

*LABORATORY CONTROL OF THUMBSUCKING BY
WITHDRAWAL AND RE-PRESENTATION
OF REINFORCEMENT*

DONALD M. BAER¹

UNIVERSITY OF WASHINGTON

A 5-year-old boy was shown cartoons, and punished for thumbsucking during alternate cartoons by turning off the cartoons for as long as his thumb remained in his mouth. Thumbsucking weakened during such periods. During alternate periods of uninterrupted cartoons, thumbsucking promptly recovered, suggesting a quick discrimination process. Two other 5-year-old boys were shown the same cartoons; withdrawal of the cartoons was made contingent upon thumbsucking for one, and randomly yoked for the other. Then their roles were reversed. Contingent withdrawal and re-presentation of the cartoons controlled thumbsucking rate; yoked withdrawal and re-presentation did not.

Positive reinforcement may be withdrawn from young children by showing them movie cartoons and programming interruptions of both picture and sound track. Making such withdrawal contingent upon a response effectively reduces its frequency (Baer, 1961); and the delay of such withdrawal by responding can set up stable avoidance behavior (Baer, 1960). In the present study, this withdrawal technique is used to produce temporary control of thumbsucking in three young children who are persistent thumbsuckers. The usual account of thumbsucking attributes it to inner tensions and conflicts (Spock, 1959, p. 211), to its selfreinforcement consequences (Fenichel, 1954, p. 63), or to a history of deprivation of sucking experience during infancy (Roberts, 1944). Palermo (1956) has summarized what experimental evidence exists, and argued that thumbsucking may be interpreted as a learned response which reduces anxiety. In this context, it would seem valuable to show to what extent thumbsucking may be modified by current environmental control, using explicit stimulus consequences of the response.

PROCEDURE

The first *S* was a 5-year-old boy from a local nursery school, who had seen the same three cartoons each session, for eight sessions sep-

arated from one another by 2 or 3 days. He showed great enjoyment, laughing and mumbling throughout, and also sucked his thumb virtually 100% of each 21-min session. During these eight preliminary sessions, the subject had seen the cartoons without interruption or any other experimental treatment. (A bar was located close to his right hand for collecting an extensive operant level; however, the operant level of bar pressing was zero throughout all of these sessions.) Thus, *S* was well adapted, but experimentally naive.

The general procedure was identical to that described in an earlier paper (Baer, 1960). The *S* was conducted to the experimental room by a young female adult, *A*, who seated him before a movie screen built into one wall of the room. She then sat behind a partition in a corner of the room. Cartoons were projected on the screen from the experimenter's control and observation room on the other side of the wall. During each of the eight preliminary sessions, three 7-min cartoons were shown without break or interruption. During each of the three experimental sessions reported here, *S* was shown the same three cartoons twice, without any break between cartoons, in the sequence *A, B, C, A, B, C*. Thumbsucking was recorded on a Gerbrands cumulative recorder which stepped one response for every three cumulative seconds of thumbsucking. Observing through a one-way mirror, the experimenter held down a key on an otherwise automatic programmer whenever *S*'s thumb was in his mouth. The programmer

¹This study was supported by U. S. Public Health Service Grant M-2208. The author is grateful to Mrs. Anne Pilisdorf for her intelligent and reliable performance as *A*.

pulsed the recorder for every 3 sec the key was depressed. Under punishment conditions, the programmer turned off the projector lamp and opened the loudspeaker's voice coil as long as the key was depressed so that sight and sound of the cartoons were withdrawn.

During the experimental sessions, *S* was shown cartoon A without punishment; was punished for all thumbsucking during B (a Control period); allowed C as a Recovery period; punished again for all thumbsucking during the second (Control) showing of A; allowed the second showing of B as a Recovery period; and punished again for all thumbsucking during the second (Control) showing of C.

RESULTS AND DISCUSSION

Cumulative thumbsucking for the three experimental sessions is shown in Fig. 1 (a photographic reproduction of a tracing of the original record). The paper speed in the recorder was 22 in. per hr; thus, maximum slope was not steep. (Note the "maximum possible rate" in the figure.) During the first showing of A in each session (operant level), the rate of thumbsucking was very nearly maximal. For the first session, recovery during C was equal to the level established during A, but recovery during the second showing of B was less. However, during the second and third sessions, recovery was typically strong and prompt. The pattern was similar for responses under the Control conditions. During the first session, succeeding Control periods were progressively more effective in decreasing rate;

during the second and third sessions, the rate was quite uniformly and effectively lowered during all Control conditions.

