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CONTROL OF TANTRUM BEHAVIOR BY OPERANT TECHNIQUES DURING EXPERIMENTAL VERBAL TRAINING

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A technique of controlling undesirable or disruptive behavior during an ongoing program of verbal training with a retardate is described. The technique required that the stimulus materials of the verbal training program be graded according to difficulty, *i.e.*, in terms of the length and complexity of the stimulus materials. (This resulted in an initial grading of the stimulus materials into different levels of probability of reinforcement.) Changes by the experimenter from high-difficulty to low-difficulty stimuli for two trials contingent upon disruptive behavior increased the rate of that behavior; changes from low-difficulty to high-difficulty stimuli for two trials contingent upon disruptive behavior decreased its rate. Thus, contingent alternation of the stimulus materials of the ongoing training program controlled the frequency of undesirable behaviors within the experimental sessions. This technique may comprise an alternative to other procedures which require punishment or timeout from the ongoing program.

The application of operant conditioning procedures to language training with speech-deficient children is a relatively recent development. Research has typically focused on language modification and acquisition techniques. A frequent problem with studies of this kind has been the treatment of undesirable competing responses which emerge in the experimental setting. So far, the most common procedure for controlling undesirable behavior has been timeout from positive reinforcement. The exact function of this procedure, whether it is a form of simple extinction or a punishing event, remains in doubt pending further experimental analysis (Leitenberg, 1965).

Risley and Wolf (1967), developing speech in echolalic children, found that the most frequent competing responses were chanting, singing, inappropriate imitation of the experimenter, and temper tantrums. These authors successfully eliminated disruptive behaviors with a timeout procedure applied over as many as 26 hourly sessions. The authors caution that this procedure is effective only to the extent that the positive reinforcer being withheld is potent. Lovaas (1967) taught verbal skills to children with severe behavior disorders (schizophrenic) who had no history of verbal behavior. Disruptive competing behaviors were treated by a short timeout: a turning away from the child for 5 sec in the case of mildly disruptive behaviors such as echolalia and temper tantrums. For more severe disruptions, a long-term timeout was applied by isolating the subject. In still other cases, punishment by application of an aversive consequence was used. These procedures apparently succeeded, although details of their cost in program time were not provided.

The control of undesirable competing responses in experimental language-training settings involves several considerations. If the objective is to accomplish speech training rapidly in alingual children, the most efficient procedures should be those which least disrupt the training process. The timeout procedure may have the disadvantage of subtracting from the time available for training. This is especially true of restraint and long-term isolation procedures. Other aversive controls such as shock may in fact punish the desired verbal responses when they occur simultaneously with the undesirable behaviors.

The purpose of the present study was to investigate a technique for controlling competing temper tantrums that would mitigate the possible disadvantages of timeout or punish-

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ment by rearranging, rather than interrupting, the ongoing language-training procedures. The tantrum control procedure was instituted with one subject as part of a program of training verbal skills in speech-deficient children.

METHOD

Subject

Janet was a 9.5-yr-old girl, institutionalized at the Kansas Neurological Institute for the past 4 yr, and diagnosed as retarded. She reportedly had developed a meager verbal repertoire by the age of 2.5 yr, but then acquired a new home and stepmother, whereupon she became completely mute and began to develop chronic tantrum behaviors. The tantrums reportedly increased in frequency and severity and eventually led to her hospitalization. Janet's case-record described her as an extremely unhappy girl who "suffers a great deal of pain". Her tantrums were described by various psychiatric observers as "extreme pain", "excessive anger", and "masturbating excessively to orgasm". The present investigators' observations of Janet's ward behavior suggested that the tantrums, which occurred at the average rate of 2 or 3 per hr, were highly functional. They seemed to produce the effect of terminating contact with other individuals who usually were making some demand of her. The topography of the behavior was such that it strongly suggested pain simulation. She would lash out with one arm, clutching at her groin with the other. Her legs jerked wildly, sometimes hurling her to the floor or into objects. Her face and neck flushed deep red, and tears would flow, accompanied by loud screams. These tantrums, usually of 10- to 15-sec duration, were occasionally repeated several times in succession. Other than cries and screams, no vocal or verbal behavior had been reported for Janet since her arrival at the institution (4 yr before).

