

*INVOLVING INSTITUTIONAL STAFF IN THE DEVELOPMENT
AND MAINTENANCE OF SIGN LANGUAGE SKILLS
WITH PROFOUNDLY RETARDED PERSONS*

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A program to involve institutional staff in developing manual sign language skills with profoundly retarded persons was evaluated. In Experiment 1, six direct care staff, with close supervision, taught a small repertoire of signs to six profoundly retarded residents who had not benefited from previous training in vocal language. Training was conducted in a group format using instructions, modeling, manual guidance, contingent reinforcers, and feedback. During training, all residents learned to identify pictures of objects with manual signs. Generalization observations during unstructured times on the residents' living unit indicated that staff used their signing skills with the residents in addition to their vocal interactions but the residents did not increase their signing or vocalizing. In Experiment 2, the residents' skills in signing with real objects on their living unit as opposed to pictures of objects were evaluated and provided with additional training where necessary. Results indicated that all participating residents learned to communicate with signing during structured interactions on their living unit, and the skills maintained during follow-up assessments ranging from 39 to 49 weeks. Results are discussed regarding the variable generalization effects noted as well as the general benefits and disadvantages of teaching manual signing skills to profoundly retarded persons.

DESCRIPTORS: sign language skills, staff training, development, maintenance, retarded residents

A significant handicap of persons with profound retardation is the lack of effective communication skills. Many profoundly retarded individuals exhibit little or no expressive language (Berkson & Landesman-Dwyer, 1977), with a

specific estimate indicating that as many as 75 to 80% have absent or near absent speech (Garcia & DeHaven, 1974). Recently, behavioral researchers have investigated the use of nonvocal communication systems to help overcome such language deficiencies.

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One nonvocal approach that has particular promise is manual sign language. Encouragement for the use of manual signing by the profoundly retarded stems from recent research which demonstrated the teaching of initial signing skills to autistic children (Carr, Binkoff, Kologinsky, & Eddy, 1978). In addition, a number of recent descriptions of general signing programs with severely and profoundly retarded persons have suggested that such individuals might benefit from sign language training (e.g.,

Grinnell, Detamore, & Lippke, 1976; Hobson & Duncan, 1979; Salisbury, Wambold, & Walter, 1978). Unfortunately, however, despite a large body of literature on manual signing (see Lloyd, 1980 for a bibliography), experimentally controlled evaluations of signing programs have been lacking (Hopper & Helmick, 1977; Moores, 1978). Subsequently, it is not surprising to find numerous calls for research on teaching signing skills to retarded populations (Bricker, 1972; Hopper & Helmick, 1977; Schiefelbusch, 1978).

A critical component in language training is providing support for newly trained skills in the trainee's natural environment (Garcia & DeHaven, 1974; Sailor, Guess, & Baer, 1973). Clearly, those persons with whom a retarded person normally spends his or her time need to be able to respond to the language skills stressed in specific language training sessions. When dealing with sign language, it seems most crucial to involve caretakers in the natural environment because their clients are being taught to communicate in a way different from the caretakers' normal language. For many profoundly retarded persons, this means involving institutional attendants, because a growing percentage of the resident populations in institutions for the developmentally disabled are profoundly retarded (Scheerenberger, 1976) and attendants spend more time with the residents than any other staff (Bensberg & Barnett, 1966). However, although there is widespread discussion of the importance of direct care staff using sign language with residents in signing programs (Hall & Talkington, 1970; Kopchick, Rombach, & Smilovitz, 1975; Topper, 1975), published research that specifically describes and experimentally evaluates methods of involving direct care personnel in signing activities with the retarded seems nonexistent.

The purpose of this investigation was to evaluate a program for involving institutional staff in developing and maintaining manual sign language skills with nonvocal, or minimally vocal, profoundly retarded persons. Measures were in-

cluded to evaluate the impact of the resident training program on the language interactions of profoundly retarded persons in their daily living environment outside of formal training sessions. Also, an evaluation of the long-term maintenance of the signing skills was included.

EXPERIMENT 1

METHOD

Participants

Staff. All direct care staff (three men and three women) on the evening shift on one unit of a state residential facility for developmentally disabled persons participated. Job responsibilities and biographical characteristics were similar to those for direct care staff reported previously (Iwata, Bailey, Brown, Foshee, & Alpern, 1976). These staff persons were selected because they spent the most time with the residents (during the day shift, the residents were off the unit attending school programs).

