*APPLICATION OF TIMEOUT FROM POSITIVE
REINFORCEMENT FOR INCREASING THE
EFFICIENCY OF SPEECH TRAINING¹*

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Language training procedures, which involved positive reinforcement for verbal imitation, were applied to increase the appropriate verbal behavior of an almost non-verbal, brain damaged, 5-yr-old boy. Two experiments assessed the effectiveness of timeout from positive reinforcement as a training procedure viewed as having potential punishing and negatively reinforcing functions. In both experiments, timein, termination of timeout and resumption of training, was arranged to have reinforcing properties in that it presented an opportunity to receive positive reinforcers. In Exp. I, the procedure consisted of temporarily halting language training (timeout) following verbal jargon and resuming it (timein) contingent upon the boy sitting quietly in his chair for approximately 30 sec. The jargon declined to almost zero for an extended period each time the procedure was employed. In Exp. II, the procedure consisted of halting language training (timeout) after emission of undesired verbal responses which previously had been reinforced as the desired approximation to the target verbal behavior. Resumption of training (timein) was made contingent upon the emission of the then-desired approximation of the target verbal behavior. In each experiment, the contingent timeout and timein of the language training that involved positive reinforcement effectively reduced the undesired and increased the desired responses.

One procedure that can be used for training a child to acquire topographically appropriate speech is imitation: the child is presented with a unit of speech as a verbal model. The child's response is reinforced each time he responds with a vocalization that approximates the model presented. At each successive approximation, the criteria for an appropriate response become more stringent and responses that do not meet the criteria are placed on extinction (ignored) while appropriate approximations are reinforced. Although speech can be trained by using positive reinforcement and extinction, it sometimes requires a rather extended training period, due to some of the behaviors in the child's repertoire. Not only does the child come to therapy with a low rate of emission of appropriate speech, but he frequently comes with a repertoire of inappropriate vocalizations

(jargon), which he emits spontaneously during each session. Furthermore, as the training progresses and more precise articulation is required, or the phoneme to be acquired is a difficult one to produce, the formerly appropriate approximations may take a considerable amount of time to be extinguished.

As long as these inappropriate vocalizations continue to be emitted in speech sessions, progress in training appropriate speech is hampered. Usually a procedure in which appropriate responses are reinforced while inappropriate behavior is placed under extinction is successful in training speech. Sometimes, however, the inappropriate behaviors are not readily modified by these procedures. It is possible that a more efficient program might result if a consequent event, rather than extinction, were used to modify the jargon and inappropriate responses.

A consequent event that has been used successfully to decelerate incompatible behavior in children is timeout from positive reinforcement (Baer, 1962; Wolf, Risley, and Mees, 1964). Timeout has been used also during speech training with echolalic children to decrease the frequency of emission of inappropriate verbal statements and shrieks (Risley

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and Wolf, 1967), and to decelerate incorrect responses (Sloane, Johnston, and Harris, 1968). The results indicate that in situations in which positive reinforcers have been established, timeout can be an effective consequence for quickly decelerating inappropriate behavior. It is possible that in attempting to modify jargon and inappropriate responses, timeout as a consequent event will function more effectively than extinction, thereby increasing the efficiency of speech training.

The present study sought to explore whether timeout from positive reinforcement within and across sessions would function (1) as a punishing event to decrease the frequency of jargon vocalizations, and (2) as a negatively reinforcing event to increase the probability that a specific speech unit would be emitted, rather than a previously correct (but currently incorrect) speech response.

METHOD

Subject

A 5-yr-old boy, who had been diagnosed as brain-damaged, served. Although his parents had attempted to enroll him in a special class, he had not been accepted due to his severely limited behavioral repertoire. No evaluation results were available because no responses had been obtained from the child during diagnostic procedures. During baseline observation the child emitted no speech and did not respond appropriately to verbal directions. In three observation periods he emitted no vocalizations. He was accepted in our experimental speech training program after he had been excluded from other special programs.

Operant procedures were used for speech training. In the initial phases of training, emphasis was placed on shaping vocal behavior. The child's vocalizations were reinforced and by the time the study began, he was imitating isolated speech sounds. The imitation training consisted of presenting the child with a model of the phoneme. Vocalizations that approximated the model were reinforced with ice cream. No consequences were presented for incorrect responses. The present study was initiated during imitative word training.

Experimental Setting

The imitative speech training was conducted in a two-room experimental suite. The

experimental and control room were separated by a wall containing a one-way vision window. A microphone was mounted in the ceiling of the experimental room and led to a Roberts Tape Recorder, Model 770, and a speaker located in the control room. The training took place in the experimental room while an observer recorded the data in the control room.

