

*A PROGRAM FOR INCREASING MANUAL SIGNING
BY AUTISTIC AND PROFOUNDLY RETARDED
YOUTH WITHIN THE DAILY ENVIRONMENT*

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A program was implemented to increase the manual signing of five profoundly retarded and four autistic youth within their daily environment. Each participant was nonvocal or minimally vocal. The program was based on modified incidental teaching strategies and was implemented by direct care personnel under supervision in an institutional setting. Specific components included rearranging the physical environment to prompt signing, altering routine staff-resident interactions to prompt, manually guide and/or reinforce signing; and conducting mini-training sessions. Additionally, staff modeled signs intermittently throughout the day. The program was sequentially implemented during two staff work shifts on each of two resident living modules. Observations conducted at four separate time periods during the day indicated that significant increases in signing occurred for all participating youth and that the increases generally maintained during follow-up checks at 5 and 17 weeks. Differential effects of the increased signing on frequency of vocalizations were noted across residents. A staff acceptability survey indicated favorable staff reports on the usefulness of signing to communicate with the youth. Results are discussed regarding the significance of manual signing for seriously developmentally disabled persons and the importance of ensuring that signing skills are used in the daily environment and not exclusively in formal training sessions. Also, areas for continued research are noted in terms of more refined analyses of client skills and subsequent progress in manual communication programs.

DESCRIPTORS: sign language, incidental teaching, autistic children, retarded children, developmentally disabled

An area of recent attention in applied behavioral research is teaching manual sign language to persons with serious developmental disabilities. For instance, it has been demonstrated that manual signing skills could be acquired by autistic (see Carr, 1979, for a review) and pro-

foundly retarded (see Poulton & Algozzine, 1980, for a review) persons through behavioral programming. The success of such programs in teaching sign language skills is especially encouraging because of the well-recognized difficulties in teaching vocal language to these populations (Carr, 1979; Carr, Binkoff, Kologinsky, & Eddy, 1978; Hodges & Deich, 1978; Kahn, 1977; Reich, 1978; Richardson, 1975).

Despite the initial successes demonstrated with signing programs, significant obstacles must still be overcome for manual signing to be a functional communication system for the seriously developmentally disabled. One such obstacle is the incorporation of signing activities into the

Appreciation is expressed to Terry Page and Martin Ivancic for their manuscript comments, to Christine L. Trippel for manuscript preparation, and to John B. Cockshott for his administrative support of program activities. Special thanks are extended to Linda McNerney Pyfer for her competent assistance throughout various aspects of our signing research. Reprints are available from Dennis H. Reid, now at Western Carolina Center, Morganton, North Carolina 28655.

daily living environments of the clients. To date, research has focused on the evaluation of formal teaching strategies during structured training that is removed from the usual living situation, although the importance of including signing activities in the normal day-to-day setting is well noted (Hall & Talkington, 1970; Kopchick, Rombach, & Smilovitz, 1975; Sosne, Handleman, & Harris, 1979; Topper, 1975). Recently, Faw, Reid, Schepis, Fitzgerald, and Welty (1981) attempted to incorporate signing into the daily routine of institutionalized profoundly retarded persons by formally involving direct care staff in the communication training procedures. Although the institutional staff were able to teach signing skills to the residents during structured training sessions, residents did not use signs to communicate in less highly structured interactions in their living areas.

One potential method for increasing the use of manual signs by developmentally disabled individuals in the daily environment is incidental teaching. As discussed by Hart and Risley (1980), incidental teaching procedures utilize naturally occurring interactions between clients and caregivers as a format to increase language behaviors. Previous incidental teaching programs have been effective in increasing the vocal behavior of preschoolers (Hart & Risley, 1968, 1974, 1975). A modified incidental teaching program has also been effective with the vocal behavior of institutionalized retarded persons (Halle, Marshall, & Spradlin, 1979). In addition to the benefits of enhancing language development, incidental teaching strategies, or modifications thereof, can be conducted during institutional direct-care routines without hindering the effectiveness or the expediency of the care (Ivanic, Reid, Iwata, Faw, & Page, 1981). Given the documented effectiveness and pragmatic characteristics of incidental teaching programs, continued research seems warranted to evaluate such an approach with sign language skills. However, it is likely that incidental teaching strategies that have been previously effective will have to be

modified for use with nonvocal or minimally vocal clients who are functioning at a very low skill level (e.g., profoundly retarded or autistic persons). Frequently, this latter population has a very low rate of initiating interactions with caregivers, such that the typical incidental teaching format of waiting for a client to initiate an interaction (Hart & Risley, 1980) might not be sufficient to create a learning situation. Hence, procedures would need to be incorporated, specifically, to prompt interactions by the clients.

The purpose of this investigation was to evaluate a program based on modified incidental teaching strategies for increasing the use of manual signing by institutionalized, autistic and profoundly retarded youth. More specifically, an attempt was made to extend previous work in which institutional staff taught signing skills to profoundly retarded persons in highly structured situations (Faw *et al.*, 1981), such that those skills would be used in the daily living environment. A secondary purpose was to evaluate the effects of increased signing on the occurrence of vocal behaviors by the clients due to the continuing controversy over benefits of acquiring signing skills on vocal behavior (Carr, 1981; Hopper & Helmick, 1977). Finally, in response to the recent concern over acceptability of behavioral treatment procedures (Kazdin, 1980), staff views of the program were evaluated.

METHOD

Participants

Residents. Nine residents of a state residential facility for the developmentally disabled participated. Five of the residents resided on a retardation module and four lived on an autism module.

The residents on the retardation module included three women and two men, with a mean age of 19 (range 18 to 21 yr) and a mean period of institutionalization of 14 yr (12 to 19). All residents were diagnosed as profoundly retarded based on overall intellectual (IQ less than 25)

and adaptive functioning (Grossman, 1977). All persons were ambulatory and could perform basic self-care skills, such as feeding and toileting, although staff monitoring of these skills was necessary. Three residents occasionally verbalized one- or two-word phrases, although these verbalizations were recognizable only to staff who interacted frequently with those residents. Two residents were hearing impaired and did not vocalize. Among the three residents who did vocalize, two displayed some vocal imitation skills. Two residents engaged in self-injurious behavior (e.g., hand biting) and three were occasionally aggressive toward other persons. The residents lived on the module with seven other residents who displayed similar skills.