Residents. Six developmentally disabled residents, three young men and three young women, participated. Ages, lengths of institutionalization, and I.Q. estimates from most recent psychological assessments are presented in Table 1. All residents were ambulatory and profoundly retarded, considering overall intellectual and adaptive functioning (Grossman, 1977). Each resident displayed independent functioning in basic self-help skills, such as eating with a spoon, although staff monitoring was necessary. Assistance was required from staff for more advanced self-help skills (e.g., buttoning a coat). Two residents occasionally verbalized one or two word phrases, although the verbalizations were intelligible only to staff who frequently interacted with them. Preliminary testing indicated that one of these residents could vocally identify two of the target objects to be taught in this study and the other resident could identify four. Four residents did not speak any intelligible words and two were legally deaf. Two residents occasionally engaged in self-injurious behavior (e.g., hand biting) and two were occasionally aggressive toward

Table 1
Summary of Resident Characteristics

<i>Resident</i>	<i>Age</i>	<i>Length of Institutionalization</i>	<i>Most Recent I.Q. Estimate</i>
KRISTEN	20	19	18
DAN	17	10	22
ANN	18	14	12
LORI	16	11	22
SAM	22	18	— ^a
FRED	17	10	11

^aExact I.Q. score unavailable due to his discharge from the facility.

other persons. The residents lived on one unit with nine other residents.

These residents were selected for the study for two reasons. First, they met previously discussed criteria regarding appropriateness for sign training. More specifically, previous training in vocal language had not been successful (Carr, 1980; Hopper & Helmick, 1977; Moores, 1978), all were well over the age of four (Carr, 1980), and all lacked other types of effective communication skills (Hopper & Helmick, 1977). Second, the residents demonstrated sufficient compliance behavior to facilitate training in that they generally complied with one-step requests from staff.

Supervisors. Staff supervisors (experimenters) included a unit supervisor who had administrative responsibility for the living unit and an assistant responsible for training activities.

Setting

The experimental setting included the resident dining and living room on the living unit and offices adjacent to the living unit.

Manual Sign Vocabulary

Nine manual signs were targeted to be taught to the residents. These signs were descriptors for objects or food/drink items and were arbitrarily categorized into three groups; Group 1: candy, bed, table; Group 2: apple, milk, radio; and Group 3: juice, T.V., banana. These signs were

selected for three reasons. First, each sign was considered by center personnel to be one that could be used in typical interactions between staff and residents on the living unit. Second, each sign had an obvious and generally available referent on the living unit. Third, these particular signs were deemed to be easy to form topographically, relative to other possible signs. A fourth group of signs (water, toy, soap) was added as a control group (see Baseline).

Behavior Definitions

Two sets of behavior definitions were used, one for assessing resident signing skills during training, and one for evaluating generalization effects of training on interactions between residents and staff on the living unit.

Definitions for assessments of resident skills. An occurrence of a target sign was defined as behavior that included all critical components for any one of the targeted signs. 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 of the fingers and hand(s) in respect to the body. For example, the critical components for the sign "table" were the movement of the arms outward in opposite directions to the sides of the body, with knuckles of the hands facing up and the hands in front of the body. Nonoccurrence of a target sign was defined as the lack of any attempted sign, or movement of the fingers and hand(s) that did not match the critical components for any target sign.

Definitions for generalization observations. Two categories of resident behavior were observed on the resident living unit: (a) signing; the same definition used in formal assessments was used for generalization observations except that during the latter, the resident had to be looking at another resident or staff member while signing; (b) word vocalizing; any vocalization that included an intelligible word while the resident was looking at another person. Staff behavior was also observed on the living unit using the same definitions, except that the staff

member had to be looking toward a resident to be scored as vocalizing or signing.

These categories were included for the following reasons. First, concerning resident vocal behavior, it was possible that the residents would increase their vocalizations after learning signing skills, as reported elsewhere with the use of sign language (Hobson & Duncan, 1979; Kahn, 1977; Reich, 1978), although experimental evidence to support such increases in vocal behavior with the profoundly retarded is minimal (Hopper & Helmick, 1977). Second, regarding staff signing, a beneficial occurrence would be that staff would use their signing skills in their daily interactions with residents. Third, regarding staff vocal behavior, it was desired that staff engage in vocal interactions with residents in addition to engaging in signing interactions such that a simultaneous vocal/signing environment would occur (Hopper & Helmick, 1977).

Observation System

Observations were conducted by an experimenter or assistant. Observers were trained via instructions and modeling, passing a written test on the components of all signs, scoring a prepared videotape, and observing on the resident living unit with feedback from the experimenter.

Observations of resident assessments. All assessments were observed through a one-way window. In order to maintain observer naiveté, the observer could not hear what was said in the assessment room, could not see the examiner's test materials, and was not aware of the order of presentation of signing trials (the order was randomized). The observer recorded the word label for the first sign that met the definition of a target sign that occurred after a given trial request by the examiner and before the next trial, or scored a nonoccurrence. A target sign recorded by the observer was scored correct only if it corresponded with the target sign requested for the same trial by the examiner.