Three pens of a Gerbrands four-pen event recorder were used to record the events in the experimental room. The pens were activated by foot switches placed on the floor of the control room. The first pen was used to record the experimenter's presentation of the model, the second recorded the subject's response, and the third recorded the consequent event if one occurred. The observer, a speech pathologist, transcribed in phonetic symbols on the event recorder tape his own observations regarding the subject's responses. Each notation was written directly beside the response as it occurred and was recorded with the pen. In this manner, agreement or disagreement on each response between the observer and experimenter was recorded. Because of the continuously running tape, occurrences of events within any specified time interval for each session could be counted. To check reliability, a second observer was introduced periodically and both would make simultaneous observation records of a session.

For the jargon behavior, percentage of agreement between the observers was obtained by dividing the smaller number of observed occurrences by the larger number when the frequency scores of the observers were not identical. In this case, interest was centered on obtaining a reliability index of frequency *per se*, and the amount of agreement over the total number of jargon occurrences.

For the subject's imitative responses, reliability was assessed between the experimenter and observer as well as the two observers. The percentage of agreement was obtained by dividing the total number of agreements by the number of agreements plus the number of disagreements. The percentage of agreement in all reliability calculations ranged from 81 to 86%.

Preliminary Procedures

The procedure for word training followed the imitation paradigm. Instead of using a

gradual fading of phoneme prompts (Risley, 1966) for word training, the procedure consisted of backward chaining. Each word was taught by first presenting the child with the final phoneme in the word; when he had acquired imitation of this phoneme, the next to the final phoneme was introduced. Chaining continued until the child had acquired all the phonemes in the chain and was imitating the complete word. When the child's imitation was appropriate, the experimenter said, "Good", and immediately followed this with a bite of ice cream. It was observed, however, that as responses with more precise topographies were required, *i.e.*, correct articulation of all phonemes in a sequence, the rate of acquisition of the chain of phonemes was considerably slower than it had been in the earlier isolated phoneme training. The slow acquisition was partly attributable to the fact that the child, after correctly imitating the new response chain for some time, would then revert to the previously learned shorter chain.

At this time the child also began to jargon; *i.e.*, after he had responded, and before the experimenter presented another stimulus, the child began to emit a number of irrelevant vocalizations. Originally, any inappropriate response or jargon was placed on extinction; no consequence was applied. The experimenter waited until he had stopped vocalizing before presenting a new stimulus, but the jargon increased. It was evident that, whereas reinforcement and extinction had been sufficient for training the speech response thus far, they were less efficient for training correct articulation of several phonemes in the context of a word. At this point, the study was initiated to explore the efficiency of using a combination of consequent events other than reinforcement and extinction for word training. An attempt was made to determine if timeout from positive reinforcement would function more effectively to decrease the jargon and increase the probability that the correct response would be emitted.

Procedures

Jargon was defined as unintelligible vocalizations consisting of one or more spoken sounds resembling English phonemes. When these vocalizations occurred after a response had been emitted and before a new model was

presented, they were scored as jargon. When timeout was used as a punishing event for jargon, the procedure consisted of the following sequence of events: after jargon was emitted the experimenter took the ice cream, turned in her chair, and sat with her back to the child. Turning to face the child again was contingent on his ceasing the jargon and remaining quietly in his chair for approximately 30 sec. If the child had been sitting quietly for 30 sec, the experimenter turned to face him, smiled, and presented the verbal model. If the child imitated the model, the experimenter reinforced the behavior by presenting the child with a bite of ice cream and a verbal, "Good".

Timeout was instituted for jargon during training of the words "pop" and "boat". In both instances, timeout was contingent upon the emission of jargon after it had increased in extinction.

When timeout was used in a negative reinforcement paradigm for emission of a specific speech response, the procedure was somewhat different. Timeout for incorrect responses was applied only after (1) the subject had previously demonstrated that he could imitate the new response, (2) the subject showed no increase in the correct responses within at least a 5-min period in a training session, and (3) his responses consisted of the previous response that had been appropriate before a new phoneme or word was added to the chain.

Timeout as a negative reinforcer was applied for incorrect responses four times. It was presented twice in the second session of training for the chain "cream", once during the second session of training for the word "dog", and once during the second session of training for the sentence "I want pop". On all four occasions, timeout was contingent upon continued emission of a formerly correct, but presently incorrect response in imitation of the experimenter's model. Timeout was terminated contingent upon the emission of the correct response. In training for "cream", timeout was contingent upon emission of "eam", and terminated contingent on emission of "ream". In training for "dog", timeout was contingent upon emission of "og", and terminated contingent upon emission of "dog". Timeout was instituted when the subject emitted, "want pop", and terminated when the child emitted, "I want pop".

