The Effects of Milieu Teaching Procedures on the Spoken Language of Children with Autism

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Ui Jung Kim · Hye Sung Choi. The Effects of Milieu Teaching Procedures on the Spoken Language of Children with Autism. 『언어청각장애연구』, 2003, 제8권, 제3호, 40-68. This study examined the effects of milieu teaching procedures on the spoken language of three children with autism. Participants were in the early stage of spoken language development. A multiple probe design across participants was used to investigate the functional relationship between the milieu teaching procedures and early functional spoken language. Results indicated that all participants acquired their language targets upon the implementation of milieu teaching procedures. The participants generalized the use of the acquired language skills to their teacher or teaching assistant and maintained their target language skills after the intervention was discontinued. Increases in the frequency of spontaneous use of language targets also were observed in all participants, especially in two of the three participants. The results of this present study, limitations, future research, and implications are discussed.

Key Words: milieu teaching, spoken language, children with autism

Ⅰ. Introduction

The pervasive language impairments in children with autism have stimulated much research on the development of effective language intervention. In early language intervention programs (e.g., discrete teaching), there was much emphasis on teaching appropriate speech production, verbal imitation, and specific language forms (Carr, 1985). Although students with autism acquired spoken language skills, research findings on early language intervention programs (Carr, Schreibman & Lovaas, 1975; Lovaas et al., 1966; Lovaas et al., 1973; Stevens-Long & Rasmussen, 1974) revealed a lack of functional utility, generalization, and maintenance of language skills (Carr, 1985; Howlin, 1981). That

is, children were not able to use those language skills that they had learned to communicate with others in everyday communicative situations. Furthermore, children with autism did not generalize their newly acquired language outside of the intervention sessions, and their language gains were not easily observed after the intervention was terminated.

To address these limitations of early language interventions, many researchers have called for naturalistic language interventions(Beisler & Tsai, 1983; Dyer, Williams & Luce, 1991; Koegel, O'Dell & Koegel, 1987; Landry & Loveland, 1989). Milieu teaching is one example of naturalistic intervention used to teach language skills (Kaiser, Yoder & Keetz, 1992; Rule et al., 1998). According to Kaiser et al.(1992), milieu teaching differs from early language interventions in that teaching episodes are embedded within typical or routine activities in the child's natural communicative environments where the child spends most of his or her day, such as the classroom and home. Teaching begins when the child initiates communicative interactions or shows interest in activities or materials. A variety of stimulus items commonly available in the child's natural environment are then used to teach language skills. Milieu teaching focuses on teaching functional use of language skills that have immediate use in the child's everyday life, such as making requests and asking questions. Explicit prompts including model, mand, and time-delay are used to teach target language skills. Consequences are provided contingent upon the child's response; that is, the child's correct use of the target language response of "juice", is followed by a cup of juice. Finally, milieu teaching promotes the generalization of acquired language skills to new contexts by selecting common stimulus items, functional responses, and natural consequences.

The systematic review of studies on milieu teaching (Kaiser et al., 1992) has indicated its effects on the acquisition of functional early spoken language skills for children who are in the early stage of language development, including children with mild to moderate mental retardation (Warren, 1992; Warren & Bambara, 1989; Warren & Gazdag, 1990; Warren et al., 1994), children with language/developmental delays (Kaiser & Hester, 1994), and children with autism (Charlop, Schreibman & Thibodeau, 1985; Taylor & Harris, 1995). Milieu teaching also has been effective with typically developing children who are at-risk for language delays (Hart & Risley, 1975). Moreover, there is

evidence that milieu teaching has promoted generalization of language skills outside intervention contexts, such as across settings, across people, and across settings and people.

At present, however, studies involving children with autism are scant as well as limited in their scope. Few studies have investigated the effects of milieu teaching on children with autism, and many of these studies involving this group of children are narrowly focused in terms of the number and types of target responses. For example, Taylor and Harris (1995) taught a single target response (What's that?) to all three participants. In a study done by Charlop et al. (1985), two target responses, "I want cookie." and "I want chip.", were taught to all participants. McGee, Krantz and McClannahan (1985) taught all participants six words (e.g., on, inside) within the semantic category of location. In addition, the effectiveness of milieu teaching procedures on promoting spontaneous use of early spoken language of children with autism has not been examined. Thus, additional research is needed to further study the effects of milieu teaching for children with autism.