The *S* left after seeing only four cartoons during the third session, saying he had "seen enough." This may be attributed to the periods of punishment undergone. On the other hand, it should be recalled that *S* had seen each cartoon a total of 13 times, at 2- or 3- day intervals: satiation is not unreasonable, punishment or not.

The prompt and strong recovery of thumbsucking during the Recovery periods of the second and third sessions, coupled with the immediate weakening of the response during Control periods, may suggest a rapid process of discrimination of the schedule components, rather than a generalized suppression of thumbsucking through punishment. At any rate, the response remained weak only during punishment, a typical enough result. Further experimental manipulation was frustrated by the "graduation" of *S* from nursery school 1 week later.

The procedure used to establish this temporary control of the thumbsucking response was a complex one. It involved withdrawal of reinforcement; re-presentation of reinforcement; and the contingency of withdrawal for thumbsucking and re-presentation for removal of the thumb from the mouth. In an attempt to show the role of the contingent use of these operations, compared with their random or non-contingent use, two other 5-year-old boys were studied in a yoked situation.

In this situation, the two *Ss* sat side by side and watched the same cartoons projected on

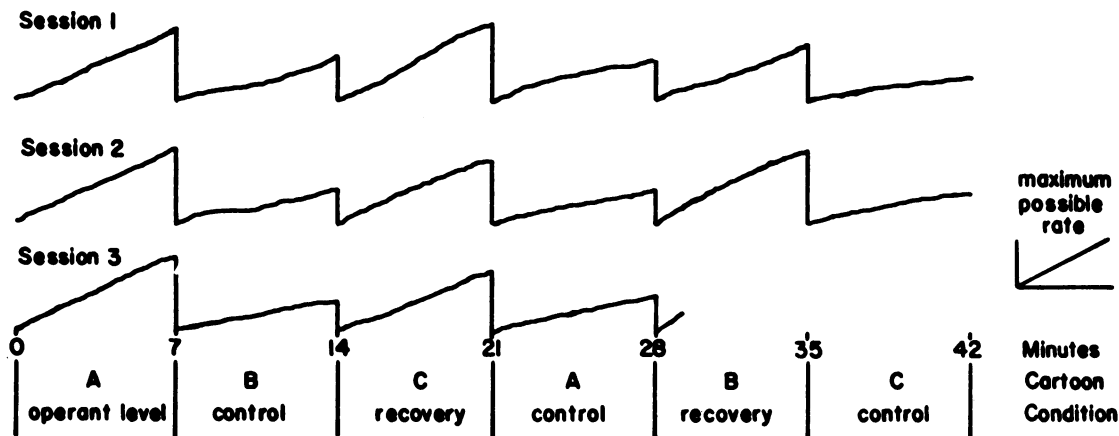


Fig. 1. Cumulative thumbsucking curves of a single subject under alternating conditions of Control and Recovery.

the screen before them. A small room-divider was placed between them so that they could not observe each other as they watched the cartoons. Two observers watched the Ss, each recording the thumbsucking of one S on separate cumulative recorders.² (The recorders were housed in boxes in a distant room, so that their clicking was inaudible to the Ss or Es.) The Ss were shown cartoons for a total of 30 min per session. No experimental procedures were used in the first three sessions, because the operant level of thumbsucking in this new situation was found to change steadily from uncharacteristically low values toward higher rates. By the end of the third session, both Ss showed stable rates of thumbsucking near 100%. Two experimental sessions, labelled Session 1 and Session 2 in Fig. 2, followed on successive days. In Session 1, S1 experienced alternating 5-min periods of continuous cartoons and contingent withdrawal/re-presentation of the cartoons. And S2, sitting beside him and watching the same screen, hence had a yoked withdrawal/re-presentation

of the cartoons during the same alternate intervals. However, in his case, these operations had only a random contingency with his thumbsucking behavior. The next day, during Session 2, the roles of S1 and S2 were reversed: S2 experienced alternating periods of continuous cartoons and contingent withdrawal/re-presentation, while S1 experienced the yoked, noncontingent withdrawal/re-presentation operations during the same alternate periods.