Generalization observations. Periodic generalization observations occurred on the resident liv-

ing unit between 3:15 p.m. and 4:00 p.m. (informal leisure time) and between 5:15 p.m. and 6:00 p.m. (supper time). The observation system consisted of altering 10-sec observe and 5-sec record intervals, cued by a cassette recorder and earplug. A staff member's behavior was observed and recorded for 1 min, followed by a resident's behavior, with continued minute-by-minute alternation between all staff and residents for a total of 18 min. A partial interval system was used for recording the occurrence of all behavior categories with each category recorded a maximum of once per interval. If a target behavior did not occur during the 10-sec observe interval, then a nonoccurrence was scored. Observers were present on the living unit intermittently for 6 mo prior to baseline, which may have reduced the reactivity to their presence (Johnson & Bolstad, 1974). Also, observers were frequently on the unit for various other projects and staff were unaware of the exact nature of what the observers were recording in this program, although staff were aware of the observers' presence.

Reliability

Observations of resident assessments. Reliability checks occurred on 70% of all sessions and during all experimental conditions. Reliability was calculated for occurrence and nonoccurrence of target signs on a trial-by-trial basis using the formula of number of agreements divided by the number of agreements plus disagreements and multiplied by 100. An agreement on occurrence was scored only when both observers recorded the target sign requested by the examiner on a given trial. Occurrence reliabilities for each group of signs averaged (mean) 95%, 98%, and 89% for groups one through three, respectively, (no occurrences were recorded for Group 4) and nonoccurrence averaged 98%, 82%, 85%, and 100%, respectively, for the four groups.

Generalization observations. Reliability observations were conducted on the residents' living unit on 40% of all sessions and during each

experimental condition. For all categories of staff behavior, occurrence and nonoccurrence reliabilities were 80% or above across all sessions. For resident behavior, occurrence and nonoccurrence reliabilities for the signing category were above 80%. For resident vocalizing, nonoccurrence reliabilities were at least 95%. For the occurrence of word vocalizations, there were only seven recordings during the entire study, with no agreement between observers for those instances.

Procedures

Prebaseline staff training. Prior to staff conducting sign training with the residents, procedures were conducted to teach staff a repertoire of manual signs. A manual was developed that included instructions for forming 34 signs as well as diagrams of each sign similar to those described by Carr et al. (1978). (A copy of the sign language manual is available from the second author.) In addition to the use of the manual, staff were trained by their supervisor in three or four brief sessions using instructions, modeling, practice, and feedback.

Baseline. Baseline consisted of assessments conducted by an examiner (experimenter) individually with residents while seated at a table. The examiner sat with his back to the observation window and faced the resident. Each assessment consisted of 12 signing trials. On each trial the examiner presented a Peabody card with the picture of an object and said to the resident, "(Name), what is the sign for (word label of the picture)?" For the two deaf residents, the examiner also signed the request; however, instead of signing the sign for the object, the examiner pointed to the picture. After the request, the examiner waited for the resident to present a sign or until a maximum of 10 sec elapsed and then presented the next trial. The examiner provided social praise for the resident attending to his instructions, noncontingent on accuracy of signing responses. To help make the assessments reinforcing, all sessions were followed by an edible treat.

Resident training. Prior to the implementa-

tion of resident training activities, procedures to teach staff how to train signing skills to residents were provided. An inservice training activity was conducted by supervisory personnel during two group meetings. A discussion of the importance of teaching signing skills as well as using those skills in the daily environment was provided, followed by a description of the training procedure to be used with the residents. Next, the supervisors role played the resident training procedure and answered staff questions. The supervisors also conducted a training session with the residents while the staff observed. The supervisors then observed each staff member conduct a session and provided feedback.

Training procedures with residents were conducted separately for each of three groups of signs. Training sessions lasted 10-15 min and were conducted four or five days per week. Prior to each training session, residents were individually tested on all three signs that comprised the target group from which sign(s) would be taught. Testing procedures were identical to baseline procedures except that all correct responses were followed by trainer praise and an edible treat. Data from these tests were used to indicate progress during training. Following the pre-session tests, residents were trained in groups of three. Each day the staff trainers arbitrarily selected three residents who were on the living unit at that time. The three residents who were trained together varied from session to session such that each resident participated in a three-person training group with each of the other five residents. All training sessions were conducted by two staff persons.

During training sessions, residents sat in a semi-circle facing the primary trainer. The secondary trainer stood behind the residents. The primary trainer provided instructions, modeled, and provided contingent feedback and edible treats for correct signing. The secondary trainer provided physical guidance as necessary and contingent praise. Training consisted of two general steps. In step one, the primary trainer presented a picture card of a target sign, asked the group

of residents "What is the sign for (name of item)?", and, along with the secondary trainer, praised and provided an edible treat for each resident correctly demonstrating the sign. If all residents responded correctly, the step was repeated and another sign was presented. If all residents did not respond correctly, then step two was conducted with the resident(s) who did not display the correct sign. Step two was initiated by the primary trainer requesting to one individual that he or she demonstrate the sign. If the individual resident correctly exhibited the sign, praise and edibles were provided and the primary trainer initiated step two procedures with the next resident (if any) who did not respond correctly in step one. If an individual resident did not respond correctly in step two, the primary trainer continued to hold the object card in view of the resident and modeled the correct sign while telling the resident, "(Resident's name), this is the sign for (name of object)" and the secondary trainer manually guided the resident's hand(s) to form the sign. Step two was then repeated with the same resident. The trainer then conducted step two procedures with another resident, if necessary. The entire two-step sequence was then repeated with the group for the same sign.

