

Journal of Early Intervention

<http://jei.sagepub.com>

Effects of Adult Contingent Imitation on Development of Young Children's Vocal Imitation

Gail Gazdag and Steven F. Warren
Journal of Early Intervention 2000; 23; 24
DOI: 10.1177/10538151000230010701

The online version of this article can be found at:
<http://jei.sagepub.com/cgi/content/abstract/23/1/24>

Published by:

 SAGE Publications

<http://www.sagepublications.com>

On behalf of:



[Division for Early Childhood of the Council for Exceptional Children](#)

Additional services and information for *Journal of Early Intervention* can be found at:

Email Alerts: <http://jei.sagepub.com/cgi/alerts>

Subscriptions: <http://jei.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

Citations (this article cites 15 articles hosted on the SAGE Journals Online and HighWire Press platforms):
<http://jei.sagepub.com/cgi/content/refs/23/1/24>

REGULAR ARTICLES

Effects of Adult Contingent Imitation on Development of Young Children's Vocal Imitation

GAIL GAZDAG

Vanderbilt University

STEVEN F. WARREN

University of Kansas

The effects of adult contingent vocal imitation on the development of vocal imitation skills by three young children with mental retardation were investigated. A multiple baseline across subjects design was implemented. Generalization sessions were conducted separately with both the children's teacher and teaching assistant. Child vocal imitation to adult contingent imitation, elicited imitation, and spontaneous imitation were measured in generalization sessions throughout the study. All children vocally imitated in response to adult contingent imitation during training. Minimal generalization to adult contingent imitation and elicited imitation prompts were shown by the children. Moderate to strong generalized increases in spontaneous imitation occurred for all children concurrent with training.

There are numerous strategies that children conceivably might use to learn language skills including hypothesis testing and rule generation (Chomsky, 1965), verbal rehearsal (Ornstein, Naus, & Liberty, 1975), observational learning (Bandura, 1977), and vocal imitation (Warren & Bambara, 1989). Within a social, interactive context the child might use these and other strategies to take advantage of a diverse range of language-learning opportunities. The child's imitation of an adult's sounds, gestures, words and expressions is a skill and a strategy that many children use in the course of early communication and language development (Masur, 1993; 1995; Snow, 1981).

The purpose of this study was to investigate the effects of adult contingent vocal imitation of children's vocalizations on the development of children's own vocal imitation skills. The study focused on children's exact and partial

(reduced) vocal imitation (Sokolov, 1992). Exact imitation occurs when "sounds in the source and response utterances match exactly" (Sokolov, p. 209). Partial imitation occurs when the "response utterance contains partial repetition with deletions but no additions" (Sokolov, p. 209).

The skill of vocal imitation "is one of the earliest communicative strategies used by children" (Sokolov & Moreton, 1993, p. 174). Vocal imitation may play a variety of roles in the facilitation of language development (i.e., cognitive, pragmatic, information processing). Immediate, deferred, exact, partial (reduced), modified (expanded), spontaneous, and elicited imitation reflect variations of the form of imitation and also may function differently, or not at all, at different developmental periods (Speidel & Nelson, 1989).

Child vocal imitation has been the focus of

numerous studies (Speidel & Nelson, 1989). For example, it has been positively correlated with language learning in children with autism (Yoder & Layton, 1988). Vocal imitation has been shown to assist in the generation of longer utterances (Speidel & Herreshoff, 1989), and the development of spontaneous speech (Speidel, 1989). The acquisition of new vocabulary (Rodgon & Kurdek, 1977) and new grammatical structures (Whitehurst & Vasta, 1975) has been attributed to vocal imitation. Infants' early imitation of words not in their repertoires predicts and may facilitate their future lexical development (Masur, 1995).

There is a reported progression in the development of vocal imitation. Children typically progress from partial (or reduced) imitations, to exact imitations, to expanded imitations (Kuczaj, 1983; Snow, 1981). Expanded (modified) imitation occurs when the response utterance contains an additional sound or sounds of at least part of the source utterance (Snow, 1981). There also is evidence that children typically engage in spontaneous imitation (imitations of utterances that have not been directly modeled) prior to being able to respond to elicited imitation prompts (utterances that are directly modeled; Snow, 1989). The developmental progression of imitation abilities generally correlates with children's emerging cognitive and linguistic abilities (Speidel & Nelson, 1989; Locke, 1993).

One strategy for facilitating the development of vocal imitation may be adult contingent imitation of the child. Contingent imitation is an imitation of the child's vocal or gestural behavior that the respondent (i.e., practitioner, parent) produces immediately following the child's production. The positive aspects of the use of adult contingent imitation may be four-fold. First, by noticing the adult's imitation of their behavior, the child may in turn learn to imitate (Snow, 1989). Second, by regulating their rate and varying their form, a child can influence and regulate the amount of adult input that is similar to the child's production (Dawson & Lewy, 1989). Third, it is likely a child will process and reproduce an adult's production because it is exactly the same as the child's most recent production

(Dawson & Lewy). Fourth, adult contingent imitation facilitates attention to the adult (Dawson & Galpert, 1987; Dawson & Lewy, 1989; Klinger & Dawson, 1992). That is, the child may be more likely to attend to the adult and the adult's actions, rather than his or her own actions, if the adult's actions are a replication of the child's own recent actions.

