

*PYRAMIDAL TRAINING FOR FAMILIES OF  
CHILDREN WITH PROBLEM BEHAVIOR*

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The pyramidal training model was extended to multiple family members of children with behavior disorders. Three primary caregivers were taught to implement individualized treatments for problem behavior. They were then taught how to use various instructional strategies (e.g., prompting, feedback) to teach 2 other family members to implement the treatment. Results showed that pyramidal training was effective in increasing caregiver implementation of treatments across three families.

DESCRIPTORS: behavior problems, parent training, pyramidal training, train-the-trainer procedures

Parent training is an integral component of behavioral interventions for children with developmental disabilities. Treatments for problem behavior must be implemented correctly and consistently by all adults who regularly interact with the child to ensure maintenance and generalization of treatment effects (e.g., Lovaas, Koegel, Simmons, & Long, 1973; Shore, Iwata, Lerman, & Shirley, 1994; Wahler, 1969; Weinberg, 1999). However, due to the cost and time required to teach all caregivers to implement treatment, training efforts often focus on only one adult in a child's family (i.e., the primary caregiver). A more practical way to include all caregivers in training may be to have the primary caregiver teach other adults (Allen & Warzak, 2000).

One important innovation in this area is the development of pyramidal "train-the-trainer" procedures, which involve training one person to implement a behavioral inter-

vention and then teaching that person to train others. Pyramidal training has produced successful outcomes for parents and professionals in clinic and residential settings (e.g., Adubato, Adams, & Budd, 1981; Neef, 1995; Page, Iwata, & Reid, 1982; Shore, Iwata, Vollmer, Lerman, & Zarcone, 1995). For example, the mother of a child with developmental disabilities received in-clinic training on procedures (e.g., use of physical prompts) to increase her child's self-care skills (Adubato et al., 1981). She then was asked to teach her husband to implement the same procedures. However, she was not taught specific parent-training skills, observers did not collect data on her behavior while she trained her husband, and she taught only 1 other caregiver to implement the procedures. Results indicated that both parents implemented the treatment proficiently during subsequent in-clinic probe sessions and that the training was associated with improvement in child behavior.

In another study, supervisors of direct-care staff were taught to implement function-based treatments for aggression and self-injury exhibited by adults with developmental disabilities (Shore et al., 1995). The supervisors then were taught how to train and monitor the direct-care staff who

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were responsible for implementing the treatment. Results showed that direct-care staff implemented the treatments with a high degree of integrity as a function of training provided by the supervisors. These findings demonstrated the efficacy of pyramidal training for complex behavior-reduction programs.

Further research is warranted on the effectiveness of pyramidal training to instruct family members to implement interventions for problem behavior. With the exception of one study (Adubato *et al.*, 1981), no previous studies have evaluated the efficacy of pyramidal training with multiple family members of the same child. In addition, much of the prior research on pyramidal training has involved paid staff exclusively (e.g., Page *et al.*, 1982; Shore *et al.*, 1995). In this study, caregivers of children with behavior problems were taught to implement individually prescribed treatments and to implement a comprehensive training program (e.g., instructions, modeling, role-play) to teach 2 other family members to implement the program.

## GENERAL METHOD

### *Participants and Settings*

Three children and their caregivers participated. Sam was a 4-year-old boy who had been referred for the assessment and treatment of stereotypic behavior consisting of hand flapping. Sam had not been diagnosed with any developmental disability at the time of this study. He could follow complex directions and had no physical or sensory impairments. He was enrolled in preschool. Myron, an 11-year-old boy who had been diagnosed with profound mental retardation, had been referred for the assessment and treatment of spitting. He did not follow directions and had no expressive language skills. He ambulated with a wheelchair and the assistance of others. Myron attended a

classroom for students with developmental disabilities at a special education school. Robin was a 7-year-old girl who had been diagnosed with severe mental retardation. She had been referred for the assessment and treatment of noncompliance. Her speech was difficult to understand, and she had a limited vocabulary. She had mild motor deficits. She attended a classroom for students with developmental disabilities at a special education school.

