

## REDUCING BEHAVIOR PROBLEMS THROUGH FUNCTIONAL COMMUNICATION TRAINING

EDWARD G. CARR AND V. MARK DURAND

STATE UNIVERSITY OF NEW YORK AT STONY BROOK, STATE UNIVERSITY OF  
NEW YORK AT ALBANY, AND SUFFOLK CHILD DEVELOPMENT CENTER

It is generally agreed that serious misbehavior in children should be replaced with socially appropriate behaviors, but few guidelines exist with respect to choosing replacement behaviors. We address this issue in two experiments. In Experiment 1, we developed an assessment method for identifying situations in which behavior problems, including aggression, tantrums, and self-injury, were most likely to occur. Results demonstrated that both low level of adult attention and high level of task difficulty were discriminative for misbehavior. In Experiment 2, the assessment data were used to select replacements for misbehavior. Specifically, children were taught to solicit attention or assistance or both verbally from adults. This treatment, which involved the differential reinforcement of functional communication, produced replicable suppression of behavior problems across four developmentally disabled children. The results were consistent with an hypothesis stating that some child behavior problems may be viewed as a nonverbal means of communication. According to this hypothesis, behavior problems and verbal communicative acts, though differing in form, may be equivalent in function. Therefore, strengthening the latter should weaken the former.

**DESCRIPTORS:** disruptive behavior, assessment, classroom behavior, communication, developmentally disabled children

A major portion of child behavior therapy is justifiably concerned with the treatment of behavior problems, given that such problems can seriously disrupt the educational process (O'Leary & O'Leary, 1977; Sulzer-Azaroff & Mayer, 1977) and in some cases may lead to institutionalization

(Quay, 1979). Behaviorists have developed treatment strategies designed to decelerate problem behaviors, which include procedures involving extinction (Lovaas, Freitag, Gold, & Kassorla, 1965), time-out (Zeilberger, Sampen, & Sloane, 1968), response cost (Iwata & Bailey, 1974), overcorrection (Foxy & Bechtel, 1983), contingent electric shock (Carr & Lovaas, 1983; Lovaas & Simmons, 1969), and ecological interventions (Durand, 1983). The focus has been on eliminating behavior problems, particularly those such as self-injury, aggression, and tantrums, that are serious enough to jeopardize the safety and effective functioning of the target children and their peers.

There is consensus among researchers and clinicians that the elimination of behavior problems is an important first step in remediation. Ultimately, however, the problematic responses must be replaced with socially useful behaviors (Goldiamond, 1974). Because there are few guidelines available to suggest what these replacement behaviors should be (Donnellan, Miranda, Mesaros, & Fassbender, 1983; Voeltz, Evans, Derer, &

---

This investigation was supported in part by U.S.P.H.S. Biomedical Research Support Grant 2 SO7 RR-07067-18 to the State University of New York at Stony Brook to the first author and a Sigma Xi Grant-in-Aid of Research to the second author. Portions of this paper were presented at the annual meeting of the American Psychological Association, Washington, D.C., August 1982, and Anaheim, California, August 1983. This research was based on a master's thesis conducted by the second author under the direction of the first author.

We thank Martin Hamburg, Executive Director, Suffolk Child Development Center, for his generous support, and Roseann D'Evanzo, JoAnn Giles, Terry Leykis, Cathy Sheredos, and Doug Walters for assistance with data collection. Finally, we thank Alan O. Ross, Susan G. O'Leary, K. Daniel O'Leary, Crighton Newsom, Paul A. Dores, and Daniel B. Crimmins for their helpful comments.

Requests for reprints or individual data should be sent to Edward Carr, Department of Psychology, State University of New York, Stony Brook, New York 11794-2500.

Hanashiro, 1983), we sought to develop a method for identifying and assessing those educational situations in which behavior problems reliably occur (Experiment 1) and, second, we sought to use the assessment information in order to select replacement behaviors (Experiment 2).

Research on the functional analysis of behavior problems provides a good basis on which to build identification and assessment methods. This literature indicates that the factors responsible for the maintenance of behavior problems fall into two broad classes: escape behavior, controlled by negative reinforcement processes, and attention-seeking behavior, controlled by positive reinforcement processes (Carr & Durand, 1985).

There is ample evidence to suggest that many children learn to emit behavior problems in the presence of aversive stimuli. The display of such problems frequently results in the removal of these stimuli, a clear example of a negative reinforcement process (Patterson, 1982). In the classroom setting, instructional demands may frequently function as aversive stimuli and a variety of behavior problems including aggression, self-injury, and tantrums may serve as escape behaviors that effectively allow the child to avoid further participation in instructional tasks (Carr, 1977; Carr & Newsom, in press; Carr, Newsom, & Binkoff, 1976, 1980; Durand, 1982; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982; Romanczyk, Colletti, & Plotkin, 1980; Weeks & Gaylord-Ross, 1981).

The literature also indicates that the display of behavior problems often results in the child's receiving attention, a clear example of a positive reinforcement process (Patterson, 1982; Wahler, 1976). Many investigators have presented data congruent with the notion that behavior problems may be a form of attention-seeking (Carr & McDowell, 1980; Iwata et al., 1982; Lovaas et al., 1965; Patterson, 1980; Wahler, 1969). These studies also imply that children may learn to emit behavior problems in response to low levels of adult attention.

Given the results of the empirical investigations to date, it is clear that any method used to assess behavior problems should include an analysis of

the effects of level of attention (to identify possible attention-seeking functions) as well as an analysis of the effects of task difficulty (to identify possible escape functions). This rationale formed the basis for the assessment procedures used in Experiment 1.

Once it has been determined that a behavior problem likely serves a specific social function (e.g., escape or attention seeking), one is in a position to consider appropriate replacement behaviors. One behavioral alternative to escape would be some form of assistance seeking. For example, it may be possible to teach the child a response that is effective in evoking teacher assistance with a difficult task. Once assistance is provided, the task should no longer be as aversive and therefore escape behaviors should decrease. Likewise, in the case of behavior problems that are attention seeking, one could teach the child an appropriate alternative response that is effective in securing adult attention.

An important question concerns the form of the response alternatives to be taught. Several studies suggest that children can be taught to solicit attention and assistance verbally (Seymour & Stokes, 1976; Stokes, Fowler, & Baer, 1978). Verbal communication training is not typically used as a method for controlling behavior problems. Nonetheless, the analysis just presented suggests that if communicative phrases are carefully chosen so that they serve the same presumptive social functions as the behavior problems they are to replace, then deceleration of these problems should be possible. This training strategy was explored in Experiment 2.

## EXPERIMENT 1

### METHOD

#### *Children and Setting*

Teachers in a day school program for developmentally disabled children were interviewed, and the first four children who met both the following criteria were selected for inclusion in this study:

They displayed at least one problem behavior per hour in the classroom and had expressive language skill consisting, at a minimum, of single word utterances. Based on these criteria, two males and two females were chosen. Jim and Sue were 13 years old; Eve, 14; and Tom, 7. The medical staff had diagnosed Jim as autistic; Sue and Eve as brain damaged; and Tom as developmentally delayed and severely hearing impaired. Tom wore a hearing aid. On the Peabody Picture Vocabulary Test, the children's mental age scores were: Jim, 3 years; Sue, 5 years, 10 months; Eve, 2 years, 5 months; and Tom, 5 years. They displayed a variety of aggressive, self-destructive, and disruptive behaviors that are defined in detail later. Jim and Tom spoke spontaneously in complete sentences. Sue spoke spontaneously in phrases of 2–3 words. Eve was limited to using single noun labels, primarily when prompted.