Procedure

Verbal acquisition. The initial phase of the study consisted of a program for imitation of words. Janet came easily under vocal imitative control, which eliminated the need to introduce imitation as a generalized response class through shaping motor behavior, *etc.* The basic unit of speech selected for acquisition was the word or phrase, graded into levels of ascending difficulty, *i.e.*, into levels of increasing numbers of words and syllables in each unit of the stimulus material. The stimulus units for this study consisted of four lists of words and phrases, beginning with one- and two-syllable words in List 1 and concluding with four-word phrases, some of them containing four and some containing eight syllables, in List 4. The four lists are presented in Table 1.

Table 1

Four word and phrase lists used as stimulus materials for the verbal acquisition procedure and alternated for the tantrum control experiment.

List 1	*List 2*	*List 3*	*List 4*
Dog	Red ball	How are you	I brush my teeth
Cat	A box	Go to bed	I tie my shoes
Cup	One boy	Cup of milk	Wash hands with soap
Book	Big house	Set the clock	Drink with a glass
Girl	Two feet	My right arm	Ice cream is good
Chair	Hot soup	Feet and legs	I comb my hair
Juice	Ice cream	A green bush	Feed the brown dog
Spoon	Blue sky	In the house	Walk to the store
House	Cold snow	Wind the watch	Eat with a spoon
Five	The door	Ring the bell	A piece of toast
Table	Little flower	Tiny yellow flower	Stepping over cardboard boxes
Cookie	Broken window	Little baby rabbit	Jumping into running water
Button	Pretty picture	Pretty orange candle	Pretty little yellow flower
Hammer	Lettuce salad	Drinking apple cider	Pouring water into glasses
Apple	Cherry Kool-aid	Painting nurse's picture	
Chicken	Birthday party	Peanut butter sandwich	
Window	Yellow napkin	Drinking cherry Kool-aid	
Napkin	Kitchen cupboard	Eating lettuce salad	
Sleeping	Eating candy	Swimming under water	
Running	Watermelon	Jumping over boxes	

Each stimulus unit was presented by the experimenter, preceded by "Janet, say . . .". Each imitated response was reinforced with a bite of food selected from an assortment of ice cream, Kool-aid, or dry cereal. Experimental sessions were conducted twice daily, and were 15 min in length. Janet's initial verbal attempts were simply mouthed silently and subsequently whispered. These were reinforced at first; then intensity was differentially reinforced over the first 10 sessions until an audible response was emitted to each stimulus (from the first 10 words on List 1). The experimenter then established a criterion of response which required a clearly audible and well-articulated imitation of the stimulus unit. Responses were clearly audible by the beginning of the study and presented no difficulty for accurate recording. Apart from the tantrum-control procedure, Janet's responses were reinforced when acceptable to the experimenter, or followed by re-presentation of the stimulus unit when an unacceptable response was made. If no response was forthcoming, the stimulus unit was re-presented after a 5-sec pause. Progress along the stimulus unit list was dictated by the experimenters' judgment of Janet's satisfactory imitation of the currently presented units. All of Janet's attempts, as well as her successes which resulted in reinforcement, were recorded by an observer using a check list.

The observer was positioned behind a one-way mirror with two-way sound transmission connecting the observation and experimental rooms. His task was to record tantrum and verbal frequencies[2] and to signal the experimenter when an experimental operation was to be applied. This was accomplished by transmitting an audible click over the intercom to the experimenter whenever a tantrum was recorded. A total of 16 sessions of verbal training were conducted before the tantrum-control procedure was initiated.