Adult contingent imitation was found to increase attention to the respondent in 4- to 6-year-old children with autism (Dawson & Adams, 1984), in 2- to 6-year-old children with autism (Dawson & Galpert, 1987), and in high-risk preterm, typically developing, and postmature infants (3½ months; Field, 1977). Contingent imitation has also been reported to decrease attention to objects by children with autism while increasing their social vocalizations (vocalizations directed to another person) and the complexity of their play (Dawson & Galpert). Dawson and her colleagues have used contingent imitation with children with autism because it is thought to "promote social responsiveness" (Dawson & Lewy, 1989, p. 63). Dawson and Lewy noted that imitation is a form of early interaction which can serve as a strategy with children at early developmental levels.

The use of adult contingent vocal imitation as a strategy to enhance child vocal imitation has been reported in a few studies of early communication intervention. For example, Warren, Yoder, Gazdag, Kim & Jones (1993) found moderate increases in child vocal imitation as a result of a more general intervention (i.e. prelinguistic milieu teaching) that included contingent imitation of the child's vocalizations. Adult contingent imitation also has been included as part of a set of intervention techniques taught to parents (McCollum & Stayton, 1985; Mahoney & Powell, 1988). As yet, however, no studies have reported the independent effects of adult contingent imitation on the development of imitation by young children with mental retardation. Therefore, the purpose of the present study was to determine the effects of adult contingent vocal imitation on the acquisition and generalization of elicited and spontaneous vo-

Table 1.
Participant Information

Child	Age ^a	MDI ^b	Age ^a equivalent	Other
Alan	29	<50, 48*	18	Mild cerebral palsy
Brad	28	50	17.5	Bilingual home
Carl	26	<50, 46*	15.5	Down Syndrome

^aAge reported in months.

^bMDI = Mental Developmental Index.

*Naglieri extrapolation.

cal imitation by three young children with mental retardation.

METHOD

Subjects and Setting

Three children between 26 and 29 months participated in this study. Each child's imitative abilities were assessed by providing opportunities to imitate in response to (a) adult contingent imitation, (b) elicited prompts, and (c) any other adult vocalization or verbalization. During a 10-minute screening session each child produced a minimum of five vocalizations and showed minimal imitation skills. Etiology was determined by reviewing school records. No child exhibited significant hearing, vision, or behavioral problems as determined through examination of school records and consultation with each child's teachers. Table 1 displays specific characteristics for each child.

All three children attended a community-based early intervention program. All experimental sessions and generalization tests with the children's teachers were conducted in a playroom near the child's classroom. The playroom was equipped with a low table and chairs, and a wide variety of age appropriate toys and play materials. All screenings, generalization tests with the children's teaching assistant, and posttests were conducted in the child's classroom.

Child Behavior

The training target was the child's vocal imitations of adult vocal imitations of the child. It was measured during the screenings, the baseline period, the training period, the stim-

ulus generalization sessions throughout the study, and the posttests. During sessions in which child behavior was videotaped, all child vocal imitations also were recorded.

Adult Behaviors

Two adult behaviors were measured: (a) adult contingent vocal imitation, and (b) adult prompt for vocal imitation. Adult contingent vocal imitation occurred when the adult exactly or partially repeated the child's immediately preceding vocalization or when the adult modified (expanded) her vocal imitation of the child by including an additional sound or sounds to the child's vocalization (e.g. "ba ba" in response to "ba"). An adult prompt for vocal imitation occurred when the adult asked the child to produce a sound, and waited at least 5 seconds for the child to respond. When the adult said, "Say, —" or "Tell me, —," an adult prompt for vocal imitation was recorded.

Observation System

Data were collected via videotape during screenings, experimental sessions, generalization sessions, and posttests. All screenings, generalization sessions, and posttests were 10 minutes in length. All baseline sessions and 20% of the intervention sessions were videotaped and coded. Although experimental sessions typically were conducted for 20 minutes, only a 10-minute portion of each session was videotaped. Therefore, each individual data point represents a 10-minute sample of data.

Two adult behaviors and one training target were coded for each data session. Determination of child imitation to adult contingent

imitation, spontaneous imitation, and elicited imitation was dependent upon the coding of adult behavior preceding child vocal imitation.

Interobserver Agreement

Interobserver agreement on the observational code was assessed by having the primary and secondary observer simultaneously but independently code the same 10-minute segment of videotaped data. These records were then compared sequentially on a point-by-point basis for agreement of exact coding of adult and child behaviors. A disagreement occurred when one observer recorded a different code from the other or when one observer recorded the occurrence of a behavior and the other observer failed to record any occurrence. Reliability was calculated for each category in the observation system and for each utterance using an exact agreement procedure in which the total number of agreements was divided by the total number of agreements plus disagreements and multiplied by 100. Reliability assessments, evenly distributed across all experimental conditions, were conducted on 25.3% of the observations made for baseline, training, and generalization.

Overall interobserver agreement was 88.5% (range = 82.4–100%). On adult contingent imitation, interobserver agreement was 89.7% (range = 86.8–92.6%) and on adult prompts for imitation, agreement was 98.0% (range = 94.4–100%). For child vocal imitation to adult contingent imitation, interobserver agreement was 82.4% (range = 66.7–100%), for child vocal imitation to adult prompt for imitation it was 100%, and for child spontaneous imitation it was 88% (range = 80.0–100%).