The three signs in each group of signs were taught individually. That is, on the first training session, one sign from Group 1 was taught. When the tests conducted immediately prior to training sessions indicated that the targeted sign was consistently being demonstrated, another sign from the same group was introduced into training. When new signs were introduced, reviews of previously taught signs were interspersed during training every time step two was completed with the new sign. The review involved one sequence of the two-step training process. Throughout training sessions, residents were intermittently praised by both trainers for attending to the primary trainer and complying with his or her requests as well as for attending to another resident with whom the primary trainer was interacting. Behaviors that interfered

with training, such as a resident standing up, were dealt with by both trainers verbally reprimanding the resident and the secondary trainer physically prohibiting the behavior where possible or manually guiding the resident back to the appropriate activity.

When the group of residents was trained to at least an average 80% proficiency across all signs as indicated on the tests conducted at the beginning of each training session, training was terminated and posttraining assessments were initiated. In all, each resident participated in 9 training sessions for Group 1 (one resident missed one session due to a home visit), 11 for Group 2 and 26 for Group 3.

After staff began training residents, several procedures were implemented by the supervisors in order to maintain the staffs' training interactions. The procedures were based on previously described staff supervision programs and consisted of supervisory prompts and feedback (Ivancic, Reid, Iwata, Faw, & Page, 1981) and overt observations (monitoring) of training by the supervisors (Burg, Reid, & Lattimore, 1979). Prompts in the form of modeling (supervisor assisting in conducting the training procedure) and/or overt observations of training sessions occurred at least twice per week during the resident training condition. Vocal prompts (e.g., "Who will be doing the sign training today?") occurred at least once per week during normally occurring staff meetings. Similarly, feedback (e.g., "Kristen seems to be making very good progress on Group 1") was provided at least once per week during normally occurring staff meetings.

In addition to the supervisory procedures implemented to maintain staffs' formal training activities, procedures were conducted to maintain their informal signing interactions on the living unit. Observations conducted prior to Experiment 1 indicated that staff did use signs in their daily interactions with residents after having received training with 34 signs. Intermittently throughout this experiment, the supervisors attempted to prompt on-unit signing by re-

mindings staff during normally occurring staff meetings of the importance of signing with residents. However, no reference was made to sign especially during supper or informal leisure times (when observations occurred). Rather, the supervisors discussed the importance of signing during all unit interactions whenever possible. Also, the supervisors modeled signing daily on the living unit by including signs when they interacted with residents.

Posttraining. Posttraining assessments were conducted under conditions identical to baseline assessments.

Experimental Design

A modified multiple baseline across groups of signs was used to evaluate effects of training. The modification in the design occurred in a manner previously reported (Gruber, Reeser, & Reid, 1979) in that baseline assessments were discontinued for all groups of signs whenever training on the target group was initiated. When training on the target group terminated, baseline assessments were resumed for the groups not yet trained and posttraining assessments were conducted for the target group until training was initiated for the next group. Throughout Experiment 1 only baseline assessments were conducted with Group 4.

RESULTS AND DISCUSSION

Mean percent correct signs for the group of residents increased at least 63 percentage points from baseline to posttraining assessments for each of the three target groups (Figure 1). There was no recording of a correct sign for the control group of signs (Group 4). During the last two assessments during baseline for Group 3, there was an increase in mean percent correct signing (mean 31%) relative to the first five assessments (mean 12%). However, the increase of 19 percentage points was considerably less than the increase of 45 percentage points which occurred between the last assessment of baseline and the first posttraining assessment.

Results for individual residents concurred closely with the group averages (Table 2). Mean percent correct signs increased by at least 33 percentage points from baseline to posttraining for each resident for each of the three groups of target signs.

Results of the generalization observations on the living unit indicated that staff included signing in their interactions with residents, with a mean occurrence of signing during 15% of observation intervals throughout Experiment 1 (including signs by all six staff members). Staff vocalizations to residents averaged 55% of observation intervals. No consistent changes in resident signing or word vocalizing on the living unit occurred throughout Experiment 1.

EXPERIMENT 2

Because *pictures of objects* were used in Experiment 1, it was not clear whether the resident signing skills would generalize to *actual objects* in their living environment, especially consider-

Table 2

Means and ranges of percent correct target signs for each resident for each condition in Experiment 1.

