CONTINGENCY MANAGEMENT OF TOOTHBRUSHING BEHAVIOR IN A SUMMER CAMP FOR CHILDREN¹

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The control of toothbrushing behavior by contingency management was studied with eight, 10 to 12-yr-old boys at a summer camp for children. This behavior occurred infrequently during baseline conditions with and without verbal instructions to the subjects to brush their teeth. Toothbrushing behavior was maintained at a high level when the behavior was required as a prerequisite for the opportunity to swim (contingency management). When, after 22 days, the contingency arrangement between toothbrushing and swimming was terminated, toothbrushing behavior returned to a low level.

While investigations of children's operant behaviors are by now common, most have utilized manipulatable (*e.g.*, toys) or consumable (*e.g.*, candy) reinforcers to maintain such behaviors (Bijou and Sturges, 1959). Praise and approval, attention, or other social reinforcers have sometimes been employed (Bijou and Baer, 1966). Occasionally, the opportunity to engage in some highly desired activity, such as riding a bicycle or playing a game, has been used as a positive reinforcer (Ferster and Simmons, 1966; Girardeau and Spradlin, 1964; Homme, de Baca, Devine, Steinhurst, and Rickert, 1963). For example, Homme *et al.* (1963) controlled sitting behavior of nursery school children by making the opportunity to run, yell, and engage in other highly probable behaviors of children contingent upon sitting quietly. The use of these desirable activities to control other behaviors is one of the procedures of contingency management (Homme, de Baca, Cottingham, and Homme, 1968). This concept is an application of the observation that, "for any pair of responses, the more probable one will reinforce the less probable one" (Premack, 1965, p. 132). The present investigation evaluated the usefulness of such a contingency management procedure in the control of toothbrushing behavior of

children in a summer-camp setting (Rickard and Dinoff, 1965).

METHOD

Subjects

Eight boys, aged 10.5 to 12.5 yr, served. It was the counselors' impression that each subject exhibited one or several behavior problems, such as withdrawal from the group, temper tantrums, or anti-social behavior patterns, as well as deficiencies in self-care behavior.

Procedure

During the 53-day camping session, the subjects lived together in a cabin with three male counselors. Brushing teeth at any time during a daily rest hour, which followed the noon meal, was chosen as the target behavior for testing the effectiveness of a contingency management system. This behavior was defined by the subject obtaining his toothbrush, placing toothpaste on it, moving to the lavatory, and brushing his teeth for at least 20 sec. Observations of toothbrushing immediately before and after breakfast and in the evenings after supper and before retiring were also made to determine the frequency of this behavior at other usual times for toothbrushing. Responses were recorded daily, except when the subjects were away from the cabin, *e.g.*, during all-day hikes and overnight camping trips.

A baseline of the frequency with which the behavior was initially emitted was obtained without comment during the first four days of

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the camp session. A second, eight-day baseline was then obtained to determine whether toothbrushing would occur if verbally requested. During this latter baseline, a single general announcement to, "go and brush your teeth", was made immediately upon all subjects' return to the cabin after the noon meal. Nothing was said concerning toothbrushing at any other time during the day.

Since the baseline observations indicated that toothbrushing would not consistently occur either spontaneously or following verbal instructions (*cf.* Allyon and Azrin, 1964), the contingency management condition was introduced. On the first day of this condition, each subject was instructed to brush his teeth and it was indicated that each subject would be given permission to go swimming only after toothbrushing occurred. When a subject emitted the appropriate response he was immediately given permission to swim. The "swimming response" was a complex chain of responses that included dressing for swimming, walking to the swimming area, and actually swimming. Hence, reference to the control of toothbrushing by making the swimming response contingent upon this behavior implies that any or all components of this chain of responses were involved in such control. On subsequent days of the contingency management condition, subjects were never directly instructed to brush teeth. However, if a subject began to dress for swimming before brushing his teeth, he was told: "You are not ready for the afternoon activity yet." After 22 days of the contingency management condition, a modified extinction procedure was introduced during the last nine days of the camping session. Because of practical considerations imposed by the camp program, this procedure was a combination of non-contingent reinforcement (removal of the contingency between swimming and toothbrushing) and no reinforcement (elimination of the swimming period) on different days.

