THE USE OF RESPONSE PREVENTION TO ELIMINATE NOCTURNAL THUMBSUCKING

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The effects of a response prevention strategy consisting of the fading of restraint and the removal of reinforcers on nocturnal thumbsucking behavior was evaluated in four experiments. In the first experiment, nocturnal thumbsucking was restrained for approximately 1 week by having each of two boys wear a boxing glove to bed. Next they wore absorbent cotton over the thumb for 11 nights. During the last phase in this condition, they wore a fingertip bandage over the thumb for 10 to 11 nights. The response prevention package completely eliminated thumbsucking behavior in both boys. In the second experiment, the removal of reinforcers alone for nocturnal thumbsucking had little or no effect on the thumbsucking behavior of three girls whereas the later introduction of the entire package completely suppressed thumbsucking in all three girls. In the third experiment, the package was evaluated in the absence of the glove restraint condition. The results showed that the treatment package was effective in the absence of the glove restraint condition for all three children. The final experiment examined whether the package could be effective if the absorbent cotton condition was abruptly removed without using the fingertip bandage condition. The results showed the treatment to be effective with one of two boys, but not the other.

DESCRIPTORS: thumbsucking, response prevention, fading, dentistry, family treatment

Chronic thumbsucking is associated with dental problems such as open bite, overjet, and closed bite dental malocclusions (Murray & Anderson, 1969; Norton & Gellin, 1968; Traisman & Traisman, 1958) especially for children 4 years of age and older (Wright, Schaefer, & Solomons, 1979). Therefore, it is important to eliminate thumbsucking when it persists in children beyond 3 years of age. One approach is time-out, in which a reinforcer is removed whenever thumbsucking occurs. For example, Knight and McKenzie (1974) had three mothers stop reading a story whenever thumbsucking occurred. When the child removed her thumb from her mouth, the mother immediately resumed reading the story. The results of this study indicated that the contingent time-out procedure produced a marked reduction in the percentage of bedtime thumbsucking in all three children.

Another effective procedure in eliminating thumbsucking is habit reversal (Azrin & Nunn, 1973; Azrin, Nunn, & Frantz-Renshaw, 1980). Using this procedure, the child is taught to describe the exact topography of his or her thumbsucking, and learns to detect instances of thumbsucking as well as stimulus and behavioral precursors. Next, the child is taught to engage in a competing response (opening and clenching fists 20 times or making a fist with the fingers gripping the thumb) following either thumbsucking or the "temptation" to suck his or her thumb. If children fail to initiate the exercises themselves, they are required to perform the exercises in their bedroom.

One problem with both of these approaches is that neither has been demonstrated to be effective in dealing with nocturnal thumbsucking, nor is it likely that these are effective contingencies for nocturnal behavior. For example, Azrin (personal communication, May, 1980) has indicated that nocturnal bruxism does not respond to habit reversal training.

Using a slightly different approach, Hughes, Hughes, and Dial (1979) omitted candy reinforcement whenever a piece of litmus paper taped onto

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a child's thumb turned blue from contact with saliva. Although this technique nearly eliminated thumbsucking while the contingency was in effect, thumbsucking returned to baseline levels when the litmus paper and candy contingency were removed. In addition, the authors noted that they were unable to find any information regarding the safety of ingesting Phenaphthazine, the dye used in litmus paper.

One procedure that might be effective in eliminating nocturnal thumbsucking is the response prevention procedure used to eliminate compulsive rituals (Levy & Meyer, 1971; Mills, Agras, Barlow, & Mills, 1973; Turner, Hersen, Bellack, & Wells, 1979). This procedure involves physically preventing the behavior and then gradually fading restraint.

Haryett, Hansen, and Davidson (1970) used response prevention without fading by cementing stainless steel spurred bars to the upper molars of children who sucked their thumbs. They found that thumbsucking was arrested for 61% of the children after the bar was in place for 3 months, 89% after 6 months, and 100% after 10 months. The long duration required for the procedure to produce a uniform effect may have been related to the absence of a fading procedure.

The studies reported here assessed the efficacy of a response prevention strategy involving the fading of restraint, feedback, and backup contingencies on nocturnal thumbsucking behavior.

EXPERIMENT 1

METHOD

Children and Setting

Two boys (Amos, 9 and Christopher, 7) living in Nova Scotia, Canada, participated in this experiment. Neither boy sucked his thumb during waking hours; both boys sucked their thumbs at bedtime.