RESULTS

Timeout contingent on jargon usually resulted in a decrease in the number of vocalizations within 5 min after its application. In both cases of timeout for jargon, the rate of vocalizations decreased from an average of four vocalizations per minute before application of timeout, to nearly zero per minute after termination of timeout. Figure 1 presents the results of applying timeout for jargon during training for the word "pop".

Fig. 1. Cumulative number of jargon vocalizations over four sessions of imitative speech training before and after timeout (T.O.) from positive reinforcement for jargon. Each dot represents 2 min.

In the first session of training for the word "pop", the jargon vocalizations averaged one every 2 min. No consequences were presented after these vocalizations were emitted. In the second session, the jargon vocalizations increased to a rate of approximately 3-per-min by the fourteenth minute. At this time, timeout was applied, contingent on the emission of the next jargon vocalization. During the first 2 min of timeout, the subject emitted eight vocalizations, and then gradually the vocalizations decreased to three within the last 2 min. After 30 sec of silence, the experimenter turned to face the subject and presented the model. A correct response was reinforced. No jargon occurred during the rest of Session 2. Except for three vocalizations in the next session, jargon remained at a zero rate.

Figure 2 presents the data on application of timeout for jargon during training of the word "boat".

On the second occasion, timeout functioned to decelerate jargon in much the same manner as it did in the first situation. Jargon was emitted at a rate of approximately one vocalization per minute during the first session of training. In the first 10 min of the second session, the child emitted approximately three jargon vocalizations per minute. Contingent timeout was in effect for the emission of jargon after the first 10 min. During timeout, five jargon vocalizations occurred within the first 2 min and then ceased. After a silence of 30 sec, the experimenter terminated timeout and presented the model. Correct responses increased and jargon decreased to a zero level for the remainder of the session. Although some jargon was emitted in the next session, it did not increase to the former high level.

Timeout for incorrect responses was applied on four occasions, one during training for the word "cream". The results are presented in Fig. 3.

Fig. 2. Cumulative number of jargon vocalizations over three sessions of imitative speech training before and after timeout (T.O.) from positive reinforcement for jargon. Each dot represents 2 min.

The chain for "cream" consisted of a sequence of four training phases: imitation of /m/, then /im/, /rim/ and finally /krim/. Timeout from positive reinforcement was introduced during the addition of the third phoneme to the chain. Before timeout, the subject had reached an 80% level of correct imitations of /im/. Therefore, the /r/, a somewhat diffi-

Fig. 3. Cumulative number of correct responses over three sessions when timeout (T.O.) was used to increase the probability of emission of "cream". Each dot represents 2 min.

cult phoneme to learn to articulate, was added to the chain.

As shown in the first session of /rim/ training, the subject had imitated /rim/ 28 times during the first 15 min of training. He was also emitting some /im/ responses, but as long as he continued to increase the number of /rim/ responses no consequences were applied for the /im/. The child reverted to the /im/ response in the final 2 min of Session 1. In the initial 6 min of the next session, his emission rate of /rim/ was zero. His response consisted of the two phonemes /im/. Timeout was applied after the next /im/ response and remained in effect until the child emitted /rim/. When he said /rim/ the experimenter turned to face him, presented the model, and reinforced /rim/ with ice cream and verbal approval. As shown in Fig. 3, the child correctly imitated five /rim/ presentations, and then reverted once more to the /im/ response. Therefore, a second timeout period was instituted after 5 min. After timeout had been in effect for 2.5 min, the child said /rim/. The experimenter turned to face him and delivered a reinforcement for correctly imitating /rim/. The frequency of /rim/ responses continued to increase while /im/ responses decreased.

Another application of timeout for incorrect responses occurred during training of the word "dog". Results are presented in Fig. 4. Timeout in this situation was contingent on emission of the response /og/ when /dog/ was the

Fig. 4. Cumulative number of correct responses over two sessions when timeout (T.O.) was used to increase the probability of "dog". Each dot represents 2 min.

model presented by the experimenter. In the first 10 min of the first session, the subject had correctly emitted /dog/ approximately 30 times. After the first 10 min of Session 1, he stopped imitating /dog/. At this time, he reverted to emitting the two-phoneme chain /og/ each time the stimulus was presented. After 8 min of incorrect responses, timeout for /og/ was applied. After approximately 3 min of timeout, the subject said, /dog/ and the experimenter turned to face him. The experimenter presented the word /dog/ and a correct response was reinforced. As shown in Fig. 4, the subject quickly increased the frequency of imitating /dog/. In the next session, he reached criterion and progressed to a new phase of training.