Experimental Procedures

Experimental design. A multiple baseline design across subjects (McReynolds & Kearns, 1983) was used to assess the intervention effects. After a baseline measurement period, intervention was sequentially introduced across the children. Tests of generalization occurred four times during baseline and approximately every third videotaped session throughout the study.

Screenings, generalization tests, and posttests. Screenings, generalization tests with the teaching assistant, and posttests were conducted to determine children's abilities to imitate initially, over the course of the intervention, and after intervention ended. One screening test, one half of the generalization tests, and one posttest were conducted by the child's teaching assistant. Two screenings were conducted by the trainer. Testing sessions always were conducted in the child's classroom using classroom toys. Peers did not participate in the testing sessions.

To insure we did not confound the child's ability to vocally imitate with his or her ability to produce various sounds, only phonemes previously produced by the child (as measured in familiarity sessions) were used to test the child's imitation ability during the screenings. Likewise, phonemes made by the child during previous sessions were used during generalization tests with the teaching assistant and posttests to test the child's imitation abilities.

The ability to imitate an adult contingent imitation was assessed by the adult contingently imitating the child's vocalization. The adult remained silent for at least 5 seconds to give the child time to imitate. In order to assess spontaneous imitation, the adult produced a sentence ending in a word that included a sound the child had produced previously. The adult then remained silent for 5 seconds to give the child time to respond. The child could spontaneously imitate any adult vocalization. During the same test, the adult assessed the child's elicited imitation ability. The adult asked the child to imitate a modeled phoneme by saying, "Say, __," and waiting at least 5 seconds for a response. The phoneme modeled by the adult was one the child had produced previously. Five opportunities for imitation of adult contingent imitation, of models, and of words with familiar sounds were provided for each child during each of these testing conditions.

All tests were conducted separately with each child. Imitation abilities were either non-existent or were exhibited at a low rate during screenings. Frequency of imitation per opportunity during the screening is summarized in

Table 2.
Frequency of Imitation per Opportunities During Screenings

Child	No. child imitations/ No. adult contingent imitations	No. child imitations/ No. adult elicited imitations	No. child spon- taneous imita- tions ¹
Alan	2/20	2/14	1
Brad	0/15	0/15	1
Carl	1/17	0/17	0

¹During a 30 minute free play period.

Table 2. Posttests were also conducted separately for each child 2 weeks after the last training session.

Baseline. All baseline and intervention sessions were conducted by one trainer who was experienced in facilitating the acquisition of prelinguistic communication, specifically requesting, commenting, and vocal imitation (Warren et al., 1993). During the baseline condition the trainer engaged in interactive play activities with each child for approximately 20 minutes four times per week. Five opportunities for the child to vocally imitate adult contingent vocal imitation were embedded in each play session. No other techniques for teaching imitation were utilized. The trainer provided opportunities for the child to imitate spontaneously by vocalizing phonemes that were in each child's repertoire. After the vocalization was provided, the trainer remained silent for at least 5 seconds in order to give the child time to respond.

The adult was also vocally responsive to the child's vocalizations. For example, if the child said, "Ah ba," the adult might have responded, "Oh, really!" Thus, the adult encouraged the child to produce vocalizations but did not directly teach imitation. No elicited imitation opportunities occurred during the baseline sessions. Developmentally appropriate practices such as environmental arrangement, following the child's attentional lead, and creation of social routines, were provided during these play sessions to insure a high rate of child engagement with the trainer (Warren, 1991). Sessions began as the trainer and the child selected play

materials for the initial play activity. Alan, Brad and Carl had 5, 8, and 11 baseline sessions, respectively.

Intervention. Environmental arrangement, following the child's attentional lead, and the creation of social routines provided enabling contexts (Warren & Yoder, 1998) for determining whether adult contingent vocal imitation directly taught child vocal imitation. The trainer offered the child toys and the child could chose a toy by looking, vocalizing, or reaching. For example, the trainer offered the child a doll and said, "Oh, do you want this doll?" The child vocalized "Da." After the child vocalized, the trainer immediately imitated the child's vocalization by saying, "Da" (an exact vocal imitation) or "Da do" (a modified imitation). Modified imitations were allowed because a novel variation on a child's utterance might draw the child's attention to the utterance. Furthermore, modifications are often used by parents when they contingently imitate vocalizations of their typically developing children (Speidel & Nelson, 1989). Following the first imitation, the trainer waited at least 5 seconds for the child to respond. A second adult contingent vocal imitation occurred when the child and trainer engaged in a social play routine of feeding dolls. The trainer said, "Oh, look! The baby is drinking milk. Good baby." The child said, "Ba." The trainer then said, "Ba ba ba" and waited at least 5 seconds for the child's response.

The adult provided an average of 31, 29 and 43 contingent vocal imitations during videotaped intervention sessions with Alan, Brad and Carl, respectively. The frequency of adult contingent vocal imitations was relatively stable for each child throughout the intervention. The range of adult contingent vocal imitations was 23 to 53 for Alan, 18 to 38 for Brad, and 28 to 57 for Carl. Individual variations in frequency of child vocalizations determined the opportunities that were available to the adult to respond with contingent vocal imitations. Not all child vocalizations were imitated.

