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The Use of Gesture to Facilitate Early Communication in Language Delayed Children

Jamie L. Labuda

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THE USE OF GESTURE TO FACILITATE EARLY COMMUNICATION

IN LANGUAGE DELAYED CHILDREN

(TITLE)

BY

Jamie L. Labuda

1977-

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

Master of Science

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

2001

YEAR

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THE USE OF GESTURE TO FACILITATE EARLY COMMUNICATION IN LANGUAGE DELAYED CHILDREN

Jamie L. Labuda
Eastern Illinois University
Abstract

This study investigated the effectiveness of gesture to facilitate communication in young children with language delays. Two children with expressive language delays, ages 18 and 22 months, served as participants. The children were exposed to intervention which targeted six vocabulary words verbally and through gesture, in two 45-minute treatment sessions weekly over a six-week period. Parent education and a home component were also included. A single subject multiple baseline across behaviors design was used to evaluate the effectiveness of gesture in intervention. Results indicated that both participants demonstrated an immediate response to gestural treatment, as seen in the production of gestures. Once gesture production was initiated by the participants, a steady increase was observed in the amount of gestures produced over treatment sessions. One of the participants progressed to verbalization of targeted vocabulary during the six-week period of the study. Following the advent of verbalizations of targeted vocabulary, a sharp decline in gesture production was observed. Gesture production reliably occurred prior to verbalization for this participant. Parent data collected during the six-week period of the study supported the results documented during treatment. In addition, parents reported increased attention and participation in communicative events in the home environment.
The development of a spoken language is one of the most important skills that a child will acquire. For many children this process is relatively simple, while others will demonstrate delays or disorders in the acquisition of communication abilities. Communication difficulties that are left untreated will often persist and may be related to subsequent academic and social deficits (Rossetti, 1996). Prevention or reduction of these potential deficits is possible with early identification and intervention. The advent of the 1986 Public Law 99-457 (Part H) mandated services to children with developmental disabilities from birth through two years of age.

Prior to the onset of first words at about 9 to 10 months, normally developing children often learn to communicate intentionally with pre-verbal gestures and sounds. These pre-verbal accomplishments provide the foundation for the emergence of language (Prizant & Wetherby, 1990). A large body of research has been conducted based on direct observation, teaching, or parental report of the use of gestures in normally developing infants (Acredolo & Goodwyn, 1985, 1988; Goodwyn & Acredolo, 1993; Morford & Goldin-Meadow, 1992; Namy & Waxman, 1998). These studies have demonstrated that early gesture use facilitates the development of spoken language and forms a naturally integrated system with speech.

Children with Down syndrome have often been included in research regarding gestural development (Casselli et al., 1998; Franco & Wishart, 1995). Although many
children with Down syndrome are delayed in speech development, they often have more advanced motor development and visual perceptual skills. Therefore, these children find it easier to recognize and make gestures using their hands rather than attempt complex speech sounds. Unlike normally developing children whose gestural productions decrease with age, gestural communication continues to increase and become more sophisticated in children with Down syndrome (Franco & Wishart, 1995). This gestural specialization will help to compensate for some remaining deficits in verbal communication (Casselli et al., 1998).

Few studies have examined the effects of teaching gestures to enhance communication. Past research in this area has concentrated on individuals with Down syndrome or mental retardation (Kahn, 1981; Kouri, 1989). The benefits of teaching gesture can be readily observed in these populations in that lexical forms first appear as signed imitations and progress to a signed-plus-speech form before becoming spontaneously spoken.

Presently, no study has focused on the effects or benefits of incorporating gesture in early intervention for language delayed children. One study examined the effects of rate, stress, and use of gesture on novel word acquisition by kindergarten children with specific language impairment (Weismer & Hesketh, 1993). An increase in comprehension of novel words was demonstrated when gestures were incorporated. Hurd (1995) examined the influence of teaching signs in an individual teaching session for 3-6 year old students with learning disabilities. The incorporation of signed-plus-spoken
input in the classroom setting was found to add support, increase attention, and improve comprehension.

Although gesture is a natural communication precursor to speech, and children with Down syndrome and mental retardation have been taught sign to facilitate verbalizations, no studies have investigated the effects of incorporating gesture in early intervention services for language delayed children. Theoretically, incorporation of gesture should improve communication skills by allowing children to use a symbol to indicate wants and needs and build a bridge for the development of further symbolic communication in the form of verbal expression (Acredolo & Goodwyn, 1996). Occasionally, parents are reluctant to promote the use of gesture in normal hearing language delayed children. They fear the children may rely heavily on gestures and loose the motivation to communicate verbally. Therefore, the purpose of the present study was to evaluate the effectiveness of gesture in early intervention services with young children with language delays.

Two language delayed children (with expressive vocabularies between 0 and 10 words), aged 18 and 22 months, were exposed to intervention targeting six vocabulary words verbally and through gesture in two 45-minute treatment sessions weekly over a six week period. Vocabulary words were modeled verbally throughout the six weeks. Gestures were introduced gradually for the six words at a rate of two gestures every two weeks. A single subject multiple baseline across behaviors design was used to evaluate the effectiveness of gesture in intervention. A home component was also included.
CHAPTER II

Review of Literature

In reviewing the literature for the present study, several areas of research were considered. This chapter begins with a general review of early intervention, including legislative changes mandating services. Common models of language instruction used in early intervention are discussed, in addition to the importance of parent education. Since a home component will be implemented as part of the present study, the review also focuses upon research which documents the accuracy and stability of parental report (Dale, 1991; Dale, Bates, Reznick, & Morisset, 1989; Yoder, Warren, & Biggar, 1997).

A review of research concerning the use of gesture in normally developing infants follows to illustrate the role of gesture in early language learning (Acredolo & Goodwyn, 1985, 1988; Goodwyn & Acredolo, 1993; Morford & Goldin-Meadow, 1992; Namy & Waxman, 1998). The review also focuses upon the use of gesture by children with Down syndrome. Recent studies have demonstrated that children with Down syndrome develop a specialization in the gestural modality to help compensate for deficits in verbal skills (Franco & Wishart, 1995; Casselli et al., 1998). Since the specific goal of this study was to evaluate the effectiveness of gesture in early intervention services, the remainder of the chapter is devoted to the few research studies concerning the effects of teaching gesture to enhance or facilitate communication (Hurd, 1995; Kahn, 1981; Kouri, 1989; Weismer & Hesketh, 1993).
Early Intervention

The advent of the 1986 Public Law 99-457 (Part H), an amendment to the Individuals with Disabilities Education Act, mandated services to children with developmental disabilities from birth through two years of age. Delayed communication development is the most common symptom of developmental disability under three years of age (Rossetti, 1996). In addition, there is a high correlation between communication skills and school success (Rossetti, 1996). For this reason, it has been hypothesized that every dollar spent on early intervention services may save a school district up to six dollars in later remedial services (Rossetti, 1996).

Models of Language Instruction

Rossetti (1996) discussed three specific models of language instruction often used in early intervention: behavioral, naturalistic, and play-based. The behavioral model is based on the theory that language is learned. The caregiver's role is to model the correct behavior and reward the child when that behavior is demonstrated. The child is provided with a language-based stimulus and a reward (such as a sticker or praise), meant to increase the frequency of the behavior. The child is required to repeat often and has little control over the chosen materials. Some authors have suggested that it may be difficult to transfer new skills to other situations when using this model (Rossetti, 1996).

The naturalistic model is based on the idea that children acquire language through interaction with their environment (Rossetti, 1996). If the need to communicate is the focus, then natural rewards for successful communication ensue. The clinician's role is to
structure the environment in order to provide opportunities for the child to use communication meaningfully. This model promotes interaction with a variety of people in a multitude of settings, thus, providing a great opportunity for generalized conversational use (Rossetti, 1996).

The play-based model was developed to increase functional communication skills through an enjoyable process (Rossetti, 1996). Children commonly learn about conversational demands and rules of discourse while interacting in play experiences. This process is flexible, therefore, several professionals can be involved. Play is motivating to the child and allows the caregiver/professional to be a communicative partner as opposed to a teacher. This model can easily fit into a family's natural routine (Rossetti, 1996).

Children learn to communicate through naturalistic interactions with their environment (Rossetti, 1996). Therefore, including caregivers as full partners in the early intervention process is vital. Parent education is a significant portion of effective early intervention. Some authors (Friel-Patti & Lougeay-Mottinger, 1985) have suggested that parents should be involved in all intervention activities and trained to use specific strategies at home. These authors further stated that home programs are an excellent supplement to skills targeted in therapy sessions. Parents can assist in reinforcing goals, aiding generalization, and modeling appropriate language (Friel-Patti & Lougeay-Mottinger, 1985).
Evaluation of Parental Report

Parents can be a valuable source of information concerning their child's communication skills. Speech-language pathologists often incorporate parental report into their clinical assessments of early child language skills and to evaluate carryover and functional outcomes of services. Several investigators have evaluated the accuracy and stability of parental report of their children's language skills (Dale, 1991; Dale, Bates, Reznick, & Morisset, 1989; Yoder, Warren, & Biggar, 1997).