The four boys who resided on the autism module demonstrated the majority of the behaviors characteristic of those exhibited by autistic children (Lovaas, Koegel, Simmons, & Long, 1973) and had been admitted to the program because of a previous diagnosis of autism. Ages were 11, 7, 9, and 11 yr and periods of institutionalization were 3 months, 3 months, 2 years, and 4 years. All residents were ambulatory and all required physical assistance from staff to perform self-help tasks except feeding. One resident occasionally verbalized one or two word utterances such as "good boy" although in a noncommunicative manner (i.e., under no apparent stimulus control) and displayed no vocal imitation skills. Three residents did not speak any intelligible words. Previous audiological exams indicated no apparent hearing impairments. Three of the residents engaged in self-stimulatory behaviors such as hand-waving, and one engaged in self-injurious chin scratching. These four residents comprised the entire autism module.

Residents were chosen to participate in this study for two primary reasons. First, all residents met previously established criteria for sign training in that prior training in vocal language had not been successful (Carr, 1981; Hopper & Helmick, 1977; Moores, 1978), all residents were

well over the age of four (Carr, 1981), and all lacked other types of effective communication skills (Hopper & Helmick, 1977). Second, increases in manual signing skills were general treatment goals for each resident as indicated in his or her individual program plan.

Staff. Staff participants included 5 male and 10 female direct care personnel who comprised the day and afternoon workshifts on both the retardation and autism modules. On the day shift, there were three staff assigned to the retardation module and four to the autism module. The afternoon shift included four staff on each of the two modules. Typically, there were two staff present per shift on each module on a given day. Job responsibilities and biographical characteristics were similar to those of institutional direct care staff reported previously (Faw et al., 1981; Iwata, Bailey, Brown, Foshee, & Alpern, 1976; Reid, Schuh-Wear, & Brannon, 1978). Generally, job duties involved assisting residents in basic care activities, conducting behavioral training programs, and maintaining the order and cleanliness of the living environment. Staff participants were familiar with the manual signs that were targeted in this project through previous training from a staff supervisor as well as an in-service activity by the staff development department in this facility. The training had consisted of the staff studying a manual that graphically depicted the signs along with a verbal description, supervisor instructions and modeling, and staff practice with corrective and positive feedback. The training also included a discussion of the importance of signing and encouragement to use the signing on the living unit with the residents.

Setting. The study was conducted on the residents' living units at the facility. In the retardation module, the setting included the living room (9 × 6 m), the dining room (5 × 5 m), and a corridor (8 × 2 m) connecting the two rooms. The living room was equipped with a sofa, easy chairs, and a television whereas the dining room contained dining tables and chairs.

The specific setting in the autism module included a living room (4 × 6 m), dining room (3 × 6 m), and connecting corridor (2 × 1 m), with furnishings similar to those in the retardation module.

Manual Signing Vocabulary

The 17 manual signs selected as the target signing vocabulary (see Table 1) were chosen because they were considered by facility staff to be ones that could be used in typical interactions between staff and residents on the living unit. Also, nine of the signs were targeted in a previous project (Faw et al., 1981) and had been taught to the residents in the retardation module. All residents in the retardation module had been observed to display most of the 17 target signs at least once prior to the study, although typically only when specifically prompted by staff. Residents in the autism module had received some training in manual signing through the public school program they attended, although they typically did not display many of the target signs prior to the study.

Behavior Definitions

Target behaviors were defined as follows. *Signing*: A manual gesture that includes all critical components for any one of the targeted signs and is directed to someone (i.e., the resident must be facing someone). The critical components for each sign consisted of necessary movements of the fingers and hand(s), shapes of the fingers and hand(s), and location(s) of the fingers and hand(s) in respect to the body. For example, the critical components for the sign "NO" were the snapping together of extended fingers and thumb of

one hand while positioned between the tip of the nose and waist. Critical components for all 17 signs are available from the second author.

The signing category included two subcategories of signing: physically prompted and non-physically prompted, defined as follows. *Physically Prompted Signing*: Signing that involves a staff member manually guiding part or all of the signing movement. *Nonphysically Prompted Signing*: Signing that does not involve a staff member manually guiding any part of the signing movement. In addition to signing, *Vocalizing* was defined as: Any audible vocalization that is directed toward another person (i.e., resident is facing another person). The vocalization could be either a word(s) or a nonword(s) sound (e.g., "oh," "ah," "uh," laughing), although apparent nonvoluntary sounds such as coughs and sneezes were not included.

Observation System

Observations were conducted by an experimenter or one of three staff assistants. Observers were trained with procedures similar to those described by Faw et al. (1981), including experimenter instructions, modeling, passing a written test on the critical components of the signs, and practice observing on the residents' living unit with feedback from the experimenter prior to formal data collection.

Observations were conducted at four time periods during the afternoon: 12:15, 1:15, 3:15, and 5:15. At each time period, residents' names were listed in random order on an observation sheet. Each resident was observed for three consecutive 1-min intervals during which the observer recorded the occurrence of target behaviors. Also, the observer recorded respective non-occurrences at the end of each 1-min interval. After observing/recording the behavior of one resident for 3 min, the procedure was repeated for each resident listed on the observation sheet. Hence, in the retardation module there was a maximum of 15, 1-min intervals (three intervals

Table 1

Target Signs Comprising the Signing Vocabulary

Yes	No	Apple	Candy	Eat	Milk
Banana	Want	Play	More	Bed	Radio
Table	T.V.	Toilet	Drink	Juice	

for each of five residents) and in the autism module there was a maximum of 12 (three intervals, four residents) for each observation session.