Figure 2 shows the results. (The curves are slightly retouched in places where the pen left too fine a line for photographic reproduction.) In either session, the subject undergoing contingent withdrawal/re-presentation of the cartoons for thumbsucking came promptly under the control of this contingency. The subject who experienced yoked withdrawal/re-presentation under the same schedule at the same time, but only randomly associated with his thumbsucking, showed no obvious effect. However, the observer did note a transitory exception to this pattern in S1 during Session 2. In the previous session, S1 had been subjected to contingent withdrawal/re-presentation for thumbsucking. When S1 was subjected to a random withdrawal/re-presentation of the cartoons (yoked to S2) during the first Control period of Session 2, he removed his thumb from his mouth quite frequently; but he re-

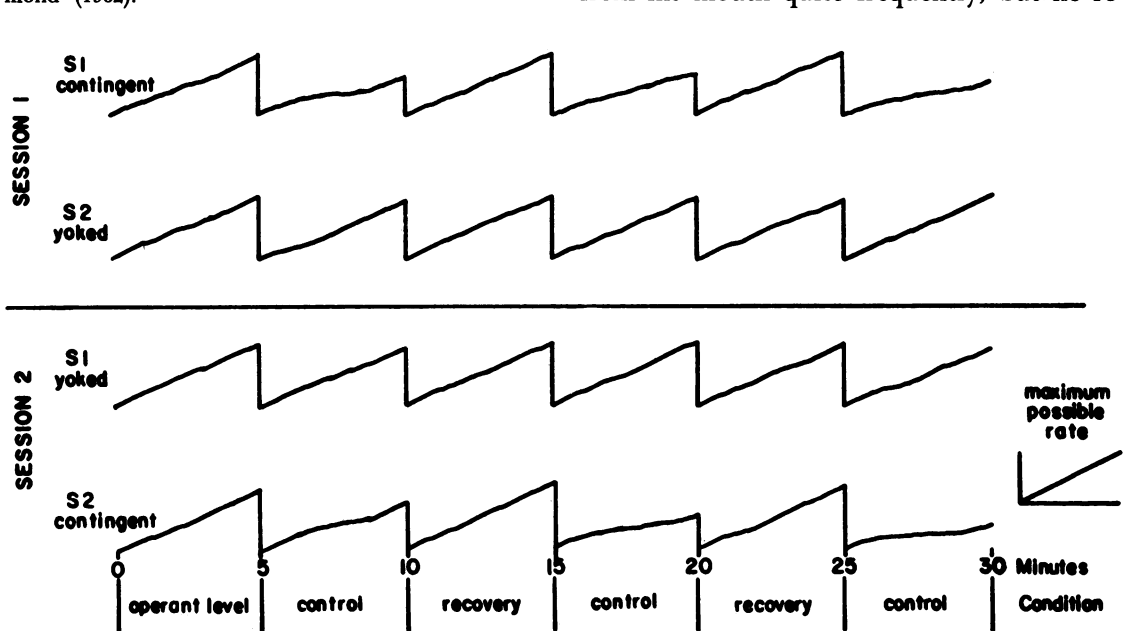


Fig. 2. Cumulative thumbsucking curves of two subjects, one experiencing contingent withdrawal/re-presentation and the other yoked, under alternating conditions of Control and Recovery.

placed it almost immediately each time. This operation was closely correlated to the withdrawal operations (contingent upon the thumbsucking of S2). It did not appreciably reduce the amount of cumulative thumbsucking, and therefore is barely discernible in Fig. 2. During subsequent Control periods of Session 2, this pattern of response virtually disappeared.

Hence, contingent withdrawal/re-presentation of the cartoons appears to weaken the thumbsucking response during periods when it is in effect; but random withdrawal/re-presentation operations of the same frequency, extent, and timing do not appreciably affect a thumbsucking response occurring at the same time.

No claims are made about the generality of this effect. The Ss number three; all were boys; and all were chosen because of their unusually high rate of thumbsucking in

nursery school settings. Hence, they are not a random sample of young thumbsuckers.

REFERENCES

- Baer, D. M. Escape and avoidance responses of preschool children to two schedules of reinforcement withdrawal. *J. exp. anal. Behav.* 1960, **3**, 155-159.
- Baer, D. M. The effect of withdrawal of positive reinforcement on an extinguishing response in young children. *Child Develpm.*, 1961, **32**, 67-74.
- Fenichel, O. *The psychoanalytic theory of the neuroses*. New York: Norton, 1945.
- Goldiamond, I. The experimental analysis and control of fluent speech and stuttering. *J. Mathetics*, 1962, **1**.
- Palermo, D. S. Thumbsucking: a learned response. *Pediatr.*, 1956, **17**, 392-399.
- Roberts, E. Thumb and finger-sucking in relation to feeding in early infancy. *Am. J. Dis. Child.*, 1944, **68**, 7-8.
- Spock, B. *The common sense book of baby and child care*. New York: Duell, Sloan and Pierce, 1957.

Received June 24, 1961