Tantrum control. The procedure alternated difficulty of stimulus unit in either of two possible contingencies. Each contingency was applied twice over a series of four successive conditions. In Conditions I and III, the occurrence of a tantrum produced two consecutive presentations of new stimulus units of decreased difficulty (shorter length), relative to the stimulus units currently being presented. In Conditions II and IV, the procedure was reversed: a tantrum resulted in two consecutive presentations of new stimulus units of increased difficulty (greater length). For example, in Condition I, Janet was initially presented with units from List 3, beginning with the first phrase. When tantrums occurred, two successive stimulus units were presented from List 1. The first of these units was presented when the tantrum ceased. Each additional tantrum during these words from List 1 caused two additional units from List 1 to be presented. Under Condition II the procedure was reversed. Initially, units from List 1 were presented. Contingent upon tantrum, two units from List 3 would be presented. Conditions III and IV paralleled Conditions I and II, except that Janet had progressed further along the word lists. Thus, in Condition III the initial stimulus unit was the seventeenth phrase in List 3. A tantrum at this point would then produce a switch to the seventeenth word in List 1. Thus, with the word lists arranged so that the stimulus material increased progressively in length, a switch from a later list to an earlier list should have increased the probability of immediate reinforcement. The reverse should have been true for a switch from an earlier list to a later list.

Before onset of the tantrum-control procedure, Janet was successfully imitating stimulus units of comparable length and complexity to those presented in all lists of Table 1, the probability of reinforcement ranging between 60 and 100%.

RESULTS

Figure 1 displays the rate of tantrums and the average level of stimulus difficulty (number of syllables) during the four tantrum-control conditions. These data show that during Conditions I and III, Janet's tantrums served

[2]In a later part of this subject's language training program, following the tantrum-control procedures, reliability of this system of recording such selected aspects of her speech was formally assessed. In this assessment, the observer in the adjoining room, listening to the subject over an intercom, recorded each utterance as correct or incorrect (reinforcable or not reinforcable), trying always to make this judgment before the experimenter could reinforce the response (if reinforcable). The experimenter kept similar records. Comparison of their judgments of correctness (reinforcability) showed a percentage of agreement in excess of 99%, for over 1000 judgments.

an operant function of reducing the difficulty of the stimulus units presented to her, and were maintained at a high level; but during Conditions II and IV, her tantrums served only to increase that difficulty level, and were greatly reduced.

Figure 2 illustrates the effect of tantrum control on Janet's verbal performance. These data represent the total number of attempts by Janet on all words per session, and the total number for each session that met the criterion and were reinforced. (These curves do not include the two responses following any stimulus switch in any of the conditions.) Figure 3 presents the same data as Fig. 2, expressing reinforced responses as a percentage of the total number of attempts. As can be seen from these figures the effects of the tantrum-control procedures were multiple. When a high rate of tantrums was maintained, relatively few words could be presented or reinforced; when a low rate of tantrums was effected, far more words could be presented and reinforced. The relative quality of Janet's imitation (the percent of words acceptable for reinforcement) was more stable, however; it was markedly reduced only under Condition III (the second tantrum-acceleration condition).

DISCUSSION

The differences in tantrum rate shown over the two sets of experimental conditions were produced by operations involving contingencies between tantrums and consequent stimulus difficulty (defined as number of syllables in