The validity of a parent report using a checklist instrument, the MacArthur Communicative Developmental Inventory (CDI: Toddlers), was assessed by Dale (1991). Twenty-four 2-year-olds and their parents participated in the study. Parents were asked to complete the CDI: Toddlers in addition to bringing their child into the speech clinic for a laboratory visit. The sample did not include any obvious cases of cognitive or sensory impairment, though no screening for developmental impairment was performed. The validity of parent report for vocabulary was assessed by correlations between the CDI: Toddlers and direct observational measures. The CDI vocabulary scores strongly correlated with the Expressive One-Word Picture Vocabulary Test scores and total number of different words, and moderately correlated with type token ratio (TTR). The authors concluded that the CDI: Toddlers parent report measures of vocabulary and syntax have high validity.

Yoder, Warren, and Biggar (1997) further investigated the validity question and examined the stability of parental report over time. Seventeen children (average age 25
months) with developmental disorders or delays and their mothers were participants. The children were selected from early intervention centers for children under 3 years old. The average number of words the mothers reported their children understood was 150. The mothers completed the MacArthur Communication Development Inventory: Infant Scale (CDI/I) demographic form and an instrument that measures the extent to which mothers confidently interpret children's prelinguistic behaviors, General Tendency to Attribute Communication (1988). The mothers completed the CDI/I twice, with a two week interval between completions. The CDI/I was divided into four subcategories (nouns, action words, games and routines, and descriptive words) to allow examination of stability of reports on different types of words. The authors found that the report of total number of words comprehended was stable. The item-by-item stability was less consistent for the four subcategories. Mothers tended to be more stable for nouns than for descriptive words and for the total scale. Mothers with lower socio-economic status (SES) and lower education level had less stable responses than mothers of a higher SES.

The Role of Gesture in Normally Developing Infants

A large body of research has been conducted based on direct observation, teaching, or parental report with the use of gestures in normally developing infants (Acredolo & Goodwyn, 1985, 1988; Goodwyn & Acredolo, 1993; Morford & Goldin-Meadow, 1992; Namy & Waxman, 1998). Prior to the onset of first words at about 9 to 10 months, children often learn to communicate intentionally with pre-verbal gestures and sounds. These pre-verbal accomplishments provide the foundation for the emergence

Morford and Goldin-Meadow (1992) explored the role of gestures in the early stages of language learning. All participants were normally developing children at the one-word stage of expressive language. The first part of the study involved home visits and tasks to measure gesture comprehension. All children were visited in their homes two or three times. The first visit was used to observe the child's gesture-speech production. The children were videotaped during free-play and their productions were analyzed. Based upon these observations, the children were categorized into two groups. The first group produced only redundant combinations (e.g., point at man + say "man") while the second group produced combinations which conveyed supplemental information (e.g., point to man + say "big"). Each of the two groups contained twenty children ranging in age from 1:2 to 2:5. During the next two visits, a five-part gesture comprehension task consisting of two single-item (single-word or single-gesture) and three combination tasks (no gesture, redundant gesture, and replacement gesture) was administered. Each of the five comprehension tasks had twelve items; therefore, each child received sixty items in all.

For the two single-item tasks, the responses in the single-word (e.g., "give") and single-gesture (e.g., give- hand extended) served as a baseline measure against which to evaluate the children's responses to the combination forms. The three combination tasks, no gesture (multi-word combination), redundant gesture (e.g., "give the clock" + give), and replacement gesture (a single spoken word presented along with a gesture that
The Use of Gesture

replaced the omitted content word in the combination, e.g. "clock" + give) were used to assess the influence of gesture on speech comprehension. Four different types of gestures were used in the comprehension task, six "point" gestures, four "give" gestures, one "throw," and one "shake." All items were requests and required a response from the child (e.g. "throw," "give the car," "point at shoe").

In addition to the comprehension tasks, the researchers coded all spontaneous gestures produced by the children during the free-play activity in the initial session. All forty of the children spontaneously produced "point" gestures, either alone or in combination with words, during the free-play activity. In comparison, thirty-eight of the children produced correct responses on at least five of the six "point" items in the single gesture category during the comprehension tasks. The "throw" and "shake" gestures were not produced spontaneously by any of the children during free-play. There was a great deal of variability among the children for the "give" gesture. Approximately one quarter of the children produced the gesture in free-play and one-half produced correct responses during the comprehension task. When viewing the free-play videotape, the authors found that the children in this study used gestures frequently in relation to the amount of speech they produced. Twenty-four percent of their communications were gesture alone. The gesture comprehension task revealed that if the gesture was comprehensible, then the children could integrate the information conveyed by gesture with that conveyed by speech. The gesture allowed increased understanding of the speech or served as a substitute for a word. The authors' suggested that gesture plays a significant role in early
language development and forms a natural integrated system with speech.

Namy and Waxman (1998) designed three experiments to test the hypothesis that early ability to learn symbols gives rise to a greater focus on words later in development. The first experiment investigated whether normally developing infants could learn novel symbolic gestures as well as novel words as names for object categories, and whether the influence of novel symbols changed over development. Performance was compared on a forced-choice triad task in three conditions, gesture, word, and no symbol.

Forty-eight 18-month-olds who were not yet combining words, and forty-eight 26-month-olds who were combining words, were participants. Twenty-six plastic toy replicas of objects were arranged to form two sets of 13 objects each. Each set contained seven members of a category and six unrelated distractor items. One of the seven served as the target object and the other six were paired with a distractor item to serve as test pairs. Of the six category choices, two were designated "near," two were "intermediate," and two were "far." Each child was tested individually in a laboratory playroom with caregivers present. Children in each age group were randomly assigned to one of the three conditions (no symbol, word, and gesture).

The experiment began with a warm-up phase when the infants were familiarized with the type of input they would be receiving. Next was the introduction phase which introduced the children to the target category. The test phase consisted of six test trials for each category (fruit and vehicles) which included a target object, a member of the target category, and a distractor. For the no symbol condition, the experimenter said
"Look at this one! Can you find another one?" The same phrases were used for the word and gesture conditions except the word or gesture was inserted. For each target category, there was a mapping trial and extension trial. The extension trial consisted of five trials in which the category choices were novel instances of the target category. The mapping trial used a category choice that was one of the two that had been labeled during the introduction phase. The results indicated that 18-month-olds applied novel symbols to categories in both word and gesture conditions. The 26-month-olds, however, applied symbols in the word, but not the gesture or no symbol conditions. The authors hypothesized that the older children may have failed to interpret gestures as names for objects because they did not expect gestures to be used in sentences or they were more conservative as to which gestures they used.

The second experiment served to teach 2-year-olds that a gesture can be used to name an object. Symbols (words or gestures) were introduced within the context of a familiar naming routine. The experimenter carried on a dialogue with a puppet who identified objects using either a word, gesture, or no symbol. Thirty-six 27-month-old infants from experiment one participated. The stimuli consisted of the initial objects that were arranged the same as in experiment one, with the addition of the puppet. The experiment consisted of a warm-up period, introduction phase, and testing phase. The target object was not included in the test so as not to confuse the infants. The trials were the same as the first experiment. The results indicated that even when a novel gesture was embedded within a familiar naming routine, the 27-month-old infants did not
interpret gestures as a name for the object category. The authors interpreted this as further evidence that older infants were conservative in their use of gestures.

The third experiment offered the infants a chance to practice using gestures. Participants were thirty-six 27-month-old infants. Thirty toy replicas of objects were used, including all of the objects from experiment two and four new familiar objects that were used during the training period. The same puppet from experiment two was also used. The procedure was the same as in experiment two except a training phase was interjected between the warm-up and introduction phases. The purpose of this phase was to give the infants experience with novel symbols referring to familiar objects. The results from this experiment indicated that 27-month-olds were capable of learning to interpret gestures as names for objects when they received practice.

Goodwyn and Acredolo (1993) addressed the controversy over whether the onset of symbolic signs or words occurs first in normally developing infants. Past research reported that milestones were achieved in gestures before words, but it had been uncertain if these gestures were truly symbolic. For this study, the subjects consisted of twenty-two hearing infants (11 months old). The study began with the parents of the infants watching a video which illustrated the phenomenon of symbolic gestures and how to model them. The parents were given a set of 8 target gestures (i.e., lip-smacking for "fish," arm-flapping for "bird," sniffing for "flower," open-close hand for "frog," a hand swoop for "airplane," index-finger tapping for "more," hand-waving horizontally for "all gone," and palms-up for "where is it?") to use with their children at home. The gestures
were to be paired with the vocal word. Toys and objects were sent home in order to ensure the use of the gestures.

Data was collected during biweekly audiotaped interviews with the mothers. The interviews gathered information about gesture modeling frequency, comprehension, and production by the infants, and the development of any vocal words. The specific referents were recorded and the interviewer asked whether the gesture had been produced in direct imitation of the parent, in response to an elicitation, or spontaneously. For nouns, the mother was asked if the word or gesture was used as a request, label, or both. In order to determine that a symbol had been used symbolically, it had to be used spontaneously over three or more interviews. The words or gestures must also have been applied beyond specific context of origin to a category and nouns must have been used in absence of the referent. Mean age for first symbolic gestures was 11.94 months and for words 12.64 months.

