ELIMINATION OF BEDTIME THUMBSUCKING IN HOME SETTINGS THROUGH CONTINGENT READING¹

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Reading stories at bedtime was made contingent upon nonthumbsucking for girls 3, 6, and 8 yr old. According to their mothers, all had been persistent thumbsuckers since infancy. Two had accompanying dental disorders. During baseline conditions, continuous noncontingent reading occurred. During experimental conditions, reading terminated on each occasion thumbsucking was observed and resumed immediately when thumbsucking ceased. High percentages of thumbsucking occurred during baseline conditions when reading was noncontingent, and low percentages occurred during experimental conditions when reading was contingent. Bedtime thumbsucking was eliminated for all three girls.

Forty-six per cent of the child population from birth to 16 yr of age are reported thumbsuckers (Traisman and Traisman, 1958). The desirability of eliminating this habit is indicated by its apparent social inappropriateness, its association with dental malocclusion, and continuing efforts to develop procedures for its control.

Thumbsucking has been associated with open bite, overjet, and closed bite dental malocclusions (Norton and Gellin, 1968). In a large group of children ranging in age from birth to 16, malocclusions were observed in 10% of the thumbsuckers and in 7% of the nonthumbsuckers (Traisman and Traisman, 1958). In another group of primary grade children, overjet malocclusion was observed in 30% of the thumbsuckers and in 9% of the nonthumbsuckers (Murray and Anderson, 1969).

The home has been a preferred setting for

implementing procedures to control thumbsucking. Management procedures sometimes recommended for use in the home include sucking natural shaped bottle feeding nipples (Picard, 1959), sucking pacifiers such as the Nuk Sauger exerciser (Meach, 1962), wearing special constraining mittens (Benjamin, 1967), prolonged sucking from the breast or bottle (Spock, 1968), wearing thumb splints, adhesive bandages, restraints, or applying bitter-tasting chemicals to the thumb (Watson, 1969), and giving parental attention contingent upon nonthumbsucking and ignoring thumbsucking (Haryett, Sandilands, and Davidson, 1968). The effects of the above procedures have not been reliably measured.

Management procedures have also been implemented outside the home by dentists, teachers, and behavioral scientists. One such procedure involves cementing a stainless steel spurred bar to the upper molars (Haryett, Hansen, and Davidson, 1970). This bar extends across the palatal arch and prevents sucking action. For a group of 59 children, mothers reported that thumbsucking was arrested for 11 of 18 children after three months of palatal bar placement, for 17 of 19 children after six months, and for all of a group of 22 children after 10 months of bar placement. Thumbsuck-

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ing resumed for six of these children within 2 yr after removal of the palatal bar, including one from the three-month group, three from the six-month group, and two from the 10-month group.

A procedure implemented in a classroom was associated with reduced thumbsucking behavior in three third-grade girls (Skiba, Pettigrew, and Alden, 1971). This procedure made teacher attention and praise contingent upon writing and folding hands, behaviors considered incompatible with thumbsucking. The effectiveness of this procedure was verified through an ABAB design for two of the three subjects. Neither continuance nor generalization of the reduced thumbsucking was reported.

In a laboratory, presentation of filmed cartoons contingent upon nonthumbsucking was alternated with periods of uninterrupted cartoons for one boy (Baer, 1962). For two additional boys, cartoons were contingent for one and yoked for the other. The yoked child was presented with cartoons only when the other child was not thumbsucking. This was alternated with periods of uninterrupted cartoons for both boys. In all cases, thumbsucking decreased only during the conditions in which the cartoons were presented contingent upon nonthumbsucking.

The present paper reports a procedure to help parents reduce thumbsucking in the home. Baer's procedure was adapted such that parents' reading of stories was made contingent upon nonthumbsucking and withdrawal of reading was contingent upon thumbsucking. The bedtime hour was selected because it is a high-probability time for occurrence of thumbsucking (Gesell and Ilg, 1943). Besides having the advantage of being readily carried out in the home, this procedure allows the parent to become a signal for nonthumbsucking behaviors.

METHOD

Subjects and Settings

Sara was 3 yr old, with her mother reporting that she had been a thumbsucker since infancy.

