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Teaching Parents to Employ Mand-Model Procedures to Teach Their Children Requesting

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In this investigation, a home-based interventionist taught 4 female parents to embed the mand-model procedure in daily activities to teach expressive language skills to their young children with speech delays. A multiple probe design was used to demonstrate experimental control and an ecological process was used to select functional areas in the home where language skills could be taught. Data were collected on parents' use of the procedure and their child's responses. During the intervention phase, parents were provided with feedback along with specific encouragement to use the individualized instructional program daily. Results indicated that parents can be taught to embed effectively the mand-model procedure into functional activities, resulting in children's acquisition of target verbal responses across settings.

The emphasis on family as the most consistent system in a young child's life highlights the importance of using resources and strategies both within and outside the family to positively impact that child. The need exists to assist families in identifying their existing strengths, which can be used to build additional family resources (Dunst, Trivette, & Deal, 1988). The family-centered approach of Part C of IDEA suggests that the home setting is a natural intervention environment. The ability to incorporate the instructional needs of the child into daily functional activities allows the family flexibility and efficiency. Therefore, using early intervention personnel to teach parents and other family members the use of teaching procedures in the home environment is appropriate. Suitable curricula and teaching procedures are needed that mesh (a) the home setting, (b) family members as teachers or early interventionists, and (c) the family's daily needs and schedules.

Among the numerous approaches to providing interventions for infants and toddlers, three have a direct bearing on this investigation. An ecological inventory approach provides a curriculum evaluation and goal setting model that involves the family in assessment and identification of functional, age-appropriate skills for their child. Domains are chosen that include the major life areas and environments in which the child is expected to function in the present and future. The family is actively involved in every portion of the ecological inventory planning process and needed developmental skills are taught in natural learning settings that encourage generalization to natural contexts (Guess & Helmstetter, 1986; Orelove & Sobsey, 1987b).

The Individualized Curriculum Sequencing Model (ICS; Guess & Helmstetter, 1986) is a transdisciplinary intervention approach that uses the ecological assessment information in a functional curriculum. The ICS model intro-

duced the concept of the skill cluster in which generalization of skills is programmed through the use of natural reinforcement and the instruction of concurrent skills or behaviors across various domains throughout the day. An individualized curriculum sequence is prepared once the skills are identified.

Naturalistic teaching procedures provide a compatible approach to the ICS model. Milieu teaching, traditionally used to teach language and communication skills (Kasler, 1993) combines teaching procedures that are used consistently in naturalistic teaching models. The four procedures that make up milieu teaching are (a) model, (b) mand-model, (c) time delay, and (d) incidental teaching techniques. All four procedures use immediate praise and access to presented materials as natural reinforcers.

Training early interventionists and parents to use naturalistic teaching procedures has resulted in both positive skill development for children and high satisfaction for interventionists and parents (Alpert & Kaiser, 1992; Hemmeter & Kaiser, 1994). Three parents of preschool-aged children were taught to use a simplified version of milieu procedures (e.g., model, imitation, delay, and environmental manipulation) in their home-based settings (Parker, 1991). MacDuff, Krantz, MacDuff, and McClannahan (1988) trained professional staff to successfully use incidental teaching techniques with school-age children with severe autism. Mudd and Wolery (1987) cited in-service training procedures with daily written and verbal feedback from the trainers as vital to the success of Head Start teachers' use of incidental teaching.

Clinic settings have been used to teach parents to use the four milieu procedures to teach language skills to their children. The teaching procedures generalized from the clinic to the home setting. Both parents and trainers reported high satisfaction with the intervention strategies (Hester, Kaiser, Alpert, & White-man, 1995; Kaiser, Hester, Alpert, & White-man, 1995). Researchers found printed materials, modeling the components of the teaching procedures, prompting, and giving specific examples and feedback essential to effectively

training trainers and parents (Hester et al., 1995).

In the present study, the home setting was used to train parents to embed functional language skills into daily routines with the use of mand-model procedures. The purpose of the study was two fold: (a) to determine whether parents could implement a naturalistic teaching procedure while effectively embedding teaching into selected functional daily activities and (b) to determine if their child would acquire the targeted skill and use it in two daily activities. The mand-model procedure was chosen because it incorporates components of model, time delay, and incidental teaching techniques and is representative of many of the naturalistic procedures. Unlike other investigations, an early interventionist served as the home trainer. Two research questions were asked: (a) Can parents correctly use the mand-model procedure with their child across two activities in the home environment? and (b) Will the child's use of the individual language targets increase when the teaching of these skills are embedded into two functional daily activities in the home environment?

METHOD

Participants

Parents. Parent participants in this investigation were selected based on the child's ability to meet the required prerequisite skills and the adult's willingness to participate. None of the participants were familiar with the mand-model teaching procedure and none had received any direct training related to selecting functional skills and embedding them in daily activities (although some parents had been observed to occasionally model words and gestures for their child to imitate). All participants were female (e.g., mother, foster mother, great aunt) although male parents were invited to participate. One participant had a General Education Diploma (GED), two were high school graduates, and one held a bachelor's degree. (See Table 1 for additional participant information.)