At least 3 members of each child's family were in need of learning a prescribed treatment for the child's problem behavior. A primary caregiver was identified for each child by determining who was responsible for the majority of child care and for interactions with child-care professionals. The primary caregiver then identified 2 additional family members in need of training. Additional information about the caregivers is displayed in Table 1.

All caregiver training sessions were conducted at the children's homes. Training sessions with Sam's caregivers were conducted in his bedroom, training sessions with Myron's caregivers were conducted in the living room, and training sessions with Robin's caregivers were conducted in the kitchen, which contained a table and chairs.

### *Pretraining Evaluations*

Prior to the study, Myron and Sam participated in functional analyses as described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) and in treatment evaluations. Robin participated in an assessment designed to identify effective reinforcers for compliance and in a treatment evaluation. All pretraining sessions for Myron and Robin were conducted in unoccupied classrooms at their schools. Sam's sessions were conducted at a clinic and at his home. The experimenter and other trained graduate students served as therapists.

A treatment was selected for each partic-

Table 1  
Caregiver Demographic Information

Child	Caregivers	Family member	Age (years)	Highest education level obtained
Sam	Primary caregiver	Mother	35	Bachelor degree
	Additional caregivers	Father	35	Bachelor degree
		Grandmother	58	High school diploma
Myron	Primary caregiver	Mother	43	High school diploma
	Additional caregivers	Brother	18	Senior in high school
		Stepfather	43	High school diploma
Robin	Primary caregiver	Mother	39	High school diploma
	Additional caregivers	Grandmother	62	High school diploma
		Sister	14	Eighth grade

ipant based on the results of these analyses. The precise treatment also depended on the child's participation in other ongoing research projects. Results of Sam's functional analysis indicated that his behavior was maintained by automatic reinforcement (see Van Camp et al., 2000). His treatment consisted of noncontingent access to toys and a 30-s time-out from toys and attention contingent on stereotypic behavior. Results of Myron's functional analysis indicated that spitting was maintained by attention. His treatment consisted of noncontingent attention and extinction. Results of Robin's compliance assessment indicated that a break from tasks combined with access to leisure materials was an effective reinforcer for compliance. Her treatment consisted of a choice of task, praise for compliance, a break from tasks with access to preferred items for compliance on two consecutive demand trials, and physical guidance for noncompliance. All treatments were found to be effective (data from pretraining evaluations are available from the second author upon request).

#### *Response Measurement and Reliability*

Trained observers collected data on child and caregiver behavior using laptop computers.

*Child behavior.* Stereotypic behavior (Sam) was defined as waving the hand in a back and forth motion or opening and clos-

ing the hand with fingers touching the palm. Spitting (Myron) was defined as the expulsion of saliva past the plane of the lips. Compliance (Robin) was defined as completion of an instruction within 5 s of the request. Data on stereotypic behavior and spitting were collected using frequency recording and were expressed as number of responses per minute. Data on compliance were collected using frequency recording and were expressed as percentage of instructional trials.

*Treatment implementation (all caregivers).* Responses related to treatment implementation, based on the prescribed treatment, were classified as antecedents to or consequences for child behavior (Shore et al., 1995). No antecedents were targeted for Sam. His target consequence (removal of toys and attention for 30 s contingent on stereotypic behavior) was considered correct if all toys and attention were removed within 5 s of stereotypic behavior and returned when no less than 20 s and no more than 40 s had elapsed. Data on toy and attention removal were collected using frequency and duration recording.

The target antecedent for Myron was delivery of noncontingent attention (e.g., talking to Myron, patting his back, etc.) every minute for 20 s and was considered correct if attention was delivered for at least 10 s

within 10 s of the specified delivery time (i.e., no more than 70 s since the last attention delivery). Myron's target consequence was the withholding of reprimands (verbal statements about the behavior, saying "no," or glaring) following spitting and was considered correct if no reprimands were delivered within 10 s of spitting. Data on attention delivery and reprimands were collected using frequency and duration recording.

