*SIDE EFFECTS OF EXTINCTION PROCEDURES
IN A REMEDIAL PRESCHOOL¹*

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Several studies have shown that behavior modification procedures aimed at a single behavior may have effects on other, nonmanipulated behaviors. A young retarded boy engaged in excessive conversation with his preschool teacher. The teacher then began to ignore his initiated conversation during free-play periods, and it decreased. In addition, (1) social behavior relative to children increased, and (2) use of girls' toys decreased during free play. Also, (3) appropriate behavior at group academics declined, while (4) disruptions rose. In a second study, the teacher alternated conditions of praise and ignoring for talking with children. Talking with children varied accordingly. In addition, use of girls' toys and group academics disruptions rose during the ignoring condition. Appropriate behaviors dropped. Lastly, a timeout procedure was used to eliminate the undesirable side effects of disruptions and of use of girls' toys. Apparently, a response class may have member behaviors that covary directly and/or inversely. Some covariations may be socially desirable, others undesirable. The appearance of undesirable "side effects" can be controlled using behavior modification techniques.

The initial behavior modification studies tended to select and quantify a single behavior of social concern. Operations were then performed that would increase or decrease that behavior. Thus, Allen, Hart, Buell, Harris, and Wolf (1964) increased social interactions in a shy 4-yr-old girl by having the nursery school teacher praise her when she was playing with the other children. Frequently, a child will have multiple behaviors of remedial concern. Wolf, Risley, and Mees (1964) used a variety of be-

havior modification procedures to reduce tantrums, glasses throwing, and eating disturbances in an autistic child. Also, they increased wearing glasses and appropriate verbal behavior. If such multiple behaviors are simultaneously recorded, it is possible to operate only on a single behavior and to observe any effects this operation has on the nonmanipulated behaviors. If the rates of the nonmanipulated behaviors are affected, the observed behaviors can be said to exhibit covariation and the behavior modification procedures to have produced "side-effects".

Sociologists have recognized behavioral covariation in the concept of *role*. Within a given role, certain categories of behavior are frequently observed together, with certain other behaviors notably absent. For example, the adolescent boy, who is acquiring the masculine role, is expected to learn several classes of behaviors that initiate and facilitate social contact with girls, such as dressing well, conversational skill, proper masculine posture, *etc.* At the same time, he is not expected to acquire much facility with domestic and feminine skills such as infant care, shy and passive social behavior, "modest" bodily move-

¹This research was conducted at the Child Behavior Laboratory, University of Illinois and was supported by U.S. Office of Education grant #0762 (032), 46-32-66-358 to Dr. S. W. Bijou. The authors wish to express their appreciation to Dr. Todd Risley for the suggestion to routinely record multiple behavior and to Dr. S. W. Bijou for his criticism and expert suggestions for the manuscript, and to Sylvia Slivon, Alice Marshall, Norman Kanter, and Dottie Whalen for their valuable assistance with other aspects of these studies. Portions of this paper were given at the Southeastern Psychological Association meetings in Louisville, Kentucky in April, 1970. Reprints may be obtained from Thomas Sajwaj, University of Mississippi Medical Center, Dept. of Psychiatry, 2500 North State St., Jackson, Miss. 39216.

ments, *etc.* Psychoanalytic theory also has recognized interrelationships among behaviors in the concepts of symptom substitution, displacement, and sublimation. In symptom substitution, certain behaviors are interrelated in that they are caused by the same defect of the mental apparatus. If one undesirable behavior (*e.g.*, bed-wetting) is eliminated or prevented, another probably more pathological behavior (*e.g.*, arson) will appear. Thus, the two behaviors covary inversely. Unfortunately, psychoanalysis has produced little quantitative evidence to support these concepts of behavior covariation.

Recently, several behavior modification studies have demonstrated behavioral covariation. Barton, Guess, Garcia, and Baer (1970) reported an increase in appropriate mealtime behaviors in retardates as undesirable mealtime behaviors were reduced through the use of different forms of timeout. Wahler, Sperling, Thomas, Teeter, and Luper (1970) used timeout to reduce disruptive behavior and found a coincident decrease in stuttering. Risley (1968), Buell, Stoddard, Harris, and Baer (1968), Lovaas and Simmons (1969), and Wahler (1969) have also reported and quantified multiple behavioral effects of behavior modification techniques. In all of these studies, the "side effects" were socially desirable and constituted an advance in an overall remedial program. These results are in sharp contradiction to expectations generated by the concept of symptom substitution.