Amos had sucked his left thumb at bedtime since he was a toddler and had never sucked his thumb during the day; Christopher sucked his right thumb only during the day until he was four and

then switched to sucking it only at bedtime. Both boys' dentists had advised the parents to do something about their boys' thumbsucking because both had bite problems. Parents observed that Christopher only sucked his thumb for approximately 30 min after being put to bed; and that Amos frequently sucked his thumb throughout most of the night and occasionally in the morning. Both children were observed by their parents in the home and both had a fixed bedtime; on school nights 9:00 p.m. for Amos and 8:30 p.m. for Christopher and on Fridays, Saturdays, and the night before holidays 9:45 p.m. for Amos, 9:00 p.m. for Christopher.

Measure

Parents measured nocturnal thumbsucking using a 15-min time-sampling procedure. Every night, each mother would check her son every 15 min after he was put to bed, recording whether his thumb was in his mouth for six consecutive observations (early evening). Then, each mother observed her son at half-hour intervals for six more observations (late evening). In addition, each mother would also check every morning 15 min before her son's usual time of awakening. During all checks the parents also noted which thumb was in the mouth.

Interobserver agreement was measured during at least two sessions during each condition. During these sessions both parents checked their son and independently recorded whether his thumb was in his mouth. This was done by having the first parent (the mother) check and record whether or not the thumb was in the boy's mouth. She then left the room, and the father independently recorded the presence or absence of thumbsucking. Interobserver agreement on the occurrence and nonoccurrence of thumbsucking was independently calculated. An agreement on the occurrence of thumbsucking was scored whenever both parents agreed that the thumb was in the mouth and an agreement on the nonoccurrence of thumbsucking was scored whenever both parents agreed that the thumb was not in the child's mouth. Interobserver agreement was always 100%.

Experimental Design

A multiple-baseline across children design (Baer, Wolf, & Risley, 1968) was used in this experiment. After obtaining baseline levels of thumb-sucking on both boys, the experimental treatment was first initiated for Christopher. Once Christopher's behavior changed, the treatment was also introduced for Amos. Following the completion of the experiment, follow-up data were collected on three randomly selected days each week.

Procedure

Baseline. During the baseline condition, no contingencies of any kind were in effect for thumb-sucking. The parents only recorded whether the children sucked their thumbs during the designated checks.

Response prevention, feedback, and contingency conditions. During these conditions, feedback, reinforcement, and response cost contingencies were always in effect while the amount of restraint was gradually reduced from a boxing glove to absorbent cotton to a fingertip bandage.

Boxing glove restraint. At bedtime during the first session in this condition, a boxing glove was placed on the hand the child used to suck his thumb (Amos' left and Christopher's right hand). The child was instructed by the mother that he was to wear the boxing glove each night for about a week to help him stop sucking his thumb. He was also shown a chart (bar graph) showing how many times he was observed sucking his thumb during baseline. The mother explained that she would show him the chart each day so he could see how much he sucked his thumb the night before. Each child was also told that (a) he would receive a particular reinforcer if he did not suck his thumb (Amos was given a choice of a candy from a grab bag; Christopher was given four pieces of his favorite candy); and (b) he would lose television time if he sucked his thumb or removed the boxing glove (Amos had to stop watching a preferred Saturday morning TV program 5 min earlier each night he sucked his thumb and hence could lose up to 35 min of TV time if he sucked his thumb every night; Christopher lost 10 min of his

favorite TV program each night he sucked his thumb).

On the following day and during all subsequent days during this condition, both boys were shown their respective graphs, praised for not sucking their thumb, e.g., "Good, you did not suck your thumb yesterday or take off your glove," and offered the agreed on reinforcer.

Absorbent cotton restraint. Following sessions 7 and 8, respectively, in the boxing glove restraint condition, Amos and Christopher were switched from wearing a boxing glove to wearing absorbent cotton bent around the thumb and held in place with 6.3 cm $\times$ 0.9 cm Elastoplast adhesive dressing strip. The absorbent cotton and tape were placed on only one of Christopher's thumbs, whereas both of Amos' thumbs were covered. All other variables remained constant during this condition.