Reliability

Reliability assessments were conducted by two of the regular observers, simultaneously but independently, during a given session. Reliability checks occurred on 35% of all observations, including during each experimental condition for each of the four time periods for both the retardation and autism modules. Observer records were compared on an interval-by-interval basis, and interobserver reliability percentages were determined by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. An agreement was scored only when both observers recorded the occurrence or nonoccurrence, respectively, of the same behavior category. This formula was used to calculate agreement percentages for occurrences of target behaviors, nonoccurrences, and overall occurrences plus nonoccurrences (Bailey & Bostow, 1979).

Across all sessions in the retardation module, overall and nonoccurrence reliabilities for the signing category and two subcategories (physically prompted and nonphysically prompted) averaged (mean) at least 91%. Occurrence reliabilities averaged 61% for signing and 80% and 61% for physically prompted and nonphysically prompted subcategories, respectively. The lower occurrence averages were due to a lower frequency during baseline in which a small number of disagreements resulted in a low percentage. For instance, throughout all reliability checks during the study, observers disagreed more than once on the occurrence of signing or on the occurrence of nonphysically prompted signing on only five occasions, and more than twice on only three occasions. For the vocalization category in the retardation module, overall, nonoccurrence, and occurrence reliabili-

ties averaged 88%, 96%, and 58%, respectively. Observers disagreed more than twice on the occurrence of a vocalization during only four reliability checks.

In the autism module, all overall and nonoccurrence reliabilities for the signing category and subcategories averaged at least 93%. Occurrence reliabilities were 74% for signing and 99% and 61% for the physically prompted and nonphysically prompted subcategories, respectively. Again, the lower reliability averages resulted when the frequency of the behavior was low. Throughout all reliability checks, observers disagreed on the occurrence of signing more than once on only four occasions and more than twice on only one occasion. Similarly, there were only five occasions with more than one disagreement on nonphysically prompted signing and two occasions with more than two disagreements. For the vocalization category, overall reliability averaged 89%, nonoccurrence 72% and occurrence 84%.

Experimental Procedures

Baseline. During the baseline condition, observations were conducted as described previously at the four time periods on the retardation and autism modules. These specific periods were chosen for three primary reasons. First, these periods included times when the day shift of staff were present (12:15 and 1:15) as well as the evening shift (3:15 and 5:15). Second, these periods included times when different types of unit activities were occurring. During the 12:15 and 5:15 periods, lunch and supper were occurring, respectively, whereas during the 1:15 and 3:15 times, loosely structured leisure activities were taking place. Hence, by using these four time periods the program could be evaluated while different staff members were present and during different types of activities. Finally, times earlier in the day were unavailable because residents were away from the facility attending summer school sessions.

During mealtimes, residents ate at small tables in groups of four or five. Staff members typically set the tables and served the food and residents ate independently. Additional staff responsibilities included interacting socially with the residents and maintaining the orderliness of the mealtime process. During the leisure times no formal, structured activities occurred. Residents were essentially allowed to do as they pleased provided no obviously inappropriate behaviors occurred such as aggression/disruption. Toys were available in both modules although residents played with them infrequently. Staff responsibilities during the leisure times included interacting socially with the residents as well as preventing/stopping obviously inappropriate behaviors. Also, during part of the leisure times, small snacks (e.g., fruit juices, cookies) were provided. Staff members typically made the snacks available on a table or cart and residents ate them independently.

During each of the four time periods, staff intermittently used signs in their interactions and verbally requested signs from some residents, although such activities were very infrequent. As noted earlier, both staff and residents had participated in various sign training programs and staff had been encouraged to incorporate signs into their daily routine in compliance with a facility-wide program philosophy. However, no procedures had been specified or taught to staff regarding how to incorporate signing into the job routine and no systematic supervisory procedures had been implemented to assist staff in this respect.

During each observation period, observers attempted to remain as far away from the residents as possible yet still be able to hear and see resident behaviors. Staff were aware that sign language behaviors of the residents were being recorded although they were not aware of the specific behavior categories. Observers had been present in the retardation module on most of the days over a 1-yr period prior to baseline taking data for various projects. Similarly, observers

had been present in the autism module on the majority of days during the 3 mo the module had been in existence. Hence, the observers' presence was not a novel situation for staff or residents, a feature that should have reduced any reactive effect of observer presence (Johnson & Bolstad, 1974).

Signing program. As with other programs using incidental teaching-type procedures (Hart & Risley, 1980), a variety of activities was incorporated into the daily routine in an attempt to increase resident signing. However, a major deviation from earlier programs occurred in that the current format included procedures for staff to prompt resident interactions, specifically and frequently, as opposed to waiting for the residents to initiate an interaction. Three general types of activities were implemented simultaneously: (a) Changing the physical environment to prompt signing, (b) altering routine staff-resident interactions to prompt, manually guide, and/or reinforce resident signing, and (c) conducting mini-training sessions. Throughout all activities, a simultaneous communication approach was used (Carr, 1981) in that staff verbalized what they were signing to the residents.

The first type of procedure, *changing the physical environment*, involved a "reinforcer display" shelf or table on which objects of a predicted reinforcing value to the residents could be placed, such as snacks and toys. The objects could be seen by the residents but could not be reached by them without help from a staff member. When the objects were displayed on the shelf and a resident approached the shelf or a staff member, the staff person waited approximately 5 sec for the resident to sign that he or she wanted an item (e.g., signing the item's label, or a request sign such as "want" while looking at a specific item). If the resident presented such a sign, the staff member gave the item to the resident and praised his or her signing. If the resident did not provide a sign within the approximate 5 sec, the staff member asked one or more of the following questions: (a) if the resi-

dent wanted an item; (b) if he or she would name (sign) a specific item ; or (c) after the staff member pointed to and labeled an object verbally, if that was the correct label (e.g., "Is this a radio?"). If a resident responded to a question with a relevant sign (e.g., signed "yes" to the question "Do you want the juice?" or signed "apple" after the staff member pointed to an apple), the staff member praised the resident and presented the object if the resident had signed that he or she wanted it. If a resident did not respond to a specific question with a relevant sign, the staff member manually guided the resident in forming a sign while verbally labeling the actions.