If behavior modification procedures can affect nonmanipulated behaviors, a more complete description of the phenomenon is desirable. Specifically, how many diverse behaviors can be affected within a given child? Can socially desirable and undesirable "side effects" appear simultaneously? Most of the above cited studies recorded only two or three categories of behaviors. Consequently, the range and quality of covariation within a given child could not be more completely described.

It was the intent of the present study to record multiple and diverse behaviors of a retarded child. Behavior modification techniques would

be applied to a single behavior. Effects on the other behaviors could then be observed.

EXPERIMENT I

Five categories of behavior were initially selected for Wayne. These were chosen because they represented his most pressing behavioral problems. Fifteen days into the study, two categories of academic behavior were added, because the teacher reported that his performance had drastically changed over the prior 10 days. His excessive frequency of starting conversation with the teacher was selected as the behavior to be directly manipulated. His continual presence and talking distracted the teacher from her responsibilities.

METHOD

Subject

Wayne was a 7-yr-old boy enrolled in a remedial preschool for disturbed and retarded children. He was referred to this preschool for gross inattention to tasks in public school with attendant lack of academic progress. His Wide Range Achievement Test performance was on the kindergarten level, and a Peabody Picture Vocabulary Test IQ was 83. During the first few days of preschool, he presented no conduct problems and was rarely disobedient. He did stay around the teacher constantly and attempted to start conversations with her. When he was physically away from her, he would be continually watching her. He talked very little with other children and infrequently played with them. On the occasions when he would play with the other children, he often took the role of a housewife and mother. He tended not to play with toys but would usually just idly hold them. When he did actively manipulate a toy, it was one with which girls most often play.

Setting

The preschool class had six other children, ages 4 to 7 yr, with varying degrees of aca-

demic retardation, often in conjunction with social and conduct difficulties. Remedial programs were implemented by the teacher in the classroom routine with assistance from university students for one-to-one tutorial situations. The teacher was instructed, in general, to praise and to give "marks" to children when they were behaving appropriately and to ignore them when they behaved inappropriately. Marks were Xs on sheets of paper. The child wore these on a string about his neck, and he could trade for candy or small toys at the end of the day. The teacher and psychologist decided which behaviors were appropriate and inappropriate in each child's program. The class had a preschool curriculum, *e.g.*, circle time, free play, arts and crafts. There were two free-play periods in the morning of about 45-min and 15-min lengths. Here, the children were free to choose their activities and playmates and to change them at will. Restrictions were set only for destructive or injurious activities. Circle time was a 30-min period between the two free-play periods. Here, the children sat on the floor around the teacher and participated in simple academic exercises, *e.g.*, "What day of the week is today? What is the weather like today?" She would praise and give marks for correct answers and other appropriate behavior.

Observation

Wayne's behaviors were recorded during free play and circle time in the morning. The observer would record every 10 sec which of the following behaviors, if any, occurred during a 10-sec interval (Allen, *et al.*, 1964). The observed categories during the two free-play periods were:

1. Initiated Speech to Teacher: audible verbal behavior for any portion of a 10-sec interval if initiated by Wayne (*i.e.*, Wayne speaks first after, at least, 10 sec of no speech between Wayne and the teacher) and including the ensuing conversation. It does not include Wayne's verbal behavior resulting from another

person's prompt.

2. Initiated Speech to Children: this is identical with initiated speech to teacher, except that speech is directed to a child. This was judged by Wayne's head orientation and the content of the speech.
3. Cooperative Play: sharing the same toy or activity or working toward a common goal with another child for any portion of the 10-sec interval. Speech between Wayne and a child did not imply cooperative play.
4. Use of Girl's Toys: touching with his hands a toy for any portion of a 10-sec interval with which girls, but not boys, usually play. These were kitchen furniture and utensils, beads, pocketbooks, rings, irons, dolls, baby bottles, ornate bells, mops, dresses, aprons, plants, hair-dressing combs, and soap bubbles.
5. Active Use of Toys: physically touching any toy with the hands *and* eye contact with it for full 10 sec interval.

These five codes were not mutually exclusive; it was possible for all to be recorded in a given 10-sec interval. Data from both free-play periods were combined for each day.