Children. Four children who met Ken-

Table 1.
Participant Information

Dyad	Child's Disability	Child Assessment
Jeff (age 24 months) Ms. Cole (foster mother); Age 53, GED	Multiple Genetic Anomalies; Cirrhosis of the Liver	Receptive Language ¹ : 9–14 mos. Expressive Language ¹ : 12–18 mos. Language Comprehension ² : 12–15 mos. (understands 50 words) Language Expression ² : 12–15 mos. (says 25 meaningful words)
Jonah (age 30 months) Ms. Gabbard (mother); Age 43, high school graduate	Expressive Language Delays	Receptive Language ¹ : 19–24 mos. Expressive Language ¹ : 17–20 mos. Language Comprehension ² : 15–18 mos. (understands 46 words) Language Expression ² : 18–21 mos. (says 31 meaningful words)
Thom (age 31 months) Ms. Powell (great aunt); Age 30, high school graduate	Expressive Language Delays	Receptive Language ¹ : 18–26 mos. Expressive Language ¹ : 15–24 mos. Language Comprehension ² : 21–24 mos. (understands 102 words) Language Expression ² : 18–21 mos. (says 42 meaningful words)
Tony (age 28 months) Ms. Witt (mother); Age 36, college graduate	Developmental & Expressive Language Delays due to Prematurity	Receptive Language ¹ : 20–24 mos. Expressive Language ¹ : 18–20 mos. Language Comprehension ² : 18–21 mos. (understands 72 words) Language Expression ² : 18–21 mos. (says 47 meaningful words)

¹Hawaii Early Learning Profile (Furno et al., 1985).

²Rossetti Infant-Toddler Language Scale (Rossetti, 1990).

tucky's First Steps' definition of developmental delay participated in the investigation. The children ranged in age from 24 to 31 months at the start of the project and each had expressive language delays of at least 6 months. Prior to initiating the study, the early interventionist and parents conducted assessments to ensure that each met the following prerequisites: (a) the ability to imitate gesturally and verbally; (b) the ability to explore and manipulate toys and objects for 5 seconds; (c) the ability to sit and maintain an attention span for 5 minutes; (d) the visual ability to see and respond to toys, food, and activities; (e) the ability to verbally produce three different single words; and (f) current attendance in the program of at least 90% or better. In addition, each participant's Individual Family Service Plan (IFSP) included an outcome stating the need to develop expressive language skills.

None of the children had a history with the mand-model instructional procedure or with systematic embedding of functional skills in daily routine activities. Current developmental levels were assessed using the *Hawaii Early Learning Profile* (Furno et al., 1985) and *The Rossetti Infant-Toddler Language Scale* (Rossetti, 1990).

In Group A were Jeff and Jonah. Jeff was 24 months of age and had multiple disabilities. He had been in foster care since birth and his foster mother, Ms. Cole served as the parent. Jonah was 30 months old and his expressive language skills were limited to single words. He did not initiate any verbal language, although he gestured and when a word was modeled, he imitated. Jonah also demonstrated articulation limitations similar to those of his next older sister, and he refused to repeat himself when not understood. Jo-

nah's mother, Ms. Gabbard, chose to participate in the study. In Group B were Thom and Tony. Thom was 31 months of age and had a history of upper respiratory infections, ear infections, and tubes in both ears which clogged regularly and required medical attention. He lived with a great aunt and uncle where First Steps early intervention services were provided. For the study, his great aunt, Ms. Powell, assumed the role of parent (with his mother's permission). Tony was a 28 month old boy who was born at 23 weeks gestation. He weighed 2 lb. 2 oz. at birth, and was hospitalized immediately for 7 weeks. Although he had overcome motor delays, he continued to display expressive language delays with articulation limitations. Tony's mother, Ms. Witt, participated in the study.

Staff. The early interventionist in this project was completing the requirements for a Master's degree in Early Childhood Special Education and had 12 years experience in early intervention. Other staff were trained by the primary early interventionist to collect procedural reliability and interobserver agreement data. All staff had bachelor's degrees in related fields.

Setting

The family's home was the instructional setting for each child. Based on individual ecological inventories of the home (e.g., surveying activities that occurred in each subenvironment of the home through observation and parent interview), the early interventionist selected the living room and the kitchen or dining room as the activity areas in which the functional language skill would be taught. During the study, only the participating parent, child, early interventionist, and data collectors were present in the instructional setting.

Materials and Equipment

The materials included functional toys and equipment required for the activities (i.e., play, feeding) in the individual settings. Living room play areas were equipped with age appropriate toys with several parts that the child enjoyed using. The kitchen or dining

room had the child's high chair, bowl or plate, spoon, cup, and food items. The early interventionist used a tape recorder to tape each session for data collection purposes.

Data Collection

Each parent participant had expressed a desire that their child use words to request, thus the word "more" was selected as the target language skill. Parents were taught to embed the mand-model teaching procedure into the two separate activity centers they had chosen. The early interventionist collected data on (a) parent's use of the mand-model teaching procedure and (b) child's response to the parent's instruction.