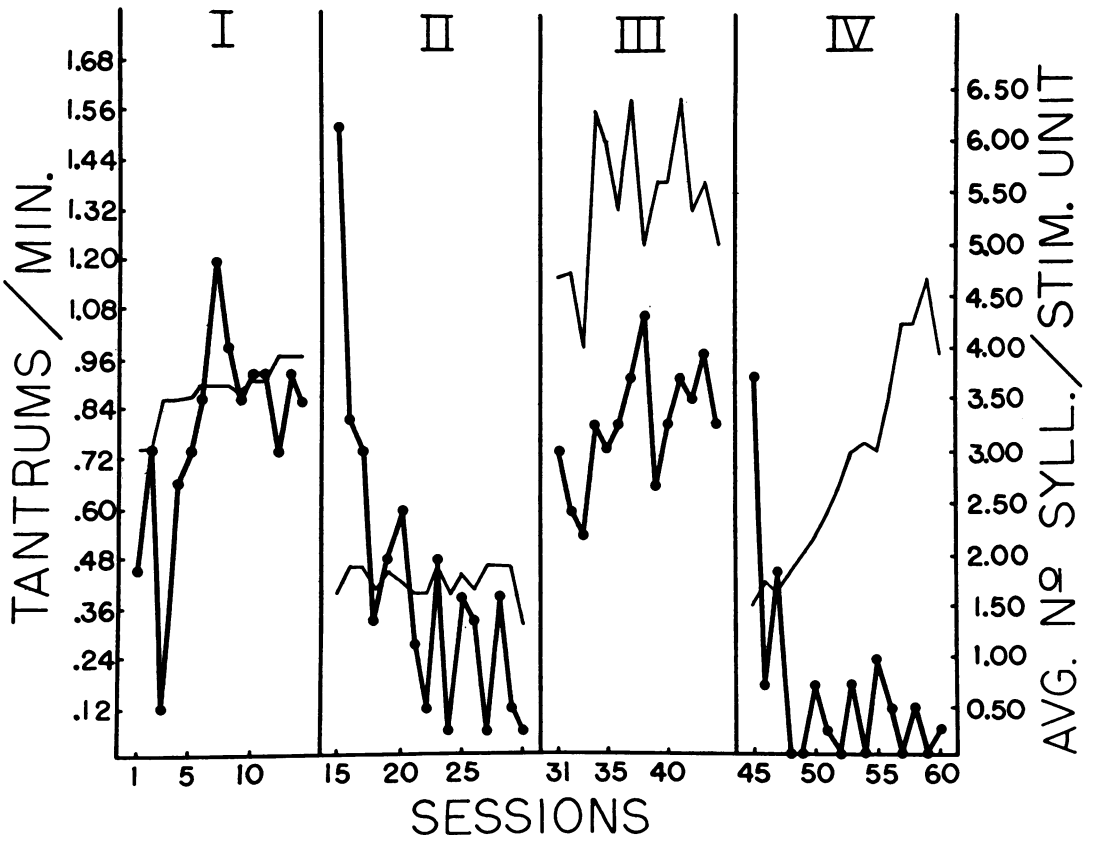

Fig. 1. Tantrum rate (heavy line) for the four conditions is shown on the left ordinate while stimulus difficulty (thin line), depicted as the average number of syllables in the stimulus material for each session, is shown on the right ordinate. In Condition I, stimulus units from List 3 are alternated with units from List 1 contingent upon tantrums. In Condition II, stimulus units from List 1 are alternated with units from List 3 contingent upon tantrums. In Condition III, stimulus units from Lists 3 and 4 are alternated with units from Lists 1 and 2 contingent upon tantrums. In Condition IV, stimulus units from Lists 1 and 2 are alternated with units from Lists 3 and 4 contingent upon tantrums.