Two categories of behavior were observed at circle time:

1. Appropriate: eye contact with teacher or with task relevant object/child for full 10-sec interval, and seated with children about teacher.
2. Disruptive: any activities, no matter how quiet, that involved leaving the circle area; or remaining within the circle and performing any behaviors judged distractive of the other children, *e.g.*, fighting, poking, talking-out, grabbing, whispering, odd noises, *etc.*

These two categories were mutually exclusive but were not exhaustive of circle-time behavior. It was possible for Wayne to exhibit behaviors that would not be scored in either category, *e.g.*, remaining in the circle-time group but being in-

attentive. These two circle-time categories were not recorded for the first 14 days of the study.

Teacher attention contingent on initiated speech to children, active use of toys, cooperative play, and use of girls' toys during free play, and appropriate and disruptive circle-time behavior was also recorded. Since the teacher rarely attended or gave marks to Wayne without speaking to him, attention was defined as audible speaking to him coincident with or immediately following any of the behaviors. Contingent teacher attention was not recorded for initiated speech to teacher.

Two highly trained observers recorded these behaviors, although only one was usually present at any time. Reliability was obtained by comparisons between these two observers, who were aware of the course of the research, and by comparisons to three other observers. These latter three observers never recorded the codes at other times and were ignorant of the intent and course of the research. Checks were made during this experiment and Experiments II and III on 14 different occasions for the free-play categories and on 10 occasions for the circle-time codes. Although these checks were not made in every condition of these three experiments, they were taken in conditions when rates of each behavior was highest and lowest. Also, these checks were evenly distributed through the three experiments. Reliability estimates were computed by dividing the number of agreements by the sum of the number of agreements and the number of disagreements. An agreement was scored if both observers scored an occurrence of the behavior in corresponding blocks; a disagreement was scored if only one observer scored the occurrence of the behavior. Agreements on the non-occurrence of the behavior were not counted as agreement.

Procedure

During the initial observational period (attend), the teacher was observed to answer much of Wayne's initiated speech directed to her. After four days, she was instructed to ignore

these completely during free play (ignore). She was permitted, though, to respond to his speech that was the result of her prompting for the entire day, even though observers were present only for the morning free-play and the circle-time periods. These two conditions (attend/ignore) were then alternated to yield an ABABA sequence. Shifts from condition to condition were made when graphs of all behaviors appeared to be roughly stable. During these conditions, the teacher did not attempt any other behavior modification program with Wayne. The only exception was initiated during the second attend condition. Here, some destructive behaviors (*e.g.*, banging a microphone) began to occur. These and only these were followed by removal from the class to a 5 by 5 ft room devoid of any objects. Wayne remained there for 2 min, plus 2 min more of quiet. No other subcategory of disruptive behavior was followed by this timeout procedure or by other disciplinary techniques.

The teacher rarely gave marks to Wayne for his initiations to her. However, she typically gave marks to him when she praised him for the other categories of free-play behavior and for appropriate circle time behavior.

RESULTS

Means of the reliability estimates were: initiated speech to teacher, 86.0%; initiated speech to children, 93.9%; cooperative play, 91.7%; use of girls' toys, 100%; active use of toys, 83.7%; appropriate circle-time behavior, 92.3%; disruptive circle-time behavior, 97.6%; and contingent teacher attention, 93.6%.

Figure 1 gives the means of each behavior summed over all three attend conditions and over both ignore conditions. Initiated speech to teacher was sharply lower when it was ignored, the means being 29% and 3%. The two categories of social behavior relative to children, initiated speech to children and cooperative play, were substantially higher during ignore conditions for initiated speech to teacher. Initiated

Fig. 1. Means of free-play and circle-time behaviors in conditions of attending (solid bars) and ignoring (open bars) initiated speech to teacher in Experiment I. All differences, except use of girls' toys, are significant at the 0.05 level (two tailed) on the Wilcoxon Rank Sum Test for unpaired replicates.

speech to children almost doubled its mean, while cooperative play's means increased five-fold. The mean of use of girls' toys was 25% for attend conditions for initiations to teacher. This fell to 20% in ignore conditions. (Covariations in this behavior are clearer in Experiment II.) Circle-time behaviors were also affected by the manipulations of initiated speech to teacher during free play. Appropriate circle-time behaviors sharply decreased, while disruptions rose substantially. All differences, except that of use of girls' toys are statistically significant at the 0.05 level (two tailed) using the Wilcoxon Rank Sum Test for unpaired replicates (Wilcoxon and Wilcox, 1964). Active use of toys is not shown, as it showed little variation in any condition. It averaged at 25% in all conditions.