While the objects were displayed on the shelf, staff interacted with each resident at least once with one or more of the procedures just described. If a resident did not approach the display shelf independently, a staff member requested him or her to do so and provided a physical prompt, if necessary, such as gently pushing the resident and pointing to the shelf.

The second general type of activity included in the signing program involved *altering routine staff-resident interactions to prompt, manually guide, and/or reinforce resident signing*. With these procedures, staff incorporated signing within their usual interactions with residents. For instance, as an example of a *prompting* activity, when it appeared that a resident wanted something such as pointing to a water fountain, the staff member modeled the sign for "drink" and/or requested that the resident show the sign for "drink." If the resident did not sign "drink," or another relevant sign such as "no," within approximately 5 sec, the staff member *manually guided* the resident's hand(s) in forming the sign. Following the signing behavior of the resident, whether or not it was manually guided, the staff member attempted to *reinforce* the signing by providing access to the object and praising the resident's signing.

A similar *prompt, manual guidance, and reinforcement* sequence was incorporated into other

types of interactions. For example, staff intermittently approached a resident and asked a simple question that could be answered with a target sign (e.g., staff carried a toy to a resident and asked if he or she wanted to play . . . if the resident reached for a toy the staff member used the *prompt, manual guidance, reinforcement* sequence with a "yes," "play," or "want" sign; if the resident turned away from the staff member, the sequence was used with a "no" sign). Similarly, staff members intermittently interrupted ongoing resident activities (e.g., watching TV) and asked a resident a question (e.g., "What is the sign for TV?") that could be answered with a target sign. Staff were instructed to conduct such interactions as often as possible without detracting from other job responsibilities.

The procedures used to alter routine staff-resident interactions as just described were also conducted during mealtimes. However, to take advantage of the reinforcing value of the food, additional procedures were used to increase signing. These included: requesting the residents to label (sign) a food item prior to it being served, providing smaller portions of food than usual in order to set the occasion for a sign for "more" (although the total amount of food made available during the entire meal remained the same) and asking the residents if they were "all done" with the meal when they finished eating (requiring a "yes" sign from the residents).

The third general type of training activity was *mini-training sessions*. Intermittently during the day, a staff member conducted brief, 3-5 min, training activities with the residents. Within each session, an object identified by a target sign (e.g., bed) was selected and several questions about the object were presented that could be answered with a target sign (e.g., "What is this?" . . . requiring the sign for "bed"; "This is a bed, right?" . . . "yes"). For every question asked, the prompt, manual guidance, reinforcement sequence was used as described previously. The main difference between the mini-training sessions and the altering of routine staff-resident

interactions was that the latter occurred intermittently during the day as a normally occurring opportunity arose whereas the former represented a more overt and longer break in the normal routine.

In addition to the three general types of training activities just described, staff attempted to model one or more of the 17 target signs whenever they interacted with the residents. Also, throughout all activities, staff attempted to reinforce all occurrences of resident signs with praise. Similarly, although not provided as frequently as praise, small food items were provided contingent on resident signing. Typically, edible treats were presented only when staff were using the food as part of other structured training programs such as toilet training.

Because a considerable amount of literature reflects difficulties in managing staff performance in residential facilities (e.g., Burg, Reid, & Lattimore, 1979; Iwata *et al.*, 1976) specific procedures were conducted to ensure staff adherence to the signing program components. A behavioral supervision model was used that has been effective previously in institutional staff management (Faw *et al.*, 1981; Ivancic *et al.*, 1981; Korabek, Reid, & Ivancic, 1981). The model included one initial in-service at the beginning of the program for each shift of module staff followed by a series of supervisory prompting and feedback procedures throughout the program. During the in-service, the importance of using sign language with the residents was reviewed with staff in a manner similar to what the staff had received prior to the study. Additionally, written and vocal descriptions of the three general types of training activities were provided as well as written and vocal instructions to model and reinforce resident signing as much as possible. The in-service was conducted by two staff supervisors (experimenters) and lasted 30-45 min.

Following the initial in-service, two types of procedures designed to prompt the staff to conduct components of the signing program were implemented: supervisor modeling and brief

supervisory interactions with staff members. During the modeling component, which occurred during the first half of the work shift for both the day and evening shifts, the supervisor interacted briefly (1-3 min) with one or more residents using signs while in the presence of a staff member(s), although not at a time when formal observations were conducted. Supervisor modeling occurred on 43% of the days in which the program was in effect across both staff shifts in the retardation module and 59% in the autism module. During the interactions with staff, the supervisor questioned how a resident was doing with signing and/or solicited procedural questions from the staff in an attempt to give supervisory attention to the signing program. Such interactions occurred on 57% of the days in which the program was in effect in the retardation module and 68% in the autism module. The supervisory interactions in which the prompting occurred also allowed the supervisor to provide feedback to staff. Feedback to staff members included praise statements for previously observed signing interactions and a presentation and description by the supervisor of a graph of the frequency of resident signing.

Follow-up. Follow-up observations occurred on both the autism and retardation modules, at time periods of 5 and 17 wk after termination of formal observations. Follow-up observations occurred during both the 3:15 and 5:15 time periods on the retardation module and at 5:15 and 7:00 on the autism module. The latter period was selected on the autism module because of a schedule conflict with the usual 3:15 time and because essentially the same activities occurred during both times (i.e., informal leisure time). Follow-up observations were not available for the earlier time periods (12:15 and 1:15) as the residents had returned to school during the day at the beginning of the fall term and, hence, were not on the living module at those times (which also resulted in a relatively short evaluation period for the signing program during the 12:15 and 1:15 periods). During the time between the end of the formal program

condition and the follow-up observations, staff were provided with intermittent supervisory prompts and feedback for conducting the signing activities although no formal observations of resident signing occurred.

Experimental Design

A multiple baseline design across times of day and participants was used to evaluate effects of the signing program. Following baseline observations, the program was implemented sequentially on the autism module while the day shift of staff was on duty (12:15 and 1:15 sessions), then on the retardation module first during the day shift, and then during the evening shift (3:15 and 5:15) and finally, during the evening shift on the autism module.