The target antecedent for Robin was the presentation of a choice of tasks and was considered correct if the caregiver presented two different task materials, asked Robin to point to the task she would like to complete, selected a task for her if she did not point to a task within 5 s, and then delivered an instruction related to the selected task. Robin's consequences consisted of praise for compliance (correct if praise was delivered within 5 s of compliance), physical guidance for noncompliance (correct if the caregiver physically guided Robin to complete the task if she did not comply within 5 s), and a break from tasks with access to preferred items for complying with two consecutive instructions (correct if the caregiver allowed Robin to leave the table and to have access to preferred toys for 110 s to 140 s within 5 s of the second compliance). Data on choice presentation, praise, delivery of a break with toys, and physical guidance were collected using frequency and duration recording.

The number of correct antecedents and consequences for all participants was determined by visually inspecting the raw data. These data were expressed as a percentage of opportunities by dividing the number of correct caregiver responses by the number of observed opportunities and multiplying by 100%. For Sam's treatment, opportunities for consequences were based on the frequency of stereotypic behavior. For Myron's treatment, opportunities for antecedents were calculated by subtracting the total duration

of spitting from the total session time and dividing by 60 s. However, this number was corrected if any attention deliveries extended past 20 s (i.e., any additional time past 20 s was also subtracted from the total session time). Opportunities for consequences were based on the frequency of spitting. For Robin's treatment, opportunities for antecedents were based on the number of instructions delivered. Opportunities for consequences were based on the number of times Robin complied with instructions.

*Trainer behavior (primary caregiver only).* Responses related to training other caregivers included data collection, delivery of feedback, and decisions about training progression. The primary caregiver collected frequency data on all child and caregiver behaviors described above using data sheets provided by the experimenter. These data were compared to data collected by an independent observer, and interobserver agreement for each caregiver and child behavior was calculated by dividing the smaller number of responses by the larger number of responses and multiplying by 100%. Feedback was defined as statements to another caregiver about incorrect implementation of the treatment. Feedback was considered correct if it consisted of an appropriate statement regarding the incorrect procedure and an instruction describing the correct procedure. Data on correct feedback were collected using frequency recording and were calculated by dividing the total number of correct feedback responses by the total number of observed opportunities. Opportunities for feedback responses were based on the frequency of the trainee's incorrect use of procedures. The primary caregiver's decisions about training progression were evaluated by reviewing the data from previous sessions. Correct progression was defined as advancing the caregiver training to the next training stage (e.g., from immediate to delayed feedback) at the appropriate time. Data on train-

ing progression were calculated by dividing the number of correct progression decisions by the total number of opportunities. Opportunities were based on the number of possible training progressions.

A second observer recorded child and caregiver behavior during 59%, 37%, and 48% of the sessions for Myron, Sam, and Robin, respectively. Sessions were divided into consecutive 10-s intervals. Agreement was calculated by dividing the smaller number of recorded responses by the larger number in any given interval. The results were summed across the session, divided by the total number of intervals, and multiplied by 100%. Mean percentage of agreement for treatment implementation averaged across caregivers was 100% for Sam, 92% for Myron, and 96% for Robin. Mean percentage of agreement for child behavior averaged across caregivers was 86% for Sam, 92% for Myron, and 99% for Robin.

### *Experimental Design*

A nonconcurrent multiple baseline design across caregivers was used. Baseline and training sessions were conducted for each primary caregiver prior to baseline and training sessions for additional caregivers.

#### PHASE 1: PRIMARY CAREGIVER TRAINING

In this phase, the primary caregiver was taught how to implement the treatment with the child (Training 1) and how to teach other caregivers (Training 2). All baseline and training sessions were 10 min (Sam and Myron) or consisted of 10 demand trials (Robin) and were conducted across approximately three 1-hr home visits (Sam and Myron) or one 2-hr home visit (Robin).