The purpose of the present study was to examine the effects of milieu teaching procedures on the acquisition, generalization, maintenance, and spontaneous use of early functional spoken language of three children with autism. Milieu teaching procedures included model, mand, and time delay. Early functional spoken language targeted in this study included one-, two-, and three-word utterances representing a semantic category of action (e.g.,"Open."), a semantic relationship of action + "please" (e.g.,"Open please."), and a semantic relationship of action + object + "please" (e.g.,"Open jar please.") that were used to make requests.

Ⅱ. Method

1. Participants

Three children with autism, two boys and one girl, participated in this study. All three children had a primary diagnosis of autism determined by a licensed psychiatrist or

a certified school psychologist. They ranged in age from 4 years 10 months to 8 years 5 months at the beginning of the study. The participants attended public elementary schools in a large school district in central Texas of the United State of America. All participants were European American and came from middle or upper-middle socioeconomic status (SES) households. The intelligence test scores for the participants were not available. No standardized language assessments had been administered to the participants. The participants were selected because they showed significant delays in spoken language development as measured by direct observations and a parent interview. Their spoken language was primarily limited to prompted one-, two-, or three-word utterances. The majority of the participants' spoken language was used to request desired items or to obtain assistance from adults. Meaningful spontaneous spoken language was occasionally observed in two of the three participants.

a. Participant 1 (Ben)

Ben, an 8-year-old boy, was responsive to adults but rarely initiated communicative interactions with adults or peers. His spontaneous language consisted primarily of delayed echolalia and noncontextual speech. His spoken language skills were a few prompted three- or four-word utterances, such as "More cookies please."and "I want books please.", followed by an adult's model (e.g., "Say, I want books please.") or question (e.g., "What do you want?").

b. Participant 2 (Chris)

Chris was a boy of 8 years and 5 months old who often initiated communicative interactions with adults. He most often used nonverbal communication skills to request items or assistance (e.g., pointing to an item, putting an adult's hand on the top of a container). Chris occasionally used one language response, "more please", spontaneously. His spoken language was limited to prompted one- or two-word utterances, such as "Popcorn", "More", "Coke please."and "More please.", followed by an adult's model (e.g., "Say, more.").

c. Participant 3 (Amy)

Amy was a girl of 4 years and 10 months old, and her spoken language included immediate echolalia and repetitions of TV commercials and stories. She often initiated communication with adults (e.g., pointing to an item). She occasionally spoke a few one-word utterances (e.g., “Pretzel”, “Cheetos”) spontaneously. Other times, her spoken language was limited to prompted one-, two-, or three-word utterances, such as “Color”, “Push swing.”, “ Help please.”, and “I want paper.”, followed by an adult's model (e.g., “Say, push swing.”).

2. Setting and Materials

All experimental sessions were conducted in a designated area within the participants' classrooms during regularly scheduled snack or breakfast times. Ben and Chris were enrolled in a self-contained, life skills classroom for children (6-9 years) who had moderate to severe disabilities. Amy attended an early childhood special education classroom for young children (3-5 years) with developmental delays and disabilities. Present during baseline, intervention, and maintenance sessions were the participant, at least three peers, and the experimenter. During generalization baseline and generalization intervention sessions, the participant, two or three peers, and the classroom teacher or teaching assistant were present. The participants, the peers, and the experimenter, and the classroom teacher or teaching assistant were seated at the same snack or breakfast table. The experimenter and the classroom teacher or teaching assistant were seated next to the participant during the experimental sessions.

Materials used in this study included a variety of food (e.g., cookie, chips, brownies, cereal, sodas, water) and other items needed to eat, drink, and store food (e.g., plastic bags, jars, containers, cups). Materials were selected based on (a) the preference of each participant and (b) the appropriateness to teach target language skills. In order to determine each participant's preferences, the participant's teacher, the teacher assistant, and the parent were asked to identify the participant's favorite food. Then a list of food was generated and used in rotation throughout the study. Favorite food was used to

maintain the participant's interest. Some items, such as a jar and a cup, were used to teach the target language skills, such as "Open jar please." and "Pour please."