Staff Acceptability Evaluation

In order to evaluate staff opinion regarding signing training activities, a questionnaire was completed by 11 staff members following termination of the program (four staff members were unavailable due to resignations or temporary leave). When presented with the questionnaire, staff were requested to respond to the questions in terms of using signs with the residents on their living units and to return the questionnaire to the supervisor's mailbox at a later time in order to ensure anonymity.

RESULTS

Signing Results

Mean percentage of observation intervals per session in which signing (physically prompted or nonphysically prompted) occurred for all residents in both modules for each time period is represented by the solid line in Figure 1. An increase in signing occurred during each time period the program was in effect, relative to baseline. Baseline means for the retardation module averaged 13% (range 0 to 27% across sessions), 9% (0 to 25%), 6% (0 to 27%), and 8% (0 to 20%) for the 12:15, 1:15, 3:15, and 5:15 time periods, respectively. During the signing

program, averages for the respective time periods increased to 41% (13-92%), 58% (17-89%), 91% (80-100%), and 57% (25-100%). Means for the respective time periods in the autism module increased from 12% (0-58%), 14% (0-33%), 10% (0-75%), and 15% (0-44%) during baseline to 41% (22-78%), 59% (10-83%), 97% (75-100%), and 62% (25-89%) during the program. Because of the relatively short duration of the signing program during the 12:15 and 1:15 time periods due to the onset of the school term, an evaluation of the effects of the program was less clear than with the 3:15 and 5:15 periods where there was a larger sample of data. In the latter periods, the initial changes that accompanied the implementation of the program maintained throughout the condition. Also, the 5- and 17-wk follow-up results indicated the increased signing maintained within the range that occurred during the program and above the mean level for baseline.

As indicated in Figures 2 and 3, results with individual resident signing coincided with the respective group changes. In the retardation module there were increases in mean percent signing for each resident when the program was implemented during each of the four time periods except for one resident (Kathy) during the 12:15 period. During two time periods, comparisons were prohibited because individuals were not present during the signing condition. In the autism module, mean level of signing increased for each resident during each time period while the signing program was in effect.

Physically Prompted versus Nonphysically Prompted Signing

An analysis of the relative amounts of physically prompted versus nonphysically prompted signing revealed differences between residents in the retardation and autism modules, although there was a general correspondence between total signing and nonphysically prompted signing as indicated in Figure 1. In the retardation module, physically prompted signing was generally

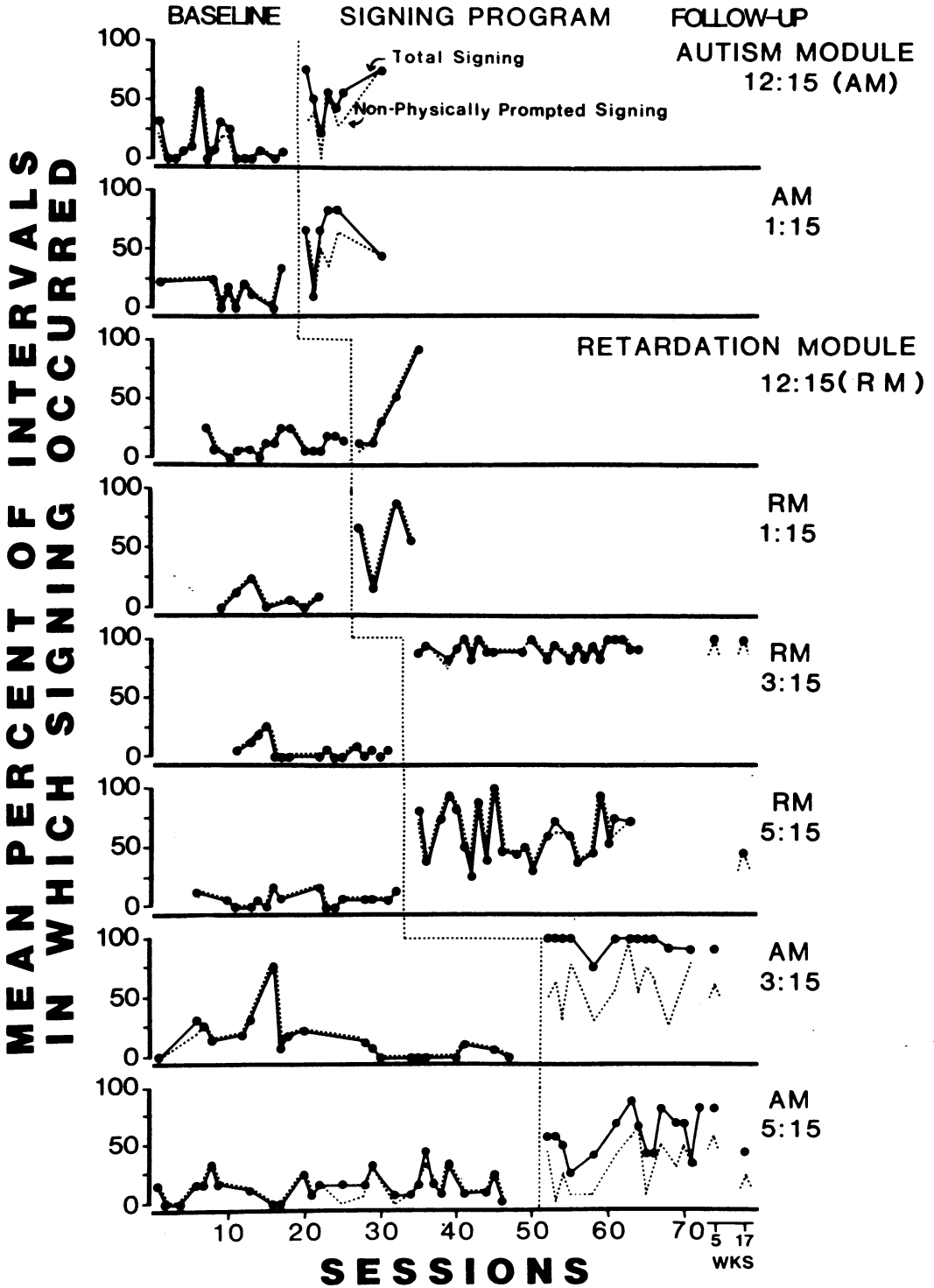


Fig. 1. Mean percentage of observation intervals in which any signing occurred (solid line) and in which nonphysically prompted signing occurred (dashed line) for all residents in the retardation (RM) and autism (AM) modules across all sessions during baseline and the signing program for each of the four time periods.

