref. 4) placed a two choice matching problem under a variety of reinforcement schedules. And Rohles (Ref. 5) has studied the performance of a chimpanzee on a three stimulus oddity problem using a FR 19 reinforcement schedule.

The success attained by studying higher intellectual functioning with automatic equipment (Ref. 6) led this investigator to hypothesize that any number of cognitive problems could be placed on operant reinforcement schedules. Thus, the purpose of this investigation was to test a portion of this hypothesis by placing an oddity problem on a fixed interval reinforcement schedule.

II. METHODS

A. Subject

The subject (S) was an experimentally naive male rhesus monkey (macaca Mulatta).

B. Apparatus

All testing was conducted in a Foringer Primate Test Chamber, Model 1103. One wall of the chamber was modified in order that four contiguous stimulus-response devices might be mounted there (Ref. 2). These devices are shown in Figure 1. They were mounted in a horizontal row and centered 12.5 inches above the chamber floor; the distance between them was 2 inches.

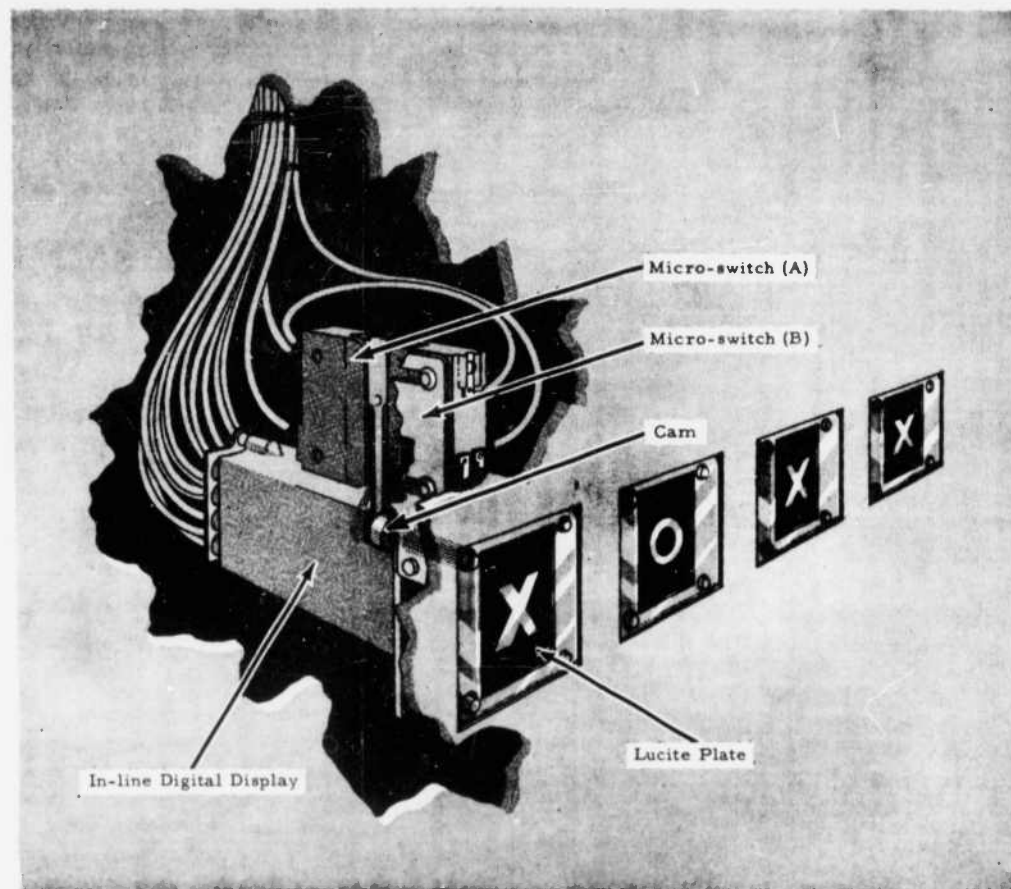


Figure 1. Stimulus-Response Device

C. Procedure

Following a food deprivation period of 48 hours, magazine training was begun. This training consisted of delivering food pellets to S aperiodically four hours per day for two days. On the third day a symbol was presented on one of the displays until the subject responded; a food pellet was delivered when this response was made. A symbol was then presented on a different display and the correct response was again rewarded. This procedure continued through the fourth day.

On the fifth day all four displays were used. On three of these, like symbols were presented; the symbol on the fourth display differed from the others. Responses to the odd symbol were rewarded; incorrect discriminations caused all displays to be turned off for 20 seconds. After this period the same four symbols were presented on the display. Four symbols were used: a circle, a triangle, a plus, and an "X". Each stimulus symbol was controlled for position and distractor stimuli. Performance on this program continued for 36 days with 250 reinforcements per day. The accuracy of discrimination at the end of the 36 days was approximately 90 percent. At this time a one-minute fixed interval schedule was introduced. Under this program only the first correct discrimination was rewarded, provided that it occurred one minute or longer after the previous reinforcement. All correct or incorrect discriminations during this one minute period were unrewarded. When this schedule was introduced, the testing session was limited to one 4-hour period per day.