3. Independent Variables

Milieu teaching procedures were used to teach the language targets. The milieu teaching procedures were three specific prompts: model, mand, and time delay. Milieu teaching procedures implemented in this study were adapted from Alpert and Kaiser (1992).

a. Model procedure

The model procedure was defined as providing demonstration of the language target, for example, "Say, open please", to the participant and asking the participant to imitate it. The model procedure was used to teach new language targets when the participant showed interest (e.g., sitting at the snack table) or initiated communicative interactions (e.g., pointing to a food container). When the participant imitated the language target, such as "Open please", in response to the first model, the experimenter responded with verbal praise (e.g., "Good asking."), verbal expansion (e.g., "Sure, let me open it for you."), and assistance (e.g., opening the food container) or access to food. No imitation or incorrect imitation to the first model was followed by a second model. When the participant imitated the language target in response to the second model, the experimenter responded with verbal praise, verbal expansion, and assistance with or access to food. The participant's incorrect imitation of the language target to the second model was followed by corrective feedback (e.g., "Open please.") and assistance with or access to food.

b. Mand procedure

The mand procedure was defined as asking questions (e.g., "What do you want?", "What do you want me to do?", "What?") or providing verbal instructions (e.g., "Tell me what you want.", "Tell me what you want me to do.") to the participants to elicit the

language target from the participant. The mand procedure was used to teach conversational or communicative language targets when the participant showed interest or initiated communicative interactions. When the participant produced the language target in response to the first mand, the experimenter responded with verbal praise, verbal expansion, and assistance with or access to food. No production or incorrect production of the target language to the first mand was followed by a second mand. When the participant produced the target language in response to the second mand, the experimenter responded with verbal praise, verbal expansion, and assistance or presentation of food. The participant's incorrect production of the language target to the second mand was followed by the same steps specified in the model procedure.

c. Time delay procedure

The time delay procedure was defined as applying a five-second time delay as a nonverbal cue (e.g., looking at the participant, giving a questioning look, being close to the participant) to help the participant produce the language target. The time delay procedure was used to help the participants initiate the language targets when the participant showed interest and initiated communicative interactions. When the participant produced the language target in response to the first time delay, the experimenter responded with verbal praise, verbal expansion, and assistance with or access to food. No production or incorrect production of the language target to the first time delay was followed by a second time delay. When the participant produced the language target in response to the second time delay, the experimenter responded with verbal praise, verbal expansion, and assistance with or access to food. If the participant produced an incorrect language target, the mand procedure was implemented. If the participant failed to produce the correct language target in response to the mand procedure, the model procedure was initiated.

In addition to the milieu teaching procedures, several environmental arrangement strategies suggested by Kaiser, Ostrosky, and Alpert (1993) were used to set up or increase teaching opportunities to teach the language target. The strategies included using food that was of interest to the participant and creating situations for which the

participant needed assistance. For example, the participant's favorite cookie was put in a jar that he could not open by himself. The participant had to use the language target, "Open jar please." to obtain the cookie. Lastly, a small amount of food was given each time so that the participant had to use the language target to ask for more food.

4. Dependent Variables

The language targets selected for the participants were one-, two-, or three-word utterances representing a semantic category of action (e.g., "Eat."), a semantic relationship of action + "please" (e.g., "Pour please."), and a semantic relationship of action + object + "please" (e.g., "Open bag please.") that were used to make requests. The language targets were determined from language samples of the participants during the prebaseline period. Prebaseline data indicated that the participants did not use the language targets spontaneously. The appropriateness of the language targets also was confirmed by the participant's parent, the teacher and/or the teacher assistant, and a speech/language therapist. Table 1 provides the language targets for each participant.

Table 1. The Language Targets for Each Participant

Participant	Language Target	
1: Ben	Three-term semantic relationship: action + object + please	Open jar please. Open bag please. Pour Sprite please.
2: Chris	Two-term semantic relationship: action + please	Eat please. Open please. Pour please.
3: Amy	One-term semantic category: action	Eat. Open. Pour.

5. Experimental Design

A single subject, multiple probe design across participants was used to assess the effectiveness of milieu teaching procedures. An initial baseline data point was collected for all three participants; then, baseline data points were collected continuously with Ben. Once baseline stability was achieved with Ben, the intervention was introduced to him. Two sessions after the intervention was introduced to Ben, baseline data points were collected continuously with Chris. Once a stable baseline was indicated with Chris, and Ben reached the criterion, the intervention was introduced to Chris. Two sessions after the intervention was introduced to Chris, baseline data points were collected continuously with Amy. Once baseline data remained stable for Amy, and Chris reached the criterion, the intervention was introduced to Amy.