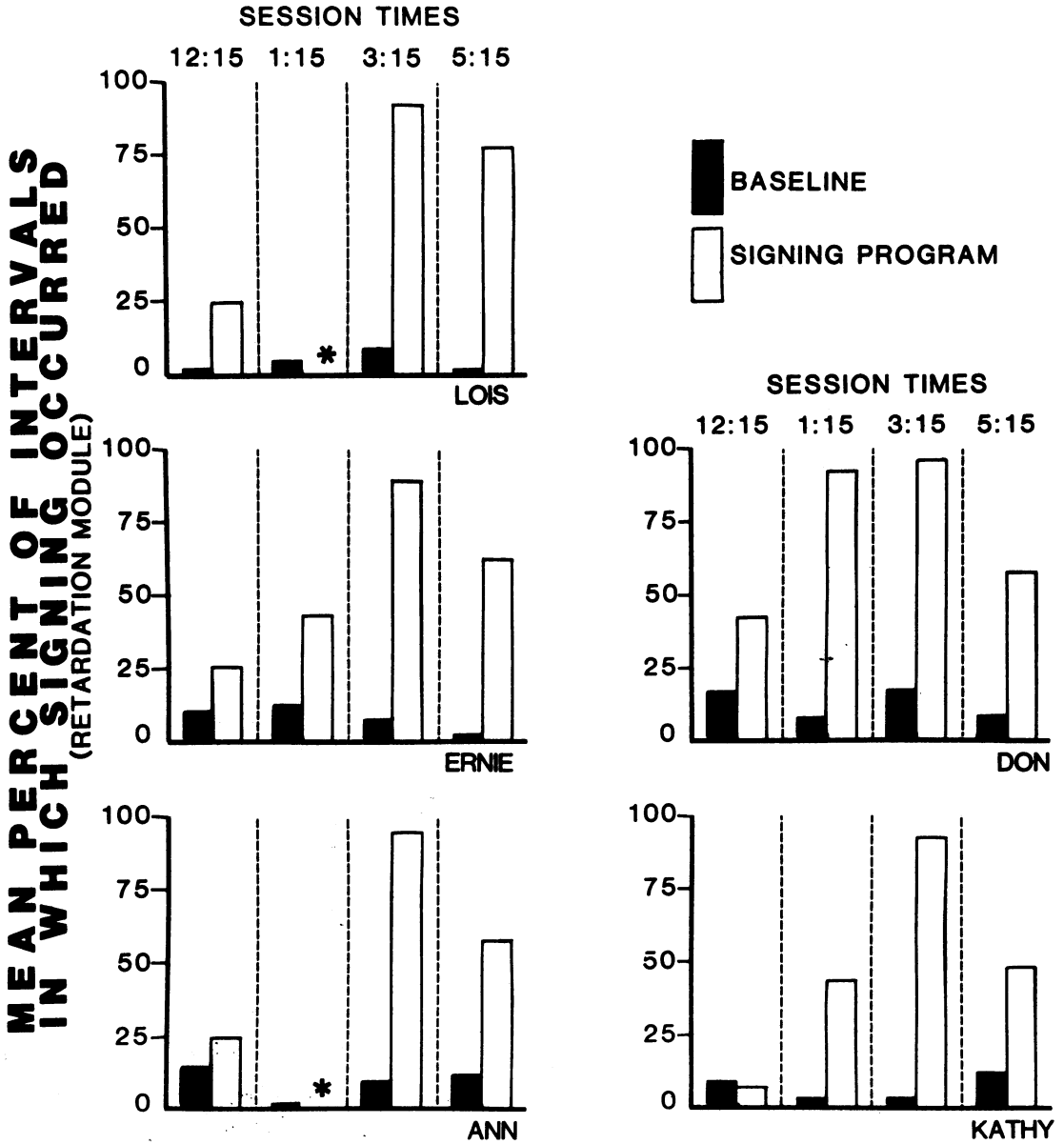


Fig. 2. Mean percentage of signing during baseline and the signing program for each resident in the retardation module for each of the four time periods. Asterisk indicates the resident was not present during that time period during the program.

infrequent and always averaged less than nonphysically prompted signing. For three residents (Lois, Don, Kathy), physically prompted signing averaged less than 10% of observation intervals for each experimental condition for each time period and, hence, all remaining signing was nonphysically prompted. For Ernie, physically prompted signing averaged 22% during the

signing program in the 1:15 period (nonphysically prompted signing was 44%) and 12% (nonphysically prompted 89%) in the 3:15 period, but 0% for the other periods for both experimental conditions. Ann's physically prompted signing was more consistent (although averaging 17 to 58 percentage points less than nonphysically prompted signing per period),