She sucked her right thumb, curled her right index finger around her nose and often held a favorite blanket in her left hand. Sara attended a day care center where she spent most of the day in a large room with 15 other children. The noon lunch time was followed by toilet activities and a 1-hr nap on the room's carpeted floor. The initial 20 min following Sara's lunch was the daily session time and took place in the lunch room on a low cot. The first author was the experimenter and primary observer and the second author was a second observer during occasional sessions.

Rosie was 6 yr old and sucked her thumb at bedtime, when watching TV, and when holding soft, fuzzy objects. Rosie's thumbsucking was the object of teasing by older siblings. Rosie's mother was the experimenter and her older brother the second observer. The 10-min daily session took place on the mother's bed.

Jennifer was 8 yr old, and according to her mother, sucked her thumb at bedtime, while watching TV, and when holding a soft blanket she called "Sucky". She did not suck her thumb when peers were present; *e.g.*, in school. Her parents also reported that she was frequently reminded by both her dentist and orthodontist to stop thumbsucking. The daily 20-min session took place in Jennifer's bedroom from 8:30 to 9:00 p.m. Jennifer's mother was the experimenter and the first author the second observer.

Response Measures and Reliability

On each occasion a subject inserted her thumb into her mouth such that a portion of the thumb was placed posterior to the lips, the experimenter activated a stopwatch, measuring the cumulative time the thumb remained in this position. (Finger sucking was never observed in these children.) Percentages of thumbsucking were calculated by dividing thumbsucking time by total session time and multiplying by 100. Total session time was the difference between start and stop time. Session times for Sara were approximately 20 min in length, with 91 of the sessions from 17 to 23 min in duration and six

sessions from 13 to 16 min. The varying session lengths allowed for stories chosen by Sara to be completed during the session. Stories were continued from day to day for Jennifer and Rosie so that session lengths remained constant.

Reliability of measurement was provided by the second observers who sat from six to 14 ft from the subject and recorded in the same manner as the experimenter. Observers were instructed to conceal stopwatches from obvious view and to attend only to the thumbsucking response when recording, rather than the reading or measuring behaviors of the experimenter. The clicking sound of the stopwatch may have been audible during infrequent quiet periods, but neither experimenters nor observers reported hearing stopwatch clicks other than their own.

An index of reliability of measures was calculated by dividing the lower recorded percentage by the higher and multiplying by 100. Further reliability was provided by placing the measures of the experimenter and observer on the same graph and comparing the two functions. Cofunctional reliability occurs when the measures of the two observers form similar functions (Goldiamond, 1968, p. 117). For instance, the experimenter may observe thumbsucking during 90% of the session time and the second observer 70%. When contingent reading is introduced, thumbsucking is observed 40% and 30% of the time. When reading is no longer contingent, observations are 95% and 65%. The two functions thus formed are similar, indicating cofunctional reliability.

Baseline and Contingent Reading Conditions

Each child was asked to choose books or stories that were read by the experimenter during sessions. During baseline conditions, the experimenter read continuously to the subject, whether thumbsucking occurred or not.

During contingency conditions, the experimenter stopped reading and was silent for the duration of the thumbsucking interval. Experimenters were instructed to ignore questions or

any other responses made by the child and to look directly at the book and only peripherally at the child. When the subject removed her thumb from her mouth, reading was immediately resumed.

RESULTS

Experimenter measures for Sara (Figure 1) are indicated by solid points. During Baseline I, when the experimenter read continuously, the mean percentage was 82 and the range 70 to 95%. For Contingent Reading I, when reading was discontinued during thumbsucking intervals, the mean was 18 and the range was zero to 50. The mean for Baseline II was 70 and the range 1 to 95%. For Contingent Reading II, the mean was 11 and the range 0 to 74%.

Second observer measures are indicated by open circles. The mean index of reliability between observers was 93%. Experimenter and observer data indicated cofunctional reliability.

Rosie's patterns of thumbsucking (Figure 2) were highly similar to Sara's. During Baseline I and II, mean percentages for Rosie were 60 and 22%; during Contingent Reading I and II, 8 and 0.8%. Ranges for Baseline I and II were 50 to 80 and 5 to 70%, and for contingency conditions 0 to 15 and 0 to 5%, respectively. The mean index of reliability was 96%, with cofunctional reliability as indicated.