Initially the child was offered access to three different toys or activities. As the child's interest naturally waned from their first selection, other toys and activities were presented

for a second selection. Additional toys and activities continued to be provided as the child's interest waned. Typical activities included music, dolls, water play, farm, cars, and ball. Following the child's attentional lead was employed to help sustain the child's interest in the activity. Alan, Brad, and Carl participated in 42, 33, and 36 training sessions, respectively.

Fidelity of treatment. A fidelity of treatment measure was used to assure that these general teaching techniques were used throughout both baseline and intervention sessions, and that adult contingent imitation was used only during intervention sessions. Fidelity of treatment was measured for 15% of the recorded experimental (baseline and training) sessions by an independent observer. The fidelity of treatment measure consisted of eight questions. Six of these questions were designed to assure that the adult followed the child's lead, engaged in play routines, imitated the child's motor behavior, vocally responded, encouraged the child to vocalize, allowed time for the child to speak, and made available appropriate toys during both baseline and training sessions. The two additional questions were designed to distinguish the adult's behaviors between baseline and training. The questions addressed whether the adult vocally imitated the child's vocalizations and whether the adult made statements to elicit vocal imitations from the child. The choice of answers included almost always, most of the time, occasionally, rarely, and never. Agreement on the lack of occurrences of elicited imitation during baseline and training sessions was 100%. Adult contingent imitation was found to occur rarely (100%) during baseline and was recorded as occurring most of the time (40%) or always (60%) during training.

Generalization with the children's teachers. Each child's primary teacher conducted one half of the stimulus generalization sessions in the training room using training toys. Spontaneous imitation and elicited imitation were tested during these generalization probes. Only those phonemes previously used by the child were modeled during elicited imitation opportunities. The teacher was asked to pro-

vide five models of familiar phonemes to the child. In addition, to give the child an opportunity to spontaneously imitate a familiar sound, the adult was asked to provide five short sentences that ended in a word that included a previously expressed vocalization of that child. They were stated without a prompt or model (e.g., "Oh, I see the ball."), and the teacher waited at least 5 seconds for the child to respond. The child could, of course, spontaneously imitate any vocalization that the adult had produced.

RESULTS

Figure 1 displays the frequency of the trainer and the teaching assistant's imitation to child vocalizations. The frequency of child imitative responses is also displayed. These data reflect the total number of training prompts to which the children responded during treatment and the total number of adult contingent imitation probes to which children responded during generalization with the teaching assistant.

During the training condition, Alan, Brad, and Carl averaged, respectively, 14.2, 9.0, and 19.7 imitations to adult contingent imitations per session (respective total imitations were 114, 63, and 138). This compared to 3, 5, and 3 total imitations, respectively, (average 0.6, 0.6, and 0.3, per session) to adult contingent imitation probes by the trainer during baseline. Clearly, there was a substantial increase in the slope of all three children's imitation to adult contingent imitation.

Alan, Brad and Carl produced a total of 3, 0, and 0 imitations to adult contingent imitations, respectively, during generalization tests with the teaching assistant during baseline. This compared with a total of 5, 1, and 1 imitations to adult contingent imitations, respectively, during generalization tests with the teaching assistant concurrent with training.

During the posttest with the teaching assistant, Alan, Brad and Carl imitated 3, 1 and 1 adult contingent imitations, respectively. The teaching assistant offered 7, 6 and 5 opportunities of adult contingent imitation, respectively, to the children during these posttests.