From this graph, the six behaviors can be divided into two sets. First, initiated speech to teacher, use of girls' toys, and appropriate circle-time behavior are directly related to each other. Means of these behaviors are higher when the teacher was attending to Wayne's initiations to teacher. Second, initiated speech to children, cooperative play, and disruptive circle-time behavior are directly related to each other. Means of these behaviors are *lower* when the teacher was attending to Wayne's initiations to teacher.

The Experiment I portion of Figure 2 gives

the daily rates for the six behaviors summarized in Figure 1. These daily rates were computed by dividing the scored blocks by the total observed blocks for that day. Median values for each category are given for each condition. Directly beneath the median is given, in parenthesis, the percentage of that behavior that was followed by teacher attention for that condition. This was computed by dividing the number of blocks of that behavior followed by attention by the total scored blocks of that behavior in that condition. For example, in the first attend condition for initiations to children, the median value of the four observed days is 7%. Of all observed occurrences of Wayne's initiated speech to children during this condition, only 5% were followed by teacher attention. In the second ignore condition for appropriate circle-time behavior, the median of the 14 observed days was zero. Of the few occurrences of this behavior during this condition, 34% were followed by teacher attention.

Initiations to teacher were immediately sensitive to the manipulations of contingent teacher attention. For the three conditions when the teacher attended to these, medians were 21%, 33%, and 29%; when she ignored them, the medians were below 5%. Appropriate circle-time behavior was strongly related to the rate of initiations to teacher. When the teacher was attending to his initiated speech to her, medians of appropriate circle-time behavior were relatively high. However, when initiated speech to teacher was being ignored, medians of appropriate circle-time behaviors fell below 5%. Use of girls' toys in free play was, also, directly related to rate of initiations to teacher. The covariations for this behavior are obscured somewhat by the great variability of the behavior and by a great burst of "girlish" play on Days 6, 7, and 8. However, medians are about three times higher in attend conditions for initiated speech to teacher contrasted to ignore conditions. Use of girls' toys occurred in both social and isolate circumstances. Of the free play behaviors, only rates of use of girls' toys exhibited a difference between the two observed free-play periods, be-

Fig. 2. Percentages of 10-sec intervals of Wayne's initiated speech to teacher and children, cooperative play, use of girls' toys in free play, and appropriate and disruptive circle-time behavior as a function of: Experiment I, teacher alternately attending and ignoring his initiations to her; Experiment II, teacher alternately attending and ignoring his initiations to children; and Experiment III, increased attention for appropriate circle-time behavior and use of timeout (TO) for circle-time disruptions and use of girls' toys. Medians of the plotted data are given in each condition. Parentheses give the proportion of each behavior followed by teacher attention in each condition; dash indicates data not taken. Arrow indicates change of teacher.

ing greater in the period following circle time. A scheduling difficulty forced the elimination of this second free-play period for the last five days of last attend condition. Since this may have affected the recorded level of use of girls' toys, these five points are omitted in Figure 2.

Initiated speech to children, cooperative play, and disruptive circle-time behaviors were inversely related to the rate of initiations to teacher. During ignore conditions, the rates of these three behaviors were typically double their attend condition values.

The percentages of initiated speech to children, cooperative play, and use of girls' toys that were followed by teacher attention (parentheses of Figure 1) were quite low and were not systematically correlated with the manipulations of teacher attention contingent upon Wayne's initiations to her. Contingent teacher attention was also very infrequent and constant for disruptive circle-time behavior. However, these percentages were higher for appropriate circle-time behaviors, being highest during ignore conditions for initiations to teacher.

The timeout procedure for extremely destructive activities, started on Day 26 during the second attend condition, was used only three times for these activities through the whole course of the research, including Experiments II and III.