6. Experimental Procedures

There were five experimental phases. They included prebaseline, baseline, intervention, generalization, and maintenance.

a. Prebaseline

Prior to the baseline, four 30-min direct observations were conducted for each participant to select his or her target spoken language skills. Each participant's language sample was collected by the experimenter. To obtain better representation of the participant's sample, she or he was observed in various contexts, such as snack/ breakfast/lunch time, circle time, and free play. The observation contexts, especially high-interest situations for the participant, were chosen. The contexts were determined by the participant's teacher and/or the teaching assistant. The experimenter interacted with the participant; however, she did not provide any specific prompts or instructions. The experimenter asked the teacher, teaching assistant, and peers to interact with the participant as normally as possible. All sessions were videotaped, and later the participant's language sample was transcribed by the experimenter for detailed analysis using the Communication Sample (Watson et al., 1989).

The experimenter also conducted an interview session with each participant's mother to obtain information about the participant's language skills at home. The experimenter asked questions using the Home Assessment Interview (Watson et al., 1989).

The information obtained from the observation and interview was summarized using the Communication Assessment Summary form (Watson et al., 1989). Based on the assessment summary results, the language target was selected for each participant.

b. Baseline

Four, five, and six 15-min baseline sessions for Participants 1, 2, and 3, respectively were conducted during snack or breakfast time by the experimenter. During the baseline session, the experimenter interacted with the participant and peers in a communicatively appropriate manner. For example, the experimenter attended to the child's interests (e.g., The child was eating a cookie. The experimenter said, "That cookie looks great.") and responded to the child's verbalizations (e.g., The child said, "Cheetos" The experimenter said, "Sure, you can have some Cheetos."). The experimenter also maintained the child's topic (e.g., The child said, "More please." The experimenter said, "You must be hungry.") and/or asked general questions (e.g., The experimenter asked, "Do you want some crackers?"). The experimenter did not attempt to use the milieu teaching procedures to elicit target language responses. Moreover, environments were not arranged to set occasions for teaching the language target. All baseline sessions were videotaped. The experimenter was present during the snack or breakfast time for at least a week prior to the baseline sessions to allow the children, the teachers, and teaching assistants to feel comfortable about the presence of the experimenter and to desensitize the children, the teachers, and the teaching assistants about being videotaped.

c. Intervention

Thirty, twenty-five, and seventeen 15-min intervention sessions for Participants 1, 2, and 3, respectively (2 to 4 times per week) were conducted by the experimenter to teach each participant the language targets. During the intervention session, the

experimenter used the milieu teaching procedures to provide specific instruction to teach the language target.

In this study, milieu teaching procedures were applied in an hierarchical order with each participant. The experimenter first introduced the model procedure to Ben. When Ben produced the language target as a result of the model procedure with at least 70% accuracy in four consecutive sessions, the experimenter introduced the mand procedure to Ben. When Ben produced the language target as a result of the mand procedure with at least 70 % accuracy in four consecutive sessions, the experimenter introduced the time delay procedure to Ben. When Ben produced the language target as a result of the time delay procedure with at least 70 % accuracy in four consecutive sessions, the intervention was discontinued for Ben.

When Ben reached the criterion as a result of the model procedure, the model procedure was introduced to Chris. When Chris produced the language target as a result of the model procedure with at least 70 % accuracy in four consecutive sessions, the mand and the time delay procedures were introduced to Chris in the same manner as they were introduced to Ben.

When Chris reached the criterion as a result of the model procedure, the model procedure was introduced to Amy. When Amy produced the language target as a result of the model procedure with at least 70 % accuracy in four consecutive sessions, the mand and time delay procedures were introduced in the same manner as they were introduced to Ben. The intervention was discontinued when Amy reached the criterion as a result of the time delay procedure. During the intervention sessions, the environment was arranged to set up or increase opportunities to teach the participant the language target. The experimenter also interacted with the participant and peers in a communicatively appropriate manner. All intervention sessions were videotaped in the same way as during baseline.

d. Generalization

Generalization sessions were conducted during baseline and intervention. Generalization of the language target to the participant's teacher or teaching assistant

was assessed. During the baseline sessions, two 15-minute generalization sessions were conducted by each participant's teacher or teaching assistant. During these sessions, the participant's teacher or teaching assistant was asked to interact with the participant as normally as possible and not to use milieu teaching procedures. All sessions were videotaped in the same way as during baseline.

During the intervention sessions, three 15-minute generalization sessions were conducted by each participant's teacher or teaching assistant using the time delay procedure. The environment was arranged, and the teacher or teaching assistant interacted with the participant and peers in a communicatively appropriate manner. All intervention generalization sessions were videotaped in the same way as during baseline.

e. Maintenance

A week after the intervention was discontinued, three 15-minute maintenance sessions were conducted by the experimenter. During the maintenance sessions, the experimenter used the time delay procedure. Environments were arranged and the experimenter interacted with the participant and peers in a communicatively appropriate manner. All maintenance sessions were videotaped in the same way as during baseline.