Jennifer's thumbsucking did not markedly decrease until after Day 38 (Contingent Reading I, Figure 3), when her bed was moved to the center of the room. The move was made because her mother reported that Jennifer was preoccupied by items on the bookshelves located on the wall, and it was thought that this preoccupation might be reducing the effectiveness of contingent reading. After the bed was moved, Jennifer's patterns of thumbsucking were closely similar to Sara's and Rosie's. Because thumbsucking did not decrease until after Day 38, Baseline III and Contingent Reading III were implemented to obtain a more conclusive verification of the effect of contingent reading.

Fig. 1. Each point represents the percentage of time Sara sucked her thumb during daily bedtime reading sessions. Experimenter measures are depicted as solid points and observer measures as open circles.

Fig. 2. Each point represents the percentage of time Rosie sucked her thumb during each daily bedtime reading session. Experimenter measures are depicted as solid points and observer measures as open circles.

Mean percentages for Baseline II and III were 25 and 68%, with ranges 0 to 52 and 57 to 75%. During Contingent Reading II, thumbsucking measures remained at zero, and during Contingent Reading III, the mean percentage was 5%, with a range of 0 to 16%. The mean index of reliability was 94%, with cofunctional reliability as indicated. No thumbsucking was observed on a post check 25 days after daily measures were terminated.

DISCUSSION

The principles of behavior analysis inherent in the described procedure are the same as in Baer's (1962). Differential reinforcement is applied for all behaviors other than thumbsucking (DRO) on a continuous schedule, while the effects of contingent withdrawal of the reinforcer punishes thumbsucking and increases the probability of stable avoidance behavior (non-thumbsucking). Emotional responses, some-

times reported to be produced by punishment, were observed in each subject during contingency conditions: *e.g.*, Sara hit the experimenter; Jennifer shouted, "Read, I'm getting mad;" and Rosie said, "I know why you're not reading."

For Jennifer, behavioral control is demonstrated by comparison of the four conditions BII, CRII, BII, and CRII (Figure 3). A marked decrease in thumbsucking behavior was observed only during the final six days of CRI, after Jennifer's bed was relocated. This relocation was preceded by reports that Jennifer was increasingly attending to items on the shelves. For instance, on Day 37 Jennifer took a newspaper from the shelf and continued to suck her thumb while reading the newspaper. In order to clarify the effects of contingent reading, a third return to baseline conditions was judged necessary.

For Jennifer and Rosie, complete cessation of thumbsucking was reported for the entire day

JENNIFER

Fig. 3. Each point represents the percentage of time Jennifer sucked her thumb during daily bedtime reading sessions. Experimenter measures are depicted as solid points and observer measures as open circles. The arrow indicates a relocation of the bed away from apparently distracting stimulus materials.

within several weeks after the procedures were terminated and reportedly has not recurred in the 4 yr since. Mothers of these girls were instructed to attend to their daughters (e.g., parental praise and proximity) when nonthumbsucking behaviors occurred and to withdraw attention (e.g., cease conversation and walk away) when thumbsucking occurred. However, whether such instructions were followed or alone led to complete generalization is questionable. Perhaps each mother was established as a stimulus in the presence of which nonthumbsucking was reinforced, thus facilitating generalization. Sara's mother did not carry out the contingent reading procedures and reported that Sara did not generalize nonthumbsucking behaviors from naptime to other situations.

The effectiveness of these procedures is further supported by anecdotal reports of two boys, ages two and four, for whom mothers applied the contingent reading procedures. For both boys, generalization was reported to be complete within several weeks after termination of procedures. Thumbsucking was reported not to have recurred during the 5 yr since reading procedures were terminated.

The use of mother's contingent reading in Baer's paradigm is an effective procedure for eliminating thumbsucking behavior at bedtime. Through implementation of these procedures, generalization may be facilitated by the establishment of the mother as a stimulus for nonthumbsucking behaviors. Further advantages are the adaptability of these procedures to the home routine and the utilization of readily available materials.

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