Fingertip bandage restraint. Following 11 sessions in the absorbent cotton restraint condition, both boys were switched from wearing absorbent cotton to wearing an Elastoplast 5 cm $\times$ 4.4 cm (2" $\times$ 1.75") fingertip dressing. Christopher wore the dressing on only one thumb for 11 sessions; Amos wore dressings on both thumbs for six sessions and on only one thumb for four additional sessions. All other variables remained constant during this condition.

No restraint. During this condition, fingertip dressings were no longer used and no restraint of any kind was placed on the thumb. However, the feedback and lost candy and TV contingencies were still in effect.

Follow-up. During follow-up, the parents checked the children three randomly selected nights a week. During the first month, the lost TV time fine was still in effect but the rest of the contingency was removed. During the last 3 months of this condition, no contingencies were in effect.

RESULTS AND DISCUSSION

The percentage of time each child had his thumb in his mouth during the early evening (first six nightly observations) and late evening (last six

Figure 1. Percentage of time Christopher and Amos had their thumbs in their mouths during the early and late evening during each session of the experiment. Circled data points represent sessions in which a second observer independently measured the behavior.

nightly observations) during each session is presented in Figure 1.

Christopher sucked his thumb only during the early evening during the baseline condition; Amos sucked his thumb well into the night. The results of the early morning check are not presented in this figure because Christopher sucked his thumb only once in the morning (during the third baseline session) and Amos only twice during the baseline condition.

The introduction of the response prevention package was associated with an immediate elimination of thumbsucking behavior. Christopher did not suck his thumb at all during the boxing glove restraint condition, and Amos only sucked his thumb on the last session of this condition. (On this session Amos was observed to suck his right thumb for the first time. Therefore, all subsequent restraint procedures were applied to both of Amos' thumbs.) During the remaining two restraint con-

ditions, neither boy was observed to suck his thumb. When the use of restraints was completely faded, there were no further instances of thumb-sucking. Similarly, neither boy was observed to suck his thumb during the follow-up condition when no contingencies were in effect. Additional follow-up data collected by the parents 2 years after the completion of this experiment indicated that neither boy was sucking his thumb.

Both the boys and their parents reported being pleased with the program's results. Amos' parents reported that he seemed interested in the graph, whereas Christopher's parents reported that he took little interest in the graph. As a result, the visual feedback condition was not used in subsequent experiments because it did not seem an essential component of the treatment package. One of the major advantages of the response prevention program was that Christopher's behavior never produced a response cost and Amos experienced re-

sponse cost only once. Indeed, the program was designed so that it was virtually impossible for the child to suck his thumb during the initial portion of the response prevention program because of the presence of the boxing glove. Nevertheless, the children were praised for not sucking their thumbs. This type of program ensures that a minimum of response cost is delivered. Although the fading of restraint in this study may have contributed to the efficacy of the technique, it is also possible that abrupt removal of the boxing glove would have produced similar results. Lassen and Fluet (1978) reported a case study in which thumbsucking was eliminated by having a child wear a thin cotton glove to bed for several weeks. Their results suggest that fading may not be necessary.

Because the treatment package contained many components, it was not possible to determine how much each component contributed to the overall results or even whether any one component may have been responsible for these results. Therefore, the purpose of the next experiment was to determine whether the use of reinforcement and response cost procedures alone could eliminate thumbsucking.

EXPERIMENT 2

METHOD

Children and Setting

Three girls living in Haifa, Israel, participated in this experiment. Natalie was 4 and Anave and Mayin were both 6. Anave and Mayin sucked their thumbs only at night as they began to fall asleep, but Natalie also sucked her thumb during the day. All three children had sucked their thumbs at night since they were toddlers. Anave and Mayin sucked their thumbs during the day until they were 4 and then switched to sucking their thumbs only at bedtime. Only Mayin had a bite problem. Initial observations conducted by the parents revealed that Anave sucked her thumb only during the early evening, whereas Mayin and Natalie sucked their thumbs during early and late evening. All three children were observed by their parents in the home and they each had a fixed bedtime (8:30 p.m. for

Natalie, 9:00 p.m. for Anave and Mayin). Natalie and Mayin both lived at home and Anave lived in a kibbutz. None of the three girls sucked their thumbs in the morning.

Measure

Parents measured nocturnal thumbsucking and obtained a measure of interobserver agreement in the same manner as described in Experiment 1. Interobserver agreement on the occurrence and on the nonoccurrence of thumbsucking was always 100%.