Sessions were conducted in a 5 × 10-m auxiliary classroom located next to the regular classroom. The experimenter sat between two of the children at a table on which various task materials were placed. All materials were placed 0.3 m from the child so that he or she could readily reach them. If more than one set of materials was used at a time, they were evenly spaced in front of the child, also at 0.3 m distance. Small-group (two children) instruction was used to approximate the regular classroom practice.

### *Experimental Design and Overview*

In a given session, a child received either an easy task or a difficult task; in addition, a child received adult attention during either 100% or 33% of the time intervals into which the session was divided. The two levels of task difficulty and the two levels of adult attention were combined to produce three conditions: easy 100, easy 33, and difficult 100. Comparison of easy 100 with easy 33 permitted assessment of the effects of attention level (i.e., 100% versus 33%) while task difficulty was held constant. Comparison of easy 100 with difficult 100 permitted assessment of the effects of task difficulty while attention level was held constant. Easy 100 was designated as the baseline condition

with which the other two conditions were compared. This designation was based on teacher reports and our own informal classroom observations which suggested that a combination of easy tasks and high levels of teacher attention generally resulted in a low frequency of behavior problems.

The easy 33 and difficult 100 conditions alternated with the baseline easy 100 condition in a reversal design. The sequence of conditions was counterbalanced across children to control for order effects. Session length was always 10 min and 1–3 sessions were run per day. When multiple sessions were run on the same day, there was a 5-min break between sessions.

### *Procedure*

*Easy 100.* In easy 100, a child worked on receptive labeling and match-to-sample and received some form of adult attention for doing so in 100% of the intervals in each session as determined by a time sampling procedure described later. In the receptive labeling task, the child was presented with several cards from the Peabody Picture Vocabulary Test, a measure of receptive labeling skill that is based on a series of picture cards graded in difficulty. Each card on this test is divided into quadrants, one picture per quadrant. A card was placed on the table in front of the child and the child was asked to point to the relevant picture named by the adult (e.g., "Point to the ball"). To ensure that this task was indeed easy, an additional assessment was conducted prior to the start of this condition. The child was twice presented with the Peabody cards, and 20 cards were selected on which the child always responded correctly. These cards constituted the materials for the receptive task.

For the match-to-sample task, 3 cards were selected at random from the group of 20 cards described above. One picture from each of the 3 cards was randomly chosen and 11 copies were made of each picture. The three different pictures were placed in a row in front of the child. These pictures constituted the samples. The remaining 30 pictures (i.e., 10 copies of each picture) were mixed together and placed in a pile 0.1 m behind the

samples. The adult pointed to the card at the top of the pile of copies and said to the child "Match this" or an equivalent statement. The child was then expected to place the card on top of the correct sample. The children had considerable experience on matching tasks and therefore did not require any prompts to match each card correctly. Typically, they would match several cards from the pile following a single command from the adult. Whenever they finished matching all the cards, the adult would gather up the copies, mix them together, and again place them behind the samples. The procedure was then recycled.

On those rare occasions on which a child made an error on either the match-to-sample or receptive labeling tasks, the adult would say "No!" or "That's not correct!" and go on to the next trial. Correct responding produced verbal praise (defined later). The two tasks were alternated, 5 min each, within each 10-min session. The task sequence was randomized across sessions.

In each session, the adult would deliver attention in the form of mands, praise, and comments. A mand (e.g., "Point to the \_\_\_\_" on the receptive labeling task, and "Match this" on the match-to-sample task) was presented in every third recording interval. Praise was given in a different third of the intervals, either contingent on correct responding (e.g., "That's right!") or contingent on general task-related behavior (e.g., "You're working very nicely!"). While giving verbal approval, the adult made eye contact with the child, smiled or nodded or both, and delivered physical approval in the form of pats on the shoulder, mussing the child's hair, tickling, and related actions. Finally, comments were made in yet a different third of the intervals and consisted of a variety of descriptive statements (e.g., "It's sunny today.").

The adult was cued by a bug-in-the-ear device as to when to deliver attention (i.e., a beep occurred every 10 s). In addition, the adult kept a written tally of the various forms of attention delivered, which helped ensure that the three forms of attention were given equally throughout the session. Some form of adult attention (i.e., mands, praise, or comments) was given in every interval

of the session, with the three forms being presented in a random sequence within and between sessions. A new trial began, every 30 s on the average, with the presentation of a mand. Thus, there were 20 mands given during each 10-min session. This procedure was in effect during all conditions. The other child who was seated at the table was given independent desk work to do while the session was being run. When the adult was not attending to the target child, the adult attended to (i.e., instructed and praised) the second child.

When a child displayed a behavior problem, the experimenter reacted as follows. If the child left his or her seat, the experimenter waited 10 s for the child to return. If the child did not return, the experimenter led the child back to his or her seat without comment. The experimenter ignored all other behavior problems (i.e., made no comment) and continued with the task at hand unless the behavior posed a physical risk. In that case, the experimenter restrained the child. For example, if the child struck the experimenter hard, the experimenter would grasp the child's hand and restrain it on the child's lap for a period of 5–10 s while the experimenter would continue with the task at hand. This procedure was in effect during all experimental conditions.

In this and subsequent conditions, approximately one-third of the sessions were conducted by an adult (randomly chosen from a pool of five adults) who was naive to the purpose of the experiment. The other sessions were conducted by the second author.

*Easy 33.* In the regular classroom, teacher attention was typically low during independent work assignments. Because match-to-sample was the most commonly used task for developing independent work skills, we chose it to assess the effects of low rates of adult attention on the level of behavior problems. This test was consistent with classroom practice and was a task that the children could complete without error. The sessions were conducted as in easy 100 but the amount of adult attention was decreased. Specifically, mands and praise were each presented during one-third of the recording intervals as before; however, they were

now programmed within the same interval rather than in different intervals as had been the case for easy 100. Also, comments were discontinued. These changes resulted in a decrease in overall adult attention from 100% to 33% of the intervals, without altering the amount of praise or mands given. That is, in the one interval out of three that included attention, both praise and mands occurred at a level equal to that in easy 100. During those periods of time in which the adult was not attending to the target child, the adult worked with the other child seated at the table.

*Difficult 100.* In the regular classroom, vocabulary tasks typically generated many errors. Because receptive labeling of picture cards from a Peabody language development kit was one of the most commonly used tasks for building vocabulary, we chose a similar task for difficult 100, to be consistent with classroom practice. To ensure that the task was indeed difficult, we carried out an additional assessment prior to the start of this condition. Specifically, cards from the Peabody Picture Vocabulary Test were selected on which the child scored at chance levels with respect to receptive labeling (25% correct). The method for selecting these cards was the same as that used in easy 100. In all other respects, this condition was run in the same manner as easy 100.

### *Response Definitions and Reliability*

Three classes of responses were recorded: disruptive behavior, adult attention, and academic behavior. Based on our preliminary classroom observations as well as teacher reports, we identified three to five common topographies of disruptive behavior for each child. These topographies included aggression for all four children (poking or hitting other people, or pulling their hair; striking or knocking over objects); tantrums for Jim, Tom, and Sue (any loud vocalization or screaming accompanied by whining or crying); self-injury for Jim, Eve, and Sue (hitting one's head with one's hand; biting one's hand); opposition for Jim, Eve, and Sue (saying "No" to an adult's request or pushing away the task materials); out of seat for Tom and Sue (child's buttocks breaking contact

with the seat of the chair for 3 s or more); and stripping in the case of Eve (removing any article of clothing from one's body).