An event recording system was used to note each occurrence of parent and child behavior during the 15 minute instructional period. Each step of the mand-model procedure used by the parent was recorded. A correct mand-model teaching episode consisted of the following three to five steps, depending on the child's response to the initial mand. Step 1: obtain the child's attention with interesting materials. Step 2: present the mand. Step 3: provide a 3 second delay for child to respond. Step 4: (If child responds correctly to Step 3) provide an appropriate consequence of praise and access to the material; (if child responds incorrectly or gives no response to Step 3) model the correct response for the child to imitate. Step 5: (If child responds correctly to Step 4) provide an appropriate consequence of praise and access to the material; (if child responds incorrectly or does not respond to Step 4) model the correct response for the child to imitate and give the child access to the material without praise. If the child responded correctly to the initial mand (Step 2), a model was not needed. Thus the correct teaching episode consisted of Step 1 and Step 2, followed by a revised Step 3, in which the parent provide the consequences (i.e., praise and access to the material). Data were recorded for each instructional step. An incorrect teaching episode was coded if the parent did not implement each step.

Child responses were recorded for verbal utterances that stated (a) "more," (b) "more"

plus the naming of an object or person, or (c) "more" used within a two to five word phrase (e.g., "I want more milk"). Correct pronunciation of the word was not necessary if the word could be understood. Child responses to the mand or model were coded as correct, incorrect, or no response. Data were recorded for target verbal utterance, response to initial mand, response to first or second model procedure, or spontaneous use of the target word without any prompt.

Each session was audiotaped and data were collected during all weekly sessions. Independent variable reliability data were collected during parent training and at least once during each condition (e.g., baseline, intervention, maintenance). In addition, interobserver agreement data were collected on parent and child behaviors at least once per condition.

Baseline

During the first phase of the research, the early interventionist collected baseline data during each weekly visit. She conducted one to two 15 minute play area teaching sessions during each weekly home visit. During the sessions, she directed the parent to interact with and talk to her child as she normally would. The interventionist made no suggestions as to instructional procedures to use with the child. She collected baseline data for a minimum of three sessions or until data were stable before she taught the instructional procedures to the parent. She collected baseline data in the setting the parent chose during each visit. Because all the families were accustomed to early intervention being presented in a play setting, play became the activity of choice for all four families during baseline data collection.

Each mand-model teaching episode consisted of the possible three to five steps that made up the mand-model teaching procedure. One or two sessions occurred during each home visit, depending on whether the early interventionist was collecting probe or baseline data.

The 4 participating families were paired in groups of two (A and B). The early interventionist collected baseline data for the first dyad

in each group during the two parent and child interaction sessions of each weekly home visit until three sessions of stable data occurred. Concurrently, the second dyad in each group participated in one probe session per week. As the first dyad in each group completed the baseline condition and began the intervention phase, the second dyad began the process of obtaining a minimum of three consecutive sessions of stable baseline data. Because there is always concern about maturation with young children, the early interventionist limited the length of time the families remained in baseline probe status. When the parent in the first dyad showed an increase in the ability to use the mand-model procedure, and the second dyad completed 3 weeks of stable baseline data, intervention was started with the second dyad.

Parent Training and Intervention

The independent variable consisted of parent training and feedback. Specifically parents were trained and encouraged to increase their child's targeted language responses through the use of (a) functional activity areas in which instruction could be embedded and (b) the mand-model teaching procedure. Intervention training began after the third baseline session or when baseline data remained stable. While the interventionist delivered training to the parent, the data collector interacted with the child.

Parent training materials included written instructions and an oral presentation on (a) selection and use of functional activity centers in which the mand model procedures could be embedded and (b) implementation of the mand-model teaching procedure. The first presentation explained the importance of providing instruction to the child throughout the day in a variety of activity center settings in the home and the concept of embedding instruction into these activity centers. The second phase of the presentation explained to the parents that they had demonstrated portions of the instructional procedures during baseline observation. Next, parents reviewed an outline defining the mand model procedures. This outline described each instructional step of the

procedure and provided examples. After a discussion of the outline, the early interventionist gave the parent a quiz to determine areas needing further explanation. She then conducted a trial teaching session between the parent and the child in which she prompted the parent as needed. Finally, she provided feedback to the parent to assist in her learning the procedure and to praise accomplishments.

An ecological inventory process was the basis of discussion to identify functional activity areas that became the settings for the instructional procedures during the investigation. Using observation and interview, the interventionist and the parent identified functional activities performed in the subenvironments of the home. On a daily basis, even when the interventionist was not present, the parent was to embed the mand-model instructional procedure in the functional activity areas to teach her child to respond by using the targeted verbal response "more." When criterion was reached, the early interventionist collected maintenance data in a probe session for each instructional activity center for up to 10 weeks.

Maintenance and Generalization

Intervention ended when a family reached the criterion of (a) parent providing at least seven correct teaching procedures in a 15 minute instructional session, and (b) child increasing their prompted or spontaneous verbal responses of using the word "more" appropriately in each session. Maintenance sessions were conducted in each functional activity center. The first set of maintenance sessions occurred 4 to 7 weeks following the end of intervention with the second dyad in each group. The second set of maintenance sessions occurred 3 to 4 weeks later. One child (Thom) entered a preschool program and was unavailable for the second set of maintenance sessions. The interventionist conducted maintenance sessions in the same manner as baseline sessions.