Experimental Design

A multiple-baseline across children design was also used in this experiment. After obtaining baseline levels of thumbsucking on all three girls, the social reinforcement and response cost condition was introduced for Anave and Mayin. Once Anave's and Mayin's behavior stabilized, the treatment was also introduced for Natalie. Following the introduction of the social reinforcement and response cost condition for all three children, the response prevention and fading condition was sequentially introduced.

Procedure

Baseline. During the baseline condition, no contingencies were in effect for thumbsucking. The parents only recorded whether the children sucked their thumbs during the designated checks.

Social reinforcement, tokens, and response cost. During this condition, the observers were instructed to praise the child in the morning and several times during the day if she did not suck her thumb during the night. The observers also gave the child a point in the morning if she did not suck her thumb the night before; the child could exchange five points for a surprise gift (a book, a small toy, or candy). On mornings when the child had sucked her thumb the previous night, she lost 1 point and 20 minutes of evening television time before bedtime.

Mitten restraint and contingencies. At bedtime during the first session in this condition, a heavy woolen mitten was placed on the hand the child used to suck her thumb. The child was in-

Figure 2. Percentage of time Anave, Mayin, and Natalie had their thumbs in their mouths during the early and late evening during each session of the experiment.

structed by the mother that she was to wear the mitten each night for about a week to help her stop sucking her thumb. Each child was also told that she would receive points on mornings that she did not suck her thumb the preceding night and would lose a point and television time on mornings that she sucked her thumb the night before or removed the mitten. These contingencies were applied in the same manner as described in *Social reinforcement, tokens, and response cost*.

On the following day and during all subsequent days during this condition, each girl was praised for not sucking her thumb, (e.g., "Good, you did not suck your thumb yesterday or take off your mitten,") and was given a point.

Absorbent cotton restraint and contingencies. Following 10, 6, and 5 sessions, respectively, in the mitten restraint condition, Mayin, Natalie, and Anave were switched from wearing a mitten to wearing absorbent cotton bent around the thumb and held in place with 6.3 cm $\times$ 0.9 cm Elastoplast adhesive dressing strip. The absorbent cotton

and tape were only placed on one of Mayin's and Anave's thumbs, whereas both of Natalie's thumbs were covered. All other variables remained constant during this condition.

Fingertip bandage restraint and contingencies. Following 10, 12, and 8 sessions, respectively, in the absorbent cotton restraint condition, Mayin, Natalie, and Anave were switched to wearing an Elastoplast 5 cm $\times$ 4.4 cm (2" $\times$ 1.75") fingertip dressing. Mayin and Anave wore the dressing on only one thumb; Natalie wore dressings on both thumbs. All other variables remained constant during this condition.

No restraint and contingencies. During this condition, fingertip dressings were no longer used and no restraint of any kind was placed on the thumb. However, social reinforcement and response cost contingencies were still in effect.

No restraint and no contingencies. During this condition, all contingencies, except social reinforcement, were removed for one of the girls (Natalie).

Follow-up. During follow-up, the observers

checked the children three randomly selected nights a week. During the follow-up condition, only social reinforcement was in effect.

RESULTS AND DISCUSSION

The percentage of time each child had her thumb in her mouth during the early evening (first six nightly observations) and late evening (last six nightly observations) during each session is presented in Figure 2.

Anave only sucked her thumb during the early evening during the baseline condition, whereas Mayin and Natalie both sucked their thumbs well into the night. The results of the early morning check are not presented in this figure because none of the three children sucked their thumbs during the early morning.

The introduction of the social reinforcement, tokens, and response cost condition eliminated Mayin's thumbsucking behavior in the early evening, but had little effect on thumbsucking later in the night. The procedures also reduced Anave's thumbsucking by about a third, but had little effect on Natalie's.

Following the introduction of the response prevention package, thumbsucking was completely suppressed in all three children. Mayin and Anave were never observed to suck their thumbs during this condition; Natalie was observed sucking her thumb on only three occasions: once during the absorbent cotton restraint condition, once during the fingertip bandage condition, and once during the no restraint condition.

The results of this experiment suggest that the use of the social reinforcement, tokens, and response cost procedure alone may not be sufficient to eliminate bedtime thumbsucking. However, when used together with the response prevention procedure, thumbsucking was typically suppressed. Although the results of this experiment demonstrate the importance of the response prevention procedure, it is not clear whether it is necessary to use all three steps beginning with the more intrusive heavy glove. The purpose of the third experiment was to determine whether the

treatment package would be effective in the absence of the heavy glove restraint condition.