Adult attention consisted of praise, mands, and comments. Praise was defined as any form of verbal approval delivered contingent on correct responding to a task (e.g., "That's right!") or contingent on general cooperative behavior (e.g., "I like the way you're working today!"). Mands were defined as any task-related request made by the adult (e.g., "Point to the truck" for the receptive labeling task, or "Match this" for the match-to-sample task). Comments were defined as any descriptive remarks made by the adult (e.g., "There sure are a lot of pictures," or "It's sunny today.>").

Academic behavior was defined separately for the two tasks. On the receptive task, a correct response was scored if the child pointed to the picture named by the adult. An incorrect response was scored if the child pointed to one of the other three pictures on the Peabody card or failed to respond within 10 s. On the match-to-sample task, a correct response was scored if the child responded to the adult's command by placing one of the copies of the pictures on top of the appropriate sample. An incorrect response was scored if the child placed the copy on top of the wrong sample or failed to respond within 10 s.

All responses were recorded using a continuous 10-s interval procedure. Observers sat in a corner of the room, 2.5 m from the child, and out of the child's line of sight. A tape recorder equipped with earphones emitted the recording interval number at the end of each 10-s interval. The presence or absence of the responses previously defined was recorded for each interval.

Reliability observers were drawn two at a time from a pool of four undergraduate students. All observers were trained prior to the investigation by recording in classrooms. Training proceeded until the observers reached a criterion of 75% agreement on all behavior categories with one standard observer (an undergraduate who had extensive experience in behavioral recording). During the experiment, reliability was assessed in 70% of the sessions conducted for each child. Observer records

were compared on an interval-by-interval basis. For disruptive behavior and adult attention, the reliability index used was the number of agreements divided by the number of agreements plus disagreements multiplied by 100. Academic behaviors were scored on a trial-by-trial basis to yield percent correct figures. The mean interobserver reliability was 80% or higher for all response categories.

## RESULTS

### *Validation of Task Difficulty and Adult Attention Manipulations*

For brevity, only group averages are reported; however, in all cases, individual data were consistent with the group means.

With respect to task difficulty, the mean percent correct observed across the four children was 96.5% in easy 100, 97.3% in easy 33, and 26.9% in difficult 100. With respect to adult attention, the mean level of this variable observed across the four children was 99.7% in easy 100, 33.4% in easy 33, and 99.9% in difficult 100. Thus, we succeeded in creating two levels of task difficulty (an easy level approximating 100% correct and a difficult level approximating 25% correct), and two levels of adult attention (a high level approximating 100% attention and a low level approximating 33% attention). Finally, praise, mands, and comments each occurred at an average of approximately 33% in all conditions except during easy 33 in which comments occurred at zero or near-zero levels as planned.

### *Effects on Disruptive Behavior*

Figure 1 shows the percentage of intervals in which disruptive behavior occurred during each session for the four children. There were three distinct patterns of disruptive behavior. Jim and Eve were disruptive primarily in the difficult 100 condition. Tom was disruptive primarily in the easy 33 condition, and Sue was disruptive in both easy 33 and difficult 100. As expected, disruptive behavior in easy 100 was negligible for all children thus justifying our use of this condition as a base-

line. The filled circles in Figure 1 depict the results of sessions run by naive experimenters. As can be seen, there were no systematic differences between these data points and those generated by the informed experimenter (open circles).

## DISCUSSION

The fact that there were several patterns of disruptive behavior displayed in Experiment 1 suggests that more than one variable was controlling the children's behavior. There is some evidence in the published literature (Carnine, 1976) that long intertrial intervals, such as those we used, may contribute to off-task behavior. Nonetheless, we felt that the use of long intervals was justified given that a major educational goal for these children involved group instruction, a situation in which long intervals are inevitable. In fact, long intervals did not in themselves guarantee disruptive behavior. The nature of the task and level of adult attention were the most reliable predictors.

Consider Jim and Eve. Their behavior problems became more frequent when demands increased in difficulty (difficult 100) but these children were relatively well behaved in the other two conditions. This behavior pattern is consistent with the notion of escape responding. Specifically, it is hypothesized that some children have a history of successfully escaping from presumably aversive stimuli (such as difficult task demands and ensuing failure) contingent on the display of disruptive behavior. If a child has this history, then difficult task demands may eventually come to be discriminative for the emission of problem behavior.

Tom's results suggest the operation of a second controlling variable. His behavior problems became more frequent when the overall level of adult attention was reduced (easy 33) but he was relatively well behaved in the other two conditions. This pattern of behavior is consistent with the notion of attention seeking. Specifically, it is hypothesized that some children have experienced the following set of contingencies. First, the amount of adult attention given to the child decreases to a low level. From time to time, when the child misbehaves, the adult attends to the child. The cu-