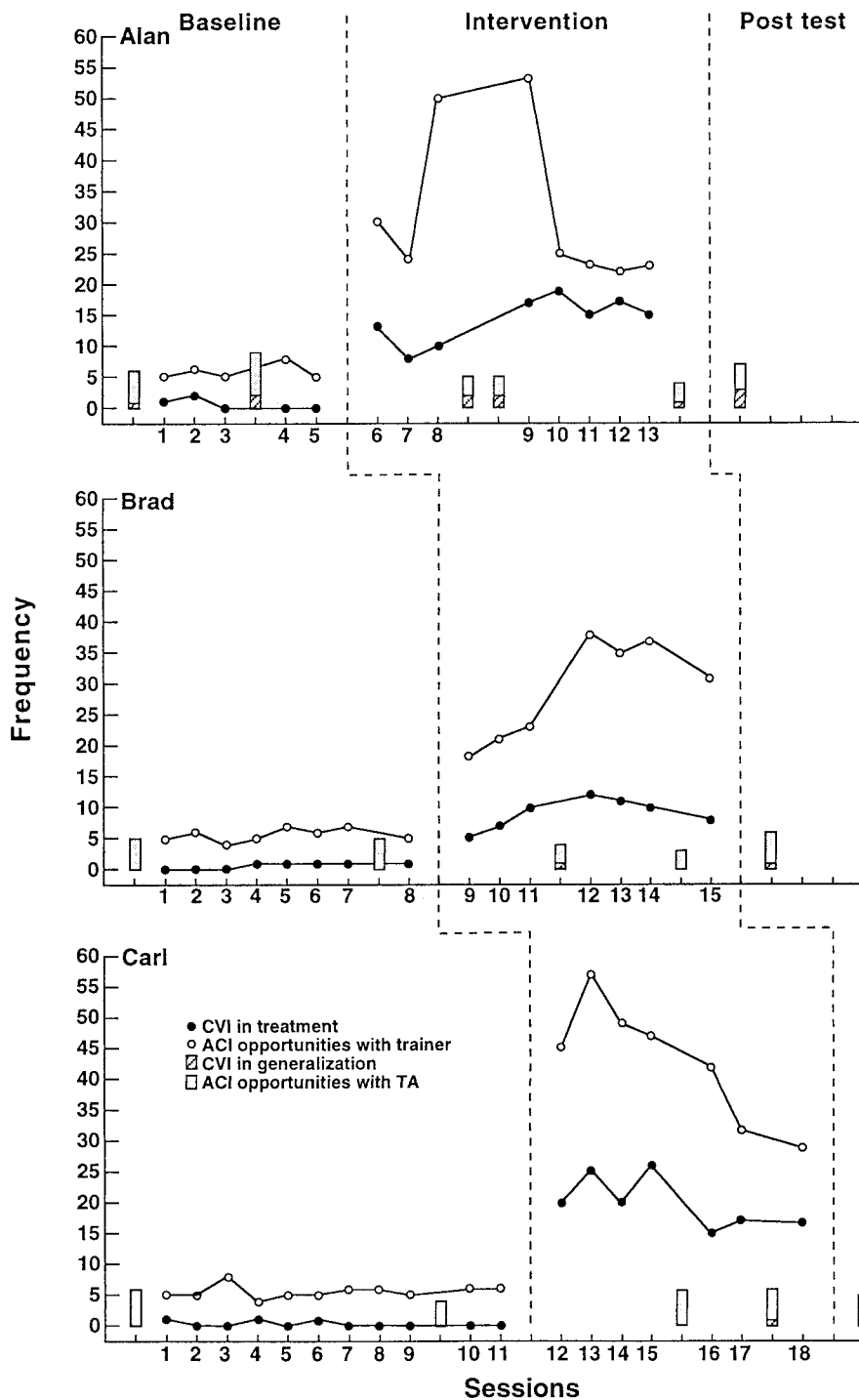


Figure 1.

Open circles indicate frequency of adult contingent imitation of the child (ACI) by trainer; dark circles indicate frequency of child vocal imitations (CVI) in response to the ACIs. Frequency of ACIs by teaching assistant during generalization probes indicated by the bars; shaded portion of bar indicates CVIs in response to ACIs.

Figure 2 displays the number of child vocal imitations to adult prompts for imitation (elicited imitation prompts) during generalization tests concurrent with the baseline, intervention and posttest conditions. No substantial changes in imitations in response to elicited imitation prompts from baseline to intervention were evident for the three children during the generalization tests with the teaching assistant or with the teacher, or during the posttest with the teaching assistant.

Figure 3 displays the children's spontaneous imitation during treatment sessions with the trainer and the generalization sessions with both the teaching assistant and the teacher. Opportunities for spontaneous imitations were continuously available during all sessions.

During baseline sessions Alan, Brad and Carl spontaneously imitated the trainer's vocalizations a total of 2, 2, and 0 times, respectively. During intervention Alan, Brad, and Carl responded with a total of 10, 19, and 10 spontaneous imitations, respectively.

During the baseline generalization sessions with the teaching assistant, Alan, Brad, and Carl each produced a total of 1 spontaneous imitation. During generalization sessions with the teaching assistant, conducted concurrent with intervention, Alan, Brad, and Carl produced a total of 8, 6, and 2 spontaneous imitations. A five- to six-fold increase in average spontaneous imitations during generalization with the teaching assistant occurred for Alan and Brad. Carl's average spontaneous imitation with the teaching assistant did not change from the baseline to the generalization sessions conducted during intervention.

During the baseline generalization sessions with the teacher, Alan, Brad, and Carl produced a total of 0, 1, and 0 spontaneous imitations, respectively. During generalization sessions with the teacher, conducted concurrent with intervention, Alan, Brad, and Carl produced a total of 3, 8, and 3 spontaneous imitations, respectively. During the posttest sessions conducted by the teaching assistant Alan, Brad, and Carl produced 5, 1 and 2 spontaneous imitations, respectively.

DISCUSSION

There was a substantial increase in all three children's elicited vocal imitation in the training setting concurrent with the intervention. None of the children, however, showed an increase in elicited vocal imitation in response to adult contingent imitation or elicited imitation prompts in the generalization and posttest sessions.

The lack of generalization may have been due to ineffective or insufficient training. That is, had training been different, more intense, or of longer duration, perhaps the children would have generalized elicited imitation to other individuals and settings. We think a more likely explanation, however, is that the children had not achieved a level of cognitive development sufficient to acquire generalized elicited imitation abilities. We view this as the most likely explanation for their failure to generalize the skill in part due to their concurrent development of spontaneous imitation abilities.

Snow's (1989) research suggests that spontaneous imitation typically develops prior to elicited imitation abilities. All three children showed moderate to strong generalized increases in their spontaneous imitation abilities concurrent with the intervention (see Figure 3). The consistency of this effect suggests it was a result of the intervention. This indicates that the children were beginning to develop the necessary cognitive abilities to vocally imitate, but had not progressed sufficiently to acquire elicited imitation abilities as a direct result of adult contingent imitation.