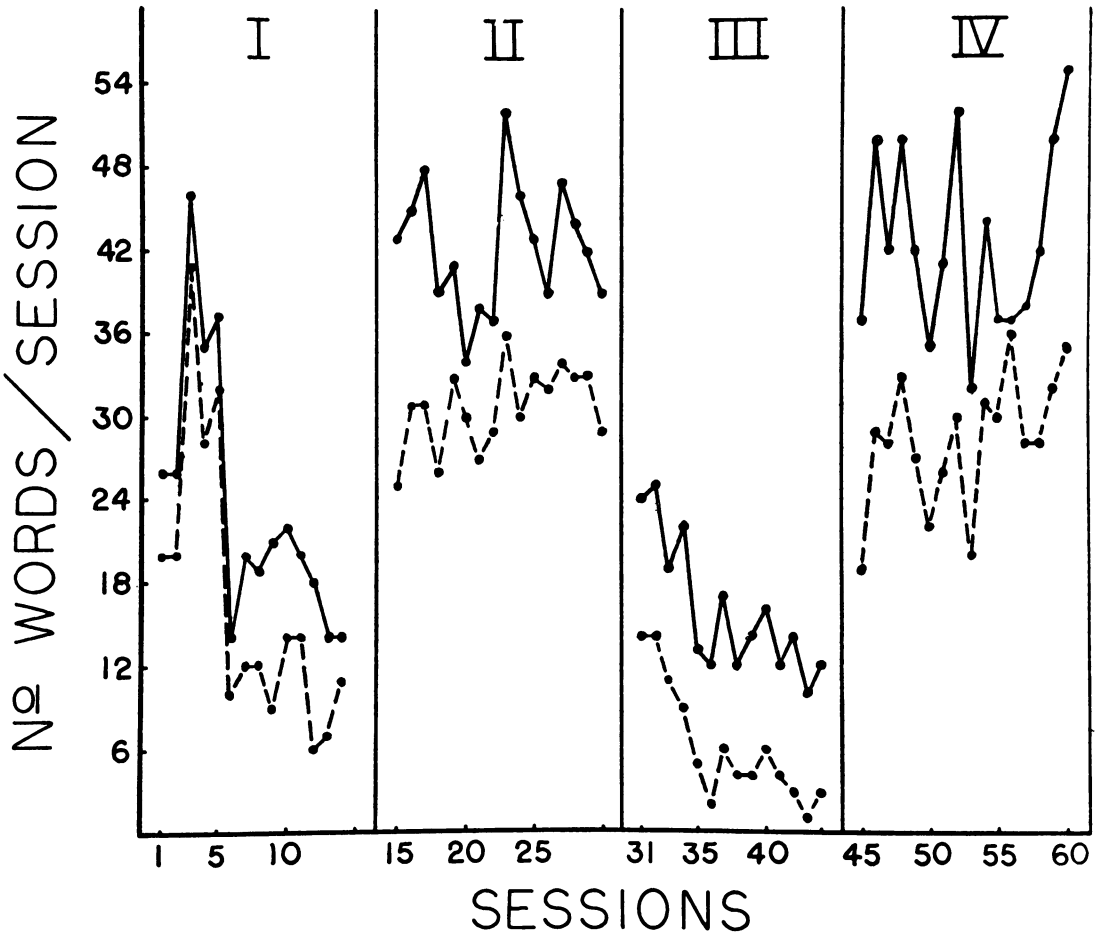

Fig. 2. The total number of verbalizations (solid line), and the number reinforced (broken line) per session are shown on the ordinate. The manipulations which define the four conditions are the same as those specified in Fig. 1.

each stimulus item). However, those operations involved other factors as well. One was the average difficulty of the stimuli prevailing for the experimental condition. Figure 1 shows a rough correlation between experimental condition and item difficulty: in general, Conditions I and III involved more difficult items than Conditions II and IV. It might be argued that the corresponding differences in tantrum rates were simply results of the prevailing item difficulty, with difficult items producing many tantrums and easy items producing few, and that the contingency between tantrums and item difficulty was irrelevant. However, close examination of the data of Fig. 1 shows that in Condition IV, item difficulty was deliberately manipulated into a steadily increasing level. In fact, Sessions 45 to 48 began with the first unit on List 1; Sessions 49 to 52 began with the tenth unit of List 1; Sessions 53 to 56 with the first unit of List 2; and Sessions 57 to 60 with the tenth unit of List 2. Yet this increase in item difficulty produced no corresponding increase in tantrum rate. Furthermore, the difficulty level of Condition III, although substantially higher than that of Condition I, was not associated with a higher average rate of tantrums than had been the case in Condition I. Spearman rank correlation coefficients were calculated for each of the conditions, between tantrum rate and level of stimulus difficulty. The correlations were: Condition I, 0.62 ($P < 0.02$, d.f. = 12); Condition II, 0.38 (n.s., d.f. = 14); Condition III, 0.50 (n.s., d.f. = 12); Condition IV, −0.45 (n.s., d.f. = 14). With the exception of a significant positive relationship for the first tantrum-acceleration condition between num-