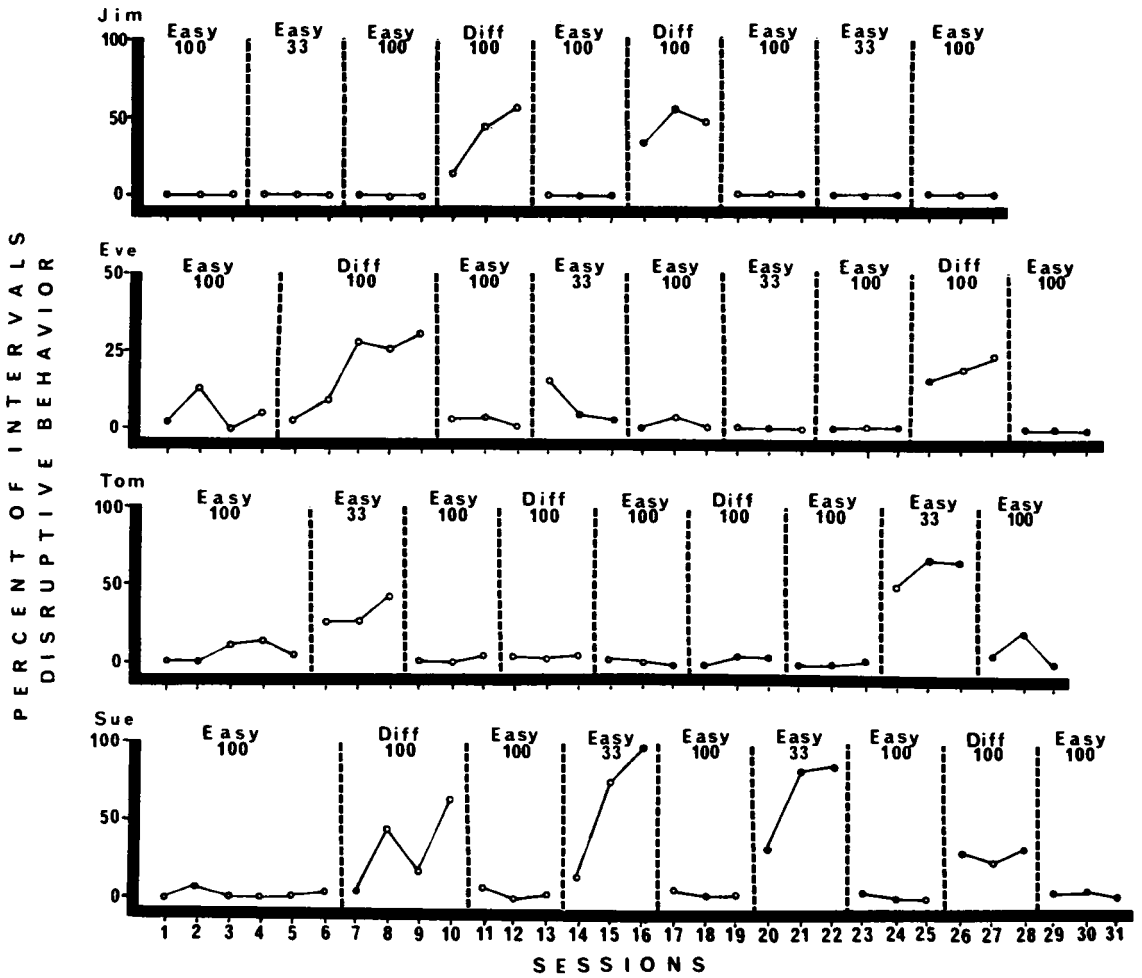


Figure 1. Percent intervals of disruptive behavior as a function of level of task difficulty (easy vs. difficult) and overall level of adult attention (100% vs. 33% of total intervals). Open circles depict sessions conducted by an informed experimenter; filled circles, sessions conducted by naive experimenters.

mulative effect of this intermittent reinforcement is that the misbehavior is strengthened. If a child has this history, then low levels of adult attention may eventually come to be discriminative for the emission of problem behavior.

Sue differed from the other three children in that her behavior problems appeared to be under the control of both the occurrence of difficult task demands and the presence of low levels of adult attention. This response pattern is consistent with the results of previously cited research indicating that the behavior problems of a given child can be controlled by more than one set of variables.

We would like to qualify our analysis by sug-

gesting that the pattern of results observed could plausibly be attributed to other processes than those mentioned. For example, behavior problems associated with task difficulty might stem from a child's failure to attend to adult instructions. Likewise, behavior problems occurring after a shift to low levels of attention might be viewed as adjunctive behavior induced by a decrease in the richness of the prevailing schedule of reinforcement. These alternative explanations need to be evaluated experimentally; however, our assumption concerning the primacy of positive and negative reinforcement processes is at least as plausible and heuristic as the alternatives just presented.

## EXPERIMENT 2

In Experiment 2, we sought to reduce the behavior problems identified in Experiment 1 by teaching the children verbal communicative phrases that served to elicit either adult assistance or adult attention.

## METHOD

*Children and Setting*

These were the same as in Experiment 1.

*Experimental Design and Overview*

The problematic situations identified for each child in Experiment 1 constituted the baseline phase in Experiment 2. The intervention consisted of two phases: relevant response and irrelevant response.

Consider first the relevant response phase for Jim, Eve, and Sue. Recall that these children misbehaved in the difficult 100 condition. Because this condition involved difficult tasks, one treatment strategy already noted would be to teach the children to solicit adult assistance. A relevant communicative response for a child to make might be a phrase such as "I don't understand." This phrase would serve to prompt a teacher to provide help on the difficult task. Accordingly, we taught this phrase to the three children involved.

Consider next the relevant response phase for Tom and again Sue. Recall that they misbehaved in the easy 33 condition. Because this condition involved low levels of adult attention, one treatment strategy noted already would be to teach the children to solicit praise. A relevant communicative response for a child to make might be a phrase such as "Am I doing good work?" This phrase would serve to prompt a teacher to praise the child. Accordingly, we taught this phrase to the two children involved.

Of course, it might be argued that teaching a child any communicative phrase would produce a decrease in disruption. To control for this possibility, we introduced an irrelevant response phase. Specifically, we taught Jim, Eve, and Sue (who misbehaved in difficult 100) to ask, "Am I doing good work?" Because this phrase was pertinent to soliciting praise but not assistance, it was desig-

nated as a communicatively irrelevant response with respect to difficult 100. As such, we predicted that it would function as a control, failing to bring about any decrease in disruptive behavior. Similarly, we taught Tom and Sue (who misbehaved in easy 33) to say "I don't understand." Because this phrase was pertinent to soliciting assistance but not praise, it was designated as a communicatively irrelevant response with respect to easy 33. Therefore, we predicted that it would not produce a decrease in disruptive behavior in this condition. In short, during the irrelevant response phase, children who misbehaved in the difficult 100 condition were taught the phrase that was relevant to easy 33, and children who misbehaved in the easy 33 condition were taught the phrase that was relevant to difficult 100. Figure 2 shows, in flow chart form, the relationships between the behavior of the child and the behavior of the experimenter in Experiment 2.

The relevant and irrelevant response phases were alternated with the baseline phase in a reversal design, with the phases counterbalanced across children. Because Tom was soon to be placed in another school, he received a shortened version of the design. Number of sessions per day and session duration were the same as in Experiment 1.

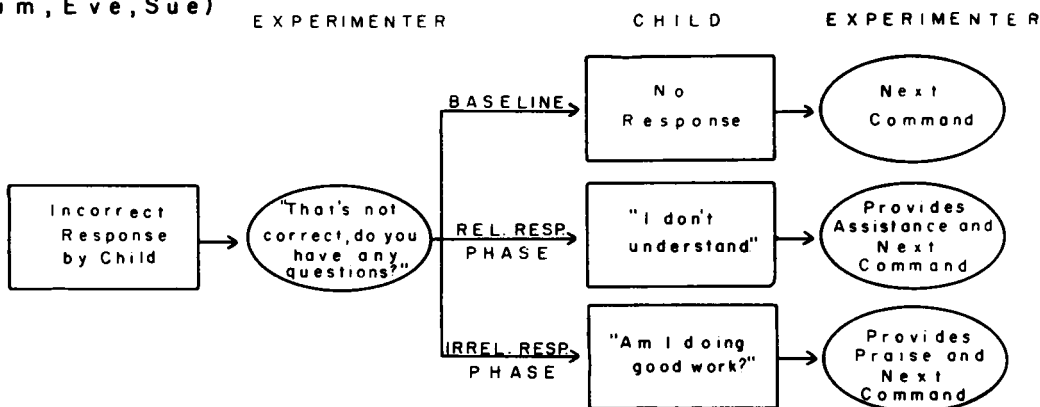
*Procedure*

*Baseline phase.* All procedures and tasks used in baseline were the same as those described in Experiment 1 with two exceptions. First, after every incorrect response in difficult 100, and after every 30 s on the average in easy 33, the experimenter would ask, "Do you have any questions?" It was necessary to include this question in baseline because it was subsequently used in the relevant and irrelevant response phases. The question was scored as a mand. Second, during difficult 100, we used 40 different Peabody cards rather than 20. This change was necessary because we anticipated that a large number of cards might be needed during intervention.