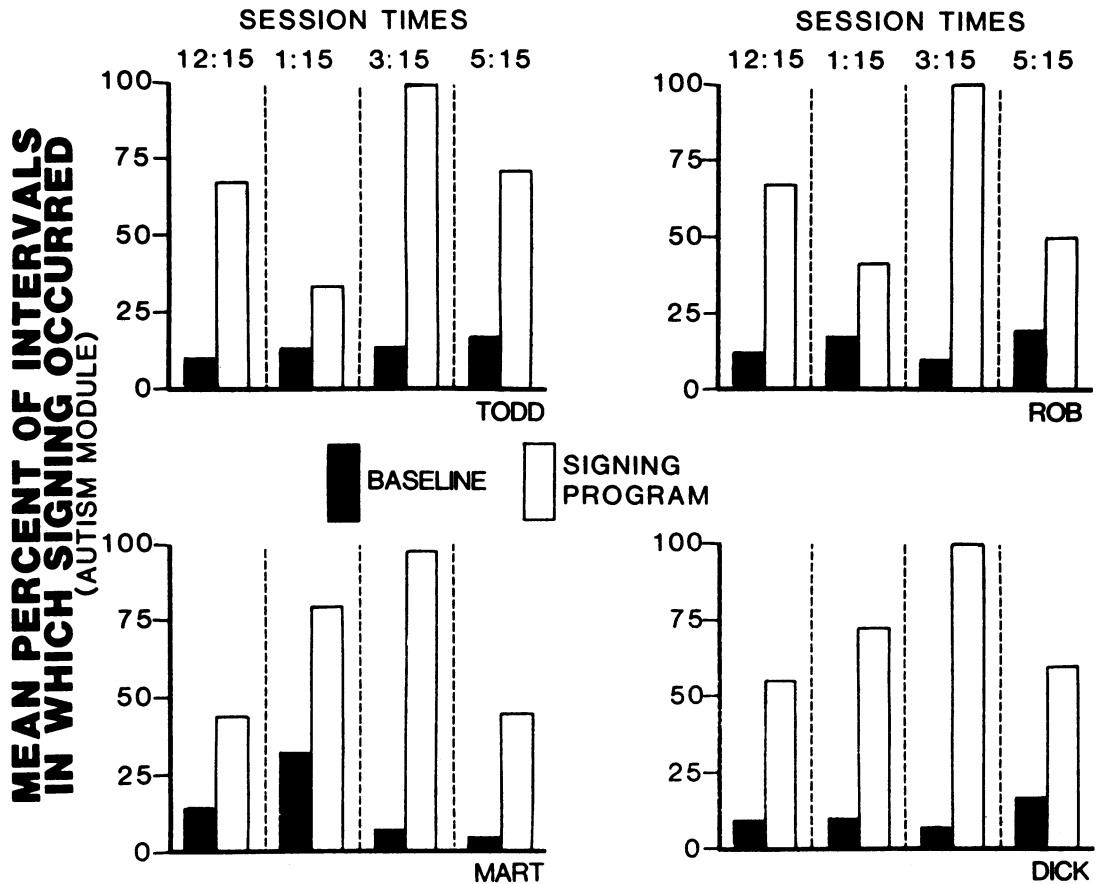


Fig. 3. Mean percentage of signing during baseline and the signing program for each resident in the autism module for each of the four time periods.

averaging 8%, 33%, and 18% for the 12:15, 3:15, and 5:15 periods, respectively (Ann was not present during the 1:15 period).

In the autism module, physically prompted signing was more frequent than in the retardation module. Table 2 presents the mean percent occurrence per condition of physically prompted and nonphysically prompted signing across all observation intervals for the four residents. During baseline, physically prompted signing averaged less than 12% during each time period for each resident except for Mart during the 1:15 period. Nonphysically prompted signing was slightly higher, although still averaging less than 20% in all time periods for all four residents, except for Mart during the 1:15 period again. During the signing program, both physically

prompted and nonphysically prompted signing increased for each resident during each time period. Averaged across all four time periods during the program, physically prompted signing occurred at a mean 57% for Todd, 57% for Dick, 59% for Mart, and 47% for Rob. Nonphysically prompted signing for the four residents averaged 47%, 57%, 35%, and 45%, respectively.

Vocalization Results

The occurrence of vocalizations both across and within individual residents was highly variable across experimental conditions (Table 3). Mean percentage of vocalizations for four residents, Ernie, Lois, and Ann (retardation) and Dick (autism), increased for the majority of time

Table 2

Mean percentage of all observation intervals with physically prompted and nonphysically prompted signing during the baseline (B'line) and the signing program (S) conditions for each resident in the autism module during the four observation periods.

Resident	Type Signing	Experimental Conditions							
		12:15		1:15		3:15		5:15	
		B'line	S ^a	B'line	S	B'line	S	B'line	S
Todd	Physically Prompted	2	47	0	17	2	100	7	64
	Nonphysically Prompted	9	46	13	25	12	67	15	50
Dick	Physically Prompted	0	39	11	60	0	97	0	33
	Nonphysically Prompted	10	39	11	53	9	90	17	46
Mart	Physically Prompted	9	33	33	67	2	92	1	43
	Nonphysically Prompted	9	17	33	60	7	50	4	14
Rob	Physically Prompted	0	28	0	25	0	90	1	43
	Nonphysically Prompted	10	50	8	33	10	62	19	36

^aSince the data represent the mean percentage of *all* observation intervals in which each type of signing occurred (as opposed to the percentage of intervals with any signing that was either physically prompted or nonphysically prompted), the totals of the percentages for the respective categories of signing do not necessarily equal 100.

periods in which they were present while the program was in effect. For two residents, Mart and Rob (autism), decreases in vocalizations occurred for the majority of time periods. No consistent changes were noted for the other residents.

Results of Staff Acceptability Questionnaire

Results of the acceptability questionnaire are presented in Table 4. Overall, staff reports were favorable toward the signing program: 45% of the staff reported that manual signing was very useful in helping them to communicate with residents, and all staff reported that signing was at least somewhat useful. Also, all staff reported that it would be helpful to learn additional signs and that it would be useful to teach more signs to the residents. Finally, 73% of the

staff reported that using signs did not interfere with their responsibilities whereas 27% reported a little interference.

DISCUSSION

Results indicated that the training program was effective in increasing the use of manual signing by profoundly retarded and autistic youth within their daily environment. All residents engaged in noticeably increased signing activities while the program was in effect and the increases generally maintained during 5- and 17-wk follow-up observations. Also, staff reported that they were able to implement the program with minimal interference with their other caregiving responsibilities and that the program was acceptable to them.

Table 3

Mean percentage of observation intervals with vocalization during baseline (B'L) and the signing program (S) for each time interval.