Residents	Sign Groups	Baseline Mean (Range) ^a	Posttraining Mean (Range)
Dan	1	17 (0-33)	100 (—)
	2	50 (33-67)	93 (67-100)
	3	25 (0-33)	92 (67-100)
Ann	1	33 (—)	95 (67-100)
	2	8 (0-33)	67 (33-100)
	3	0 (—)	42 (0-67)
Lori	1	67 (—)	100 (—)
	2	17 (0-33)	100 (—)
	3	25 (0-33)	92 (67-100)
Sam	1	0 (—)	95 (67-100)
	2	0 (—)	80 (33-100)
	3	25 (0-33)	59 (33-67)
Kristen	1	25 (0-33)	100 (—)
	2	25 (0-33)	100 (—)
	3	0 (—)	75 (0-100)
Fred	1	59 (33-67)	95 (67-100)
	2	0 (—)	80 (33-100)
	3	0 (—)	59 (33-67)

^aBlanks (—) indicate all assessments resulted in percentages equal to the condition mean.

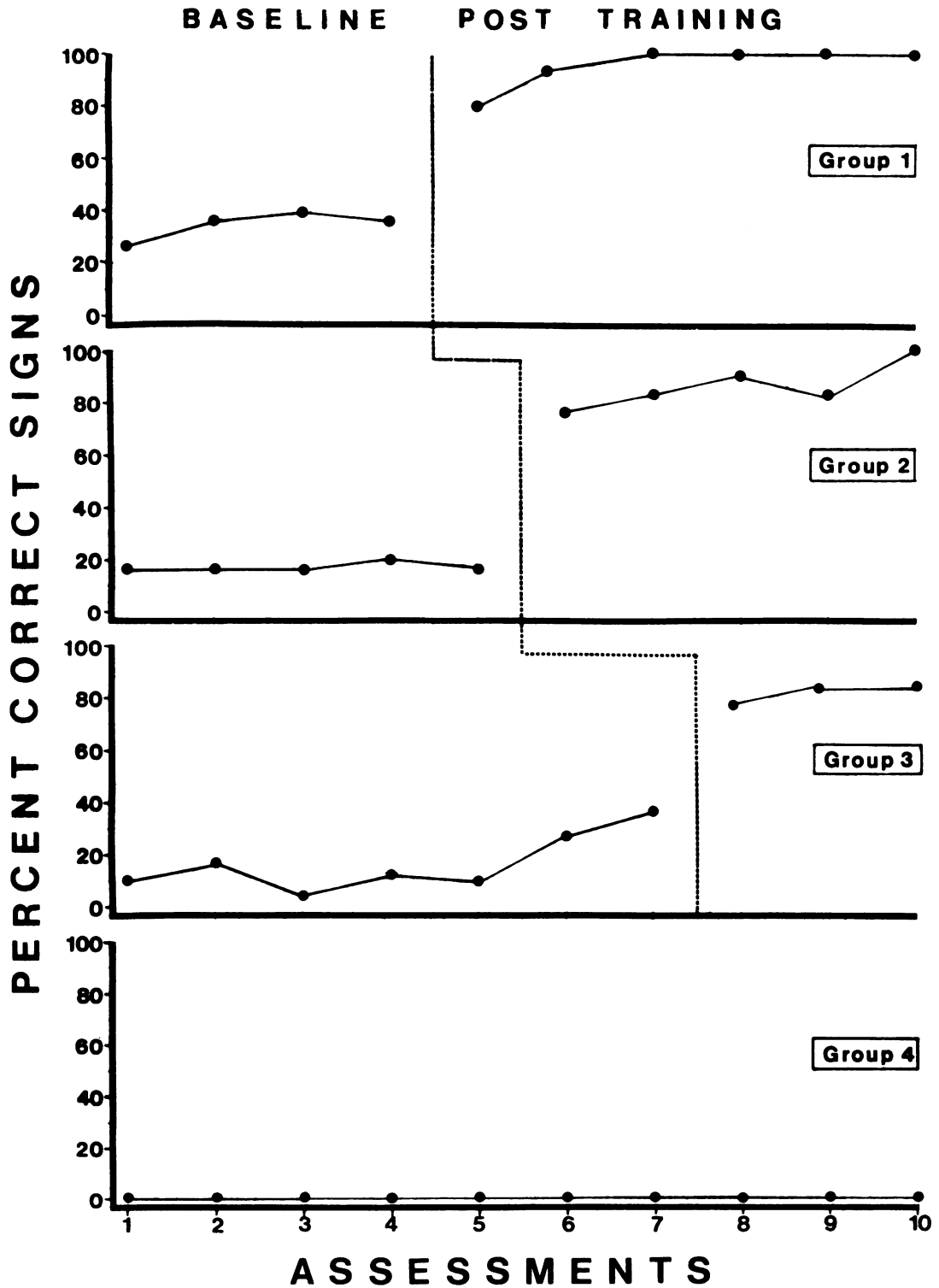


Fig. 1. Mean percent correct signs for six profoundly retarded residents during baseline and posttraining assessments for the target groups of manual signs, and during baseline assessments for the control group (Group 4) in Experiment 1.

ing the lack of resident signing during the on-unit observations. The purpose of Experiment 2 was to assess possible generalization during structured interactions on the living unit and where necessary, train the residents to respond to real objects.