In this and subsequent conditions, approximately two-thirds of the sessions were run by an adult (randomly chosen from a pool of five adults)



DIFFICULT 100  
(Jim, Eve, Sue)



EASY 33  
(Tom, Sue)

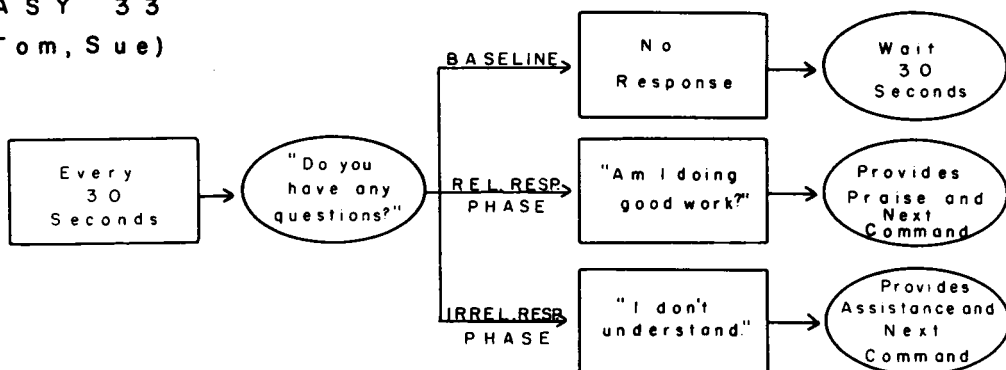


Figure 2. Relationships between the behaviors of the child and the behaviors of the experimenter during baseline (a condition in which child verbal responses had not yet been taught or were ignored if they had been taught), relevant response (a condition in which the child's verbal response was relevant to the situation evoking the problem behavior), and irrelevant response (a condition in which the child's verbal response was not relevant to the situation evoking the problem behavior).

who was naive to the purpose of the experiment. The other sessions were run by the second author.

*Relevant response phase.* This phase was identical to baseline except that it was preceded by a training period. Specifically, each child was taught to respond to the query, "Do you have any questions?" with either "Am I doing good work?" or "I don't understand" depending on which statement was relevant to the problem situation at hand.

Training was carried out in a single session consisting of three stages. In stage one, the child was verbally prompted by the experimenter to make the requisite response (i.e., "Say, 'I don't understand'" or "Say, 'Am I doing good work?'"). When the child correctly imitated on at least 8 out

of 10 trials, stage two began. In this stage, imitation training was continued in the context of the task itself. Specifically, in difficult 100 the experimenter asked the child to point to the correct picture. When the child made an error, the experimenter said "That's not correct!" (as before) and added, "Do you have any questions? Say, 'I don't understand.'" When the child imitated correctly, the experimenter said a variation of the sentence, "O.K., I'll show you" and pointed to the appropriate picture while verbalizing its label (e.g., "This is a horse."). In easy 33, the experimenter asked the child to match the pictures as before. Every 30 s, the experimenter inquired, "Do you have any questions? Say, 'Am I doing good work?'" When

the children imitated correctly, the experimenter said a variation of the sentence, "I like the way you're working today. You're putting all the picture where they belong!" Verbal praise was always accompanied by smiles and nods as well as physical approval such as tickling and pats on the back. When the child imitated correctly on at least 8 out of 10 trials, stage three began. In this stage, the adult's verbal prompts were faded out. That is, the adult spoke the sentence "Say, ' \_\_\_\_'" more and more quietly over trials.

Training was considered complete when the child was responding correctly to "Do you have any questions?" on 10 consecutive trials without any prompts. At this point, regular sessions were again conducted with each child as per the general baseline procedure described previously. The adult continued to respond to each child's trained verbal response with the appropriate consequence (i.e., assistance or praise). Because children in difficult 100 were now receiving assistance, they would occasionally learn a new label. Therefore, to keep the difficult 100 condition difficult, we replaced any card that the child labeled correctly, twice in a row, with a new card drawn from the pool of 40 cards.

Because Sue misbehaved in both difficult 100 and easy 33, she was trained in each condition separately. Each day she received training in both difficult 100 and easy 33 with sessions randomly alternated between the two conditions.

*Irrelevant response phase.* This phase was conducted in the same manner as the previous one except that each child was taught to respond to the experimenter's question in a manner opposite that specified in the previous phase. That is, in difficult 100, the child was now taught to answer, "Am I doing good work?" and, in easy 33, to say "I don't understand."

During difficult 100, the experimenter responded to the child's communicative phrase by praising (e.g., "I like the way you're trying today."). However, assistance was not provided. During easy 33, the experimenter responded by providing assistance (e.g., "The picture goes here [pointing] just where you put it last time."). However, praise was not provided. In short, during the irrelevant re-

sponse phase, the children were taught phrases that produced consequences that were presumably irrelevant to the problem situation. Specifically, the children received praise in difficult 100, a situation that called for assistance; and they received assistance in easy 33, a situation that called for praise.

### *Response Definitions and Reliability*

Disruptive behavior, adult attention, and academic behavior were recorded using the definitions described in Experiment 1. In addition, two classes of child verbal responses were recorded. A relevant response was defined as the phrase "Am I doing good work?" emitted during easy 33, or the phrase "I don't understand" emitted during difficult 100. An irrelevant response was defined as the phrase "I don't understand" emitted during easy 33, or the phrase "Am I doing good work?" emitted during difficult 100.

Reliability was assessed in 70% of the sessions conducted for each child. The reliability procedure and computation method were carried out as per Experiment 1. The mean interobserver reliability was 80% or greater for all response categories with the exception of disruptive behavior for Sue, which was 74%.

## RESULTS

### *Validation of Task Difficulty and Adult Attention Manipulations*

The validation data directly parallel those reported in Experiment 1 and will therefore be presented briefly. In all cases, individual data were consistent with group means.

With respect to task difficulty, the mean percent correct across children varied from 25.0% to 27.4% during all phases of difficult 100 and from 94.9% to 95.4% during all phases of easy 33. During the relevant response phase of difficult 100, a child's score in some sessions ranged as high as 33% correct, reflecting the fact that, occasionally, the child learned a new label. However, our practice of replacing learned picture cards with new ones ensured that the overall percent correct remained close to the desired 25% level. With respect to adult attention, the mean level of this variable ranged

from 98.4% to 99.1% during all phases of difficult 100 and from 35.2% to 35.6% during all phases of easy 33. Because both attention level and task difficulty were held constant across phases, changes in the amount of disruptive behavior across phases cannot be attributed to changes in either of these two variables. Finally, praise, mands, and comments each occurred at an average of approximately 33% in all conditions except during easy 33 in which comments occurred at near-zero levels as planned.

### *Child Verbal Responses*

The relevant response category occurred during an average of 36.8% of the intervals across children during the relevant response phase. During the other two phases, namely, baseline and irrelevant response, the relevant response category occurred in only 2.3% and 3.7% of the intervals, respectively. The irrelevant response category occurred during an average of 10.1% of the intervals across children during the irrelevant response phase. In contrast, during the baseline and relevant response phases, the irrelevant response category occurred in only 1.7% and 1.1% of the intervals, respectively. It should be noted that in the initial baseline, none of the trained responses (i.e., relevant or irrelevant) was observed to occur. These responses were only observed during baseline sessions that were conducted later in the experiment (i.e., after training had taken place). Table 1 shows the mean percent intervals in which each child displayed either a relevant response or an irrelevant response across the three phases of Experiment 2. These individual data are consistent with the group means just reported.