The failure of the intervention to effect elicited imitation and its apparent success at facilitating the development of spontaneous imitation supports earlier findings (Snow, 1989; Speidel & Nelson, 1989) that generalized spontaneous imitation precedes the ability to engage in generalized elicited imitation. This suggests that an intervention aimed at establishing elicited imitation abilities should first verify the existence of spontaneous imitation abilities. If the child is not spontaneously imitating, then emphasis should first be placed on assisting the development of this ability.

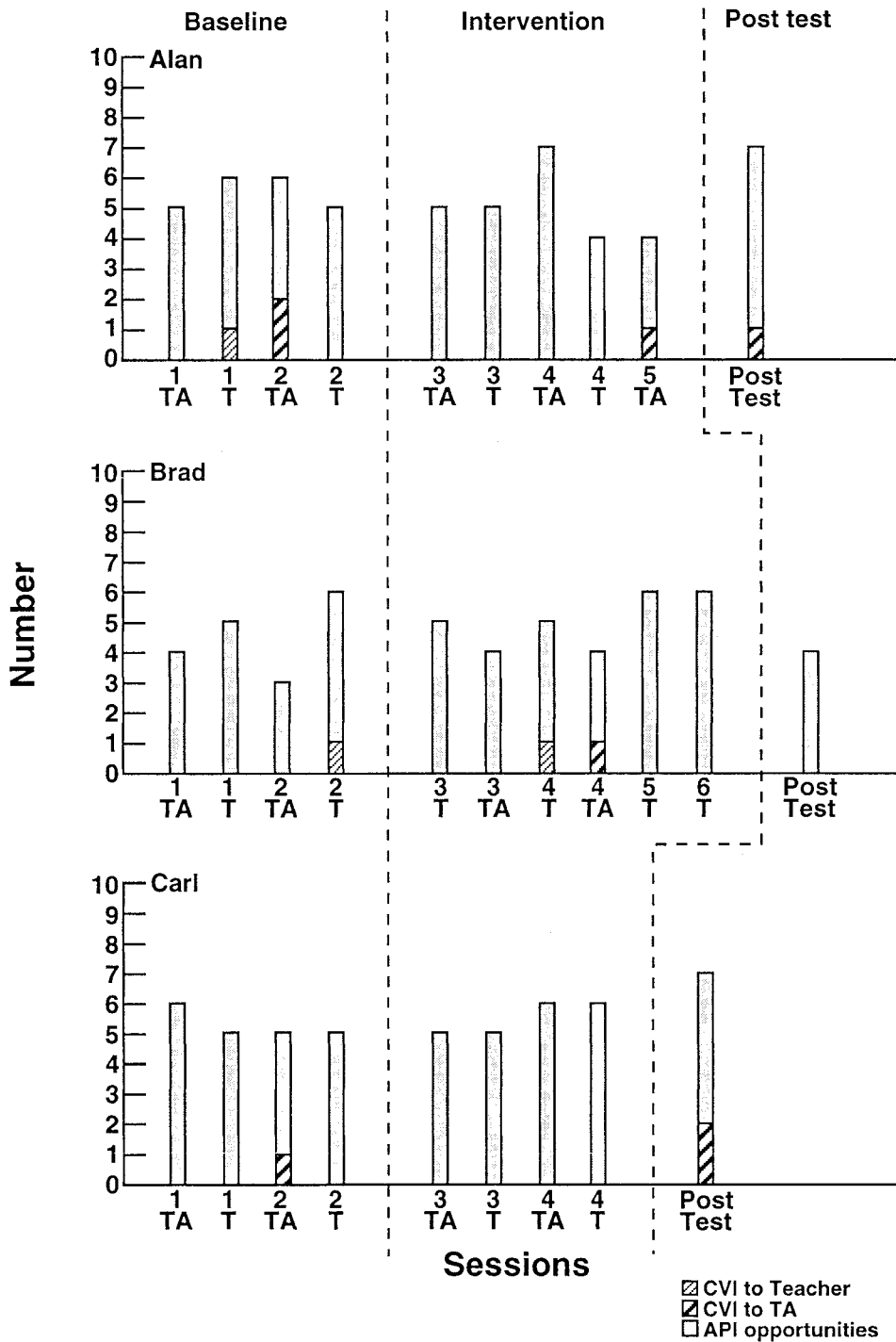


Figure 2. Adult prompts for imitation by the teacher (T) or teaching assistant (TA) is indicated by the bar. Child vocal imitation in response to these prompts is indicated by the crossed lines on the bar (heavier lines for responses to the teaching assistant).