METHOD

The setting, signing vocabulary, behavioral definitions, and observers were the same as in Experiment 1 with the addition of the residents' bedrooms as part of the setting. One of the original six residents did not participate as he was discharged from the facility. Also, no generalization observations were conducted during the 3:15 p.m. and 5:15 p.m. periods on the living unit.

Observation System and Reliability

Observation procedures were similar to those during previous assessments. However, because the assessments occurred on the living unit of the residents, the observer was in the same room with the examiner and resident, and, because the observer could hear the examiner's request and see the object being referred to, he or she was not naive concerning which sign was being requested. Reliability observations were conducted on 63% of all assessments, including before and after training, and resulted in only one disagreement between observers on the occurrence of one sign.

Procedures

Baseline. Baseline consisted of individual assessments with each resident, using an object located on the actual living unit. The examiner walked through the unit with a resident, located an object identified by each of the nine target signs and three control signs (Group 4), and requested the resident to identify the object manually: "(Name), what is the sign for this?" while pointing at the object. If the resident did not make a sign within 5 sec, the examiner repeated the question, allowed 5 more sec for the re-

sponse, and proceeded to the next request. Throughout assessments, the examiner praised each resident for attending to him, noncontingent on accuracy of responding.

Real object training. Real object training was conducted individually with each resident by a staff member and involved the staff person escorting the resident to the actual object and giving the request, "What is the sign for this?" while pointing to the object. A correct response was followed by praise and edible treats. If an incorrect or no response occurred, the staff person presented the picture card used during training in Experiment 1 with the actual object and made a request using the word label of the object. A correct response was followed by praise and a treat. If a correct response did not occur, the staff modeled the sign and repeated the request, manually guiding the resident if necessary. The staff member then put the card away and repeated the original request while pointing to the object. Again, a correct response was followed by praise and a small treat, whereas for an incorrect response, the staff modeled the sign, manually guided it, and proceeded to the next object. During each training session, the staff member conducted the training procedure for all nine of the target sign objects.

Staff were instructed in the real object training procedures through a 10-15 min meeting with the supervisor. No specific scheduling was conducted regarding which staff should train which residents although the occurrence of training sessions was prompted as described in Experiment 1. Staff were instructed to review a publicly posted list regarding resident progress in training sessions and to try to keep the training up to date across residents. Real object training was terminated individually when a resident correctly identified at least 80% of the objects in response to the first request by the staff member in a given training session. In total, there was 1 real object training session for Kristen, 7 for Dan, 11 for Fred, and 20 for Ann.

Post real object training and follow-up. Post-training and follow-up assessments were con-

ducted identically to baseline assessments. Follow-up assessments were conducted three times with each resident. The first follow-up ranged from 19 to 54 days after the last posttraining assessment, the second from 62 to 122 days, and the third from 279 to 343 days.

RESULTS

Results of the real object assessments are presented in Table 3. On the assessments prior to real object training, there was a mean 49% correct signs across residents for the nine items targeted in Experiment 1, whereas no correct signs were presented for the control items not taught in Experiment 1. Because Lori correctly presented all target signs during baseline, she did not participate in real object training. All four residents who did participate correctly presented at least 78% of the signs (mean 84%) on the post real object training assessments. The increases maintained at the approximate post-training level on follow-up assessments for all residents except for Dan on his 100-day follow-up (although his percentage was still 34 percentage points above baseline). No resident failed to present more than one target sign on the last follow-up assessment. Throughout all real object assessments, only one control sign was correctly identified (by two residents).

GENERAL DISCUSSION

Results of the two experiments demonstrated procedures through which institutional staff can develop and maintain manual sign language skills of profoundly retarded persons. All residents noticeably increased their manual signing skills during a *structured testing situation* as well as during *structured interactions* on their living unit. Perhaps more importantly, the increased skills during *structured interactions* on the living unit maintained during follow-up assessments covering periods from 39 to 49 wk after termination of training.