EXPERIMENT 3

METHOD

Children and Setting

Two boys and one girl living in Haifa, Israel, participated in this experiment. Ranni was 7 and Yossi was 8. The girl, Dalyt, was 4 years old. None of the children sucked their thumbs during waking hours and all three children began sucking their thumbs at night as they began to fall asleep.

Dalyt had sucked her thumb at bedtime since she was a toddler and never sucked her thumb during the day, whereas Ranni and Yossi sucked their thumbs during the day until they were about 5 and then switched to sucking them only at bedtime. Both Ranni's and Yossi's dentists had advised the parents to do something about their thumbsucking and Ranni had a bite problem. Initial observations conducted by the parents revealed that Ranni and Dalyt sucked their thumbs for up to 2 hours after being put to bed, and that Yossi frequently sucked his thumb throughout the night. None of these children were observed sucking their thumbs in the morning. All three children were observed by their parents in the home and they each had a fixed bedtime: on school nights (9:00 p.m.) and on Fridays (10:00 p.m.).

Measure

Parents measured nocturnal thumbsucking and obtained a measure of interobserver agreement in the same manner as described in Experiment 1. Interobserver agreement on the occurrence and nonoccurrence of thumbsucking was always 100%.

Experimental Design

A multiple-baseline across children design was used again. After obtaining baseline levels of thumbsucking on all three children, the experimental treatment, which consisted of reinforcement and response cost contingencies, and a response prevention procedure that began with the

use of absorbent cotton, was first initiated for Ranni. Following the completion of the experiment, follow-up data were collected on three randomly selected days each week.

Procedure

Baseline. No contingencies were in effect for thumbsucking. The parent only recorded whether the children sucked their thumbs during the designated checks.

Absorbent cotton restraint and contingencies. The absorbent cotton restraint condition used in this experiment was carried out in the same manner as described in Experiment 1. Each child was given a point each morning that he or she did not suck his or her thumb the preceding night. Each child could exchange five points for a surprise gift (a record or a small inexpensive toy). On mornings when the child sucked his or her thumb, he or she lost a point. Ranni and Yossi also lost 15 min of TV time and Dalyt lost access to her favorite toys for 15 min.

Fingertip bandage restraint. This condition was carried out in the same way as described in Experiment 1. The reinforcement and response cost procedures remained in effect during this condition.

No restraint. During this condition, fingertip dressings were no longer used and no restraint of any kind was placed on the thumb. However, the reinforcement and response cost contingencies were still in effect.

Follow-up. During follow-up, the parents checked the children three randomly selected nights a week. During the first month the fine procedure was still in effect but the rest of the contingency was removed. During the last 3 months of this condition, no contingencies were in effect.

RESULTS AND DISCUSSION

The percentage of time each child had his or her thumb in his or her mouth during the early evening (first six nightly observations) and late evening (last six nightly observations) during each session is presented in Figure 3.

Ranni and Dalyt sucked their thumbs only dur-

ing the early evening in the baseline condition, whereas Yossi sucked his thumb well into the night. The results of the early morning check are not presented in this figure because none of the children were observed sucking their thumbs in the morning.

The introduction of the response prevention package with the absorbent cotton was associated with an immediate reduction of thumbsucking behavior. Dalyt never sucked her thumb after the introduction of the absorbent cotton restraint condition, Yossi sucked his thumb only once during the fingertip bandage restraint condition, and Ranni sucked his thumb only once during the absorbent cotton restraint condition and during the no restraint condition. During follow-up, there were no further instances of thumbsucking.

All of the parents reported being pleased with the program's results. One of the major advantages of this procedure is that it took less time and did not involve wearing a heavy glove, which could be very uncomfortable in warm weather.

In each of the preceding experiments, the restraint procedure was faded over two or three steps. The purpose of the fourth and final experiment was to determine whether the fading procedure was a necessary component of the treatment package. Therefore, the absorbent cotton restraint condition was abruptly removed after it had been in effect for approximately as long as the three restraint conditions were used in Experiments 1 and 2.

EXPERIMENT 4

METHOD

Children and Setting

Two boys living in Nova Scotia, Canada, participated in this experiment. Matt was 7 and Kirt was 4. Neither boy sucked his thumb during waking hours and both boys began sucking their thumbs at night as they began to fall asleep.