7. Data Collection

The experimenter watched the videotapes of all 15-min baseline, intervention, generalization during baseline, generalization during intervention, and maintenance sessions for all three participants. First, the experimenter collected data on the participant's use of the prompted language target. Use of the prompted language target was defined as production of the language target that was used to make requests and was elicited by model, mand, or time delay. The occurrence and nonoccurrence of the participant's use of the prompted language target to each milieu teaching procedure of model, mand, and time delay, were recorded. Then the occurrence and nonoccurrence of language target use to each milieu teaching procedure were converted to the percentage of correct use of the language target. Percentage data were calculated by dividing the

number of correct language targets during a session by the total number of teaching opportunities for the same session and multiplied by 100. Second, the experimenter collected data on the occurrence of the participant's use of the spontaneous language target. Use of spontaneous language was defined as the production of the language target that was used to make requests and was not elicited by the milieu teaching procedures, model, mand, or time delay.

8. Interobserver Agreement

Interobserver agreement was calculated to determine accuracy of data collection. At least 10% of the baseline, intervention, generalization during baseline, generalization during intervention, and maintenance sessions was used for interobserver agreement. First, interobserver agreement was calculated on the participants' prompted use of language targets (in response to milieu teaching procedures) and spontaneous use of language targets. The experimenter and an observer independently watched the videotapes of the 15-min experimental sessions. The interobserver agreement for the prompted use of language targets was 100 % during baseline, 99 % (range, 92 % to 100 %) during intervention, 100 % in generalization during baseline, 92 % in generalization during intervention, and 97 % during maintenance. The interobserver agreement for the spontaneous use of language was 100 % during baseline, 96 % (range, 93 % to 100 %) during intervention, 100 % in generalization during baseline, 99 % (range 92 % to 100 %) in generalization during intervention, and 97 % during maintenance. Next, the interobserver agreement was calculated on the experimenter's correct use of milieu teaching procedures during the intervention sessions. The experimenter and an observer independently watched the videotapes of ten randomly selected 15-min intervention sessions. The average interobserver agreement of intervention fidelity was 97 % (range 93 % to 100 %). The interobserver agreement was computed by dividing the number of agreements by the number of agreements plus disagreements and multiplied by 100.

Ⅲ. Results

1. Acquisition of Language Targets

Figure 1 presents the percentage of correct use of the language targets during baseline and intervention sessions (in response to each milieu teaching procedure: model, mand, and time delay) for the three participants.

a. Baseline

None of the participants used their language targets during baseline. The mean percent correct use of language targets during baseline was 0 % for all participants.

b. Model procedure

The model procedure resulted in a high percentage of correct use of the language targets for all three participants. The mean percentage of the correct use of the language targets to the model procedure was 100 %, 94 % (range, 59 % to 100 %), and 95 % (range, 86 % to 100 %) for Ben, Chris, and Amy, respectively.

c. Mand procedure

Although the percentages of correct use of the language targets decreased when the mand procedure was first implemented, it gradually increased for all participants. The mean percentage of correct use of the language targets to the mand procedure was 35 % (range, 0 % to 100 %), 48 % (range, 0 % to 96 %), and 46 % (range, 7 % to 100 %) for Ben, Chris, and Amy, respectively. The graphic data showed during the mand procedure that the model procedure was implemented as a result of the participant's incorrect use of the language targets in response to the mand procedure.

d. Time delay procedure

The percentage of correct use of the language targets were decreased when the

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Figure 1. Percentage of correct use of language targets in response to each milieu teaching procedure, model, mand, and time delay.

time delay procedure was first implemented for Ben; however, two sessions after the time delay procedure was introduced, the percentage of correct use of the language targets increased. The graphic data show that during the time delay procedure Ben's incorrect use of the language targets in response to the time delay procedure was followed by the mand procedure, and his incorrect use of the language targets to the mand procedure was followed by the model procedure. The mean percentage of correct use of the language targets to time delay procedure was 67 % (range, 6 % to 100 %), 97 % (range, 92 % to 100 %), and 97 % (range, 86 % to 100 %) for Ben, Chris, and Amy, respectively.