Timeout contingent on inappropriate responses also was used in training the subject to emit a three-word chain. The subject had learned to emit "want pop" and the third item in the chain, "I", was added to the response.

The model presented by the experimenter consisted of "I want pop". Results of the fourth application of timeout for incorrect responses are presented in Fig. 5.

Fig. 5. Cumulative number of correct responses over three sessions when timeout (T.O.) was used to increase the probability of emission of "I want pop". Each dot represents 2 min.

In the initial 18 min of Session 1, the subject had correctly emitted the three-item chain approximately 30 times, but the responses alternated between "I want pop", and "want pop". At the end of the session, all his responses consisted of the two-word chain. The same response, "want pop", continued to be emitted in the initial 10 min of Session 2, so timeout was applied. After 2 min had elapsed, the subject said, "I want pop". The experimenter turned in her chair and presented the model "I want pop". The two-word chain decreased in frequency and emission of the three-word chain increased. By the end of the third session, he was emitting the three-word chain at criterion level and training for that phase was terminated.

In general, timeout contingent on emission of incorrect responses resulted in a rapid increase in emission of the complete chain of phonemes or words with more precise articulation on each phoneme. Timeout for incorrect responses was applied on four occasions. On each occasion after timeout was terminated contingent on the emission of a correct response, the number of correct responses increased rapidly. Conversely, the number of incorrect responses rapidly decreased and were gradually eliminated from the child's repertoire. Usually the child reached criterion in that phase of training within the next two ses-

sions and progressed to the next step in training.

DISCUSSION

Timeout contingent on emission of jargon successfully decreased vocalizations when extinction (ignoring the jargon) was ineffective for this purpose. Although timeout did not eliminate the jargon for the remainder of the program, it reduced vocalizations across several sessions to a point at which the jargon no longer interfered with training. Subsequently, when jargon again increased in frequency, timeout effectively reduced it within a short time.

The present results are similar to those obtained by Risley and Wolf (1967) in a training program in which timeout functioned to decelerate crying, temper tantrums, and inappropriate imitative vocalizations. The imitative vocalizations were somewhat similar to the jargon vocalizations emitted by the child in the present study. In both studies, timeout consisted of the experimenter remaining in the room and turning away from the child. Termination of timeout was contingent on the child's ceasing the inappropriate behavior. Vocalizations for the children in the two studies decreased in frequency within the session in which timeout was applied, and remained close to zero throughout the following sessions.

In the present study, the probability that a specific phoneme chain would be emitted was increased when timeout was used as negative reinforcement in situations in which positive reinforcement and extinction had been ineffective. Timeout, however, was used for this purpose only when the child had demonstrated that the response was in his repertoire, and when the problem was one of increasing the frequency of emission, rather than shaping the topography of the response. When the child had emitted the correct response at approximately a 30 to 40% level during a session, it was concluded that the response was present and available to the child.

Timeout has been successfully used to decelerate emission of incorrect responses by Sloane, Johnston, and Harris (1968). They did not, however, use timeout as a negative reinforcer. That is, their procedure consisted of the teacher dropping her head on the chest,

remaining mute, and averting her eyes for 60 sec if the child made two consecutive incorrect responses or unsatisfactory approximations. Termination of timeout, however, was contingent on passage of time in their study, not on the emission of a particular correct response by the child.

The procedures used in the two studies increased the frequency of correct responses. In the Sloane *et al.* (1968) study, timeout functioned as a punishing event to decelerate incorrect responses. As the incorrect responses decreased, the frequency of the correct response increased, but emission of the correct response was not required to terminate timeout.

In the present study, the behavior that terminated the aversive stimulus was specified as the emission of the correct response. In this capacity, timeout functioned as a negative reinforcer to increase the emission of the correct response as well as a punisher to decrease incorrect responses. Once the required response had occurred, timeout was instituted. With the resumption of training, emission of the correct response was maintained by positive reinforcers.

CONCLUSIONS

Timeout from positive reinforcement in speech training has been used primarily as a decelerating consequence for inappropriate behavior, not directly to increase emission of the appropriate speech response. As a punishing event, it functions to eliminate behaviors that are incompatible with, or interfere with training. Elimination of inappropriate behaviors indirectly results in an increase in correct

responses because they have a greater probability of emission when other behaviors are not occurring.

The present study replicated the findings of other studies in which timeout functioned to reduce inappropriate behavior during speech training. In addition, it demonstrated that the specific speech response being trained could be required to terminate timeout in speech training. In some phases of training, timeout would appear to have greater value for functioning as negative reinforcement to increase directly the frequency of the correct response, rather than as a punishing event that "clears the way" for correct responses to occur.

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