Past research indicated that when infants were exposed to gestures from birth, symbolic use of a sign occurred between 12 and 13 months. Since 12 to 13 months is usually when symbolic vocal words appear, this may indicate that their emergence is predictable and dependent on cognitive development. The authors suggested that their research supports a gestural advantage because, although the time lag was small between the two modalities, onset in the gestural modality occurred prior to the onset of symbolic words. This indicates that once the necessary cognitive skills are in place, it is easier for babies to learn through gestures.
Use of Gesture by Children with Down Syndrome

Children with Down syndrome have often been included in research regarding gestural development. Although many children with Down syndrome are delayed in speech development, they often have more advanced motor development and visual perceptual skills. Therefore, these children find it easier to recognize and make gestures using their hands rather than attempt complex speech sounds.

Franco and Wishart (1995) examined the nature and frequency of pointing and other gestures by twenty-two children (ages 21-47 months) with Down syndrome. Prior to the experiment, each child's level of communicative competence was assessed using the Expressive Scale of the Reynell Developmental Language Scales (1977) and the Vineland Adaptive Behavior Scales (1984). Gestures were elicited from the children in two different contexts, referential/declarative (to share interest or information) and instrumental/imperative (to request access to a toy). For the instrumental/imperative context, an interesting toy was placed out of the child's reach and for the referential/declarative, animated dolls with moving arms and legs were incorporated. The children were tested in two partner conditions, first with their mother and second with another child with Down syndrome matched by age. Four categories of gestures were coded: pointing (arm and index finger extended), indicating (arm extended with no pointing posture), reaching (arm extended with palm held downward), and other (clapping, imitation of doll movements, etc.). Pointing gestures were used predominantly with the referential dolls, whereas reaching gestures were elicited only in the out-of-reach
toys context. Visual checking, turning to look at the communicative partner in conjunction with the production of a gesture, was also measured.

The authors found that the children tended to turn and look at their partner before most pointing gestures. In addition, the children used more gestures with their mother and more visual checking with their peer. In comparison to their normally developing peers, gesture production in children with Down syndrome followed a similar pattern, but appeared later. As they developed, the children with Down syndrome used a higher frequency of sophisticated gestures.

Another study investigated the relationship among verbal and gestural modalities in the early development of children with Down syndrome in comparison to their normally developing peers (Casselli et al., 1998). Forty normally developing children (8-17 months) and forty children with Down syndrome (10-49 months) served as participants. The parents of the children with Down syndrome completed the MacArthur Communicative Developmental Inventory (1989). The "Gestures and Words" form of this questionnaire consists of a list of 408 words, divided into 19 categories including nouns, verbs, and function words and a list of 63 gestures and actions, also grouped into categories (deictic and representational gestures, pretend actions and routines). The parents were instructed to mark those words which their child understood and/or produced and indicate which gestures their child produced.

The results from parent reports indicated that verbal comprehension and production did not develop synchronously, whereas lexical comprehension and gestural
production developed at the same time. Children with Down syndrome differed significantly from their normally developing peers in the area of gestural production. A marked preference for gestural communication was exhibited by the children with Down syndrome even when their word repertoire was greater than the number of gestures.

Early in development, the gestural and vocal production of children with Down syndrome were similar to their normally developing peers matched for word comprehension. Unlike normally developing children, however, gestural communication continued to increase and become more sophisticated in the children with Down syndrome. This specialization in the gestural modality was used to compensate for the remaining deficits in verbal skills.

Teaching of Gestures to Enhance Communication

Parents may speculate that introducing gesture into a young child's repertoire may inhibit verbal communication (Acredolo & Goodwyn, 1996). In their research with normally developing infants, Acredolo and Goodwyn (1996) have proven that introducing gestures not only leads to enhanced communication, but it also accelerates the process of learning to talk, stimulates cognitive development, and enhances the parent-child bond. In addition, initiating gesture use introduces young children to the social rules of conversation and demonstrates how motivating communication can be.

The benefits of gesture incorporated in intervention programs to compensate for deficits in speech production can be readily observed in the Down syndrome population. Kouri (1989) examined the influence of sign through a case study. The subject, B.V.,
was a female with Down syndrome (2:8). Efforts by an early intervention program to elicit spoken imitations had resulted in a low success rate. B.V.'s developmental level was assessed using the Minnesota Child Development Inventory (1972). Her general development level was 17.5 months.

For this research, B.V. attended a university clinic setting for eight months, twice weekly, for individual 40-minute sessions. The treatment program integrated signed-plus-speech input. B.V. was allowed to play with a variety of objects and only when she focused on an object would the clinician begin modeling. The modeled forms included object or action labels in addition to expressions signaling various functions and personal-social meanings (e.g., "no-no," "want," "silly"). Signed English vocabulary, minus the morphological markers, was used along with conventional gestures representing social phrases and routines (e.g. "oops," "peek-a-boo"). No direct elicitations were used. B.V.'s mother recorded words and gestures used at home. Each of B.V.'s responses were coded in terms of modality (signed, signed-plus-verbal, verbal) and whether it was spontaneous (no previous prompt) or spontaneously imitated directly after the clinician's production.

During the eight months, B.V. produced 1,634 words in the clinic setting. Of these words, 17% were signed imitations, 5% simultaneous imitations, 25% spoken imitations, 8% spontaneous signs, 3% spontaneous simultaneous words, 33% spontaneous spoken words, 2% imitated combinatorial productions, and 6% spontaneous word combinations. B.V. also produced 232 different new words, 117 were spontaneous
and 115 were unsolicited imitations. She relied heavily on sign at the onset of therapy, but near the end of therapy, most of the words that B.V. signed became spontaneous spoken productions. The benefit of sign was also demonstrated when lexical forms appeared as signed imitations and then progressed into either a spontaneous signed or signed-plus-speech form before becoming spontaneously spoken.

Other populations can also benefit from the incorporation of gestural communication in intervention. Kahn (1981) tested the effectiveness of sign in comparison to verbal language training with twelve children (53-101 months) who evidenced profound mental retardation. Six children were living and attending school at a private residential facility and six children were living at home and attending private day-care school. The subjects were not receiving speech services in their schools. Prior to the study, the stage of sensorimotor period functioning for each child was determined by administering the Uzgiris and Hunt Scales (object permanence, means-end, vocal imitation, gestural imitation, causality, spatial relations, and schemes). The highest sensorimotor stage (as assigned by the author) was stage five, causality, for seven of the participants and stage six, space, for five of the participants.

The participants were divided into three groups, verbal, sign, and control. Two children who lived at home and two children who lived in a residential setting were included in each group. The children in the control group were spoken to but were not encouraged to communicate with the speech-language pathologist. Each subject received training from a graduate assistant for 20 minutes a day, five days a week, for 33 months.
Baseline probes were administered at the beginning and end of each year of the program, as well as every two weeks. The verbal and sign groups went through the Bricker et al. (1976) program which consisted of 26 phases such as eye contact, imitation, comprehension, and production. The sign group received verbalizations along with each sign, however, attempts were made to elicit only the signs and not the verbalizations in this condition.

The results showed that both the verbal and sign groups learned more language skills than the control group. All four of the subjects in the sign group learned to use some signs, while only two of the four in the verbal group learned to say words. Two of the subjects in the sign group also produced three or four words at the end of the program. Correlations were calculated comparing each of the seven Uzgiris and Hunt Scales (1975) with the highest phase of training achieved by both groups. The scores on the causality scale were highly correlated with the children's success in learning to sign and speak, and scores on object permanence were highly correlated with success in learning to speak. The authors noted that the unsuccessful participants obtained lower scores on the scales than the successful subjects. The researchers concluded that the use of sign-plus-speech can assist a child with mental retardation learn to develop some speech.

Children with learning disabilities often have significant difficulty processing incoming information. Researchers have suggested that teachers can increase comprehension by incorporating multi-modality instruction (visual/auditory) into the classroom. Hurd (1995) investigated the influence of sign on individual teaching sessions.
for children with learning disabilities between 3;6 and 6;0 years. Two groups of four children with severe learning disabilities were selected on the basis of a lack of understanding of the target words *big* and *little* in prior assessment. Group 1 attended a school that used Makaton signing and group 2 attended a school with no signing. Each child was seen individually for one session. Group 1 was taught with sign plus verbal expression. Group 2 was taught with verbal expression only. Vocalizations of the words *big* and *little*, signing of these words, and eye contact were recorded and analyzed. Children in the sign plus verbal expression group produced more attempts at the spoken words and had a higher frequency of eye contact. The author reported that the addition of a sign held the child's attention and added support.

Only one study has examined the influence of gesture in children with language delays. Weismer and Hesketh (1993) investigated the ability of children with specific language impairment (SLI) to learn novel words when variations in speaking rate, stress, or use of gestures were introduced. The authors also examined the performance of children with SLI compared to children with normal development.