2. Generalization of Language Targets

Figure 2 presents the percentage of correct use of the language targets in generalization sessions during baseline and intervention for the three participants.

a. Baseline

All three participants never used their language targets with their teacher or teaching assistant in the generalization sessions during baseline. The mean percentage of correct use of the language targets in the generalization sessions during baseline was 0% for all participants.

b. Intervention

The percentage of correct use of the language targets in response to the time delay procedure with their teacher or teaching assistant was increased for all three participants in the generalization sessions during intervention. The mean percentage of correct use of the language targets in the generalization sessions during intervention was 92 % (range, 91 % to 94 %), 95 % (range, 88 % to 100 %), and 96 % (range, 90 % to 100 %) for Ben, Chris, and Amy, respectively.

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Figure 2. Percentage of correct use of language targets in response to the time delay procedure in the generalization sessions during baseline and intervention.

3. Maintenance of Language Targets

Figure 1 presents the percentage of correct use of the language targets during the maintenance sessions for the three participants. The percentage of correct use of language targets in response to the time delay procedure during maintenance was at levels similar to the percentage of correct use of language targets during the last four intervention sessions for all three participants. The mean percent of correct use of language targets during maintenance was 96 % (range, 88 % to 100 %), 98 % (range, 95 % to 100 %), and 94 % (range, 86 % to 100 %) for Ben, Chris, and Amy, respectively.

4. Spontaneous Use of Language Targets

Figure 3 presents the frequency of all three participants' spontaneous use of the language targets during baseline, intervention, and maintenance sessions. Figure 4 presents the frequency of all three participants' spontaneous use of the language targets in generalization sessions during baseline and intervention.

a. Baseline

As indicated in Figure 3, all three participants never used their language targets spontaneously during the baseline sessions.

b. Intervention

The increase of the spontaneous use of language targets for all three participants (primarily Chris and Amy) during the intervention sessions was indicated in Figure 3. However, Ben used his language target spontaneously only once during intervention. The mean number of spontaneous use of language targets was 1 (range, 0 to 5) for Chris and 3 (range, 0 to 8) for Amy.

c. Maintenance

Data presented in Figure 3 indicated the increase in each participant's spontaneous

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Figure 3. Frequency of spontaneous use of language targets during baseline, intervention, and maintenance sessions.

use of language targets during maintenance (primarily Chris and Amy). The mean number of spontaneous use of language targets was less than 1 (range, 0 to 1) for Ben, 10 (range, 6 to 12) for Chris, and 5 (range, 1 to 12) for Amy.

d. Generalization across adults during baseline

As indicated in Figure 4, no participants used their language targets spontaneously with their teacher or teaching assistant in generalization sessions during baseline.

e. Generalization across adults during intervention

Data presented in Figure 4 indicated that Ben never used his language targets spontaneously with his teacher in generalization sessions during intervention. The substantial increase in the spontaneous use of language targets in generalization sessions during intervention was indicated for Chris and Amy. The mean number of spontaneous use of language targets was 9 (range, 3 to 14) for Chris and 6 (range, 2 to 8) for Amy.

Ⅳ. Discussion

This study investigated the effects of milieu teaching procedures on the acquisition, generalization, maintenance, and spontaneous use of early functional spoken language of three children with autism. This section presents discussion of the findings, limitations of the research, suggestions for future research, and implications for practice.

The results of this study indicated that all three children with autism learned and used their language targets to request food or assistance from the experimenter as a result of milieu teaching procedures. The findings provided evidence that each milieu teaching procedure, model, mand, and time delay, was effective in teaching language targets to all three participants. Prior to intervention, none of the participants used their language targets. As a result of milieu teaching procedures, all three participants acquired and used their language targets.

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Figure 4. Frequency of spontaneous use of language targets in the generalization sessions during baseline and intervention.

When the model procedure was implemented, all participants quickly learned to imitate their language targets. This is not surprising because researchers argued that the model procedure is especially effective in teaching new or difficult language targets (Alpert & Kaiser, 1992; Beisler & Tsai, 1983; Cavallaro, 1983). The language targets selected in this study were new to each participant; therefore, the use of the model procedure was appropriate. This suggests the efficacy of using the model procedure to teach the language targets for children when the language targets are not already in their language repertoire.