DISCUSSION

The teacher's ignoring of Wayne's initiated speech to her not only decreased his initiations to her but also precipitated systematic changes in his other behaviors. As initiated speech to teacher decreased, use of girls' toys in free play and appropriate behavior in circle time also decreased. However, initiated speech to children, cooperative play, and disruptive circle-time behavior increased. Thus, the manipulation of teacher attention for one of Wayne's free-play behaviors not only affected three other free-play behaviors but also affected his performance at circle time. It might be argued that a possible cause of this covariation would be shifts in be-

haviors to which the teacher attends. When she was ignoring Wayne's initiated speech to her, she had more time to praise and give marks for his cooperative play and his talking to children. Consequently, the two behaviors would increase. This explanation is not feasible. For four of the five nonmanipulated behaviors, the probabilities of contingent teacher attention remained low and stable throughout the manipulations of teacher attention for his initiations to teacher. Also, this explanation could not account for the shifts in Wayne's disruptive circle-time behavior.

Only teacher attention contingent on appropriate circle-time behavior shifted concomitantly with the manipulations of teacher attention for Wayne's initiated speech to teacher. This correlation cannot account for the changes in appropriate circle-time behavior. Normally, increased probability of teacher attention serves to increase behavior it follows. The exact reverse is seen here. It is extremely doubtful that teacher praise during circle time served as a punishment for Wayne. It is more likely that the *frequency* of teacher attention at circle time remained constant across the conditions of this experiment. If the rate of appropriate circle-time behavior would be decreased for some other reason (*e.g.*, manipulations during free play), the observed *probabilities* of circle-time teacher attention would increase, as a statistical artifact.

EXPERIMENT II

In Experiment I, manipulations of Wayne's initiated speech to the teacher prompted changes in six of the seven recorded behaviors. It was of interest to manipulate a second behavior and observe whether similar behavioral changes would occur. Initiated speech to children was selected, because the teacher wishes to further increase his social behavior relative to children.

METHOD

Observations of all the previous behaviors of Wayne and the teacher were continued from Experiment I. Following the final condition of

the first experiment, the teacher was instructed to attend to Wayne's initiations to her and, in addition, to praise and give marks for his initiations directed to other children. After nine days of this, she was instructed to ignore initiated speech to her but to continue praising and giving marks for those directed to children. Initiations to teacher were ignored for the balance of the research with Wayne, as it was especially aversive to the teacher. After 15 days, she was instructed to ignore both categories of initiations. Fourteen days later, she was instructed to begin again to attend and give marks only to initiated speech to children. No other instructions were given.

The setting conditions were maintained as in Experiment I, with one major exception. Midway in the condition where initiations to children were being ignored, the teacher resigned for medical reasons. She was replaced by one of the observers, since the observer was intimately familiar with the classroom routine and the former teacher's behavior. She was especially instructed to follow as closely as possible the former teacher's behavior relative to Wayne. A new observer was trained, but the recording of teacher attention contingent on Wayne's behavior at circle time was dropped. Reliability was reassessed and is included with those given in Experiment I.

RESULTS

Figure 3 gives the means of the free-play and circle-time behaviors for the two attend conditions and for the ignore condition of initiated speech to children. (The first condition of this experiment is omitted.) Initiated speech to children and appropriate circle-time behavior were higher when the teacher praised and gave marks for Wayne's initiations to children. Conversely, use of girls' toys and disruptions at circle time were sharply higher when initiations to children were ignored. Cooperative play showed little change. All differences, except cooperative play, are statistically significant at the 0.05 level (two

tailed) using the Wilcoxon Rank Sum Test for unpaired replicates.

The middle portion of Figure 2 gives the daily percentage of initiated speech to teacher, initiated speech to children, cooperative play, use of girls' toys during free play, and appropriate and disruptive circle-time behavior. Median values for each behavior are given for each condition. In parenthesis is the percentage of teacher attention that followed the behavior during that condition. With the teacher attending to initiations to children and continuing to attend to those directed to her, the medians of initiations to children and cooperative play rose to 25% and 15% respectively from corresponding values of 13% and 2% in the last condition of Experiment I. The median of use of girls' toys fell from 17% to 2%. When the teacher began to ignore initiated speech to her, but continued to attend to those directed to children, the rate of initiated speech to children rose to a median of 34%, but cooperative play and use of girls' toys showed little change. With the elimination of teacher attention contingent on initiations to children, initiations to children dropped, but the median of use of girls' toys rose to 17%. Cooperative

Fig. 3. Means of free-play and circle-time behaviors in conditions of attending (solid bars) and ignoring (open bars) initiated speech to children in Experiment II. The first condition of this experiment is not included in these means. All differences, except cooperative play, are significant at the 0.05 level (two tailed) on the Wilcoxon Rank Sum Test for unpaired replicates.

play did not change. When the teacher again attended to initiated speech to children, initiations to children rose and rates of use of girls' toys fell to a median of 3%. Cooperative play, again, did not change. Initiated speech to teacher remained below 3% for the last three conditions and did not vary systematically in any of the conditions. As in Experiment I, active use of toys did not vary.