### *Baseline*

The experimenter instructed the primary caregiver to implement an antecedent condition associated with high levels of problem behavior as previously identified by the func-

tional analysis (Sam and Myron) or to deliver task demands (Robin), and to respond to all of the child's behaviors as she normally did. Sam's caregiver was told to give him access to preferred toys and to interact with him continuously. Myron's caregiver was instructed to direct her attention to a household activity (e.g., cooking) while he played with a few toys. Robin's caregiver was instructed to have her complete academic tasks (e.g., naming objects and sorting by color) with materials provided by the experimenter.

### *Treatment Implementation (Training 1)*

The primary caregiver was given written and verbal instructions on the recommended treatment. She also participated in a role-play situation, in which an experimenter acted as the child and engaged in target behaviors, until the caregiver independently implemented the treatment with at least 80% accuracy during at least one role-play session. Following these sessions, the caregiver was given immediate feedback while implementing the treatment with the child. Feedback consisted of descriptive statements regarding the correctness or incorrectness of prescribed antecedents and consequences. The caregiver was required to implement the treatment with at least 80% accuracy (averaged across treatment components) for two consecutive sessions to proceed from immediate to delayed feedback (i.e., feedback given at the end of the session). She was considered trained when she implemented the treatment with at least 80% accuracy for two consecutive sessions under the delayed feedback condition.

The 1st child to participate in the study (Sam) did not engage in problem behavior during the last two delayed feedback sessions with the primary caregiver. Thus, an additional procedure was included for subsequent participants to ensure that the caregiver would be observed to implement the treatment even if the child did not engage



in problem behavior. The experimenter again role-played as the child if the child did not engage in the specified target behaviors for two consecutive sessions (during immediate or delayed feedback sessions). During each role-play session, the experimenter provided prespecified opportunities for the primary caregiver to implement the treatment (i.e., three opportunities for each targeted caregiver behavior). One role-play session at or above 80% correct implementation was considered sufficient for moving to the next level of training. Just one role-play session was conducted due to time constraints (i.e., the caregiver would have already participated in two sessions with the child before any role-play session was conducted). The primary caregiver was instructed to refrain from telling other caregivers about the treatment and to refrain from implementing the treatment in their presence.

#### *Caregiver Training (Training 2)*

After the completion of Training 1, the experimenter taught the primary caregiver how to conduct training sessions with the other caregivers and observed the primary caregiver engage in mock training. The primary caregiver was taught to implement the same training procedures that had been used in Training 1. That is, the primary caregiver was taught to give verbal and written instructions about the treatment, to role play with the other caregivers while providing feedback, and to observe the other caregivers implementing the treatment with the child while giving immediate or delayed feedback. First, the primary caregiver was given written instructions describing the treatment (identical to the instructions given in the previous condition) and data sheets for monitoring child and caregiver behavior. In addition, the primary caregiver was given written instructions that described all target behaviors (e.g., child compliance, correct delivery of attention), how to use the data sheets to record

occurrences of the behaviors, and how to perform the calculations to determine if a caregiver met the training criteria.

Next, the primary caregiver implemented the training procedure during a role-play situation with a confederate trainee (one of the experimenters) while a second experimenter played the role of the child. The experimenter provided multiple opportunities (i.e., at least 10 per response) for the caregiver to record all relevant child and caregiver responses on the data sheet. One of the experimenters provided feedback about the primary caregiver's use of the training procedure, collected data simultaneously with the primary caregiver, and gave feedback about the accuracy of the data collection. The primary caregiver also calculated the data at the end of each mock training session and determined if the training criteria had been met. Feedback was provided regarding these procedures. Two mock training sessions at or above 80% correct implementation (averaged across training components) was the criterion for moving to Phase 2.

#### PHASE 2: OTHER CAREGIVER TRAINING

In this phase, the primary caregiver instructed other caregivers to implement the treatment using the specified procedures. All baseline and training sessions lasted 10 min (Sam and Myron) or 10 demand trials (Robin) and were conducted across two to three 1-hr home visits (Myron and Sam) or one 2-hr home visit (Robin) per caregiver. As each caregiver was taught, he or she was instructed not to tell other untrained caregivers about the treatment or to implement the treatment in their presence.

