LABORATORY CONTROL OF TOE-SUCKING IN A YOUNG RHESUS MONKEY BY TWO KINDS OF PUNISHMENT¹

CHARLES W. TOLMAN² AND MARVIN R. MUELLER³

UNIVERSITY OF SOUTH DAKOTA

Both response-contingent withdrawal of a visual reinforcement and response-contingent presentation of an aversive stimulus (loud noise) were found to be effective in suppressing toe-sucking in a young rhesus monkey.

Baer (1962) has demonstrated that thumb-sucking in children can be controlled under conditions where withdrawal of positive reinforcement is made contingent upon placing the thumb into the mouth and re-presentation of the reinforcement upon its removal. Thumbsucking recovered promptly, however, when the contingencies were removed.

The present study is an attempt to replicate the effect with a young rhesus monkey, which had become a chronic toe-sucker, as well as to obtain comparable data using a more conventional punishment—the contingent presentation of an aversive stimulus.

METHOD

Subject

A 16-month old male rhesus monkey, refused care at birth by its mother, served as the subject. It was put into the charge of a female student assistant. Until it was five months old, *S* was housed individually in a cage located in a student laboratory where human traffic was relatively heavy and constant. The *S* was then transferred to another cage in the colony quarters where it remained until and throughout the present investigation. Although *S* had auditory and olfactory contact with the other members of the colony, the cage location prevented visual contact except when other monkeys were being transferred to and from their cages. Thus, *Ss* exper-

ience with humans was relatively extensive; experience with other monkeys was extremely limited.

The *S* had been a persistent toe-sucker, commonly sleeping with its toe in its mouth. Moreover, *S* had become quite proficient at moving and climbing on two hands and one foot while simultaneously sucking its toe.

Apparatus

In Exp. I, *S* was observed in a modified Butler box, one side of which was Plexiglass. It was placed against a one-way vision window through which the observations were made. The window through which *S* could observe the area in front of the box was 4 by 4 in. square and covered by Plexiglass. This small window had a hinged door which, powered by an electric motor, could be raised or lowered remotely.

For Exp. II the experimental chamber was a simple rectangular cage with wire screen sides.

The method of recording the rate of toe-sucking was similar to that used by Baer (1962). A Gerbrands cumulative recorder was programmed to mark a response for every cumulative 3 sec of toe-sucking. One experimenter, observing the monkey through the one-way observation window, held a switch closed as long as *S* sucked its toe; the second operated the door on the small window.

Procedure

Experiment I. Two students, one male and one female, were used as reinforcing stimuli. They were instructed to remain active throughout the test session and, when *S's* window was opened, to direct their activity toward *S*. The positive reinforcement, then, was a view

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²Reprints may be obtained from Charles W. Tolman, Idaho State University, Pocatello, Idaho 83201.

³Now at Texas Christian University.

through the small window of two active humans. Withdrawal was accomplished by closing the window; re-presentation by opening it again.

The experiment was run in two sessions, separated by approximately 23 hr. Before each session, *S* was allowed 10 min to adapt to the experimental chamber. The first session consisted of the following succession of conditions, each lasting 10 min: (1) a preliminary period in which operant rate was recorded with the window open continuously; (2) a Punishment period, in which closing of the window was made contingent on *S* placing its toe into its

mouth and opening the window was made contingent on withdrawal of the toe from the mouth; (3) a No Punishment period with the window open continuously; (4) a Punishment period; (5) a No Punishment period; (6) a Punishment period; and (7) a No Punishment period.

For the second session, the procedure of the first was repeated except that Period 7 was replaced by a 50-min period of recovery under noncontingent punishment. The window was opened and closed on a prearranged schedule with an average of two closures per minute, each having an average duration of 6 sec.

Fig. 1. Cumulative records of toe sucking under various conditions of punishment. A and B: punishment by withdrawal of reinforcement. C: punishment by presentation of an aversive stimulus, noise.

Experiment II. This presented an aversive stimulus instead of withdrawing a positive reinforcement. The aversive stimulus was a loud sound emitted simultaneously by a buzzer and two electric door bells placed directly over *S*'s chamber. The sound was presented when the toe was placed into the mouth and was stopped when the toe was removed.

The general procedure was similar to Exp. I with the exception of the order of conditions in the first session. Instead of alternating conditions every 10 min, determination of operant rate was followed by 20 min Punishment, 20 min No Punishment and 10 min Punishment. Also, due to failure of *S* to recover during the Noncontingent period of the second session, a third session was run on the following day. This consisted of 10 min Operant, 50 min Noncontingent, 10 min Punishment, and 10 min No Punishment.

Noncontingent presentations averaged 2 per min with a duration of 1 sec each.

RESULTS AND DISCUSSION

The results of Exp. I are presented in Fig. 1, Section A. As in Baer's results, the rates during Punishment periods are consistently lower than during Operant and No Punishment periods. The recovery of a relatively high rate under conditions of non-contingent withdrawal and re-presentation indicates that it was the contingencies during the Control periods which account for the lowered rate.

Baer's results showed prompt and strong recovery during each Recovery period. The same quality of recovery was also reported under yoked withdrawal/re-presentation (analogous to noncontingent withdrawal/re-presentation in the present experiment). The present results, however, showed a continuous decrease in the amount of recovery with the single exception of the period following the 23 hr between Sessions 1 and 2. The recovery under noncontingent withdrawal/re-presentation was also gradual. Where the children in Baer's study apparently rapidly discriminated the conditions of the experiment, the monkey did not.

In this connection, a record representing a session of 1 hr Control followed immediately with 1/2 hr Recovery and taken six days later is presented in Fig. 1, Section B. It will be noticed that recovery occurred promptly and

at a high rate. After five additional days of experience with alternating Punishment and No Punishment, *S* had apparently come to discriminate the conditions.

The results of Exp. II, as shown in Fig. 1, Section C, show several contrasts with the results of Exp. I. Suppression during Punishment periods is greater with the presentation of an aversive stimulus. The quality of recovery, both with no punishment and with noncontingent presentation of the aversive stimulus, is also different. In Exp. II, recovery with no punishment was delayed but once it occurred it was generally at maximum. This contrasts with the generally less-than-maximum recovery rates under the same condition in Exp. I, but the difference becomes much less evident when later records, e.g., Fig. 1, Section B, are used for comparison. The delay of recovery, however, was consistently peculiar to Exp. II. This appears to be due mainly to the lower rates under the Punishment condition.

Under noncontingent presentation of the aversive stimulus, recovery was considerably delayed, suggestive of the effectiveness of noncontingent shock reported by Estes (1944). The lower rate under noncontingent than under contingent aversive stimulation in the present experiment however, does not necessarily conflict with Azrin's (1956) more recent finding that noncontingent stimulation is less effective. The presentation of the aversive stimulus was nearly four times more frequent during the Noncontingent periods (20/10 min) than during Punishment periods (5.6/10 min).

Although delayed, recovery did eventually occur under noncontingent aversive stimulation. An explanation of this recovery in terms of adaptation is complicated by the immediate suppression obtained when the contingency was restored.

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