RESULTS AND DISCUSSION

Inter-observer agreement (three observers) on the occurrence of the toothbrushing response was sampled approximately twice per week during the camp session and was typically 100%. Figure 1 provides the percentage of subjects present who brushed teeth on each

day of the camp session.³ Spontaneous toothbrushing at any time during the first baseline condition occurred twice (once in the morning and once in the evening on Day 3). During the baseline condition with verbal instructions, toothbrushing increased somewhat compared to the previous baseline but never did more than two subjects brush their teeth on a given day. Seven of the eight subjects responded at least once during this eight-day period. After the first five days of the contingency management condition, during which the contingency between swimming and brushing teeth was established, virtually all subjects present on a given day consistently brushed teeth during rest hour. The contingency was inadvertently not in effect on Day 17 and toothbrushing behavior fell to a zero level. On only six of the 22 days of contingency management did less than 100% of the subjects present brush their teeth at the appropriate time. Toothbrushing at times during the day other than when the contingency was in effect occurred on only one day (morning of Day 22).

During the last five days of the contingency management condition, no verbal reminder to the subjects was necessary. On some of these days, as the time for the swimming period approached, one subject would ask for the time of day and then announce to the group that each subject should brush his teeth so that they could go swimming. At other times, no such announcement was made by a subject, but one subject would brush teeth and receive permission to dress for swimming. Upon receipt of such permission from the experimenter, other subjects immediately initiated the required response. All subjects consistently completed toothbrushing within 20 min from the time that the first subject brushed his teeth. The response typically occurred immediately before the time for swimming. On only one occasion did one subject brush his teeth more than 15 min before this time.

The results of the extinction procedure indicate that the elimination of the regularly scheduled swimming period was sufficient to reduce toothbrushing behavior to a low level. On Day 37, the swimming area dried up from lack of rain, making swimming impossible for

³On nine days during the camp session, at least one subject was away from the camp for the day to visit his parents.

Fig. 1. Percentage of subjects who brushed their teeth in the morning, during the rest hour, and in the evenings during the camping session.

four consecutive days. No toothbrushing occurred on these days. The swimming period was eliminated also during the last two days of the camping session, with a similar effect upon toothbrushing.

On the first day of the extinction procedure, the swimming period followed a camp circus in which the subjects had an important role. The lateness of the swimming period and the unusual preceding activity may have contributed to the reduction in toothbrushing behavior observed on this day. On the second day of this procedure, when a swimming period followed the regular rest hour, seven of the eight subjects brushed their teeth at that time. The subjects were promised a swimming period at a nearby lake after the noon meal on Day 41 and again seven of the eight subjects brushed their teeth. These increases in toothbrushing on days when the non-contingent swimming period occurred after the rest hour suggest that three exposures to these condi-

tions were not sufficient to establish the non-contingency between the two behaviors.

Although systematic data were recorded only for toothbrushing behavior, a number of other opportunities existed for applying contingency management principles in the summer-camp setting. Trips to a nearby town, periods of rest, movies, nature hikes, and other highly preferred behaviors were made contingent upon such non-preferred behaviors as cleaning the cabin area, participation in group construction projects, and discussion of solutions to group and interpersonal problems. The preliminary results were very encouraging, although not conclusive. Further systematic research will be necessary to determine the range of behaviors that contingency management procedures can deal with effectively in an active summer-camp environment.

These procedures can, of course, be employed in other less-structured settings (*cf.* Homme *et al.*, 1968). In the child's home en-

vironment, for example, highly preferred behaviors such as watching television, playing with peers, or "free time" are available for use as reinforcers for less-preferred but necessary behaviors. A successful implementation of the procedures employed in the present example of contingency management seems primarily dependent upon the consistency with which such contingencies between behaviors can be arranged for the child.

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