Sixteen kindergarten children participated in the study, eight with SLI and eight children with normal development. The children with SLI were enrolled in self-contained classrooms for children with severe language disorders. Each of the 16 subjects participated in all three experimental conditions: rate, stress and visual. The participants were seen individually for four 40-minute sessions in their school. Three novel words were chosen for each of the three tasks. For the first two conditions, the
children were asked to listen to words a puppet said and when it was their turn they could say the word and place the puppet by the correct toy. The stimulus sentences for the rate condition were presented at a slow, normal, and fast rate. For the stress condition, the novel words were produced in either an emphatically or neutrally stressed utterance. The visual condition involved pairing a novel word with a gesture or using verbal input alone. The invented words were intended to convey prepositions and the children were to place the puppet in the correct location.

Overall, the mean scores for the children with SLI were lower than those of the normally developing children except for the identical comprehension scores for the visual condition. Novel word acquisition for both groups was significantly affected by variations in speaking rate and use of gestures. The comprehension of the children with SLI improved when a normal or slow speaking rate was used and also when gestures were incorporated.

**Summary and Statement of Objectives**

In the past two decades early intervention services have become mandated. Delayed communication development is the most common symptom of developmental delay for children under three years of age (Rossetti, 1996). Language intervention often has a central role in early intervention services. Children learn to communicate through naturalistic interactions with their environment (Rossetti, 1996). Therefore, home programs and parent education must be included as a supplement to traditional therapy sessions.
Normally developing children learn to communicate intentionally through pre-verbal gestures and sounds at approximately 9 to 10 months (Prizant & Wetherby, 1990). Numerous studies have documented that the early use of gestures by normally developing children precedes the development of spoken language and forms a naturally integrated system with speech for communication (Acredolo & Goodwyn, 1985, 1988; Goodwyn & Acredolo, 1993; Morford & Goldin-Meadow, 1992; Namy & Waxman, 1998).

Several studies have demonstrated the effectiveness of teaching sign or gesture to facilitate oral language skills in language delayed children with Down syndrome or mental retardation (Kahn, 1981; Kouri, 1989). Only one study has examined the effects of gesture in language learning for children with specific language impairment (Weismer & Hesketh, 1993). An increase in the comprehension of novel words was demonstrated when the teacher used gestures to accompany verbalizations with a group of kindergarten age language impaired children.

Although gesture is a natural communication precursor to speech and children with Down syndrome and mental retardation have been taught sign to facilitate verbalizations, no studies have investigated the effects of incorporating gesture in early intervention services for language delayed children. Therefore, the purpose of the present study is to evaluate the effectiveness of gesture in early intervention services for young children with language delays. The specific research questions addressed follow.

1. Does verbalization of targeted vocabulary increase when gesture is added as a component of treatment for two children with language delays?
2. Does communication of targeted vocabulary increase when gesture is added as a component of treatment for two children with language delays?

3. Does verbalization of targeted vocabulary at home increase when gesture is added as a component of treatment for two children with language delays?

4. Does communication of targeted vocabulary at home increase when gesture is added as a component of treatment for two children with language delays?
CHAPTER III

Method

Overview

Two language delayed children (with expressive vocabularies between 0 and 10 words), ages 18 to 22 months, served as participants. The children were exposed to intervention targeting six vocabulary words, verbally and through gesture, in two 45-minute treatment sessions weekly over a six week period.

A single subject multiple baseline across behaviors design was used to evaluate the effectiveness of gesture in intervention. This design allows separate parts of speech, such as nouns and verbs, to be treated as separate behaviors (Richards et al., 1999). In addition, the sequential implementation of target items parallels natural teaching and effective treatment is not withdrawn (Richards et al., 1999). Parent education and a home component were also included.

The number of target gestures and verbalizations produced during each 45-minute session were measured. There was a non-treatment baseline period of two sessions. Vocabulary words were modeled verbally throughout the six weeks. Gestures were introduced and paired with verbal models gradually for the six words at a rate of two gestures every two weeks. Treatment incorporating gestures began on the first set of two gestures while the other sets continued to be verbally modeled and monitored in an extended baseline. Once a gesture was introduced its use continued with verbalization until completion of the study.
Participants

Participants were recruited through the Eastern Illinois University Speech-Language-Hearing Clinic located in Charleston, Illinois. Families were notified that summer speech-language therapy would be offered to children between 18 and 36 months (with expressive vocabularies of less than 10 words) as a component of a research study. Families were instructed to contact a graduate clinician in speech-language pathology from Eastern Illinois University to request participation in the study. The graduate clinician described the selection procedures, in addition to the methods of the study, to families who expressed interest.

The first two families who contacted the clinician and met the selection criteria participated in the study. The children were an 18-month-old male and a 22-month-old female. The participants were from caucasian, middle-class families residing in central Illinois. The mother of the male participant received a Master's degree in Speech-Language Pathology and was working as a speech-language pathologist at the time of the study. The mother of the female participant received a Bachelor's degree from the Board of Trustees program with an emphasis in education, and was working in human services at the time of the study. Parent permission for participation in the study was obtained, in addition to departmental human participants permission. See Appendix A for research participation authorization.

Children were assessed using the Rossetti Infant-Toddler Language Scale (1990), the MacArthur Communicative Developmental Inventory (1989), and the Mullen Scales
of Early Learning (1995). Table 1 summarizes assessment results. The Rossetti is a
criterion referenced scale for children ages 0-36 months with sections evaluating
interaction and attachment, gestures, pragmatics, play, comprehension, and expression.
The Rossetti provides a mastered age level which is used to determine the extent of the
child's delay. The percentage of delay is based on the child's mastered age level on the
test divided by their chronological age. This percentage is subtracted from 100% to
determine the child’s percentage of delay from their chronological age. In order to
qualify for early intervention (birth to 3 years) services in the state of Illinois, a child
must exhibit more than a 30% delay from their chronological age. Participant 1 exhibited
an 80% delay in the area of language expression and a 30% delay in pragmatic skills.
Skills in the interaction and attachment, gesture, and language comprehension domains
were mastered at his chronological age. Play skills were mastered at an age level above
participant 1's chronological age. Participant 2 exhibited a 70% delay in the area of
language expression and a 40% delay in pragmatic skills. Gesture, play, and language
comprehension domains were mastered at an age level above participant 2's chronological
age.

The MacArthur Communicative Developmental Inventory (1989) is a parental
checklist used to assess comprehension and production of vocabulary. The "Gestures and
Words" form of this parent questionnaire consists of a list of 408 words divided into 19
categories that include nouns, verbs, and function words and a list of 63 gestures and
actions, also grouped into categories (deictic and representational gestures, pretend
actions, and routines). The chronological ages of each of the participants exceeded the upper limits of the "Gestures and Words" inventory. In an effort to avoid under or overestimation of communicative skills, parent responses were used exclusively for identifying areas of strength and weakness for intervention. The parent responses for both participants indicated either strong or age-appropriate skills in the areas of language comprehension and gesture. In the area of language comprehension, "understands" was marked for 80 to 100% of the items in each of the 19 categories for participant 1. For participant 2, "understands" was marked for 90 to 100% of the items in each category. In regard to gestures, "yes" was marked for 95 to 100% of the items in each category for both participants. A "yes" response refers to gestures (e.g., pointing, reaching, head nod) and actions (e.g., brush hair, put on shoe, throw a ball) that the child attempts or performs regularly. In the area of language expression, the majority of participants verbalizations were under the "sound effects and animal sounds" category. Participant 1's verbalizations consisted of "uh-oh", while participant 2's verbalizations were "uh-oh, hi, boo, shh, up, mama, ow, and yum."

Participants exhibited an expressive vocabulary of less than 10 words according to parent report and clinician observation. No other identified deficits, such as fine motor, gross motor, or cognition, were present as determined by the Mullen Scales of Early Learning (1995). The Mullen is a criterion referenced scale with sections evaluating gross motor ability, fine motor ability, cognitive development, expressive language, and receptive language. Each section is divided into age levels. In order to qualify for early
intervention services in any of the areas, the child must exhibit a 30% delay from their chronological age. Both participants exhibited strengths in gross motor, fine motor, visual reception, and receptive language. Additionally, each participant exhibited more than a 30% delay in the area of language expression. Participant 1 had a mastered level for expressive language skills at 9 months. In this area, he played a gesture/language game (i.e., peek-a-boo) and said a first word (i.e., "uh-oh"). Participant 1 did not jabber with inflection or communicate intentions by using jargon combined with gestures. Participant 2 had a mastered level for expressive language skills at 14 months. She jabbered with inflection and communicated intentions by using jargon combined with gestures, but she did not combine a word and a gesture or name objects.

Table 1: Summary of assessment results.