	<i>Time Period</i>							
	<i>12:15</i>		<i>1:15</i>		<i>3:15</i>		<i>5:15</i>	
	<i>B'L</i>	<i>S</i>	<i>B'L</i>	<i>S</i>	<i>B'L</i>	<i>S</i>	<i>B'L</i>	<i>S</i>
Retardation								
Module								
Lois	58	58	42	— ^a	45	91	43	70
Ernie	31	33	29	78	40	77	7	57
Ann	6	17	8	—	20	9	20	26
Don	22	67	21	22	12	3	5	16
Kathy	0	0	9	0	6	0	0	4
Autism								
Module								
Todd	12	42	53	42	30	67	26	25
Dick	80	60	67	80	67	72	73	90
Mart	44	28	87	93	53	42	58	17
Rob	87	47	100	84	77	82	73	67

^aResident was not on the living unit during this time period.

The increases in signing by the residents assume special significance when considering the well-noted difficulty in teaching vocal language to autistic and profoundly retarded persons as mentioned earlier. Also, the results become more important when considering that the residents were using the signing skills within their daily environment with their usual caregivers, as opposed to within more formal training sessions that are typically conducted by professionally trained therapists in richly staffed therapy programs away from the daily living situation. However, the increases in signing do not necessarily indicate that the use of such skills by the residents was under the control of stimuli that were totally natural to the usual environment (e.g., Sosne *et al.*, 1979). That is, although informal observations indicated that some residents did use signs without any apparent verbal or physical prompt by staff persons (especially in the retardation module), considerable staff activity was generally required to evoke and maintain resident signing. Whether the amount and/or quality of staff activity could be reduced such that the residents would use their skills in

Table 4

Questions and staff responses to acceptability questionnaire.

<i>Question</i>	<i>Response Category</i>	<i>Number of Staff Responses</i>
How frequently do you use manual signs with the residents?	Very frequently	3
	Somewhat frequently	8
	Not at all	0
How useful are the signs in helping you to communicate with the residents?	Very useful	5
	Somewhat useful	6
	Not useful at all	0
When you use signs, how much does it interfere with your other responsibilities?	Interferes very much	0
	Interferes a little	3
	Doesn't interfere at all	8
How helpful would it be if you were taught more signs?	Very helpful	7
	Would help a little	4
	Not helpful at all	0
How useful would it be to teach the residents more signs?	Very useful	8
	Somewhat useful	3
	Not useful at all	0

the daily environment without specific teaching-type interactions by staff represents an area in which additional research would be useful. A specific direction for this line of research would be to use a packaged program as in this study to increase signing within the usual living setting and then evaluate the relative effects over time of the different program components. The frequency of more intrusive teaching strategies (e.g., physical prompts) should be gradually replaced by less intrusive ones until signing occurred under essentially natural conditions (e.g., an object observed by a resident would evoke a signing request by the resident to a staff person).

Although a detailed analysis of each specific component in the training program was not provided in the current investigation as just alluded to, an evaluation of two major components was conducted in terms of the use of physical versus nonphysical prompts. This breakdown was considered to be the most important difference in type of prompt, given the skill levels of the

residents, because physically prompted signing represented a very rudimentary communication attempt as it was more a function of staff behavior (i.e., staff manually guided the residents in signing behaviors) whereas nonphysically prompted signing represented more active communication by the residents. Results of this general evaluation indicated noticeable differences in the types of signing by the autistic youth versus the profoundly retarded individuals. For the autistic residents, the increases in signs that were not physically prompted were generally less than those for the profoundly retarded persons. A conclusive explanation for such differences is not possible at this time. However, some possibilities can be provided. First, the residents in the retardation module had received more intensive training in signing skills prior to this program due to their participation in a previous signing project (Faw et al., 1981), although all residents had received some training in signing. Second, the autistic residents were at a lower skill level in terms of general adaptive behavior (except possibly for Dick in the autism module) and were younger than the profoundly retarded residents. Finally, characteristics idiosyncratic to the disability of autism may have prohibited a greater amount of progress, such as the inability to attend to stimuli in different modalities when presented simultaneously (Carr et al., 1978). Throughout the project, staff used the simultaneous communication approach that involved manual signing and vocalizing the sign's label. This approach may have interacted negatively with the attentional deficiency of the autistic residents.

As noted previously, specific prompting and feedback procedures were used by the supervisors to ensure staff compliance with the program strategies. Based on informal observations by the supervisors, compliance of the staff appeared satisfactory throughout the program. If staff performance had not appeared satisfactory and/or residents did not noticeably increase their signing, more formal monitoring of staff activities would have been conducted. Special concern was

warranted on the issue of staff compliance because the success of the program was dependent on the staff members' performance. Essentially, staff were expected to incorporate procedures typically used in formal training sessions between one therapist and one client into their daily job routines, although the procedures were used for only brief periods of time on an intermittent basis. Hence, considerable changes in staff behavior were needed in order to bring about changes in resident behavior. Because of the importance of staff activities in this respect, as well as frequent reports of unsatisfactory staff performance in institutional settings (e.g., Burg et al., 1979; Iwata et al., 1976), it is recommended that future programs include specific supervisory interactions with staff as conducted in this program as well as being prepared to implement a more formal staff monitoring system if necessary.

Results with resident vocal behavior support Carr's findings (1979) that simultaneous vocal/sign training affect vocal behavior differentially across individuals. In this study, it appeared that the increases in vocal behavior that accompanied the signing program occurred with four of the highest skilled residents, two of whom were the only residents who demonstrated any vocal imitation skills. Recent research has indicated that vocal imitation skills can be a predictor of some speech development that accompanies simultaneous communication training (Carr & Dores, 1981). However, such an explanation here is post hoc and points to the need for continued research on specific client variables that lead to multiple behavior changes during simultaneous vocal/sign language training.

As a final note, the caution expressed by Faw et al. (1981) warrants reiteration. That is, the promising results of this study regarding the use of signing by seriously developmentally disabled youth should not be taken as support for the widespread use of sign training with such a population. Manual signing is an abnormal method of communicating in most settings and is recommended only in those cases where clear evi-

dence exists for the inability of clients to make significant progress in vocal language.

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Received August 25, 1981

Final acceptance February 8, 1982