#### *Baseline*

Baseline sessions were identical to those conducted with the primary caregiver prior to training.

### *Training*

The primary caregiver (i.e., the trainer) taught each caregiver (i.e., the trainee) sequentially across time using the previously described procedures. Data on child behavior, trainer behavior, and trainee behavior were collected. All sessions were videotaped for rescoring purposes due to the large number of dependent variables measured.

Prior to this phase, the primary caregiver was told that the experimenter would not participate in training procedures (i.e., provide feedback regarding training procedures) and that any questions would be answered following training. To observe how the primary caregiver would perform as a trainer, feedback was withheld until all caregivers were taught to implement the treatment. This phase ended when all caregivers implemented the treatment procedures with at least 80% accuracy (averaged across treatment components). The primary caregiver was then instructed to tell all participating caregivers to implement the treatment on a regular basis.

At the completion of training, each caregiver was observed while implementing the treatment procedure without the primary caregiver present (with the exception of Sam's caregivers). The experimenter gave the primary caregiver feedback about treatment integrity. Sessions with Myron's caregivers took place a week after the completion of training. Sessions with Robin's caregivers took place on the last day of training.

## RESULTS

### *Accuracy of Treatment Implementation*

The accuracy of treatment implementation (averaged across antecedents and consequences) by each caregiver is shown in Figure 1. These data were collected prior to training and during sessions in which either immediate or delayed feedback was provid-

ed. Sam's caregivers never implemented the correct consequence for stereotypic behavior (removal of toys and attention for 30 s) during baseline sessions (left panel). The percentage of correct responses increased quickly to 100% during training for Sam's mother and father. It should be noted that Sam's mother, who was responsible for collecting data and making decisions regarding training progression for Sam's father, incorrectly determined that Sam's father had met the training criterion even though data collected by observers indicated that he had not met the criterion. Because stereotypic behavior did not occur during treatment sessions with Sam's grandmother, all data presented here were collected during role-play situations with the experimenter while his mother observed and provided feedback. Sam's grandmother implemented the treatment procedures with perfect accuracy during both sessions. Additional sessions in the absence of the primary caregiver were not conducted with Sam's family due to time constraints of the participating caregivers.

Myron's caregivers implemented the treatment at moderate to low levels of accuracy during baseline (middle panel of Figure 1). During training, all caregivers displayed high levels of correct responses. Two additional sessions were conducted with Myron's brother, and three sessions were conducted with Myron's stepfather in the absence of the primary caregiver. They implemented all treatment procedures with 100% accuracy during these sessions.

All of Robin's caregivers displayed low levels of correct responses during baseline and implemented the treatment with near-perfect accuracy following training (right panel of Figure 1). Two additional sessions were conducted with Robin's grandmother and sister in the absence of the primary caregiver. Although Robin's grandmother continued to implement the antecedents with perfect accuracy, correct implementation of conse-