Appropriate and disruptive behaviors at circle time showed no changes in the first two conditions. With the elimination of teacher attention for initiations to children, appropriate circle-time behavior decreased and disruptions rose sharply. Reinstatement of teacher attention for initiated speech to children reversed these changes.

The percentages of contingent teacher attention were low and relatively stable for the use of girls' toys and for the partial data on the two circle behaviors. However, these probabilities for initiated speech to children varied with the conditions, indicating that the teacher followed instructions. The change in teachers (arrow in the middle section of Figure 1) did not affect the recorded behaviors.

DISCUSSION

A covariation among four typographically different behaviors appeared. Cooperative play and active use of toys showed little covariation. As in Experiment I, the systematic changes in the use of girls' toys and circle-time behaviors could not be explained by concomitant changes in teacher attention, as seen in the low and stable percentages of contingent teacher attention for these behaviors. Thus, in this experiment, the observed variations were related to manipulations of Wayne's behavior relative to children, rather than his behavior relative to the teacher, as in Experiment I.

This experiment allows a partial analysis of the conditions necessary for behavior covariation to appear in this child. Clearly, the manipulation of his behavior relative to the teacher was not a

necessary condition because the manipulation of his behavior relative to children also produced covariation. There are two other possible necessary conditions. First, a behavior may change because another behavior has changed. Physical compatibility or incompatibility is the simplest condition determining such a relationship between two behaviors. Certainly initiations to children and cooperative play are highly compatible. The direct relationship between these two behaviors observed in Experiment I can be explained most parsimoniously by such physical compatibility. Some of the inverse relationships might appear to be explained by physical incompatibility. Certainly, Wayne could not talk to the teacher and to children simultaneously. Certainly, appropriate and disruptive circle-time behaviors could not be occurring concurrently. However, physical incompatibility alone cannot explain the observed data for these two relationships. It does not follow that initiations to children must have increased as initiations to teacher were decreased. These two behaviors were not the opposite sides of a coin. It was entirely possible for Wayne to amuse himself quietly. This was demonstrated in Experiment II when the teacher ignored Wayne's initiations to children. Initiations to children decreased but initiations to teacher did not increase concomitantly. A similar argument can be made for appropriate and disruptive circle-time behaviors. He could exhibit behaviors at circle time (*e.g.*, playing quietly with his fingers) that would not have been recorded as appropriate or disruptive. In Figure 2, Days 17, 18, 29, and 68 show rates of appropriate and disruptive behaviors to be low simultaneously. These two inverse relationships should be viewed as instances of functional incompatibility (Risley, 1968) to indicate that physical incompatibility was probably necessary, but not sufficient in itself, to account for the observed relationship.

A second possible necessary condition for behavioral covariation would be the discriminative properties of the teacher's behavior. Here, the rate of one of Wayne's behaviors would change

as a function of the teacher's behavior, independent of its reinforcing or punishing properties and independent of the rates of his other behaviors. The changes in Wayne's circle-time behaviors are most directly suggestive to this possibility. Since circle time was a setting distinct from free play, physical compatibility or incompatibility is obviously not relevant. It should be noted though that appropriate circle-time behavior was greatest in Experiments I and II when the teacher was attending to either his initiations to her or to children. Conversely, disruptions at circle time were highest when the teacher was ignoring during free play in both experiments. This suggests that relative presence or absence of teacher attention during free play, regardless of the specific free-play contingencies involved, was a critical determinant of the circle-time behaviors. Thus, the teacher's behavior during free play may have served some discriminative function for circle-time behaviors.