Although generalization was not formally assessed, the early interventionist used procedures known to facilitate generalization such as embedding the instructional procedure into a variety of functional activity centers

that are chosen by the family. In our study, these activity centers provided parents the opportunity to make the learning process a part of many daily activities in a variety of natural settings and children the opportunity to receive instruction in natural settings and receive reinforcement that occurred naturally (e.g., access to more food or more of an activity, parental praise for verbalizing a request). A variety of materials, settings, and people were available to provide generalization opportunities. Thus, variables that have been known to facilitate generalization were integrated into daily functional family interactions with the child.

Experimental Design

The early interventionist used a multiple probe design (Blackhurst, Schuster, Ault, & Doyle, 1994) across participants to evaluate whether experimental control occurred. The experimental design was strengthened as the baseline probe, intervention, maintenance probe process was replicated across two sets of two families in a time lagged manner. Because of time constraints and an effort to limit the time a family was in baseline condition, replication of the intervention on the second tier occurred after 3 weeks if the parent in the first tier showed an increase in the target behavior. Thus, experimental control was based on the change in the behavior of the parent, not the child.

Reliability

A colleague of the early interventionist collected procedural reliability data on the early interventionist's implementation of the parent training and intervention feedback. The steps that she observed included: (a) provision of stimulus that signaled parent to begin instruction, (b) timing the session for a 15 minute interval, (c) data collected on data collection sheet, and (d) feedback to parent consisting of praise and training corrections.

At least once per condition, a colleague also collected interobserver agreement data on the two dependent variables (parents' use of the mand-model procedure and child response). In addition, independent variable reliability data

on the investigator's adherence to maintaining the rules of the study and providing parent training or feedback were collected. Audiotaping was introduced as a data collection procedure when the research team concluded a potential reliability problem existed. Scheduling constraints prevented the colleague from collecting frequent reliability data and parent-child interactions were occurring at a rapid speed making data collection difficult. Thus each session was audiotaped and the interventionist or colleague rechecked the accuracy of collected data as needed.

Independent variable reliability agreement was calculated by dividing the number of observed behaviors by the number of planned behaviors performed by the early interventionist and multiplying by 100 (Brown & Snell, 1993). Dependent variable reliability agreement was calculated comparing the interobserver data collected by the early interventionist and her colleague and dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100 (Brown & Snell, 1993).

Social Validity

At the conclusion of the study, participating parents responded to a nine question survey, rating questions on a scale of 1 (*low*) to 5 (*high*). Parents also could make written comments about their evaluation of the investigation. Items on the survey included questions regarding the (a) effectiveness of the home activity centers as instructional settings, (b) effectiveness of the mand-model procedure, (c) clarity of parent training by the interventionist, (d) clarity of written training materials, (e) usefulness of practice sessions in teaching the mand-model procedure, (f) helpfulness of post-session feedback, (g) acquisition of new skills for home intervention, (h) intent to continue to use home activity center as instruction following the investigation, and (i) intent to continue to use the mand-model procedure following the investigation.

RESULTS

Reliability

Observation in the home allowed simultaneous observation and data collection of de-

pendent and independent variable reliability data. Independent variable reliability data were obtained on the investigator's adherence to maintaining the rules of the study and providing parent training or feedback.

Dependent variable reliability. Results of the interobserver agreement data collected on each parent's correct use of the teaching procedure and the child response were high. The overall mean percentage of agreement on each parent and child pair during baseline condition was 96% (range 81% – 100%). During the intervention condition, the overall mean percentage of agreement on each parent and child pair was 98% (range 84% – 100%). The interobserver agreement results during maintenance conditions indicate an overall mean agreement for each parent and child pair of 99% (range 88% – 100%).

Independent variable reliability. Overall procedural reliability agreement was 95% (range 81% – 100%). The only step that was not at 100% agreement was collecting parent and child data, which had an overall mean of 90% (range 81% – 100%).

Mand-Model Procedure Effectiveness Data

Figures 1–2 show the data collected on the parent and child responses. The top portions of the figures display the percent of teaching episodes in which the mand-model teaching procedures were correctly presented by the parent to their child. The lower portions of the figures display the number of times during probe baseline, intervention, and maintenance sessions in which the child used the target verbal response "more." Parent training in the use of the mand-model procedure, which is demonstrated through correct parent use of the procedure, and child response using the target verbal response "more" is displayed visually using a multiple probe design across four parent and child pairs.

Graphed data indicate that a functional relationship existed between the dependent and independent variables across the parent and child pairs in each multiple probe design. Baseline probe data were recorded at 0 for all parents and children except for one single response. In the intervention phase, all parents