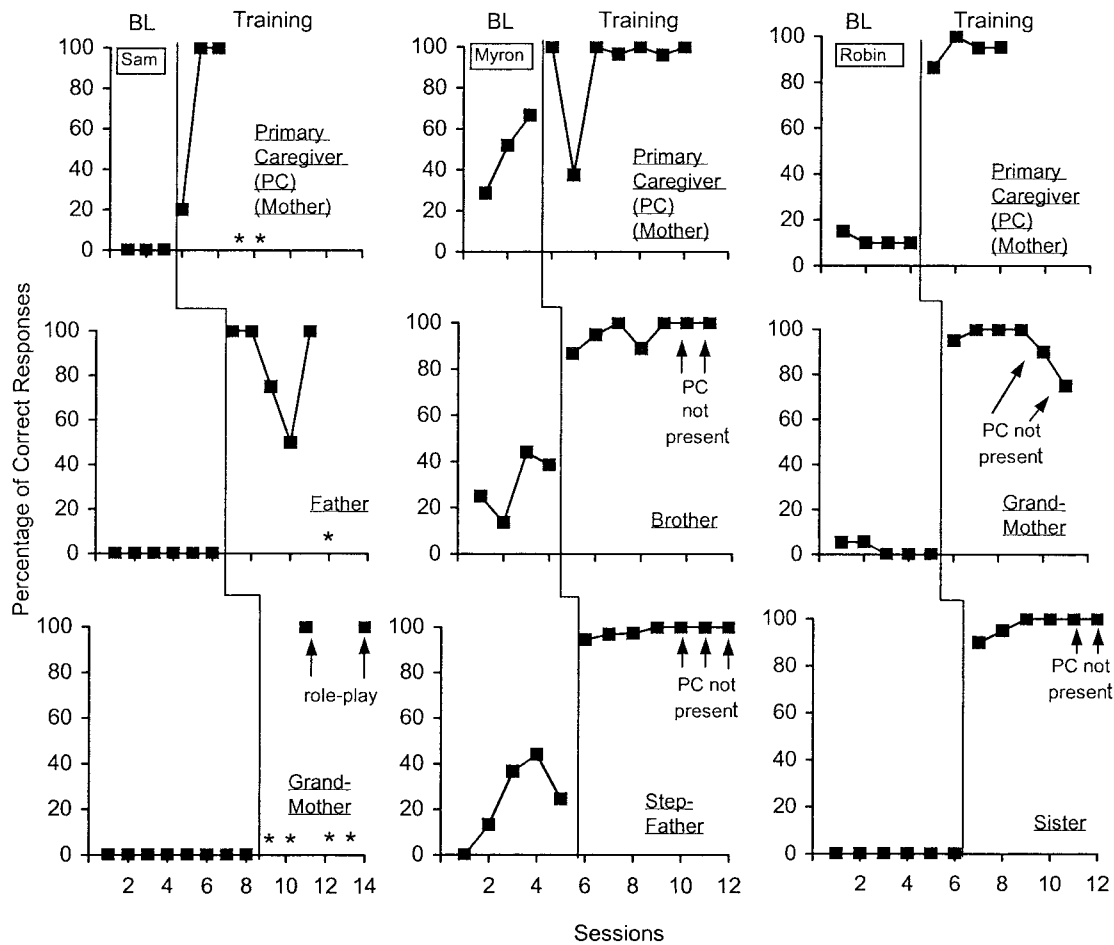


Figure 1. Percentage of correct responses for the caregivers of Sam (left panel), Myron (middle panel), and Robin (right panel) across baseline and training sessions. Asterisks indicate sessions during which there was no opportunity to implement the treatment.

quences decreased somewhat. Robin's sister continued to implement all treatment components with high accuracy.

#### *Accuracy of Training by the Primary Caregiver*

Overall, primary caregivers implemented training procedures with a high degree of accuracy across the trained caregivers. Results were averaged across training components (data collection, delivery of feedback, and training progression) and sessions for each primary caregiver. Sam's mother implemented the procedures with an average of 85% accuracy while training his father and with

100% accuracy while training his grand-mother. When Sam's father failed to remove all toys and attention during time-out during several training sessions, Sam's mother delivered feedback but scored these instances as correct consequences. In addition, she continued the progression of training (i.e., from immediate to delayed feedback) even though Sam's father had not met the criterion for progression. These inaccuracies accounted for the lower level of correct implementation when she trained Sam's father. Myron's mother implemented training procedures with 100% accuracy while training Myron's brother and stepfather. Robin's