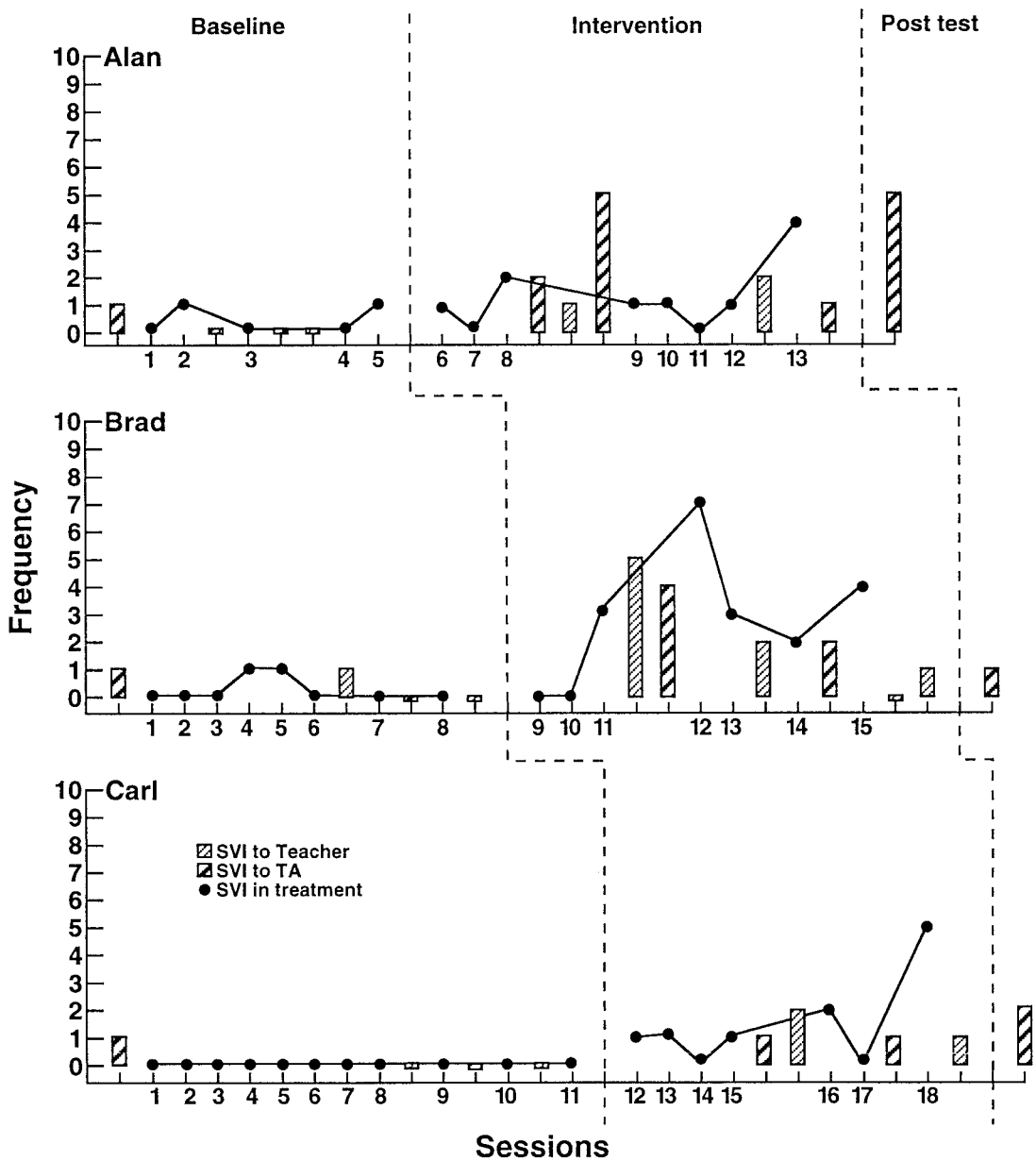


Figure 3. Frequency of spontaneous child vocal imitation (SVI) in the training setting is indicated by the darkened circles attached by the solid line. The frequency of SVI in generalization probes with the classroom teacher is indicated by the bar with lighter crossed lines. The frequency of SVI in generalization probes with the teaching assistant is indicated by the bars with heavier crossed lines.

It should be noted that the participants in this study did respond with elicited imitations in the intervention context, but showed no generalization of this effect. This lack of generalization does not mean the intervention procedure was inappropriate developmentally or ineffective because it appeared to facilitate spontaneous imitation. Furthermore, had the children already exhibited spontaneous imitation abilities, the intervention might have systematically facilitated their elicited imitation skills. Also, as we noted in the introduction, other research has suggested that adult contingent imitation may have effects on other skills not measured in this study including social responsiveness, play skills, and turn taking (Dawson & Adams, 1984; Dawson & Galpert, 1987; Dawson & Lewy, 1989; Klinger & Dawson, 1992; Tiegerman & Primavera, 1981). Therefore, it seems prudent for practitioners to continue to use adult contingent imitation as part of more general interventions aimed at increasing social responsiveness and early communication abilities in young children with delays in these areas of development.

In summary, this study suggests that adult contingent imitation may facilitate the development of spontaneous imitation skills in young children with mental retardation. The effects of this procedure on facilitating elicited imitation skills remain to be demonstrated. Like other researchers and practitioners, we suspect this procedure can enhance very early development in a number of ways. As this study demonstrates, however, the effectiveness of the intervention may be mediated by the nature of the targeted skills (i.e. spontaneous vs. elicited imitation) relative to the general developmental level of the child.

REFERENCES

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Chomsky, N. (1965). *Aspects of the theory of syntax*. Cambridge, MA: MIT Press.

Dawson, G., & Adams, A. (1984). Imitation and social responsiveness in autistic children. *Journal of Abnormal Child Psychology*, 12, 209–226.

Dawson, G., & Galpert, L. (1987). *Mothers' use of imitative play for facilitating eye contact and toy play in autistic children*. Paper presented at the biennial meeting of the Society for Research in Child Development, Baltimore.