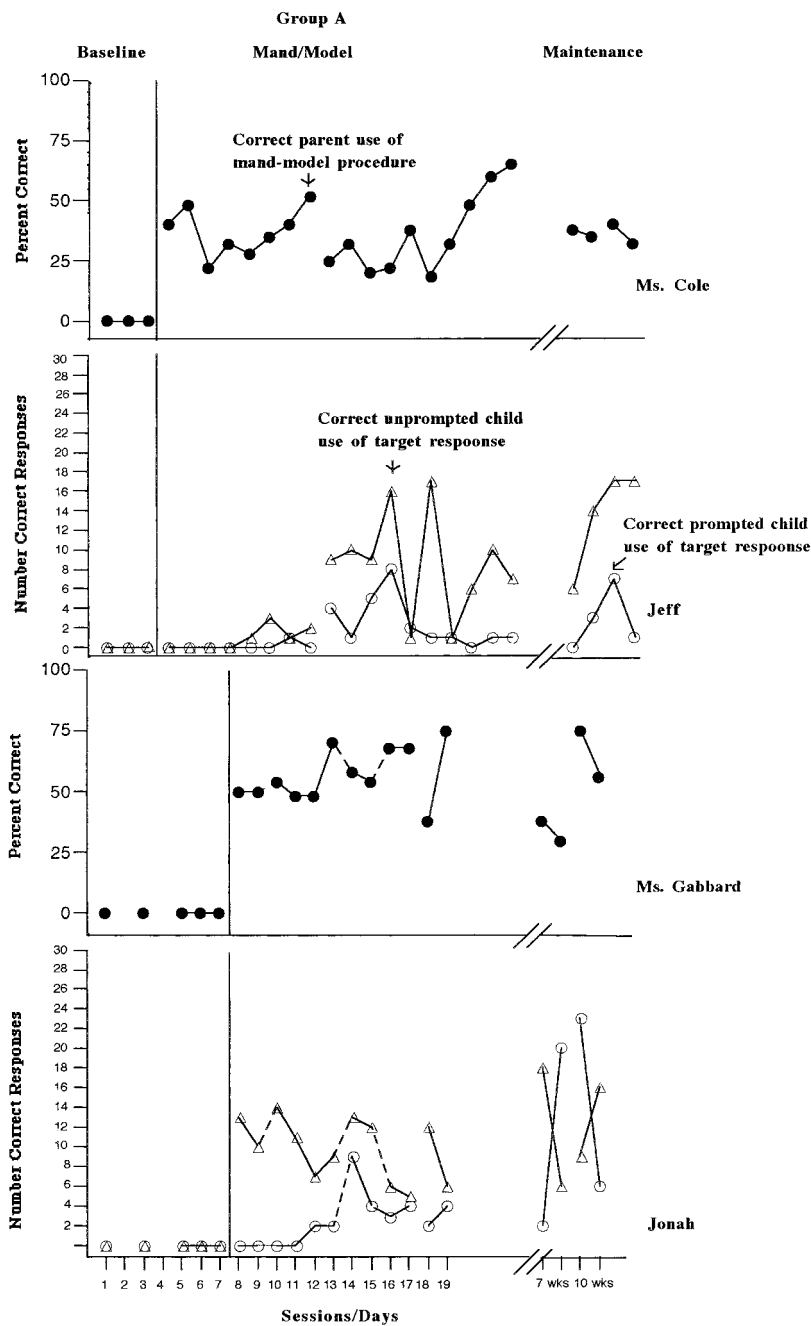


Figure 1.
Graphic data for Dyad A.

demonstrated an immediate increase in the correct use of the procedure. An argument can be made that experimental control was exhibited across the two sets of parents.

For Jeff, Jonah, and Thom, the number of times the parent used the mand-model procedure and the child performed the target response was 0 in both baseline probe phases.