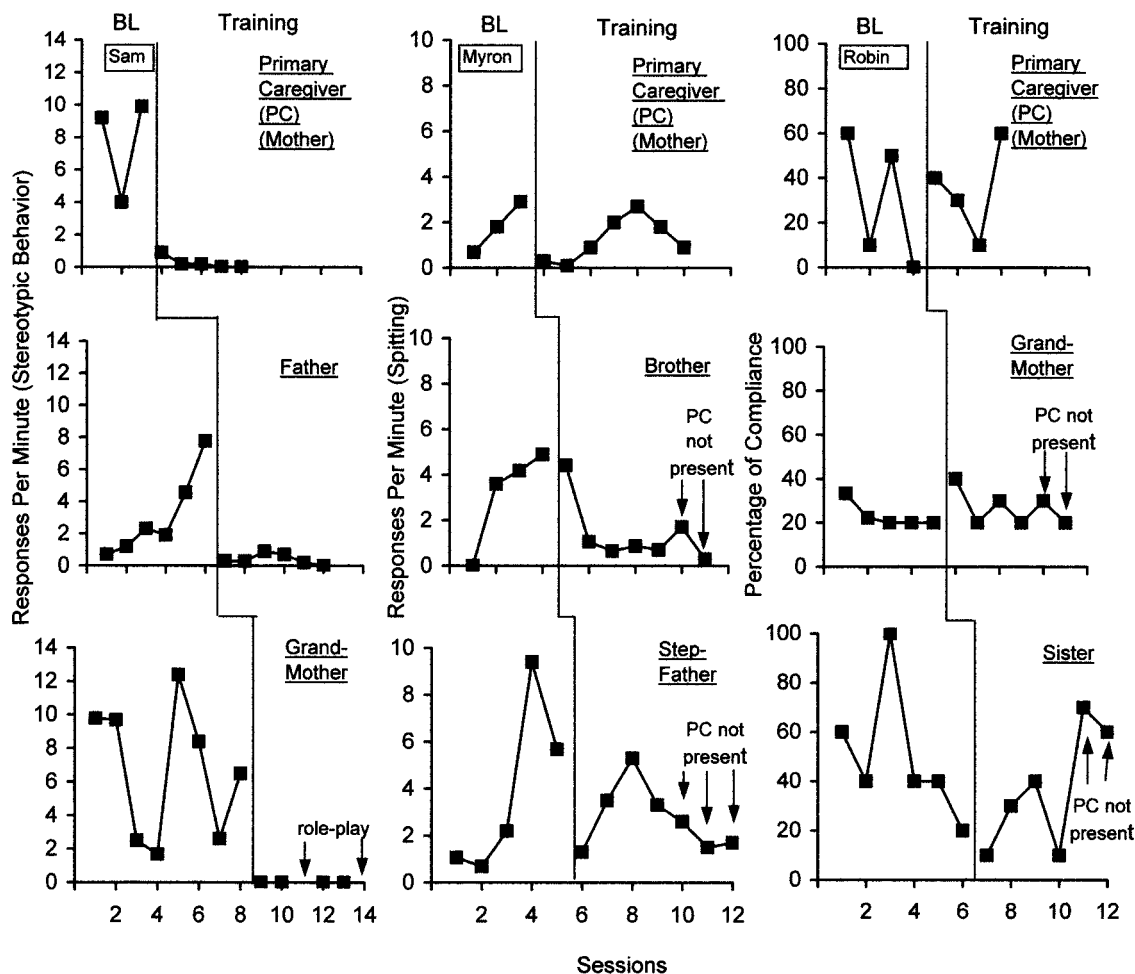


Figure 2. Responses per minute of stereotypic behavior for Sam (left panel), responses per minute of spitting for Myron (middle panel), and percentage of compliance for Robin (right panel) during baseline and training sessions.

mother implemented the procedures with 100% accuracy while training Robin's grandmother and with 99% accuracy while training Robin's sister. When Robin's sister responded incorrectly to noncompliance on a few occasions, Robin's mother did not deliver feedback or record those occasions as incorrect implementation of the treatment procedures.

*Effects on Child Behavior*

Levels of child problem behavior prior to and following training sessions with each caregiver are displayed in Figure 2. Moderate

levels of stereotypic behavior were observed during baseline sessions with all of Sam's caregivers (left panel). Treatment produced immediate reductions in stereotypic behavior to near-zero levels with all caregivers. In fact, Sam never engaged in stereotypic behavior with his grandmother after his mother and father had begun to implement the treatment.