### *Effects on Disruptive Behavior*

Disruptive behavior was reduced to low levels after a child was trained to emit a relevant communicative response but remained high after a child was taught an irrelevant communicative response. The top panel of Figure 3 shows the percentage of intervals in which disruptive behavior occurred during each session for Jim. In baseline (before

Table 1  
Child Verbal Response (Percent Occurrence) in Each Phase of Experiment 2

Child	Child verbal response	
	Relevant	Irrelevant
Jim (Difficult 100)		
Baseline	2.8 (0-18)	0
Relevant response	33.2 (22-55)	0.4 (0-5)
Irrelevant response	0	10.8 (0-30)
Eve (Difficult 100)		
Baseline	1.2 (0-10)	0.2 (0-3)
Relevant response	17.9 (5-35)	1.3 (0-7)
Irrelevant response	0.8 (0-5)	12.7 (0-30)
Tom (Easy 33)		
Baseline	5.0 (0-25)	4.3 (0-22)
Relevant response	33.9 (23-65)	4.4 (0-17)
Irrelevant response	0	9.3 (0-23)
Sue (Easy 33)		
Baseline	1.3 (0-15)	0
Relevant response	32.3 (15-70)	0
Irrelevant response	6.7 (0-25)	8.3 (0-25)
Sue (Difficult 100)		
Baseline	1.3 (0-20)	0
Relevant response	46.3 (20-65)	0.4 (0-7)
Irrelevant response	5.0 (0-30)	9.0 (0-20)

*Note.* All numbers shown are percentages. Numbers outside parentheses are means; numbers inside are ranges.

any communicative responses were trained), Jim displayed an average level of disruption of 36.2%. Disruptive behavior during the irrelevant response phase averaged 48.8%. In sharp contrast to the above figures, Jim's disruption fell to a level of 0.5% in the relevant response phase. The data for the other three children are similar to those for Jim.

The filled circles in Figure 3 depict the results of sessions conducted by naive experimenters. As can be seen, there were no systematic differences

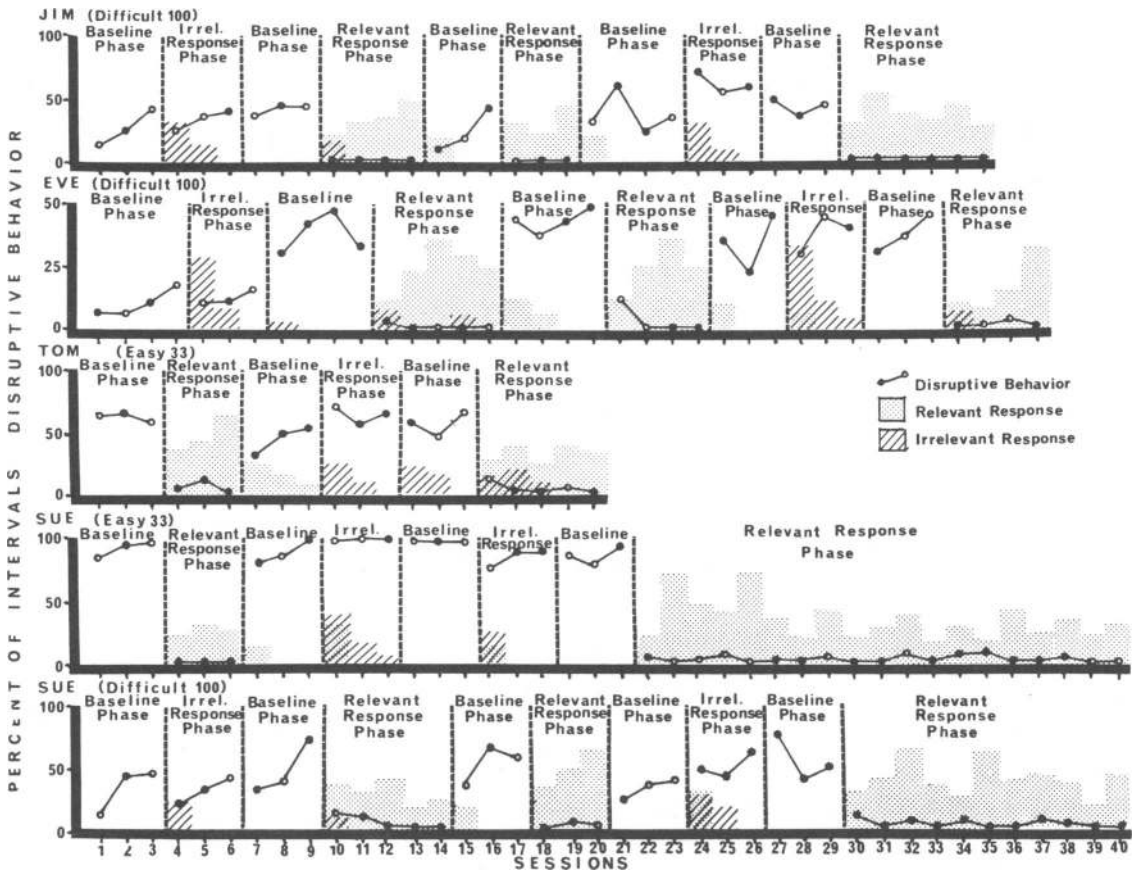


Figure 3. Percent intervals of disruptive behavior during baseline, relevant response, and irrelevant response phases. Open circles depict sessions conducted by an informed experimenter; filled circles, sessions conducted by naive experimenters. The level of relevant verbal responses is indicated by stippled bars and that of irrelevant verbal responses, by hatched bars.

between these data points and those generated by the informed experimenter (open circles).

Figure 3 also displays for each child the level of relevant and irrelevant responses across each phase of the experiment. Consider Jim's data (top panel). During the initial relevant response phase, Jim displayed sustained rates of the relevant response category (stippled bars) across the entire phase. Sustained rates of the relevant response were also maintained during the later relevant response phases. In contrast, consider the initial irrelevant response phase. During this phase, the rate of irrelevant response (hatched bars) was not sustained across sessions. By the end of the phase, the response level had decreased to zero. This pattern is also evident during the later irrelevant response

phase. It should be noted that all the response patterns described above for Jim were also characteristic of the responding of the other three children. Finally, consider the baseline phases for the four children. Occasionally, either relevant or irrelevant responses or both would occur during the early sessions of these phases. In all cases, however, responding showed a steady decline, generally to a zero level, as the phase progressed.

#### DISCUSSION

In Experiment 2, task difficulty, overall attention level, and the level of praise, mands, and comments were all held constant across phases for each child. Therefore, decreases in the level of disruptive behavior cannot be attributed to changes

in any of these variables. It thus appears that the establishment of a functional communicative response was the effective variable in reducing behavior problems.

The mechanism by which communication training works may be conceptualized as follows. Consider first those children who exhibited behavior problems in the difficult task condition. If difficult task demands and subsequent failure are discriminative for high rates of behavior problems, then a procedure that reduces task difficulty and thereby limits incorrect responding will effectively remove the stimuli that are discriminative for problem behavior. The relevant communicative response (i.e., "I don't understand") functioned to elicit adult assistance that resulted in the child's making a correct (though prompted) response. In other words, each time that the child made the verbal request, the adult provided assistance, thereby simplifying the difficult task and averting failure on the part of the child. Thus, the stimuli controlling high rates of behavior problems were effectively eliminated and, not surprisingly, the child's behavior improved.

Consider next those children who exhibited behavior problems in the low attention condition. Recall that in the baseline phase of this condition, the adult attended to behavior problems on an intermittent basis (e.g., the adult held down the child's hands following a severe aggressive act but simply ignored less severe aggressive acts). In other words, attention-seeking behavior problems were responded to inconsistently. In contrast, following relevant response training, the child's attention-seeking verbal requests (i.e., "Am I doing good work?") were consistently reinforced. It is a well-known operant principle that consistent reinforcement is a more effective means of strengthening an operant than inconsistent reinforcement (Sulzer-Azaroff & Mayer, 1977). Therefore, it is plausible that the observed decrease in attention-seeking behavior problems and concomitant increase in attention-seeking verbal requests reflect the fact that the communication contingency provided highly consistent reinforcement for the latter behavior in the face of highly inconsistent reinforcement for

the former behavior. The result was that the verbal requests were strengthened and replaced the problem behaviors.