ber of tantrums per session and level of stimulus difficulty, this factor did not, of itself, significantly contribute to the tantrum management data. In fact, the fourth condition (tantrum deceleration) reveals a strong but non-significant negative relationship between tantrums and difficulty. Coupled with such internal data, there remains a fact of procedure: in Conditions II and IV, tantrums were followed by two items of increased difficulty each time they occurred. If difficulty in fact did evoke tantrums, then the tantrum rate should have been increased locally by these two trials, thus requiring an additional two trials of increased difficulty for each such tantrum evoked, and implying a run-away condition for tantrums, if such control were powerful. But in fact, the need to program additional two-item contingencies for tantrums occurred only three times during these two conditions (II and IV).

Figure 2 shows that the number of reinforcers given the subject per session also was generally correlated negatively with her tantrum rate, over the two sets of experimental conditions. It might be argued that a low density of reinforcers over each 15-min session could evoke tantrums, and a high density reduce them, apart from the contingency holding between tantrums and stimulus difficulty. However, it must be remembered that those conditions which increased tantrum rate necessarily reduced the number of reinforcers given, in that the tantrums took up considerable amounts of time during these sessions. The Spearman rank correlation coefficients

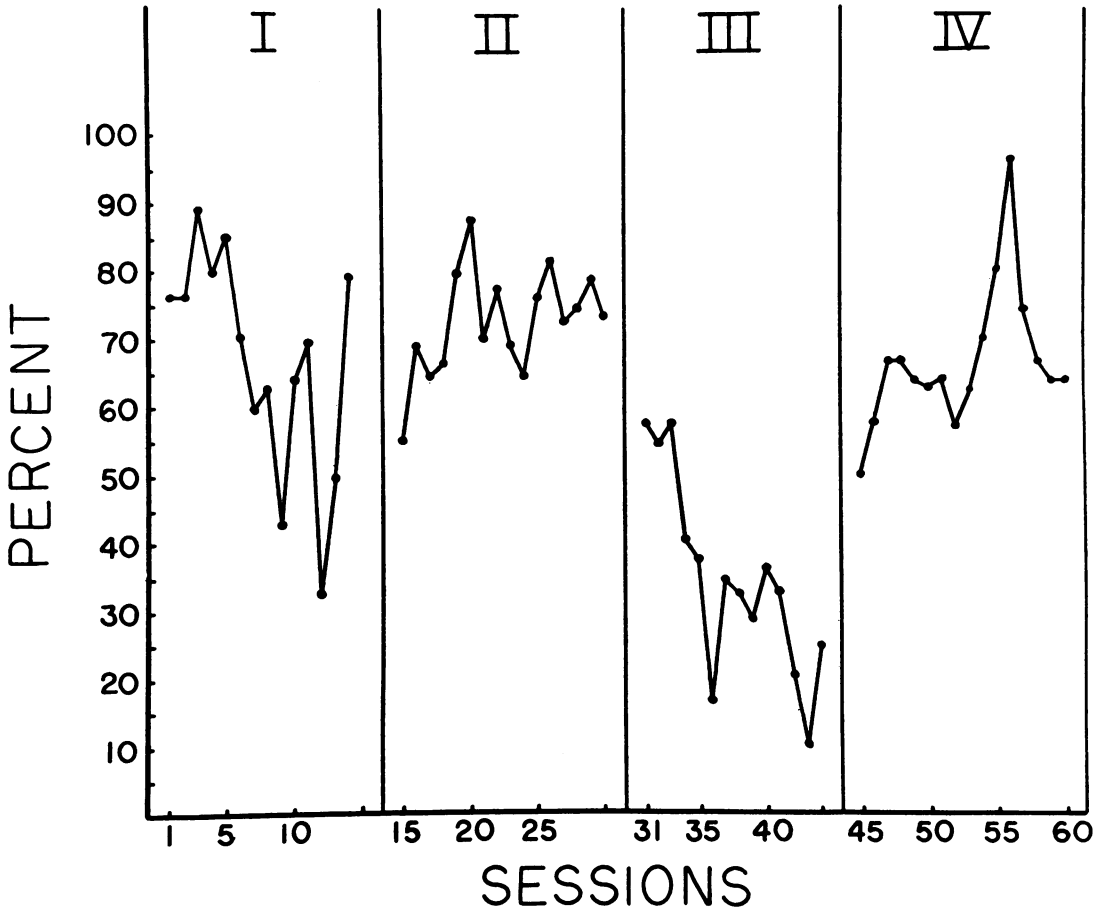

Fig. 3. The percentage of verbalizations which met the criterion of acceptability and were reinforced are shown on the ordinate. Data are not included for verbalizations to the two items following a stimulus switch contingent upon a tantrum emission. The manipulations which define the four conditions are the same as those specified in Fig. 1.

between tantrum rate and number of reinforcers earned, within each of the four experimental conditions, were: Condition I, −0.50 (n.s., d.f. = 12); Condition II, 0.02 (n.s., d.f. = 14); Condition III, −0.58 ($P < 0.05$, d.f. = 12) and Condition IV, −0.39 (n.s., d.f. = 14). Significance levels were computed for two-tail tests. With the exception of the second tantrum-acceleration condition, Condition III, wherein the high rate of tantrums produced would be expected to be associated with a lower probability of reinforcement, the density of reinforcers within each condition was not significantly correlated with tantrum rate. It is therefore unlikely that reinforcer density was responsible for the increase and decrease in tantrum rate across the four conditions.