Both Matt and Kirt had sucked their thumbs at bedtime since they were babies. Matt stopped sucking his thumb during the day at the age of 5½ and Kirt stopped sucking his thumb during

Figure 3. Percentage of time Yossi, Ranni, and Dalyt had their thumbs in their mouths during the early and late evening during each session of the experiment.

the day just prior to beginning the study. Initial observations conducted by the parents revealed that Matt usually sucked his thumb only during the early evening after being put to bed, whereas Kirt also sucked his thumb in the morning. Both boys were typically put to bed between 8:00 p.m. and 8:30 p.m. on weekdays and between 9:00 p.m. and 10:00 p.m. on weekends.

Measure

The parents measured nocturnal thumbsucking and obtained a measure of interobserver agreement in the same manner as described in Experiment 1. Interobserver agreement on the occurrence and nonoccurrence of thumbsucking was always 100%.

Experimental Design

A multiple-baseline across children design was also used in this experiment. After obtaining baseline levels of thumbsucking on both boys, the response prevention condition was first introduced for Matt. The response prevention procedure was

abruptly removed for both boys and later introduced and removed for Kirt.

Baseline. No contingencies were in effect for thumbsucking. The parents only recorded whether the children sucked their thumbs during the designated checks.

Response prevention. During this condition, absorbent cotton was bent around each thumb and held in place with 6.3 cm $\times$ 0.9 cm Elastoplast adhesive dressing strip. Each boy was told that he would receive 25¢ in the morning if he did not suck his thumb at night. The boys were praised in the morning if no thumbsucking occurred. The money was placed in the child's clear glass piggy bank on days that it was earned.

No restraint. During this condition, the use of the absorbent cotton was abruptly discontinued and no restraint of any kind was placed on the thumb. However, both boys continued to receive 25¢ in the morning if they did not suck their thumbs the night before.

Follow-up. During follow-up, the parents

removal of reinforcers alone was not effective. These results also showed that the glove restraint condition was an unnecessary component of the original procedure and suggest that fading from gauze to a fingertip bandage may have contributed to the overall efficiency of the package.

These findings suggest that a procedure, which has proven effective in eliminating compulsive rituals in clinical populations (Levy & Meyer, 1971; Mills, Agras, Barlow, & Mills, 1973; Turner, Hersen, Bellack, & Wells, 1979), may also prove effective in managing a more common problem involving a frequently repeated behavior (i.e., thumbsucking). It remains to be determined whether similar procedures would prove effective with other common problems such as nailbiting, hairpulling, and behavior management problems.

Although the response prevention program was not applied to daytime thumbsucking in these experiments it is likely that this procedure would also prove effective with this common problem. Because the results of Experiment 3 demonstrated that use of the obtrusive and restrictive glove restraint procedure was not necessary to obtain suppression of nocturnal thumbsucking, it is likely that the use of the gauze and fingertip bandage procedure would be sufficient to suppress daytime thumbsucking. It was noted that although the gauze and fingertip bandage restraint conditions prevented thumbsucking, they did not seem to impair functioning or be overly inconvenient for the children. Further research should assess the effectiveness of the response prevention procedure with daytime thumbsucking.

One major advantage that this procedure offers over other procedures is that it is not necessary to apply frequent consequences to obtain a large change in behavior. As a result, the parents require very little instruction and supervision to carry out the program successfully. Once parents give the instructions to the child and apply the restraint, they need apply only one consequence in the morning.

It is not clear why a response prevention strategy is so effective in helping to eliminate a long-standing persistent behavior. It may be that response

prevention works by breaking down stimulus control by preventing the child from making the response in the presence of its usual controlling stimuli. Perhaps future research could be designed to examine this question.

Although the results of Experiment 2 showed that the contingency procedure alone was not sufficient to eliminate nocturnal thumbsucking, it cannot be concluded that it was not a necessary condition because the restraint procedure was never used without it. There is, however, a good reason why the contingency procedure was used in each experiment along with response prevention. Contingencies were not used directly to prevent the children from sucking their thumbs (the restraint accomplished this), but to ensure the children's cooperation and compliance in leaving on the gloves, mittens, gauze, or bandage. If no consequences were applied for leaving them on, it would seem reasonable that at least some children would take them off. In any case, the use of simple contingencies adds little to the amount of work required of the parents; therefore, knowing whether it is a necessary condition for the program's success is somewhat less important than knowing whether the response prevention condition is essential.

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