<table>
<thead>
<tr>
<th>TEST</th>
<th>PARTICIPANT 1</th>
<th>PARTICIPANT 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mullen</td>
<td><em>Expressive Language</em>: 9 months</td>
<td><em>Expressive Language</em>: 14 months</td>
</tr>
<tr>
<td></td>
<td><em>Gross &amp; Fine Motor, Visual Reception, Receptive Language</em>: Mastered at or above chronological age</td>
<td><em>Gross &amp; Fine Motor, Visual Reception, Receptive Language</em>: Mastered at or above chronological age</td>
</tr>
<tr>
<td>Rossetti</td>
<td><em>Language Expression</em>: 0-3 months</td>
<td><em>Language Expression</em>: 3-6 months</td>
</tr>
<tr>
<td></td>
<td><em>Pragmatic Skills</em>: 6-9 months</td>
<td><em>Pragmatic Skills</em>: 9-12 months</td>
</tr>
<tr>
<td></td>
<td><em>Attachment, Gesture, Play, Language Comprehension</em>: Mastered at or above chronological age</td>
<td><em>Attachment, Gesture, Play, Language Comprehension</em>: Mastered at or above chronological age</td>
</tr>
<tr>
<td>MacArthur</td>
<td><em>Language Expression</em>: &lt; 10 words</td>
<td><em>Language Expression</em>: &lt; 10 words</td>
</tr>
</tbody>
</table>
Response Measurement

All treatment sessions were videotaped. A graduate clinician viewed the videotapes and recorded data weekly after two 45-minute treatment sessions. The data reflected the number of gestures and verbalizations produced by each participant for the targeted vocabulary words within each 45-minute session. The number of times that the clinician attempted to elicit each vocabulary word was documented. Spontaneous verbalizations and gestures by the participants were also recorded. A sample data collection sheet is presented in Appendix B.

According to Darley and Winitz (1961), at least two criteria must be satisfied before an utterance can qualify as a true word. These criteria were used to define a verbalization for the present study. First, the utterance should be produced consistently in the presence of the same person, object, or event. Second, the utterance should bear some phonetic resemblance to a conventional adult word. A similar set of criteria was used to define a gesture. Webster (1987) defines a gesture as the use of motions of the limbs or body as a means of expression. To qualify as a gesture, the motor pattern should be produced consistently in the presence of the same person, object, or event. In addition, the motor pattern should be a recognizable attempt or approximation of a target gesture.

Additional data was obtained through parental questionnaires collected five days a week. Parents were asked to keep a diary of their child's gesture/word use, in addition to filling out a daily questionnaire. The questionnaire was used for recording which
gestures or words the child used at home. See Appendix C for parent questionnaire form.

Reliability

All treatment sessions were videotaped and the number of gestures and verbalizations produced by the participants were counted by a graduate student in communication disorders and sciences at Eastern Illinois University. In addition, the number of times that the clinician attempted to elicit each target vocabulary word was counted. Twenty percent of the sessions were viewed and re-scored by another graduate student. Intrajudge reliability, a comparison of results by the same individual, was .99 for gestures and verbalizations produced by the participants and .97 for clinician elicitations. Similarly, interjudge reliability, a comparison of results by different individuals, was .98 for gestures and verbalizations produced by the participants and .98 for clinician elicitations.

Experimental Conditions

Baseline

Each child was seen for 45-minute sessions twice weekly. Two baseline sessions consisted of 45-minute structured-play sessions. A graduate clinician interacted with the child without directly eliciting language. The child played with the objects which represented the vocabulary words during the baseline sessions. The clinician verbally modeled the vocabulary words without modeling any of the gestures. All spontaneous verbalizations and gestures were recorded for each 45-minute session. Intervention began following two 45-minute baseline sessions, after consistent baselines were evidenced.
Criteria for a stable baseline was zero verbalizations and gestures for the target vocabulary.

**Naturalistic Language Intervention Using Gestures**

**Clinic-Based Treatment.** The treatment targeted six different vocabulary words, introducing two gestures of either nouns or verbs every two weeks. The target vocabulary included a set of two nouns, a set of two verbs, and additional set of two nouns. The six vocabulary words represented common nouns and verbs of interest to the child as reported by parents. The child was not using any of the words verbally or gesturally as judged by clinician observation or parental report. The following factors were considered when selecting target vocabulary. Children's early words must be those that they can use to refer to what they already know about their world (McLean & McLean, 1999). Bloom (1970) noted that the words in children's early vocabularies were of two types, substantive forms and functional or relational forms. Substantive words serve as labels for objects and actions (e.g., "ball," "kiss"), whereas function words describe a relationship which might apply to an object or event (e.g., "all gone," "more"). The early vocabularies of children consist of mainly nouns, including objects, substances, animals, people, letters, and numbers, in addition to action words such as "go" and "bye-bye" (Nelson, 1973). The phonetic make-up of the word was also considered. According to McLaughlin (1998), early attempts at producing words consist primarily of the front consonants (/p, b, d, t, m, n/). Selected vocabulary was also partially based upon parental input on important and functional words for their child. The vocabulary words chosen for
participant 1 were ball, blanket, dog, car, drink, and help. For participant 2 the vocabulary words were baby, dog, blanket, book, drink, and more.

An appropriate gesture was paired with each vocabulary word. Gestures were adapted from the book *Signing Exact English* (Gustason, Pfetzing, & Zawolkow, 1980), or from the book *Baby Signs* (Acredolo & Goodwyn, 1996). *Baby Signs* pair actions with objects (e.g., wiggling index finger to represent a caterpillar). The selected gestures were adapted to meet each child’s fine and gross motor ability level. In addition, the evolution of early gestural behaviors was considered. The earliest gestures involve making direct contact with an object or person, such as taking a person's hand and placing it upon an object (McLean & McLean, 1999). Later in the gestural evolution, children produce the same hand movements without an object, such as reaching or waving "bye-bye" (McLean & McLean, 1999). This later occurring gesture, called a distal gesture (McLean & McLean, 1999), was used in the present study. The child's stage of gestural development was determined by parental report and clinician observation. Table 2 includes descriptions of selected gestures.

The sequence of introducing gestures for nouns or verbs was different for the two participants. The target behaviors for participant 1 were nouns, nouns, verbs while for participant 2 the target behaviors were nouns, verbs, nouns. Treatment incorporating gestures began on the first set of two gestures while the other sets continued to be verbally modeled and monitored in an extended baseline.

The setting for intervention was the Eastern Illinois University Speech-Language-
Table 2: Descriptions of Selected Gestures

<table>
<thead>
<tr>
<th>Gesture</th>
<th>Descriptions of Adapted Gestures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball</td>
<td>Form hands into a claw-like shape; fingers and thumb come together and form ball-shape.</td>
</tr>
<tr>
<td>Baby</td>
<td>Pretend as though you are cradling a baby; rock arms from side to side.</td>
</tr>
<tr>
<td>Blanket</td>
<td>Pretend as though you are covering yourself with a blanket; right arm sweeps up across left side of the body.</td>
</tr>
<tr>
<td>Book</td>
<td>Open palms side-by-side formed into book shape; open and close palms</td>
</tr>
<tr>
<td>Car</td>
<td>Using two fists, pretend as though you are grasping a steering wheel and steer.</td>
</tr>
<tr>
<td>Dog</td>
<td>Open palm slaps knee to call dog</td>
</tr>
<tr>
<td>Drink</td>
<td>Form hand into claw shape, will look as if you are grasping a cup; place thumb on chin; pretend to drink</td>
</tr>
<tr>
<td>Help</td>
<td>Left hand palm open, form right hand into a fist, fist pushes down open palm</td>
</tr>
<tr>
<td>More</td>
<td>All fingers in contact with thumb for both hands; bounce finger tips together</td>
</tr>
</tbody>
</table>

Hearing Clinic in Charleston, Illinois. Parents were invited to observe all treatment sessions. The mother of participant 1, a speech-language pathologist, observed a portion of all treatment sessions and the mother of participant 2 observed all sessions. Each child participated in two individual therapy sessions each week. The intervention took place during 45-minute structured play activities. A variety of objects (e.g., books, puzzles, toys) which represented the six vocabulary words were integrated into each session. The graduate clinician engaged in activities with the child including those objects while incorporating naturalistic intervention strategies.

Each of the six vocabulary words were verbally or verbally and gesturally modeled by the clinician a minimum of 15 times during each 45-minute session. During
the baseline condition, the target six vocabulary words were only verbally modeled by the clinician. The verbal model was defined by an emphasis on loudness and stress patterns. The clinician also exaggerated visual articulatory postures, such as squeezing the lips together tightly to produce the /m/ in "more." The clinician often held objects close to her face or pointed to her mouth while producing the target vocabulary in an attempt to gain the child's attention. During the treatment condition, the target vocabulary was verbally and gesturally modeled by the clinician. The clinician gained the child's attention by calling his/her name prior to gesturally modeling a vocabulary word. As the gestures were introduced, the clinician also provided physical guidance to assist the participants in producing the gesture. In addition, the clinician often specifically asked the participants to produce the gesture (e.g., "show me ball"). The participants were also encouraged to verbalize in addition to producing the target gesture. The clinician used the strategies listed previously to encourage verbalization.

Intervention incorporated naturalistic play-based techniques, such as those described in Table 3. According to Linder (1993), naturalistic play-based intervention contributes a means for developing a curriculum for children that is child-centered, individualized, interactional, integrated, and holistic. The natural interactions between the adult and child are reinforced through approaches such as modeling and incidental teaching. In the present study, mand-model, sabotage, cuing, and focused stimulation were found to be the most effective in eliciting target vocabulary.