Dawson, G., & Lewy, A. (1989). Arousal, attention, and the socioemotional impairments of individuals with autism. In G. Dawson (Ed.), *Autism: Nature, diagnosis & treatment*. New York: The Guilford Press.

Field, T. (1977). Effects of early separation, interactive deficits, and experimental manipulations on infant-mother face-to-face interaction. *Child Development*, 48, 763–771.

Klinger, L. G., & Dawson, G. (1992). Facilitating early social and communicative development in children with autism. In S. F. Warren & J. Reichle (Eds.), *Causes and effects in communication and language intervention* (pp. 157–186). Baltimore: Brookes.

Kuczaj, S. A. (1983). *Crib speech and language play*. New York: Springer-Verlag.

Locke, J. L. (1993). *The child's path to spoken language*. Cambridge, MA: Harvard University Press.

Mahoney, G., & Powell, A. (1988). Modifying parent-child interaction: Enhancing the development of handicapped children. *The Journal of Special Education*, 22, 82–96.

Masur, E. F. (1995). Infant's early verbal imitation and their later lexical development. *Merrill-Palmer Quarterly*, 41, 286–306.

Masur, E. F. (1993). Transitions in representational ability: Infants' verbal, vocal, and action imitation during the second year. *Merrill-Palmer Quarterly*, 39, 437–456.

McCollum, J. A., & Stayton, V. (1985). Infant/parent interaction: Studies and intervention guidelines based on the SIAI model. *Journal of the Division for Early Childhood*, 9, 125–135.

McReynolds, L. V., & Kearns, K. P. (1983). *Single-subject experimental designs in communication disorders*. Baltimore: University Park Press.

Ornstein, P. A., Naus, M. J., & Liberty, C. (1975). Rehearsal and organizational processes in children's memory. *Child Development*, 46, 818–830.

Rodgon, M., & Kurdek, L. (1977). Vocal and gestural imitation in children under two years old. *Journal of Genetic Psychology*, 131, 115–123.

Snow, C. E. (1981). The uses of imitation. *Journal of Child Language*, 8, 205–212.

Snow, C. E. (1989). Imitativeness: A trait or skill? In G. E. Speidel & K. E. Nelson (Eds.), *The many faces of imitation in language learning* (pp. 73–90). New York: Springer-Verlag.

- Sokolov, J. L. (1992). Linguistic imitation in children with Down syndrome. *American Journal on Mental Retardation, 97*, 209–221.
- Sokolov, J. L., & Moreton, J. (1993). Individual differences in linguistic imitativeness. In J. L. Sokolov & C. E. Snow (Eds.), *Handbook of research in language development using CHILDES* (pp. 174–209). Hillsdale, NJ: Erlbaum.
- Speidel, G. E. (1989). Imitation: A bootstrap for learning to speak? In G. E. Speidel & K. E. Nelson (Eds.), *The many faces of imitation in language learning* (pp. 151–179). New York: Springer-Verlag.
- Speidel, G. E., & Herreshoff, M. J. (1989). Imitation and construction of long utterances. In G. E. Speidel & K. E. Nelson (Eds.), *The many faces of imitation in language learning* (pp. 189–198). New York: Springer-Verlag.
- Speidel, G. E., & Nelson, K. E. (1989). A fresh look at imitation in language learning. In G. E. Speidel & K. E. Nelson (Eds.), *The many faces of imitation in language learning* (pp. 1–21). New York: Springer-Verlag.
- Tiegerman, E., & Primavera, L. (1981). Object manipulation: An interactional strategy with autistic children. *Journal of Autism and Developmental Disorders, 11*, 427–438.
- Warren, S. F. (1991). Enhancing communication and language development with milieu teaching procedures. In E. Cipani (Ed.), *A guide for developing language competence in preschool children with severe and moderate handicaps* (pp. 68–93). Springfield, IL: Charles C. Thomas.
- Warren, S. F., & Bambara, L. M. (1989). An experimental analysis of milieu language intervention: Teaching the action-objective form. *Journal of Speech and Hearing Disorders, 54*, 448–461.
- Warren, S. F., Yoder, P. J., Gazdag, G., Kim, K., & Jones, H. (1993). Facilitating prelinguistic communication skills in young children with developmental delay. *Journal of Speech and Hearing Research, 36*, 83–97.
- Warren, S. F., & Yoder, P. J. (1998). Facilitating the transition to intentional communication. In A.M. Wetherby, S.F. Warren, & J. Reichle (Eds.), *Transitions in Prelinguistic Communication* (pp. 365–384). Baltimore: Brookes Publishing.
- Whitehurst, G. J., & Vasta, R. (1975). Is language acquired through imitation. *Journal of Psycholinguistic Research, 4*, 37–59.
- Yoder, P. J., & Layton, T. (1988). Speech following sign language training in nonverbal autistic children with minimal verbal language. *Journal of Autism and Developmental Disorders, 18*, 217–229.

Gail Gazdag is now with the Psychology Department at the Rosewood Center, Owings Mills, MD. Steven Warren is now with the Kansas Center for Research on Mental Retardation, Life Span Institute, University of Kansas.

This research was supported in part by grants PO1HD15051 and RO1HD27594 from the National Institute for Child Health and Human Development.

Address correspondence to Steven F. Warren, University of Kansas Life Span Institute 1052 Dole Building, Lawrence, KS 66045