The conceptualization just outlined is further supported by the results of the irrelevant response phase. Consider first those children whose behavior problems were set off by the presence of difficult demands and ensuing failure. Merely teaching such children to solicit praise (the irrelevant response) would not remove the stimuli that evoke the behavior problems. Hence, one would predict that the problems would remain frequent, a result that was in fact observed. The praise-seeking response was nonfunctional in the difficult demand condition since it did not evoke adult assistance. Therefore, one could make a second prediction, namely, that the response should extinguish and, indeed, it did.

Consider next those children whose behavior problems were hypothesized to be attention-seeking. Simply teaching such children to solicit assistance in the low attention condition should have no effect. That is, an assistance-seeking response would be nonfunctional because it would merely evoke aid in the form of a brief confirmatory statement (i.e., "The picture goes here.") rather than effusive attention in the form of praise (e.g., "I like the way you're working!") coupled with nods, smiles, and physical approval (e.g., tickling). Again, such a nonfunctional response would be expected to have no decelerative effect on behavior problems and the response would therefore be likely to decrease over time. Both expectations were confirmed. To sum up, the irrelevant response phase demonstrated that not all communicative phrases will be effective in reducing behavior problems. The phrase that is chosen must be functionally related to the specific nature of each child's behavior problems. Or, to put it in other terms, the specific form of the verbal response is not important. What matters most is the consequence that follows a particular verbal communicative act.

Of course, one could argue that behavior problems might also have been reduced without any communication training; that is, one could simply provide the children with assistance or praise where

appropriate and not teach the children to request these events verbally. However, this procedure would place the child in a passive role, a role that developmentally disabled children already play too often. Communication training, in contrast, provides an important educative function in that children learn that communicative behavior can produce consistent and useful social effects such as eliciting assistance on academic work and praise for good performance. In this manner, the child's role becomes that of an active participant rather than a passive recipient. Ultimately, one would also like to drop the adult query, "Do you have any questions?" and have the child emit the verbal response spontaneously. This type of spontaneity is an important focus of our current research dealing with functional communication training as a treatment for behavior problems.

Finally, we note that certain problem situations, at least initially, may call for an intervention strategy other than communication training. Children who pose serious physical danger to themselves or others through their behavior may require decelerative treatments on a crisis intervention basis. Eventually, however, the issue of teaching alternative behaviors will arise, and we offer communication training as one possibility.

## GENERAL DISCUSSION

Behavior problems can be reduced by teaching children communicative phrases that are effective in altering the stimulus conditions that control the problems. In Experiment 1, we demonstrated an assessment method for identifying, within an instructional context, those stimulus situations (i.e., difficult demands or low adult attention or both) that were discriminative for child misbehavior. In Experiment 2, we demonstrated that the communicative phrase that is selected to replace the behavior problem must be functionally related to the controlling stimuli. Communicative phrases that were functionally unrelated were ineffective in reducing behavior problems.

These data are consistent with a broader conceptualization of misbehavior that has recently

emerged within the field. This conceptualization has been referred to as the communication hypothesis of child behavior problems. The hypothesis states that behavior problems may function like nonverbal communicative acts to request (i.e., mand) specific reinforcers that are socially mediated (Carr, 1985; Carr & Durand, 1985; Neel et al., 1983; Reichle & Yoder, 1979).

There are several sources of data bearing on this hypothesis. Within the field of psycholinguistics, research suggests that many nonverbal behaviors displayed by very young children, such as pointing or showing objects to an adult, serve communicative functions (Bates, Camaioni, & Volterra, 1975; Leung & Rheingold, 1981). Some of these behaviors serve as nonverbal requests for adult attention and others, as requests for specific reinforcing objects and events. Several developmental psychologists have extended this analysis to other nonverbal behaviors, in particular, those behaviors that adults find disturbing. For example, studies of early social behavior (Bell & Ainsworth, 1972; Brownlee & Bakeman, 1981; Wolff, 1969) suggest that crying and aggression in infants and toddlers may also function as nonverbal requests that are effective in reliably securing attention and material reinforcers from adults as well as in terminating aversive situations. Finally, in the area of developmental disabilities, there is a substantial literature demonstrating an inverse relationship between level of communicative skill and frequency of behavior problems (Casey, 1978; Foxx & Livesay, 1984; Shodell & Reiter, 1968; Talkington, Hall, & Altman, 1971). This inverse relationship has led some investigators (e.g., Shodell & Reiter, 1968; Talkington et al., 1971) to speculate that behavior problems may function like nonverbal communicative acts and that, once children are taught more reliable ways to gain attention or escape aversives (e.g., through speech), the behavior problems are no longer as effective and disappear.

The communication hypothesis has heuristic value in that it may lead to the formulation of specific remediation strategies such as those described above. It is likely that we will never be able to demonstrate definitively that a particular

child intended to ask for assistance or attention by means of his or her misbehavior. Nonetheless, we may find it helpful to view misbehavior *as if* it were a form of nonverbal communication, specifically, a request for certain behaviors on the part of others. Then, reasoning analogically, we may proceed by teaching those children whose misbehavior is construed as communicating a nonverbal request for attention, a verbal means for obtaining the same. In addition, we may teach those children whose misbehavior is construed as communicating a nonverbal request to escape, a verbal means for obtaining assistance. Seen in this light, the key notion underlying the effectiveness of communication training is that of functional equivalence. Specifically, although two behaviors may differ in form (e.g., aggression versus the phrase, "Am I doing good work?"), they may nonetheless be identical in function (i.e., both aggression and the verbal request produce attention). The communication training strategy capitalizes on this equivalence by strengthening a socially desirable form (i.e., a verbal request) that serves the same presumptive function as a socially undesirable form (e.g., aggression) thereby weakening or eliminating the latter.

It is worth emphasizing that the strategy we have described will fail unless there is functional equivalence between the two forms. This point was made clear in the irrelevant response phase during which, for example, a verbal request for attention was taught in a situation in which the misbehavior ostensibly served an escape function. In this instance, the verbal request and the misbehavior were functionally nonequivalent and, as we have noted, misbehavior did not decrease. The necessity for equivalence emphasizes the extreme importance of first performing a functional analysis of behavior problems (as was done in Experiment 1) prior to selecting specific communicative phrases designed to replace these behaviors. Clearly, then, the notion of functional equivalence is a cornerstone of the communication hypothesis of behavior problems and its associated method of treatment. In this regard, the hypothesis is consistent with the central thesis of the behavioral approach to psychology,

namely, that the understanding of human behavior is best advanced through the analysis of function rather than form.