The most productions of target vocabulary were observed when one of the
Table 3: **Naturalistic Intervention Strategies** (Fey, 1986)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidental Teaching</td>
<td>The clinician waits for a naturally occurring &quot;teachable moment&quot; and employs one of the naturalistic intervention strategies.</td>
</tr>
<tr>
<td>Self-Talk/ Parallel-Talk</td>
<td>The clinician talks out loud to herself. The clinician talks out loud about her actions and the child's actions.</td>
</tr>
<tr>
<td>Modeling</td>
<td>The clinician demonstrates a word/s necessary to help the child communicate without expecting the child to say the word.</td>
</tr>
<tr>
<td>Expansion</td>
<td>The clinician adds more information to word/s the child has used.</td>
</tr>
<tr>
<td>Scaffolding</td>
<td>The clinician provides cues in a play situation for concepts that the child cannot do independently.</td>
</tr>
<tr>
<td>Sabotage</td>
<td>The clinician manipulates the environment (hiding toys, placing them out of reach, etc.) so the child has a need to communicate.</td>
</tr>
<tr>
<td>Focused Stimulation</td>
<td>The clinician uses intensive examples with multiple repetitions to stress a vocabulary word.</td>
</tr>
<tr>
<td>Known Scripts</td>
<td>The clinician uses familiar routines or stories to model target concepts.</td>
</tr>
<tr>
<td>Cuing/Prompting</td>
<td>The clinician develops a hierarchy of cues to elicit a target response from the child.</td>
</tr>
<tr>
<td>Mand-model</td>
<td>The clinician directs the child's attention to an object, requests (mand) a response, provides a model for the child to imitate, praises the child for responding appropriately, and gives the child the object of interest.</td>
</tr>
</tbody>
</table>

strategies was paired with the participants' favorite toy or activity. For example, participant 1 enjoyed playing with a ball comprised of colorful suction cups. Periodically throughout the activity, the clinician would place the ball out of the child's reach or throw the ball out of reach (i.e., sabotage). At this time the clinician produced a verbalization of the target vocabulary word (i.e., "ball") paired with its gesture (i.e., hands coming together to form a ball). The participants also enjoyed snack time, drawing on the chalkboard, and reading books (i.e., focused stimulation).
In addition, the participants appeared to acquire gestures or verbalizations more quickly within an interactive routine. For example, participant 2 enjoyed playing with a toy shopping cart. The clinician sat across the room with the shopping cart and placed an object which represented the target vocabulary into the cart. Before the clinician would push the cart to the child, she was required to verbalize or produce a gesture (i.e., mand-model). Other routines included playing catch, peek-a-boo, and preparing snack.

**Parent Program.** Prior to intervention, the objectives of the study were explained to each child's mother. The clinician discussed naturalistic intervention and the phenomenon of gesture with the mothers. In addition, it was determined that each child had access to a set of objects at home which represented the target gestures. Each mother was provided with a questionnaire including a list of their child's target vocabulary prior to the initial baseline session. The clinician invited the mothers to expose their children to objects which represented the target vocabulary in the home environment. Gestures for the target vocabulary were not introduced to the mothers during baseline sessions, but verbal models of the target vocabulary were encouraged. When each set of two gestures was introduced to the child during therapy, the parents were asked to begin modeling the target gestures with their child at home. The clinician met with the mother of participant 2 prior to and following each treatment session to discuss any questions or concerns. The clinician also discussed the participant's progress and the purpose of any strategies used during the treatment session. In addition, the clinician offered demonstrations of gestures/verbalizations and suggestions for activities to try at home. The clinician met
with the mother of participant 1 less often due to her extensive background in speech-language pathology. A questionnaire regarding the child's gesture use and verbalizations at home was provided for each parent (see Appendix C for parent questionnaire form).
CHAPTER IV

Results

The present study investigated the effectiveness of gesture in early intervention services with language delayed children. The specific research questions addressed were:

1) Does verbalization of targeted vocabulary increase when gesture is added as a component of treatment for two children with language delays? 2) Does communication of targeted vocabulary increase when gesture is added as a component of treatment for two children with language delays? 3) Does verbalization of targeted vocabulary at home increase when gesture is added as a component of treatment for two children with language delays? 4) Does communication of targeted vocabulary at home increase when gesture is added as a component of treatment for two children with language delays?

Results were obtained by recording the number of gestures and verbalizations produced by each participant during each 45-minute therapy session. Additional data was collected through questionnaires which were completed five times each week by the mothers of the participants. Questionnaires which included a list of the target vocabulary, were provided for each of the participants' mothers prior to the initial baseline session. Treatment incorporating gestures commenced on the first set of two gestures while the other sets continued to be verbally modeled and monitored in an extended baseline. The results collected for each participant are presented in the following figures.

Clinic-Based Data

Participant 1
Figure 1 shows the number of gestures and verbalizations produced by participant 1 across baseline and treatment conditions. Participant 1 began intervention after stable baselines were evidenced over 2 sessions. Treatment for noun group A was initiated during session 3 and continued for 11 sessions through the final session. The remaining gesture groups continued to be monitored in an extended baseline. Participant 1 responded to treatment during session 5, as seen in the production of gesture twice. Gesture production for noun group A remained relatively stable throughout the entire intervention with 2 to 4 gestural productions in each treatment session. Participant 1 did not produce verbalizations of the target vocabulary in noun group A.

Intervention for noun group B was initiated during session 7 and continued for 7 sessions through the final session. The verb group continued to be monitored in an extended baseline. Participant 1 responded to treatment with a gesture production during session 9. Gesture production for noun group B continued throughout intervention, with a peak observed at session 11 with 4 gestural productions. Verbalizations were not produced for the target vocabulary in noun group B.

Intervention for the verb group began during session 11 and continued for 3 sessions through the final session. The same pattern of response observed for the first two treatment sets continued for the verb group. Gesture production began during session 12 with 3 productions for the verb group and continued through the final session with 5 productions. Similar to the preceding treatment sets, no verbalizations were produced for the verb group.
Figure 1. Number of gestures and verbalizations across baseline and treatment conditions for participant 1.

Figure 2 shows the combined number of gestures and verbalizations produced by participant 1 across all treatment conditions. Treatment incorporating gesture was initiated after stable baselines were evidenced over two sessions. Treatment for noun group A began during session 3. The other two sets of gestures were monitored in an extended baseline. Treatment for noun group B began during session 7 while treatment
The Use of Gesture

for the verb group began during session 11. Once a set of gestures was introduced, treatment continued until the final session. Participant 1 began to produce gestures during session 4. Once a gesture was initiated by participant 1, its use remained stable over the duration of treatment. No verbalizations were produced for the three vocabulary sets.

![Figure 2](image)

Figure 2. Number of gestures and verbalizations across baseline and treatment conditions for participant 1.

**Participant 2**

Figure 3 shows the number of gestures and verbalizations produced by participant 2 across baseline and treatment conditions. Participant 2 began intervention after stable baselines were evidenced over two sessions. Treatment for noun group A was initiated during session 3 and continued for 10 sessions through the final session. The remaining
The Use of Gesture 45

gesture sets continued to be monitored in an extended baseline. Participant 2 showed a similar response to treatment as observed in participant 1, evidenced in initial gesture production during session 5. The amount of gestures produced by participant 2 for noun group A was greater than the amount produced by participant 1. In addition, while gesture production for noun group A remained relatively stable in participant 1, participant 2 continued to increase gestural productions through session 10 with a maximum of 12 gestural productions for noun group A. A verbal explosion and subsequent decline in gestures was observed during session 11. Participant 2 continued to verbalize through the final sessions and no longer produced gestures for noun group A.

Intervention for the verb group was initiated during session 7 and continued for 6 sessions through the final session. Noun group B continued to be monitored in an extended baseline. Participant 2 responded with gesture production during the initial treatment session. A sharp increase in gesture production for the verb group was observed over sessions 8 and 9. Identical to noun group A, a verbal explosion and subsequent decline in gestures was observed during session 11.

Intervention for noun group B was initiated during session 10 and continued for 3 sessions through the final session. The same pattern of response observed for the first two treatment sets continued for noun group B. Participant 2 demonstrated an immediate response to treatment, as seen in the initiation of gesture production. A sharp increase in gesture production was observed during session 10. With the advent of verbalization during session 11, a sharp decline in gesture production was observed. The latency
period between the introduction of gestures and the advent of verbalizations decreased significantly from the initial treatment set to the final treatment set.

Figure 4 shows the combined number of gestures and verbalizations produced by participant 2 across all treatment behaviors. Treatment incorporating gesture was initiated after stable baselines were evidenced over two sessions. Treatment for noun
The Use of Gesture 47

group A began during session 3. The other two sets of gestures were monitored in an extended baseline. Treatment for the verb group began during session 7 while treatment for noun group B began during session 10. Once a set of gestures was introduced, treatment continued until the final session. Participant 2 began to produce gestures during session 4 with sharp increases over the duration of treatment. In addition, a verbal explosion was observed during session 11. The verbalizations continued through the final session while the amount of gestures produced sharply decreased.