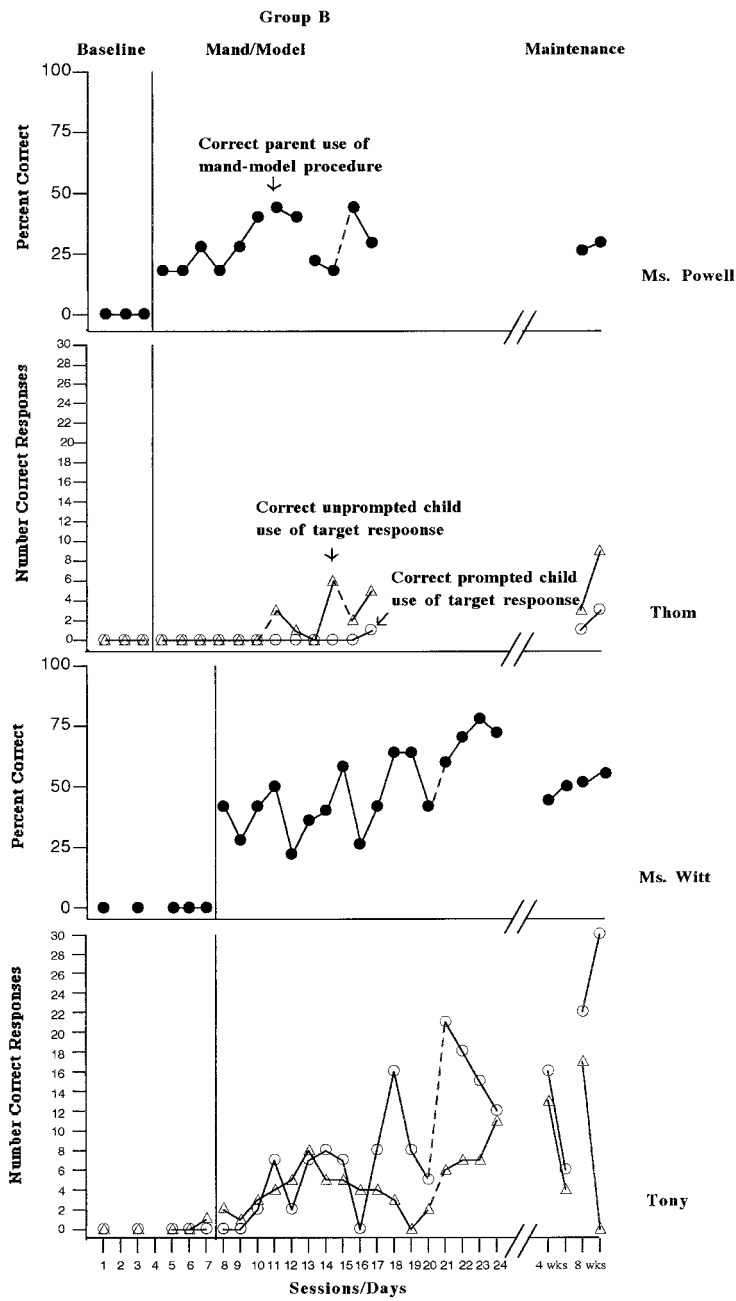


Figure 2.
Graphic data for Dyad B.

Tony's mother (Ms. Witt) provided the mand-model procedure 0 times during baseline condition with the child performing the target response 0 times until the final baseline session

when he spontaneously used the target verbal response "more" one time.

During the intervention condition, the overall mean for parents' correct use of the mand-

Table 2.

Mean Percent Scores by Sessions of Parent Use of Mand-Model Teaching Procedure During Intervention

Behavior Responses	Ms. Cole & Jeff <i>n</i> = 18	Ms. Gabbard & Jonah <i>n</i> = 12	Ms. Powell & Thom <i>n</i> = 12	Ms. Witt & Tony <i>n</i> = 17
	<i>M</i> (range)	<i>M</i> (range)	<i>M</i> (range)	<i>M</i> (range)
Correct Procedure Use	36% (20–64%)	53% (39–74%)	31% (19–44%)	52% (21–77%)
Errors:				
No joint attention	3% (0–35%)	1% (0–6%)	1 (0–25%)	0% (0%)
Mand only	15% (0–50%)	17% (0–32%)	22% (0–42%)	15% (8–40%)
No time delay	6% (0–40%)	4% (0–18%)	4% (0–19%)	1% (3–11%)
Mand-1, model only	9% (0–31%)	10% (0–28%)	8% (0–38%)	7% (0–22%)
Model only	29% (0–76%)	11% (0–26%)	33% (0–77%)	17% (0–48%)
No praise	2% (0–18%)	4% (0–12%)	1% (0–7%)	8% (3–27%)

model procedure was 43.1% (range = 19% to 77%) over a total of fifty-nine 15 minute intervention sessions. During the maintenance condition, the overall mean correct use of the mand-model procedure by parents was 41.6% (range = 26% to 74%) over a total of fourteen 15 minute maintenance sessions. A summary of the parents' use of the mand-model teaching procedure during intervention and maintenance conditions are shown in Tables 2 and 3, respectively.

Increases in child responses appeared to correspond to the increases in parent behaviors. Jonah and Tony immediately demonstrat-

ed an increase of correct prompted responses to the mand-model procedure on the first session of intervention. Although Tony made one response in baseline condition, he increased to three correct responses during the teaching episodes in the first intervention session. Jonah and Tony continued to make prompted responses in succeeding sessions and began to initiate spontaneous responses by sessions 5 and 3, respectively. Jeff and Thom demonstrated a similar increase of correct prompted responses to the use of the mand-model teaching procedure by sessions 5 and 7, respectively, with both making unprompted responses

Table 3.

Mean Percent Scores by Session of Parent Use of Mand-Model Teaching Procedure During Maintenance

Behavior Responses	Ms. Cole & Jeff <i>n</i> = 4	Ms. Gabbard & Jonah <i>n</i> = 4	Ms. Powell & Thom <i>n</i> = 2	Ms. Witt & Tony <i>n</i> = 4
	<i>M</i> (range)	<i>M</i> (range)	<i>M</i> (range)	<i>M</i> (range)
Correct Procedure Use	36% (32–40%)	52% (30–74%)	28% (26–31%)	50% (46–55%)
Errors				
No joint attention	8% (0–18%)	1% (0–6%)	0% (0%)	0% (0%)
Mand only provided	21% (0–18%)	11% (0–17%)	16% (13–18%)	17% (16–30%)
No time delay	2% (0–7%)	1% (0–3%)	17% (9–26%)	1% (3–11%)
Mand-1 model only	6% (2–17%)	2% (0–4%)	5% (0–20%)	0% (0%)
Model only	15% (0–35%)	12% (1–28%)	31% (23–39%)	5% (2–15%)
No praise	11% (4–17%)	6% (6–50%)	3% (3–3%)	28% (5–42%)

by sessions 7 and 12, respectively. A functional relationship was demonstrated between the independent and dependent variables as a change occurred when the independent variable was introduced following collection of stable baseline data.

The children provided 507 correct responses (304 prompted responses and 203 unprompted responses) with a mean of 8.6 (range = 0 to 27) total verbal target responses per 15 minute session during the intervention condition. The children provided 290 correct responses (149 prompted responses and 141 unprompted responses) with a mean of 20.7 (range = 4 to 40) total verbal target responses per 15 minute sessions during the maintenance condition.