Unlike the model procedure, the introduction of the mand procedure resulted in a significant decrease in the percentage of correct use of the language targets for all three participants. The initial lack of responsiveness of each participant to the mand procedure could be explained by several factors. Because Ben rarely initiated communicative interactions with adults, his teacher and teaching assistant frequently modeled appropriate verbal responses for him. That is, Ben might be dependent on an adult's modeling. Given this information, the experimenter added a partial prompt to the mand procedure by pronouncing the first sound of Ben's language targets. For example, the experimenter used verbal instruction (e.g., "Tell me what you want me to do.") or asked (e.g., "What do you want me to do?") and then gave Ben the first sound, /p/, of the language target, "Pour Sprite please." When this adaptation was made to the mand procedure, Ben produced his language targets at a high percentage. The adaptation to the mand procedure was continued for three sessions. This finding suggests that children with autism who seldom initiate communicative interactions may need partial prompts between the model procedure and the mand procedure. The use of a partial prompt to ease the transition from the full model to the mand was recommended by Beisler and Tsai (1983). It was also likely that Chris and Amy experienced difficulty processing and understanding the long mand (e.g., "Tell me what you want me to do," "What do you want me to do?") used by the experimenter. Therefore, the experimenter simplified the mand to "What?" or "Tell me." For Chris and Amy, the percentage of correct use of the language targets increased significantly after the mand was simplified. This finding suggests that simplified mands are easier to understand and more appropriate than long mands for children with autism who have difficulty following directions or questions.

The sudden decrease in the percentage of correct use of the language targets in response to the mand procedure during sessions 22, 23, and 24 for Ben was due to a classroom variable. During these sessions, Ben's teacher turned on computers for children who finished their snack early. Ben constantly turned his head to the computer and was distracted by sounds coming from the computer. Once the computers were turned off during subsequent intervention sessions, an increase in the percentage of correct use of the language targets was observed. The slight decrease in the percentage of correct use of the language targets in response to the mand procedure during sessions 24, 25 and 26 for Chris was related to his physical condition. Chris's loose tooth bothered him (i.e., Chris was wiggling his loose tooth with his tongue) so that he was unable to attend to the mand procedure implemented by the experimenter. When his loose tooth came out (session 27), an increase in the percentage of correct use of the language was observed.

When the time delay procedure was implemented, the percentage of correct use of the language targets continued to be high for Chris and Amy. However, the percentage of correct use of the language targets for Ben decreased initially (sessions 29 and 30). The time delay procedure is best used to help children initiate communication in situations in which they want to obtain materials or assistance from adults (Alpter & Kaiser, 1992; Halle, Baer & Spradlin, 1981). In this study, all participants wanted to eat food or needed assistance from the experimenter to obtain food. Although the percentage of correct use of the language targets was low during the first two time delay sessions for Ben, it increased significantly two sessions after the time delay procedure was implemented. This finding suggests that the time delay procedure may benefit children with autism who have language skills but do not initiate communication to improve initiation skills in contexts where they want to request materials from adults.

The results of this study also indicated that all three participants generalized their acquired language targets to their teacher or teaching assistant and maintained their language targets at levels similar to the last four intervention sessions one week after the intervention was withdrawn. In addition, the results of this study indicated that the frequency of spontaneous use of language targets during intervention increased the most in two of the three participants. During intervention, noticeable increases in the frequency

of spontaneous use of language targets were observed for Chris and Amy. A low frequency of spontaneous use of language targets was observed for Ben throughout intervention. Similar findings were indicated during maintenance. Ben rarely used his language targets spontaneously. Significant increases in the frequencies of spontaneous use of language targets during maintenance were indicated for Chris and Amy. The frequency of spontaneous use of language targets increased in generalization during intervention for Ben and Amy, and they consistently produced their language targets spontaneously with their teacher or teaching assistant. Ben did not use his language targets spontaneously with his teacher in generalization during intervention. This finding may suggest that Ben would benefit from an extended number of time delay procedures.

The findings of the present study are consistent with those of previous studies in that milieu teaching procedures are effective in facilitating the acquisition of early functional spoken language of children who are in the early stage of spoken language development in naturally occurring communicative contexts (McGee et al., 1985; Warren, 1992; Warren & Bambara, 1990). Additionally, the findings of this study extend the line of research by focusing on children with autism. The majority of previous milieu teaching studies involved children with mild to moderate mental retardation. There also is a lack of data on milieu teaching procedures in enhancing the acquisition and use of semantic categories and semantic relationships for children with autism. The results of the present study suggest that milieu teaching procedures can be used to teach an early semantic category and semantic relationships to children with autism. This study contributes to the previous literature on milieu teaching procedures by examining the spontaneous use of language targets with children with autism.