![Figure 4. Total number of gestures and verbalizations across all treatment conditions for participant 2.](image)

Home-Based Data

Participant 1

Figure 5 shows the number of gestures and verbalizations produced by participant
Participant 1's mother reported zero productions of target vocabulary, both verbally and gesturally, in the home environment during the baseline period. Gestural treatment for noun group A was initiated in the home environment during week 2 (sessions 3 and 4) and continued through week 7.

Figure 5. Number of gestures and verbalizations across baseline and treatment conditions in the home environment for participant 1.
The remaining gesture groups continued to be monitored in an extended baseline by participant 1's mother. Participant 1 responded to treatment in the home environment during week 2, as seen in the production of gesture 12 times. Gesture production for noun group A remained relatively stable throughout the entire intervention with 15 to 25 gestural productions each week. Participant 1's mother reported no verbal productions of target vocabulary in noun group A.

Intervention for noun group B was initiated in the home environment during week 4 (sessions 7 and 8) and continued through week 7 (session 13). The verb group continued to be monitored in an extended baseline by participant 1's mother. Participant 1 responded to treatment during week 4, as seen in the production of gesture 10 times. Gesture production in the home environment for noun group B continued throughout intervention with an average of 9 gestures each week. Participant 1's mother reported no verbalizations for the target vocabulary in noun group B.

Intervention for the verb group was initiated in the home environment during week 6 (sessions 11 and 12) and continued through week 7 (session 13). Gesture production was reported to begin during week 6 with 3 productions and continue through the final week with 4 productions. Similar to the preceding treatment sets, participant 1's mother reported no verbalizations for target vocabulary in the verb group.

Figure 6 shows the combined number of gestures and verbalizations produced by participant 1 across all treatment behaviors in the home environment. Treatment incorporating gesture was initiated in the home environment after stable baselines were
evidenced over two sessions. Treatment for noun group A began during week 2. The other two sets of gestures were monitored in an extended baseline by participant 1's mother. Treatment for noun group B began during week 4 while treatment for the verb group began during week 6. Once a set of gestures was introduced, treatment continued through the final week. Participant 1 began to produce gestures during week 2. Once a gesture was initiated by participant 1, its use in the home environment remained stable over the duration of treatment. No verbalizations were produced in the home environment for the three vocabulary sets.

Figure 6. Total number of gestures and verbalizations across all treatment conditions in the home environment for participant 1.

Participant 2

Figure 7 shows the number of gestures and verbalizations produced by participant
2 across baseline and treatment conditions in the home environment. Participant 2 began home-based intervention after stable baselines were evidenced over two clinic-based sessions. Treatment for noun group A was initiated in the home environment during week 2 (sessions 3 and 4) and continued for through the final week. The remaining gesture sets continued to be monitored in an extended baseline by participant 2's mother. Participant 2 responded to treatment in the home environment during week 2, as seen in the production of 17 gestures. Gesture production for noun group A remained stable through week 5 with 8 to 12 gesture productions each week. A spike in gesture production was reported by participant 2's mother during week 6, as seen in 20 gesture productions. This spike in gesture production coincided with the advent of verbalizations for noun group A in the home environment. Participant 2 continued to verbalize in the home environment through the final week and produced fewer gestures for noun group A.

Intervention for the verb group was initiated in the home environment during week 4 (sessions 7 and 8) and continued through the final week. Noun group B continued to be monitored in an extended baseline by participant 2's mother. Participant 2 responded with gesture production in the home environment during week 4, as seen in the production of gesture 12 times. A sharp increase in gesture production for the verb group was reported by participant 2's mother during week 6 with 37 productions. Similar to noun group A, the advent of verbalizations was also reported to coincide with the increase in gesture production. Participant 2's mother reported a subsequent decline in gestures for the verb group during week 7.
Intervention for noun group B was initiated in the home environment during week 6 (sessions 11 and 12) and continued through the final week. The same pattern of response reported by participant 2's mother for the first two treatment sets continued for noun group B. Participant 2 demonstrated an immediate response to treatment, as seen in

Figure 7. Number of gestures and verbalizations across baseline and treatment conditions in the home environment for participant 2.
20 gesture productions during week 6. The advent of verbalization was also reported to occur during week 6. The latency period between the introduction of gestures in the home environment and the advent of verbalizations decreased significantly from the initial treatment set to the final treatment set.

Figure 8 shows the combined number of gestures and verbalizations across all treatment behaviors in the home environment. Treatment incorporating gesture was initiated in the home environment after stable baselines were evidenced over two clinic-based sessions. Treatment for noun group A began during week 2. The other two sets of gestures were monitored in an extended baseline by participant 2's mother. Treatment in the home environment for the verb group began during week 4 while treatment for noun
group B began during week 6. Participant 2 began to produce gestures in the home environment during week 2 with sharp increases over the duration of treatment. In addition, the advent of verbalizations in the home environment was reported during week 6. Verbalizations in the home environment continued through the final week while the amount of gestures produced decreased.
CHAPTER V

Discussion

The primary purpose of the present study was to determine the effectiveness of gesture in facilitating early communication for young children with expressive language delays. Examination of the data regarding gesture and verbal productions in each participant yielded several interesting findings.

Both participants demonstrated an immediate response to gestural treatment, as seen in the production of gestures. Once gesture production was initiated by participant 1, a steady increase was observed in the amount of gestures produced over treatment sessions. Many of these productions remained imitations of clinician models. No verbalizations of target vocabulary were documented for participant 1 during the 6-week period of the current study. Participant 2 followed a similar pattern of steady increases for gesture production throughout the majority of the study. However, a significant spike in gesture production, both imitated and spontaneous, was observed prior to the onset of verbal productions. Following the advent of verbalizations of target vocabulary, a sharp decline in gesture production was observed. As the number of verbalizations of specific target vocabulary expanded, gesture production for those words continued from highs of 8 - 14 to fewer than 3 gestural productions per session within a one week period.

As new treatment sets were introduced, the latency period between onset of treatment incorporating gestures for the target vocabulary and gesture production decreased. Regarding the final set of target vocabulary, participant 1 produced more
gestures during the initial treatment session and demonstrated greater increases over subsequent sessions than was observed with preceding treatment sets. Participant 2 displayed a similar pattern of behavior until the advent of verbalizations. Verbalizations were not produced until the 10th session, eight sessions after the initiation of gestural treatment. The initial verbalizations for participant 2 consisted of vocabulary from the initial treatment set, although, verbalizations of vocabulary from the second treatment set emerged during the same session. The second treatment set had been introduced with gestures during session number 7. Verbalizations for the third treatment set emerged during session 12, two sessions following the initial gestural treatment session for that set. No significant relationship was observed regarding the onset or amount of gestures and verbalizations produced and the type of treatment set (i.e., nouns or verbs).

Gesture production occurred prior to verbalization for participant 2, although the interval gradually decreased. This finding corroborates data reported by Goodwyn and Acredolo (1993) on normally developing infants. The 22 participants in their study demonstrated a small, yet reliable, difference in onset time which favored the gestural modality over the verbal modality.

Although both participants responded to treatment quickly, participant 2 consistently produced a greater sum of gestures per treatment session. In addition, many of participant 1's gesture productions remained imitations of clinician models, while participant 2 quickly transitioned to spontaneous productions. Participant 2 also progressed to verbalizations during the final sessions. Individual differences such as
gender and developmental level may have contributed to these results. Participant 1 was an 18-month-old male and participant 2 was a 22-month-old female. Gender differences were addressed in a study by Acredolo and Goodwyn (1988) which examined the spontaneous development of gestures in normally developing infants. A significant gender difference was revealed in that females produced significantly more gestures than males. The authors hypothesized that this may be the result of the degree or type of parental interaction experienced by the separate sexes.

With regard to developmental level, both participants exhibited a significantly limited expressive vocabulary prior to the onset of treatment. According to parental report and clinician observation, participant 2 displayed a slightly more advanced expressive repertoire. The majority of verbalizations produced by participant 2 consisted of animal sounds (e.g., "moo") and environmental noises (e.g., drinking/eating sounds). Normally developing children typically learn to communicate intentionally through gestures and sounds prior to the onset of first words (Prizant & Wetherby, 1990). Participant 1 produced a small number of these sounds prior to the onset of treatment. However, many environmental noises and animal sounds emerged throughout the course of intervention. This indicates that although participant 1 did not produce verbalizations of target vocabulary during intervention, he was following a similar pattern of expressive development as observed in participant 2.

Parent data collected in the home environment during the six-week period of the current study supported results documented during treatment. Parents did not report any
productions of target vocabulary during baseline conditions. In addition, once a gesture was introduced in therapy and to the parents, productions were immediately documented at home as well as in the clinic. Once the participants began using a gesture or verbalization at home, its use continued through the final treatment session. Productions of gestures were also reported to have steadily increased over the duration of treatment. The advent of verbalizations for participant 2 occurred in the home during the same week that it occurred in treatment. A subsequent decline in gesture use was reported by the parents of participant 2.