Social Validity Results

Results of the parent survey provided evidence of the social validity of the procedures. On a scale of 1 (*low*) to 5 (*high*), parents rated all items as 3 or higher. Across parents, they gave ratings of 5 to the effectiveness of activity centers as instructional settings, the clarity of parent training, the clarity of written materials, and the helpfulness of practice sessions. Two parents gave the effectiveness of the mand-model teaching procedure a rating of 4, and two parents gave a rating of 5. One parent commented, "The learning procedure I was shown has been the most helpful tool to teaching my child that I have ever seen or used. It absolutely works."

Other factors also can be considered of value in determining social validity. All of the play materials used came from the early interventionist's First Steps toy bag. Foods provided by the parent were items their child would have eaten that day for meal or snack. Thus, it should be feasible for any interventionist to implement such a procedure in the home setting.

DISCUSSION

The results of this study indicate that parents of 24 to 31 month old children with developmental delays can learn to use the mand-model instructional procedure to teach their

individual child to make verbal requests (i.e., "more") within two functional areas in their homes, while increasing the children's use of the target verbal language skill. The results further indicate that, even if the parents do not consistently implement the procedure with a high degree of accuracy, the procedure can be effective. All 4 children learned to use the target word "more" in prompted and unprompted response situations in the intervention condition. They all continued to display increasing trends in the use of these verbal skills in their maintenance sessions 3 to 8 weeks after the conclusion of the intervention.

A contribution of this investigation to the literature is that instruction was set in two functional areas in the home. These settings provided daily activities in which parents could embed teaching episodes and follow responses with natural reinforcement (e.g., access to requested food or activities, provide praise for verbal request). Over time, the parents maintained the ability to embed the procedure and the children maintained use of the target response (i.e., requesting "more"). In addition, intervention in the home environment provided the parents and children with access to multiple exemplars that can facilitate generalization, including people, materials, and activities. Anecdotal parent reports at the conclusion of the study indicated that the children's use of the target word generalized to activities in the community and to extended family and friends. The children expanded language to use two to four word phrases. The children also initiated verbal language interactions rather than only responding to others. Limitations of data collection, however, prevent verification of the relationship of anecdotal reports of progress to the investigation.

Although limited in scope to female parents and a single target response, results of this investigation also add to the research literature by documenting the effectiveness of training parents to teach their young children with developmental delays a verbal language skill through the use of the mand-model teaching procedure, one of the milieu teaching procedures. According to previous studies, parents have been successfully trained to use milieu

language strategies to teach their children in a clinic setting and then successfully generalized the use of these strategies to the home (Alpert & Kaiser, 1992; Hemmeter & Kaiser, 1994). The unique element of the current investigation was to place the intervention in the participating families' homes, using an early interventionist as the trainer and designating functional activities as the settings in which the parent used a milieu strategy to teach their child a verbal language skill.

Social validity results further strengthen the value of the research project. Parents expressed their beliefs that the mand-model teaching procedure and the home functional activity centers were effective in teaching their children. Results of the survey, however, must be viewed with caution because parents may have responded positively in an effort to please the early interventionist. Increases in children's language skills, which were maintained for at least 8 weeks following the study, add validity to the results.

No particular pattern emerged to suggest whether the play area or the feeding area provided stronger learning situations. Children's preferences were mixed. One child demonstrated more prompted responses in the feeding areas and more unprompted responses in the play center, and another child demonstrated similar response levels in both. The natural reinforcers of the functional activity centers (e.g., requested food or activity, parental praise for verbalized requests) also provided the support and reinforcement to maintain the skill, although it can be argued that parental praise was part of the procedure and may or may not have been used with consistency independent of the mand-model intervention. Data confirm the continued upward trend of all 4 children during the two maintenance sessions. The multiple opportunities to use the word "more" in the normal daily activities in the home provide an opportunity for continuing natural reinforcement of the skill. The children increased prompted and unprompted verbalizations and displayed continuing trends of moving from prompted to unprompted target responses.

Some limitations of the research study

should be considered. First, a threat to internal validity is found in the participation of only two families across each multiple probe design. While this situation was strengthened by replicating the study across a second set of families, at least three families in each set would have been preferable.

Second, Tony spontaneously produced the target verbal response in the final baseline session. Baseline conditions were not continued because he already had been in baseline probe conditions for 4 weeks (7 sessions). The concern was that threats of maturation needed to be controlled. The child responded by immediately producing the target verbal response when the instructional procedure was presented. He also demonstrated throughout the study response trends that were similar to the trends of the mother's presentation of the instructional procedure. Nevertheless, his single response during baseline condition weakens experimental control.

Third, the early interventionist made efforts to control for maturation effects by keeping the study's time line as short as possible. Due to constraints of the early intervention program's weekly visit schedule, however, each parent and child pair was involved for 4 to 5 months.

Fourth, Thom's limited data are a concern. He had a 3-week absence during the intervention condition plus two separate 1-week absences. He only was able to participate in two sessions of maintenance condition data collection. In addition, he displayed resistant behavior, being nonresponsive to the instructional procedures. His mother (Ms. Powell) demonstrated her frustration with the child's nonresponsive behavior by making errors of using just the mand or the model portions of the instructional procedure.