A key issue in language training is stimulus generalization. Two types of stimulus generalization were indicated in the current project. First, there was generalization in the use of signs by residents across different staff. That is, the increases in resident signing skills in Experiments 1 and 2 represent generalization from signing to persons who trained the residents to signing to someone who was not involved in training (examiner). One explanation for the generalization across people is that six different staff members participated in training each resident (Stokes, Baer, & Jackson, 1974). Second, there was possible generalization from signing with pictures of objects (Experiment 1) to actual objects (Experiment 2). During baseline assessments with real objects in Experiment 2, all resi-

Table 3
Percent Correct Signs for Real Object Assessments on the Living Unit (Experiment 2)

	Assessments				Follow-Up 1		Follow-Up 2		Follow-Up 3	
	Pre	Post			(Days)		(Days)		(Days)	
	Real Object Training	Real Object Training			Target	Control	Target	Control	Target	Control
Dan	22	0	78	0	89 (33)	0	56 (100)	0	89 (321)	0
Ann	22	0	78	0	89 (19)	0	100 (62)	0	89 (280)	0
Lori	100	0	—	—	100 (54) ^a	0	100 (122)	33	100 (343)	33
Kristen	33	0	100	0	89 (43)	0	100 (62)	0	100 (279)	0
Fred	67	0	78	0	89 (29)	0	78 (96)	33	89 (317)	0

^aBecause Lori did not participate in a posttraining session, her follow-up days represent time from her pre-training assessment.

dents correctly signed to some of the objects that had been taught with pictures in Experiment 1 whereas no resident correctly signed to control objects that had not been taught. However, the signing with real objects occurred at less than satisfactory levels for four residents, requiring subsequent real object training. Also, because no baseline assessments of signing to real objects were conducted prior to training with pictures in Experiment 1, conclusions on the extent of generalization must be cautious.

Despite the increases in resident signing during *structured interactions* in the actual living environment, no significant increases occurred during *unstructured interactions* (the observation periods during leisure and supper times in Experiment 1). A number of explanations can be offered for these results. First, as suggested in the baseline results with real objects in Experiment 2, there was only partial generalization in signing with pictures of objects to signing with real objects. Hence, prior to training in Experiment 2, real objects did not control signing totally. Unfortunately, observations during unstructured interactions after real object training were unavailable. Without such data it cannot be determined if the initial lack of signing on the living unit was due to signing not being under control of real objects. Second, the on-unit observation system might not have been sensitive enough to detect signing behavior of residents because their signing was brief and generally consisted of one sign at a time as opposed to staff signs which comprised a considerably larger vocabulary. Informal observations supported this possibility as more signing appeared to be occurring than detected through the observation system. Also, the successful follow-up assessments of up to 49 wk suggest that signing occurred in order to account for the maintenance. That is, it seems unlikely that signing skills would maintain for 11 mo without some intermittent occurrence and subsequent reinforcing by staff. A third explanation is that residents were not taught enough signs to communicate frequently in their daily environment.

Considering the lack of resident signing during unstructured interactions, additional research is needed to determine ways of promoting such activities. For instance, incidental teaching procedures (Hart & Risley, 1968, 1974, 1975) that have increased language skills with preschool populations could be evaluated for use with manual signing with profoundly retarded persons. Also, more procedures to promote generalization from training sessions and structured interactions could be incorporated into training. For instance, in addition to the multiple trainer strategy used here to promote generalization across staff, training could be conducted in different settings (Handleman, 1979). Finally, research evaluating the acceptability of the use of manual signing (Kazdin, 1980) by staff warrants attention. Although unsolicited comments noted during this study indicated that staff believed the signing activities were useful, formal evaluation of their reactions to signing and subsequent frequency of using signs would be useful for establishing future signing programs.

Observations of resident vocalizations on the living unit during unstructured situations showed no increases in Experiment 1. As mentioned previously, there have been claims that simultaneous signing/vocal language training will result in increased vocal skills by developmentally disabled children. However, a review of the data with autistic children indicates this is not a consistent finding (Carr, 1979) and in fact, the supposition in developmental disabilities is quite controversial (Carr, 1980). Actually, the on-unit generalization results with vocalizations in this study should be interpreted very conservatively because it was not demonstrated that the residents increased any interactions (signing or vocalizing) during unstructured situations.

Although results of the signing program were encouraging, statements as to the ultimate benefits of signing as a language system with the profoundly retarded should be cautious. In essence, signing is an abnormal communication system in that most persons, both institutional and non-

institutional, do not communicate with formal sign language. For this reason, decisions on the teaching of signing skills to retarded persons should consider all possibilities for teaching vocal language first. However, where repetitive attempts to teach vocal skills have failed, sign language may be the most viable approach for allowing such persons to communicate effectively.