In general, then, it is argued that the contingency between tantrums and consequent stimulus difficulty was the factor responsible for the control of tantrum rate achieved in this study, rather than prevailing conditions of stimulus difficulty or reinforcement density.

There are typically three important aspects of the paradigm for language training with speech-deficient children, all of which need experimental refinement. These are the sequential programming of training phases, the basic response units suitable for training, and the management of competing responses during training. This study addressed itself to the third consideration, and attempted to demonstrate an advantageous technique of extraneous behavior control. Earlier procedures for modifying undesirable competing responses have involved either timeout from positive reinforcement or the application of a contingent noxious consequence. In the present study, tantrum control was accomplished by manipulating the stimulus characteristics as a consequence of emission of tantrums. The disadvantages of timeout and aversive consequences have already been noted. One advantage of the present procedure is that virtually no experimental time is sacrificed, and no extinction or punishment of the response to be strengthened occurs.

Although the general topography of the tantrums remained constant throughout the study, several changes in detail had taken place by the beginning of the fourth experimental condition. While the duration of the response and its extensiveness in space remained constant, its intensity decreased substantially. These tantrums originally involved violent muscle jerks, immediate profuse tearing, and deep flushing of the face and neck. By Condition IV, these presumably respondent components had almost disappeared. The intensity of the screams had also decreased considerably. The tantrums of Condition IV appeared to be almost a sham. In some instances during that condition the tantrums seemed to occur in alternation with laughter, a behavior seldom evidenced by Janet before this experiment. These changes in tantrum intensity were not sufficient to alter the definition of the response during the experiment.

The present study may have some implications for programmed educational instruction. Many teachers currently employ the practice of returning to easier material when a child makes errors. This procedure conceivably may strengthen error-prone behaviors incompatible with the goals of instruction.

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