EXPERIMENT III

In Experiments I and II, as the rates of the manipulated behaviors changed, other behaviors systematically covaried with them. Some of these concomitant behavioral changes can be judged socially desirable for this young boy (*e.g.*, increased cooperative play), while others would be judged undesirable (*e.g.*, increased disruptions at circle time). The symptom substitution viewpoint might argue that the appearance of the latter undesirable behavior is a serious check to the use of behavior modification techniques in remedial situations.

This intent of this experiment was to demonstrate that such undesirable behaviors can be eliminated by using other behavior modification techniques. Increased teacher attention for appropriate circle-time behavior was attempted initially to reduce disruptions. A timeout procedure was then added for disruptions. Since the end of the school year was rapidly approaching, reversals of the timeout procedure could not be employed. Rather, as an approximation to

a multiple baseline technique for a demonstration of its effectiveness (Baer, Wolf, and Risley, 1968), the timeout procedure was then extended to use of girls' toys.

METHOD

The data collection and setting conditions described in Experiment II were maintained.

The teacher was instructed: (1) to attend to as much of Wayne's appropriate behavior as possible during the circle time; (2) to stop attending to initiated speech to children and; (3) to continue ignoring initiations to her during free play. After seven days of this, the timeout procedure, described in Experiment I, was added for disruptions at circle time. Five days later, timeout was extended to use of girls' toys in free-play periods.

RESULTS

The far right portion of Figure 2 shows the effects of these procedures. Appropriate circle-time behavior began to fall even though the teacher was instructed to praise it more frequently. The use of timeout, three times the first day and five times subsequently, effectively eliminated disruptions. The rate of appropriate circle-time behavior then increased sharply. The use of timeout twice the first day and once subsequently eradicated use of girls' toys.

Rates of initiations to children and cooperative play remained constant at the levels seen in Experiment II, even though the teacher ceased attending to either behavior as she was instructed. Active use of toys, again, did not vary. Percentages of contingent teacher attention for the other free-play behaviors were low and did not vary systematically with the manipulations.

DISCUSSION

It was clear that the undesirable behaviors generated in Experiments I and II could be easily controlled. Their appearance did not constitute

a serious byproduct of the use of behavior modification techniques in this preschool situation for this child. It was also apparent that the covariation among the different behaviors had ceased. When rates of disruptive behavior at circle time and use of girls' toys were decreased to zero through the use of timeout, only appropriate circle-time behavior increased.

It is of interest that initiated speech to children and cooperative play rates remained high and stable through these manipulations. In Experiment I, initiated speech to children was sensitive to the manipulation of initiated speech to teacher. In Experiment II, it was sensitive to direct contingent teacher attention. Here though, teacher attention was removed for initiations to children, and its rate did not drop. Qualitative observation suggested that children gradually began to react more positively to Wayne as the research progressed. This could suggest that natural reinforcers, *i.e.*, other children's behavior, were now a factor partially controlling Wayne's initiated speech to children and cooperative play. This would overshadow the covariations demonstrated in Experiments I and II.

CONCLUSIONS

In Experiment I, as the teacher alternately attended and ignored Wayne's initiations to her, five other categories of behavior covaried. In Experiment II, covariation was again observed when one of the nonmanipulated behaviors of Experiment I was directly manipulated. Some of these covarying behaviors were directly related to the rate of the manipulated behavior (*i.e.*, increased as the manipulated behavior increased), while others were inversely related (*i.e.*, decreased as the manipulated behavior increased.) Also, some of these covariations would be judged socially desirable (*e.g.*, increased cooperative play), while others would be judged socially undesirable (*e.g.*, increased circle-time disruptions). The extent of the covariation was marked in Wayne's behavior with only one recorded behavior, active use of toys, being unaffected.

Bijou and Baer (1967, p. 78) define a response class as "... a group of responses which develop together. All grow strong or weak, even though the environment may be acting directly on only some of them." This definition is given in the context of the data of Baer and Sherman (1964). They reinforced and extinguished only certain imitations and found that other imitations, though never reinforced, would increase and decrease in strength with the manipulated imitations. The response class definition of Bijou and Baer thus suggests that rates of behaviors in a response class are directly related. However, the covariations observed in Wayne and those observed by Risley (1968), Buell *et al.*, (1968), and Barton *et al.*, (1970) suggest that member behaviors of a response class may also be inversely related. Thus, a response class may well be composed of behaviors that covary directly and/or inversely. The response class definition of Bijou and Baer might then be modified: a group of behaviors that covary directly and/or inversely, even though the environment acts directly on as few as one member behavior. It should also be emphasized that Bijou and Baer's stipulation that the environment act directly on only some of the response class members is met in this research with Wayne. Although the teacher would occasionally praise and give marks for nonmanipulated behaviors, the probabilities of this reinforcement were low and stable across the conditions of these studies. Consequently, such direct reinforcement could not account for the observed systematic covariations.