Additionally, the early interventionist did not make decisions about which functional areas to use as the teaching settings until the parent training sessions conducted between baseline and intervention conditions. During baseline sessions, teaching episodes occurred only in the play area. Thus, the possibility exists that baseline data collected during feeding activities could have produced different re-

sults due to the strong value of food as a reinforcer.

Another problem is that parents may or may not have provided consistent verbal praise to their children naturally following verbal requests during baseline conditions. The early interventionist only collected data on whether parents used the entire mand-model procedure correctly and not whether they used any of its components independently. Because verbal praise is part of the mand-model procedure, a possible increase in parent praise during intervention cannot be ruled out as a sole variable that increased responses.

A final concern is the variability in the children's correct target response data. The children produced extremely high and extremely low scores from one session to the next. These extremes could be found between two sessions conducted during a single visit. The inability to control all the influences on an experiment in the home setting is possibly the reason for the variability. Interruptions of siblings and telephone calls provided distractions that could not be controlled completely. Also, the age of the children, the extent of developmental delays, and behavioral control issues between parent and child were contributing factors.

Perhaps, the most interesting outcome of this investigation has to do with the parents' ability to correctly use the teaching strategy. The fact that the parents correctly used the mand-model procedure for a mean of 32% to 52% (range = 21% – 77%) of the opportunities during intervention and maintenance sessions can be viewed as a limitation. An argument could be made that these mean percentages were too low to conclude that a functional relationship occurred. On the other hand the parents delivered a high number of teaching episodes that were not scored because they contained procedural errors. Tables 2 and 3 indicate parent delivery of "the mand only," "the mand-time delay-with only one model," and "model only" were the three main errors. Thus, the parents' total instruction stayed within the components of the mand-model instructional procedure. This provides an interesting result in that the relatively low accuracy

of the parents' delivery of instruction still resulted in a high number of correct responses by their children.

It should be noted that the investigator collected data only on parent and child performance one day per week (2 sessions per day). This was due to (a) the lack of time to schedule more frequent home visits and still serve her entire caseload and (b) respect for the families' privacy and reluctance to be more intrusive in their homes. It is impossible to know if the parents implemented the procedure on a daily basis or if they implemented the procedure with higher or lower levels of accuracy when not being observed by the investigator. Indeed, it is possible that the presence of the interventionist served as a S^D for the parents to implement the intervention. Nevertheless, the investigation mirrors the real world of the home interventionist who typically does not have frequent access to families and must rely on their willingness and motivation to implement procedures they are taught during home visits. Our response data, however, show that children increased their ability to use the target response with parents in the presence of the interventionist. This result alone provides justification for home intervention and parent training.

Although the procedures employed in this investigation had the potential for facilitating generalization, no formal data were collected. Future investigations should focus on this aspect of home intervention and assess if teaching language responses during functional activities with natural reinforcers actually results in generalization to other activities, settings, and communication partners. In this case, the investigation attempted to facilitate generalization by training across two settings. Future investigation also should compare the effectiveness of training during single and multiple activities on facilitating generalization to novel activities.

Although this investigation supports the effectiveness of training parents to use the mand-model teaching procedures embedded in home-based functional activity centers, further study needs to address additional issues. Parent training issues, in particular, need to be

examined. Previous research has demonstrated that the effectiveness of the child's learning process is directly involved in the effectiveness of the training the parent and the parent trainer received (Kaiser et al., 1995). The professional's ability to use a procedure accurately does not ensure he or she can effectively teach parent to use the procedure (Hester et al., 1995). In addition, questions can be raised regarding the relationship of parent procedural reliability to the child's rate of learning. How accurately must a parent implement a procedure so their child will learn the target response(s)? Further research also should indicate whether early intervention professionals need to have practical application training, as well as reading and studying the milieu procedures, to effectively prepare the parent to use the various procedures and strategies (Kaiser et al., 1995).

Previous studies were conducted frequently in clinical settings. Additional research is needed to determine how the training needs for parents of 1 to 3 year old children in the home environment can best be met. Children's ages and the home setting provide a different set of constraints than are found with older children in a clinical setting. Another concern is obtaining reliable data with the least possible intrusion to the family and without affecting the parent confidence in teaching the procedure. Future studies should address the reliability issues and examine ways to increase the accuracy of parent delivery of the intervention (e.g., rely more on daily videotape than on weekly on-site data collectors). Also, social validity should be examined more stringently, with particular emphasis on the feasibility and effectiveness of interventionists in training parents to teach their children using the procedures they have been taught. Finally, the issue of the effectiveness of fathers (or other appropriate male figures) as teachers or interventionists in children's instructional programs must be addressed. In this investigation, the early interventionist made attempts to find families in which the father (or other male figure) took a leading role as caregiver or shared the instructional responsibilities with the mother. While a few families with

such fathers were served by the early intervention program, none of the children in those families met the criteria to participate in this study.

In summary, this investigation indicates that female parents can be taught to embed the mand-model procedure during functional activities within the home and that parent implementation of this procedure in the home (even if not done with 100% accuracy) can have a positive effect on the language development of their children in regard to making requests. Thus, early interventionists in the home should consider teaching the milieu procedures to parents of young children with developmental delays.

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