## REFERENCES

- Bates, E., Camaioni, L., & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill-Palmer Quarterly*, *21*, 205-226.
- Bell, S. M., & Ainsworth, M. D. S. (1972). Infant crying and maternal responsiveness. *Child Development*, *43*, 1171-1190.
- Brownlee, J. R., & Bakeman, R. (1981). Hitting in toddler-peer interaction. *Child Development*, *52*, 1076-1079.
- Carnine, D. W. (1976). Effects of two teacher-presentation rates on off-task behavior, answering correctly, and participation. *Journal of Applied Behavior Analysis*, *9*, 199-206.
- Carr, E. G. (1977). The motivation of self-injurious behavior: A review of some hypotheses. *Psychological Bulletin*, *84*, 800-816.
- Carr, E. G. (1985). Behavioral approaches to language and communication. In E. Schopler & G. Mesibov (Eds.), *Current issues in autism: Volume 3. Communication problems in autism* (pp. 37-57). New York: Plenum.
- Carr, E. G., & Durand, V. M. (1985). The social-communicative basis of severe behavior problems in children. In S. Reiss & R. Bootzin (Eds.), *Theoretical issues in behavior therapy* (pp. 219-254). New York: Academic Press.
- Carr, E. G., & Lovaas, O. I. (1983). Contingent electric shock as a treatment for severe behavior problems. In S. Axelrod & J. Apsche (Eds.), *Punishment: Its effects on human behavior* (pp. 221-245). New York: Academic Press.
- Carr, E. G., & McDowell, J. J. (1980). Social control of self-injurious behavior of organic etiology. *Behavior Therapy*, *11*, 402-409.
- Carr, E. G., & Newsom, C. D. (in press). Demand-related tantrums: Conceptualization and treatment. *Behavior Modification*.
- Carr, E. G., Newsom, C. D., & Binkoff, J. A. (1976). Stimulus control of self-destructive behavior in a psychotic child. *Journal of Abnormal Child Psychology*, *4*, 139-153.
- Carr, E. G., Newsom, C. D., & Binkoff, J. A. (1980). Escape as a factor in the aggressive behavior of two retarded children. *Journal of Applied Behavior Analysis*, *13*, 101-117.
- Casey, L. O. (1978). Development of communicative behavior in autistic children: A parent program using manual signs. *Journal of Autism and Childhood Schizophrenia*, *8*, 45-59.
- Donnellan, A. M., Miranda, P. L., Mesaros, R. A., & Fassbender, L. L. (1983, November). *A strategy for analyzing the communicative functions of behavior*. Paper

- presented at the meeting of The Association for the Severely Handicapped, San Francisco.
- Durand, V. M. (1982). Analysis and intervention of self-injurious behavior. *Journal of the Association for the Severely Handicapped*, 7, 44-53.
- Durand, V. M. (1983). Behavioral ecology of a staff incentive program: Effects on absenteeism and resident disruptive behavior. *Behavior Modification*, 7, 165-181.
- Foxx, R. M., & Bechtel, D. R. (1983). Overcorrection: A review and analysis. In S. Axelrod & J. Apsche (Eds.), *Punishment: Its effects on human behavior* (pp. 133-220). New York: Academic Press.
- Foxx, R. M., & Livesay, J. (1984). Maintenance of response suppression following overcorrection. *Analysis and Intervention in Developmental Disabilities*, 4, 65-79.
- Goldiamond, I. (1974). Toward a constructional approach to social problems. *Behaviorism*, 2, 1-84.
- Iwata, B. A., & Bailey, J. S. (1974). Reward versus cost token systems: An analysis of the effects on students and teacher. *Journal of Applied Behavior Analysis*, 7, 567-576.
- Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1982). Toward a functional analysis of self-injury. *Analysis and Intervention in Developmental Disabilities*, 2, 3-20.
- Leung, E. H. L., & Rheingold, H. L. (1981). Development of pointing as a social gesture. *Developmental Psychology*, 17, 215-220.
- Lovaas, O. I., Freitag, G., Gold, V. J., & Kassorla, I. C. (1965). Experimental studies in childhood schizophrenia: Analysis of self-destructive behavior. *Journal of Experimental Child Psychology*, 2, 67-84.
- Lovaas, O. I., & Simmons, J. Q. (1969). Manipulation of self-destruction in three retarded children. *Journal of Applied Behavior Analysis*, 2, 143-157.
- Neel, R. S., Billingsley, F. F., McCarty, F., Symonds, D., Lambert, C., Lewis-Smith, N., & Hanashiro, R. (1983). *Innovative model program for autistic children and their teachers*. Unpublished manuscript, University of Washington, Seattle.
- O'Leary, K. D., & O'Leary, S. G. (1977). *Classroom management* (2nd ed.). New York: Pergamon.
- Patterson, G. R. (1980). Mothers: The unacknowledged victims. *Monographs of the Society for Research in Child Development*, 45, (5, Whole No. 186).
- Patterson, G. R. (1982). *Coercive family process*. Eugene, OR: Castalia.
- Quay, H. C. (1979). Residential treatment. In H. C. Quay & J. S. Werry (Eds.), *Psychopathological disorders of children* (2nd ed.) (pp. 387-410). New York: John Wiley.
- Reichle, J. E., & Yoder, D. E. (1979). Assessment and early stimulation of communication in the severely and profoundly mentally retarded. In R. L. York & E. Edgar (Eds.), *Teaching the severely handicapped. Volume 4* (pp. 180-218). Seattle: American Association for the Education of the Severely/Profoundly Handicapped.
- Romanczyk, R. G., Colletti, G., & Plotkin, R. (1980). Punishment of self-injurious behavior: Issues of behavior analysis, generalization, and the right to treatment. *Child Behavior Therapy*, 2, 37-54.
- Seymour, F. W., & Stokes, T. F. (1976). Self-recording in training girls to increase work and evoke staff praise in an institution for offenders. *Journal of Applied Behavior Analysis*, 9, 41-54.
- Shodell, M. J., & Reiter, H. H. (1968). Self-mutilative behavior in verbal and nonverbal schizophrenic children. *Archives of General Psychiatry*, 19, 453-455.
- Stokes, T. F., Fowler, S. A., & Baer, D. M. (1978). Training preschool children to recruit natural communities of reinforcement. *Journal of Applied Behavior Analysis*, 11, 285-303.
- Sulzer-Azaroff, B., & Mayer, G. R. (1977). *Applying behavior analysis procedures with children and youth*. New York: Holt, Rinehart, & Winston.
- Talkington, L. W., Hall, S., & Altman, R. (1971). Communication deficits and aggression in the mentally retarded. *American Journal of Mental Deficiency*, 76, 235-237.
- Voeltz, L. M., Evans, I. M., Derer, K. R., & Hanashiro, R. (1983). Targeting excess behavior for change: A clinical decision model for selecting priority goals in educational contexts. *Child and Family Behavior Therapy*, 5, 17-35.
- Wahler, R. G. (1969). Oppositional children: A quest for parental reinforcement control. *Journal of Applied Behavior Analysis*, 2, 159-170.
- Wahler, R. G. (1976). Deviant child behavior within the family: Developmental speculations and behavior change strategies. In H. Leitenberg (Ed.), *Handbook of behavior modification and behavior therapy* (pp. 516-543). Englewood Cliffs, NJ: Prentice-Hall.
- Weeks, M., & Gaylord-Ross, R. (1981). Task difficulty and aberrant behavior in severely handicapped students. *Journal of Applied Behavior Analysis*, 14, 449-463.
- Wolff, P. H. (1969). The natural history of crying and other vocalizations in early infancy. In B. M. Foss (Ed.), *Determinants of infant behavior. Volume 4* (pp. 81-109). London: Methuen.
- Zeilberger, J., Sampen, S. E., & Sloane, H. N., Jr. (1968). Modification of a child's behavior problems in the home with the mother as therapist. *Journal of Applied Behavior Analysis*, 1, 47-53.

Received September 17, 1984

Final acceptance March 2, 1985