The data suggest a functional approach to the identification of members of a response class. With Wayne, as initiations to teacher were reduced, initiations to children increased. This follows common sense. However, common sense would not have led us to expect changes in rates of use of girls' toys. Predictions based on common sense or on similarities in behavioral typography may be quite misleading. It would appear that the proper recourse is to maintain a functional definition of response classes, that is, actually to manipulate a single behavior and ob-

serve which behaviors covary. This is analogous to the functional definitions of positive reinforcement and of punishment. Clearly, this is a laborious task of data collection and tabulation. Computerizing this burden is most necessary.

In this study, contingent teacher attention had behavioral effects that extended beyond the target behaviors. One possible explanation would involve multiple functions of differential teacher attention. A given behavior of the teacher (*e.g.*, praising a child) may have three different functions that may engender multiple and markedly different effects on the child's behavior. First, teacher behavior may serve as a positive reinforcer for child behaviors it follows. Thus, teacher attention was maintaining Wayne's initiated speech to her. Second, the significant agents of reinforcement in a child's history (*e.g.*, teachers, parents) may be reinforcing a given set of behaviors. When the teacher praises one of this set, this action may be a discriminative stimulus that the other behaviors of the set would likewise be systematically praised or ignored. Thus, rates of nonreinforced behaviors will change. This possibility is supported by the correlations of the circle-time behaviors to the presence or absence of teacher attention in free play (Experiment II). Over time, it might be expected that a discrimination between agents of reinforcement would develop, and any response class phenomena would disappear. Note that the most covariation was observed in Experiment I, less in Experiment II, and least in Experiment III.

The third possibility is that the strengthening or weakening of a given behavior modifies the setting conditions and thereby prompts changes in other behaviors. For example, since the teacher is ignoring the child, he will be spending less time around her. Therefore, he will be elsewhere, probably engaging in low rates of other behaviors. This would provide the opportunity for different sources of reinforcement to come into contact with these low-rate behaviors and, then, to strengthen and to maintain them. Wayne was around children more and qualitative observation suggested that the incidence of other chil-

dren reacting positively to Wayne increased over Experiments I, II, and III. If such were a positive reinforcer for Wayne, all behaviors associated with contact with children should have risen and become less dependent on manipulations of contact with the teacher. Note that initiated speech to children and cooperative play did not vary as obviously in Experiment II, as it had in Experiment I. During Experiment III they were independent of teacher attention. These possibilities of discriminative and setting event functions are not incompatible and could well be operating simultaneously. Possible research techniques to separate them could involve delivery of noncontingent teacher attention to preserve discriminative functions while changing the child's behavior. Another possibility would involve direct manipulations of natural reinforcers. In any event, a quantitative and comprehensive recording of the behavior of reinforcing agents and more complete estimations of probabilities of teacher and natural reinforcements are very much in order.

This operant view of behavioral covariation presents a more complete approach to possible behavioral side effects of a remediation program than the classical psychoanalytic view of symptom substitution. Symptom substitution emphasizes undesirable behaviors increasing as the symptom behavior is eliminated, if the "underlying cause" is not treated. In this series of experiments, the side effects of behavior modification procedures were mixed. Also, the forementioned studies of Risley (1968), Buell, *et al.*, (1968), Lovaas and Simmons (1969), Wahler (1969), Wahler *et al.*, (1970), and Barton *et al.* (1970) found desirable "substitutions". Thus, the concept of symptom substitution is only partially correct. Actually, four possible categories of "substitutions" or side effects may occur: (1) desirable behaviors may increase; (2) undesirable behaviors may decrease; (3) desirable behaviors may decrease; (4) undesirable behaviors may increase. The occurrence of the first two possibilities should be seen as dividends and as advances toward the desired remedial goals. The

appearance of latter two possibilities should be dealt with as any other problem behavior and not as an obstacle to a behavior modification program.

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Received 23 February 1971.

(Revised 20 September 1971.)