Low levels of spitting were exhibited by Myron with his mother during baseline, and a modest reduction in spitting was observed during training sessions. Myron engaged in moderate rates of spitting with his stepfather

and brother during baseline. Small decreases in spitting were observed during training sessions with his stepfather, but clearer reductions were observed with his brother. Moderate to low levels of compliance were observed with Robin's mother, grandmother, and sister during baseline sessions. No improvement in compliance was observed with any of Robin's caregivers during training sessions.

## DISCUSSION

These findings systematically replicate previous research by demonstrating an efficient model for training multiple family members (spouses, grandparents, teenaged siblings) to implement individually prescribed treatments in the natural environment (e.g., Aduvato *et al.*, 1981; Neef, 1995). In addition, the procedures described by Shore *et al.* (1995) were extended to caregivers who had not been previously trained to work with individuals with developmental disabilities and behavior problems.

In prior research on parent training, large groups of parents typically were taught to implement general behavior-management strategies or treatment packages that were not tailored to the operant function of the target response (see Breiner & Beck, 1984, for a review). Efficient training modalities, such as manuals and group instruction, were ideal in these cases because the same treatment was taught to all participants. More research is needed on low-cost training strategies that are uniquely suited for teaching individually prescribed treatments to current and future caregivers of a child with problem behavior. Results of the current study indicate that one member of a child's family could rapidly learn to train other caregivers and, thereafter, could teach multiple future caregivers (e.g., family members, babysitters) without the assistance of professionals.

Nevertheless, results are limited in a num-

ber of respects. First, this study focused solely on the initial acquisition of treatment implementation and did not evaluate long-term maintenance of parent skills or improvement in child behavior. Initial follow-up data were not collected primarily because of caregiver time constraints and because long-term follow-up was beyond the scope of the current study. Second, child problem behavior did not always improve immediately following treatment implementation. Caregivers might be reluctant to adhere to the treatment when improvement is not immediate (Allen & Warzak, 2000). Additional follow-up visits and parental incentives for improvement in child behavior (Muir & Milan, 1982) may be necessary to ensure that treatment implementation is maintained.

Conversely, problem behavior did not occur during a number of the training sessions with Sam's caregivers, limiting opportunities for the caregivers to implement the procedure and to receive appropriate feedback. Another problem arose when Sam's mother determined that the father had met the criteria to terminate training even though he had completed only one session with greater than 80% accuracy under the delayed feedback condition. Although Sam's father implemented time-out with perfect accuracy when stereotypic behavior occurred during the next-to-last session, the level of his proficiency is somewhat inconclusive, because stereotypic behavior did not occur during the last session. Moreover, an essential outcome of successful training is the ability of the trainee to exhibit the target skills in the absence of the trainer. None of Sam's caregivers were willing to schedule additional follow-up sessions with the experimenter to measure this outcome. With the exception of Robin's grandmother, all remaining caregivers demonstrated the skills in the absence of the primary caregiver. However, it is not known if any of the caregivers implemented

the treatment procedures in the absence of the experimenters.

Thus, further research is warranted on the use of pyramidal training procedures with caregivers in home settings. The effectiveness of less comprehensive instructional packages for pyramidal training (e.g., manuals or verbal instruction alone) and the long-term effects of this training should be evaluated. Studies should examine whether the primary caregiver continues to successfully train caregivers beyond those initially trained using the prescribed training procedures. Finally, the long-term outcomes for child behavior following pyramidal training versus traditional caregiver training should be compared in future research.

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## STUDY QUESTIONS

1. Describe the key features of pyramidal training. What is a potential advantage of pyramidal training?
2. Briefly describe the outcome of each child's assessment and the subsequent intervention.
3. Provide examples of correct and incorrect implementation of Sam's treatment.

4. Briefly summarize the three major classes of dependent variables used in the study.
5. Describe the two phases of primary caregiver training.
6. How were the effects of other caregiver training evaluated?
7. Summarize the results of the study with respect to the major dependent variables.
8. What were some of the limitations of the study?

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