During the six-week period of the present study, participant 1's parents reported that he appeared to be vocalizing more. In addition, participant 1's mother believed that he understood the concept of communication through gesture. For example, when she asked him to say a word, he would show her the sign for "ball." She also noticed that he was beginning to pay more attention to her face when she attempted to elicit vocabulary. Participant 2's parents reported an increase in new phonemes and words at home. They also noticed that she was paying more attention to her communication partners' mouth postures.

The results of the present study strongly support earlier longitudinal descriptive research of gesture use. The majority of the previous studies concentrated on the development of gesture in normally developing infants (Acredolo & Goodwyn, 1985, 1988; Goodwyn & Acredolo, 1993; Morford & Goldin-Meadow, 1992; Namy & Waxman, 1998). In a study of 38 normally developing infants, Acredolo and Goodwyn
(1988) found that their participants produced gestures for a period of time before transitioning to verbal words. Once verbalization commenced, gestures were completely abandoned. In a similar study, Kouri (1989) studied the efficacy of gesture to facilitate verbalizations in a child with Down syndrome. The participant relied heavily on sign at the onset of therapy, but near the end of therapy most of the words that she signed became spontaneous spoken productions. In addition, the latency period between imitated signs and spontaneous verbalizations decreased as treatment progressed. Participant 2 displayed a similar pattern of behavior as documented in these previous studies. She used gestures exclusively when treatment was initiated, however, the gestures transitioned into verbal productions during the final sessions. In addition, the advent of verbalizations coincided with a gradual abandonment of gesture production.

Several naturalistic intervention strategies were utilized in the present study. Mand-model, sabotage, cuing, and focused stimulation were found to be effective in eliciting target vocabulary. Most productions of target vocabulary were observed when one of the strategies was paired with the participants' favorite toy or activity. For example, participant 2 enjoyed playing with window clings comprised of baby pictures. Periodically throughout the activity, the clinician would place the pictures out of the child's reach (i.e., sabotage). At this time the clinician produced a verbalization of the target vocabulary word (i.e., "baby") paired with its gesture (i.e., pretending to cradle a baby). Participant 2 imitated the clinician's actions after one session and gradually progressed to spontaneous gesture productions. Carry-over of this gesture was observed
in a variety of contexts, such as requesting baby items from the clinician and directing the clinician's attention to baby items. In addition, "baby" was the first verbalization produced by participant 2.

The participants appeared to acquire gestures or verbalizations more quickly within an interactive routine. For example, participant 1 enjoyed pretending to feed a toy dog during snack time. Prior to each snack time, the clinician placed the dog across the room and called the dog to the table using a verbalization plus gesture (i.e., slapping her knee). After a few sessions, participant 1 participated in this routine with the clinician and eventually generalized to events involving the toy dog outside of the original routine. This finding supports earlier data reported by Acredolo and Goodwyn (1988) in an investigation of the spontaneous development of gestures in normally developing infants. Over one half of the gestures produced by their participants emerged out of interactive routines between parent and child.

A specific strength of the present study was the information provided concerning the incorporation of gesture in early intervention for language delayed children. The advent of the 1986 Public Law 99-457 (Part H) mandated services to children with developmental disabilities from birth through two years of age. Early intervention services have subsequently proliferated across the country. Several studies have demonstrated the effectiveness of teaching sign or gesture to facilitate oral language skills in language delayed children with Down syndrome or mental retardation (Kahn, 1981; Kouri, 1989). Yet only one study has examined the effects of gesture on language
learning for children with specific language impairment, and the participants were school age (Weismer & Hesketh, 1993).

Another strength of this study was the detailed information provided on individual participant's performance rather than group data which may mask individual differences. While both participants in the present study demonstrated an immediate response to treatment, the pattern and degree of response was significantly different. Weismer and Hesketh (1993) investigated the influence of prosodic and gestural cues with kindergarten children with specific language impairment. The results indicated that comprehension of novel stimuli increased when gestures were incorporated, however, the group data did not detail individual participant's performance. The form of response and extent of success across participants was not specified. The authors discussed the need for patterns of individual difference to be addressed in future investigations.

One identified weakness of the present study was the small number of participants. While the performance of each participant was reported in detail, only two children participated in the treatment. It is difficult to draw unequivocal conclusions regarding the efficacy of gesture in early intervention due to the small number of participants. Both participants exhibited moments of non-compliance on a few occasions. In addition, the sequence of treatment was interrupted for participant 1 due to a scheduled vacation.

The results compiled in this study indicate several areas for future research. Subsequent studies should focus on the role of individual differences in the acquisition of
gestures and verbalizations in children with language delays. Additional studies may provide insight into the gender differences observed concerning the quantity of gestures produced over sessions. Certain environmental factors or interactions may foster the acquisition of gestures or verbalizations in males and females. Future studies may also examine the impact of developmental age on the success of intervention. With regard to receptive language, children may need to reach a certain developmental age before intervention can be successful. Some children may benefit from this type of intervention more than others, therefore it is imperative to determine the characteristics of children who will be successful.

The children that participated in the present study both evidenced expressive language delays and demonstrated strengths in receptive language. Future research should examine if gesture is effective in facilitating early communication for children with both expressive and receptive language delays.

Future research may focus on the type of vocabulary chosen as intervention targets and their impact on performance. For example, are object gestures (i.e., nouns) or action gestures (i.e., verbs) acquired first? In addition, it is important to determine which types of gestures children produce most often and in what contexts they occur. When choosing vocabulary to focus on in intervention, it is imperative to determine which words are the most functional for each individual child.

The present study occurred during a short 6-week period which was effective in minimizing maturational effects. Both participants displayed immediate responses to
intervention. However, a longitudinal study could provide insight into the long term impact of intervention incorporating gesture.

A substantial amount of early intervention services are provided in the child's home environment. Future studies should investigate the efficacy of intervention incorporating gesture in this environment. Comparative research can determine whether center- or home-based intervention promotes greater gestural and verbal acquisition. The transition from gesture to verbal communication may occur more quickly in one environment than in another. There may be specific environmental factors which foster gesture and verbal development in young children.

While this study revealed that children with expressive language delays benefited from early intervention incorporating gesture, additional research is needed. Some children may not rely as much on gestures, while others may rely on gestures for a more extended period. Gestures allow children to communicate with, and talk about, their world. These interactions assist children in learning what communication can accomplish. The earlier that language delayed children are provided with an effective communication system, the social rules of conversation can be introduced, making them active communication partners. Theoretically, incorporation of gesture should improve communication skills by allowing children to use a symbol to indicate wants and needs and build a bridge for the development of further symbolic communication in the form of verbal expression. Prior to choosing appropriate intervention, all aspects of development must be assessed. The acquisition of early communication is a highly individualized
process and each case must be considered separately.
References


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APPENDIX A

Research Participation Authorization
RESEARCH PARTICIPATION AUTHORIZATION

Jamie Labuda, graduate student, and two professors from Eastern Illinois University, Lynn Calvert and Rebecca Throneburg, are conducting a research project assessing the effectiveness of gesture in facilitating early communication. I authorize permission for ________________, ________________, who is my ___________ to (child's name) (birthdate) (relationship) participate in this project. I give my permission for the researchers to use all data collected during the research, including audio/video recordings for teaching and publications. I give my permission for the researchers to review my child's therapy file. I understand that my child's name will not be used in any descriptions or reports of data.

__________________________________________  ______________________________________
(parent signature)                          (parent names)
__________________________________________  ______________________________________
(address)                                   (phone)
__________________________________________  ________________________________
(city) (state) (zip)                         (date)
APPENDIX B

Data Collection Sheet
Client Name _____________________________ Date ____________

1st 15-minute segment ☐ 2nd 15-minute segment ☐
3rd 15-minute segment ☐

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Spontaneous Verbalizations: __________________________________________

Spontaneous Gestures: __________________________________________

Other notes:

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________
APPENDIX C

Parent Questionnaire Form
The Use of Gesture 75

Child's Name ___________________________________ Date ____________

Please circle one number for each of the following questions.

How many times did your child verbalize the following words today?

1. Noun A1 0 1 2 3 4 5 6 7 8 9 10
2. Noun A2 0 1 2 3 4 5 6 7 8 9 10
3. Verb B1 0 1 2 3 4 5 6 7 8 9 10
4. Verb B2 0 1 2 3 4 5 6 7 8 9 10
5. Noun C1 0 1 2 3 4 5 6 7 8 9 10
6. Noun C2 0 1 2 3 4 5 6 7 8 9 10

Please list any other verbalizations your child produced today:

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

How many times did your child use a gesture for the following words today?

1. Noun A1 0 1 2 3 4 5 6 7 8 9 10
2. Noun A2 0 1 2 3 4 5 6 7 8 9 10
3. Verb B1 0 1 2 3 4 5 6 7 8 9 10
4. Verb B2 0 1 2 3 4 5 6 7 8 9 10
5. Noun C1 0 1 2 3 4 5 6 7 8 9 10
6. Noun C2 0 1 2 3 4 5 6 7 8 9 10

Please list any other gestures your child produced today:

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Comments:
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
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