III. RESULTS AND DISCUSSION

A representative cumulative record of performance is shown in Figure 2. The performance is typical of the fixed interval schedule in that, following reinforcement, the subject does not respond but resumes lever pressing as the time for reinforcement approaches. The record shows this behavior in the form of "scallop"; however, they are not so pronounced as with other species. The level of accuracy was also high as evidenced by the number of errors. Timing accuracy is shown by the fact that during this session the subject received 229 reinforcements; perfect performance would have resulted in 240 reinforcements or one per minute.

The results of this investigation tend to support the hypothesis that problems involving higher intellectual functioning can be investigated by operant methods with automatic equipment. The results further suggest the importance of the reinforcement schedule in the learning of the instrumental skill sequence. As pointed out

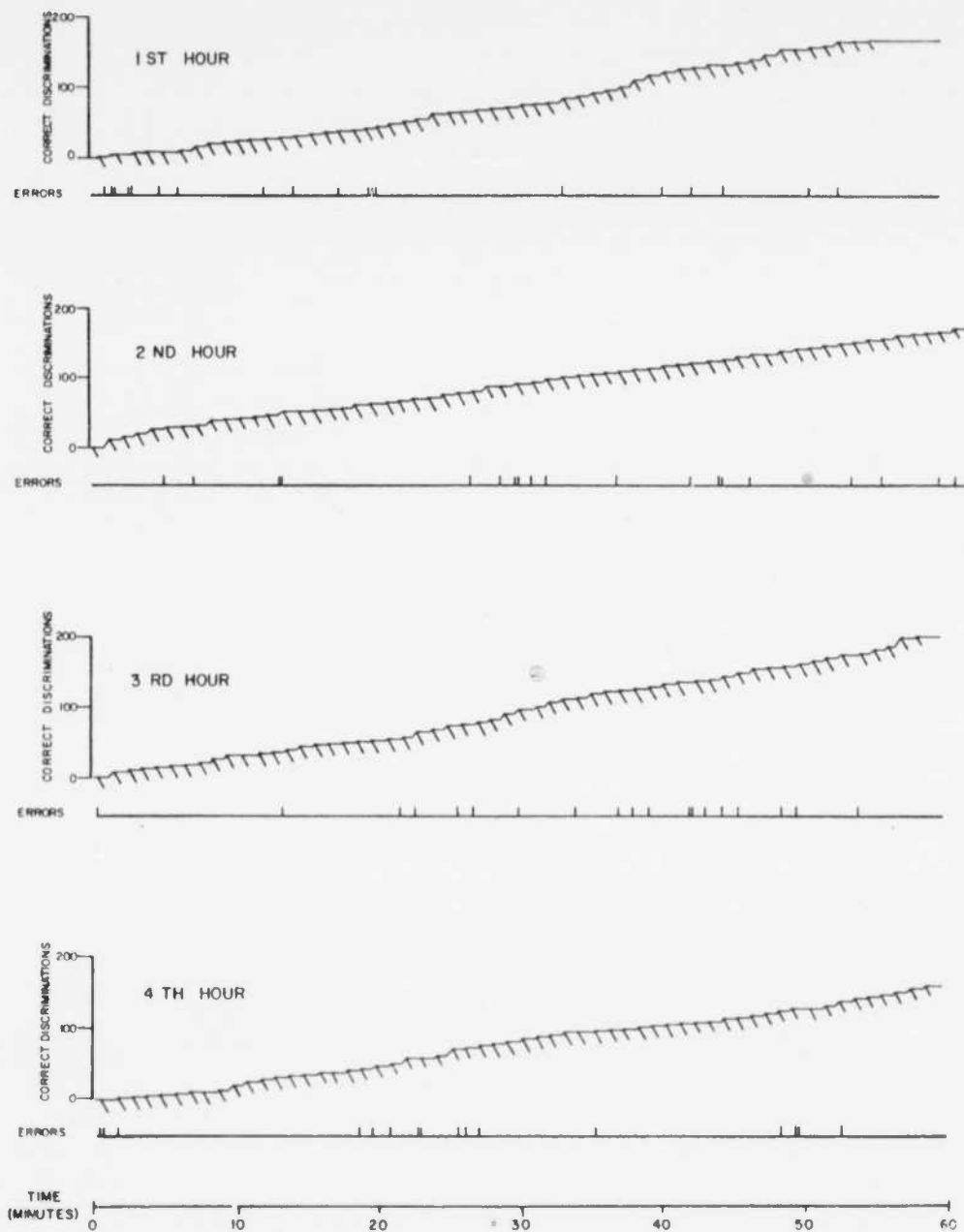


Figure 2. Cumulative response curves showing performance for 4 consecutive one-hour periods on a 4 choice oddity problem with an FI 1 reinforcement schedule.

by Rohles (Ref. 7), when an oddity discrimination was changed from continuous reinforcement to fixed ratio reinforcement the subject responded to the serial order of the presentations instead of on the basis of concept. The explanation offered was that the delay in reinforcement would be longer if the subject was responding on the basis of concept than if it was responding in the basis of order. This explanation applied to the present study in that it is apparent that the learning of the order would in no way reduce the delay of reinforcement, and through observations it is believed that he was not responding in a serial order.

The procedure in this investigation of combining the cognitive problem and operant schedule presents a more difficult problem for the subject than does either technique used separately. It suggests a new and unique approach to the investigation of animal behavior for toxicity studies, research in space environments, and psychopharmacology.

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