The findings of this study should be interpreted with caution due to the following limitations. First, this study involved only three children with autism which limits the generalizability of the results. The children targeted in this study may not be similar to other children with autism who have significant impairments in spoken language and are in the early stages of spoken language development. Second, limited data was collected during generalization baseline, generalization intervention, and maintenance. This study was conducted during a regular semester in public elementary schools. The actual experimental phrases of this study began two weeks after the semester started. Due to

time constraints, it was not possible to collect extended data points during generalization and maintenance. Lastly, the maintenance of the participant's language targets was assessed one week after the intervention was discontinued because it was the end of the semester. Although the results are encouraging, one week between the discontinuation of intervention and maintenance may not be sufficient to assess the durability of the intervention effect.

Future research could involve replicating this study with other children with autism to determine the consistency of the results, thereby increasing the external validity of the findings. Longer generalization and maintenance sessions also need to be conducted in a future study for inspection of trend stability and change in trend over time. To investigate more accurately the durability of intervention effects, longer periods between the discontinuation of intervention and maintenance assessment may be required in the future study.

The results of this present study indicated that milieu teaching procedures hold great promise for individuals (e.g., speech and language pathologists, educators, parents) who strive for teaching language skills to children with autism. Several implications can be drawn from the results of this study.

Due to the problems in speech, language, and communication, the majority of children with autism receive services from their speech and language pathologists (SLPs) on a regular basis during the school day. As demonstrated in this study, milieu teaching procedures can be successfully conducted during daily routine activities in contexts where children spend the majority of their time, such as classrooms. SLPs working for school districts should consider the potential benefits of using milieu teaching procedures to incorporate speech, language, and communication goals of children with autism into the highly natural daily activities so that children can learn language skills, use their acquired language skills with other people, and maintain their language skills over time.

Because one of the primary advantages of milieu teaching is that it can be easily implemented in everyday contexts, teaching staff and parents are good candidates for implementing naturalistic language interventions, such as milieu teaching procedures. Teachers and teaching assistants have frequent contact with children with autism during the regularly scheduled school day. In this present study, milieu teaching procedures were

integrated into the 15-min breakfast or snack time in the participant's classrooms. The results of this study suggest that teachers and teaching assistants of children with autism may implement milieu teaching procedures without disrupting daily classroom routines and can teach their children's language goals with minimal time requirements. By implementing the milieu teaching procedures in normal social and communicative interactions, there may be an increased possibility that children with autism will learn typical language and thus facilitate the generalization and maintenance of their language skills. The results of previous studies have indicated the effectiveness of teacher-implemented language and communication interventions for children with autism (Dyer et al., 1991; Smith & Camarata, 1999).

Parents of children with autism also spend a great deal of time with their children throughout daily activities, even in situations where SLPs and teaching staff do not have access. The daily home activities can involve multiple opportunities for teaching language skills. In previous studies on milieu teaching (e.g., Alpert & Kaiser, 1992; Hemmeter & Kaiser, 1994; Hester, Kaiser, Alpert & Whiteman, 1995; Kaiser, Hancock & Nietfeld, 2000), parents of children with disabilities were trained to implement milieu teaching procedures. The results of these studies indicated that parents who learned milieu teaching procedures were able to implement the procedures with their children at home. As a result of parent-implemented milieu teaching procedures, children showed improvement in their use of language. Parents who participated in these studies indicated that they were very satisfied with the training they received and recommended the same type of training for other families. This finding is important for parents of children with autism when they consider using milieu teaching procedures for their children. The findings of this study and previous parent-implemented milieu teaching procedures suggest that parents may be good language interventionists. By incorporating milieu teaching procedures into everyday home activities, parents of children with autism may help their children improve functional language skills.

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한글초록

환경요법이 자폐아동의 구어에 미치는 영향

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본 연구는 환경요법이 자폐아동의 구어에 미치는 영향을 알아보는 것이 목적이었다. 연구 참여자들은 구어발달의 초기단계에 있는 세 명의 자폐 아동이었다. 실험효과를 검증하기 위하여 대상자간 중다기초선 설계가 사용되었다. 환경요법을 실시한 결과, 모든 참여자들은 습득한 언어기술을 그들의 담임교사와 보조교사에게 일반화 하였고 중재가 끝난 이후에도 그들의 언어기술이 유지되었다. 모든 참여자가 목표한 언어를 자발적으로 사용하는 횟수가 증가하였다. 본 연구의 제한점과 이후연구에 대한 시사점을 논의 하였다.

핵심어: 환경요법, 구어, 자폐아동

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