REFERENCES

- Bensberg, G. J., & Barnett, C. D. *Attendant training in southern residential facilities for the mentally retarded*. Atlanta: Southern Regional Education Board, 1966.
- Berkson, G., & Landesman-Dwyer, S. Behavioral research on severe and profound mental retardation (1955-1974). *American Journal of Mental Deficiency*, 1977, **81**, 428-454.
- Bricker, D. D. Imitative sign training as a facilitator of word-object association with low-functioning children. *American Journal of Mental Deficiency*, 1972, **76**, 509-516.
- Burg, M. M., Reid, D. H., & Lattimore, J. Use of a self-recording and supervision program to change institutional staff behavior. *Journal of Applied Behavior Analysis*, 1979, **12**, 363-375.
- Carr, E. G. Teaching autistic children to use sign language: Some research issues. *Journal of Autism and Developmental Disorders*, 1979, **9**, 345-359.
- Carr, E. G. A program for establishing sign language in developmentally disabled children. In O. I. Lovaas, A. Ackerman, D. Alexander, P. Firestone, M. Perkins, & D. Young (Eds.), *The me book: Teaching manual for parents and teachers of developmentally disabled children*. Baltimore: University Park Press, 1980.
- Carr, E. G., Binkoff, J. A., Kologinsky, E., & Eddy M. Acquisition of sign language by autistic children. I. Expressive labelling. *Journal of Applied Behavior Analysis*, 1978, **11**, 489-501.
- Garcia, E. E., & DeHaven, E. D. Use of operant techniques in the establishment and generalization of language: A review and analysis. *American Journal of Mental Deficiency*, 1974, **79**, 169-178.
- Grinnell, M. F., Detamore, K. L., & Lippke, B. A. Sign it successful—manual English encourages expressive communication. *Teaching Exceptional Children*, 1976, **8**, 123-124.
- Grossman, H. J. (Ed.). *Manual on terminology and classification in mental retardation*. Washington, D.C.: American Association on Mental Deficiency, 1977.
- Gruber, B., Reeser, R., & Reid, D. H. Providing a less restrictive environment for profoundly retarded persons by teaching independent walking skills. *Journal of Applied Behavior Analysis*, 1979, **12**, 285-297.
- Hall, S. M., & Talkington, L. W. Evaluation of a manual approach to programming for deaf retarded. *American Journal of Mental Deficiency*, 1970, **75**, 378-380.
- Handleman, J. S. Generalization by autistic-type children of verbal responses across settings. *Journal of Applied Behavior Analysis*, 1979, **12**, 273-282.
- Hart, B., & Risley, T. R. Using preschool materials to modify language of disadvantaged children. *Journal of Applied Behavior Analysis*, 1974, **7**, 243-256.
- Hart, B., & Risley, T. R. Incidental teaching of language in the preschool. *Journal of Applied Behavior Analysis*, 1975, **8**, 411-420.
- Hart, B. M., & Risley, T. R. Establishing use of descriptive adjectives in the spontaneous speech of disadvantaged preschool children. *Journal of Applied Behavior Analysis*, 1968, **1**, 109-120.
- Hobson, P. A., & Duncan, P. Sign learning and profoundly retarded people. *Mental Retardation*, 1979, **17**, 33-37.
- Hopper, C., & Helmick, R. Nonverbal communication and the severely handicapped: Some considerations. *AAESPH Review*, 1977, **2**, 47-53.
- Ivancic, M. T., Reid, D. H., Iwata, B. A., Faw, G. D., & Page, T. J. Evaluating a supervision program for developing and maintaining therapeutic staff-resident interactions during institutional care routines. *Journal of Applied Behavior Analysis*, 1981, **14**, 95-107.
- Iwata, B. A., Bailey, J. S., Brown, K. M., Foshee, T. J., & Alpern, M. A performance-based lottery to improve residential care and training by institutional staff. *Journal of Applied Behavior Analysis*, 1976, **9**, 417-431.
- Johnson, S. M., & Bolstad, O. D. Methodological issues in naturalistic observation: Some problems and solutions for field research. In L. A. Hamerlynck, L. C. Handy, & E. J. Mash (Eds.), *Behavior change: Methodology, concepts and practice*. Champaign, Ill.: Research Press, 1974.
- Kahn, J. V. A comparison of manual and oral language training with mute retarded children. *Mental Retardation*, 1977, **17**, 21-23.
- Kazdin, A. E. Acceptability of alternative treatments for deviant child behavior. *Journal of Applied Behavior Analysis*, 1980, **13**, 259-273.
- Kopchick, G. A., Rombach, D. W., & Smilovitz, R. A total communication environment in an institution. *Mental Retardation*, 1975, **13**, 22-23.
- Lloyd, L. L. Unaided nonspeech communication for severely handicapped individuals: An extensive bibliography. *Education and Training of the Mentally Retarded*, 1980, **15**, 15-34.
- Moore, D. F. Nonvocal systems of verbal behavior. In R. L. Schiefelbusch & L. L. Loyd (Eds.), *Lan-*

- guage perspectives: Acquisition, retardation and intervention.* University Park Press: Baltimore, 1978.
- Reich, R. Gestural facilitation of expressive language in moderately/severely retarded preschoolers. *Mental Retardation*, 1978, **16**, 113-117.
- Sailor, W., Guess, D., & Baer, D. M. Functional language for verbally deficient children: An experimental program. *Mental Retardation*, 1973, **11**, 27-35.
- Salisbury, C., Wambold, C., & Walter, G. Manual communication for the severely handicapped: An assessment and instructional strategy. *Education and Training of the Mentally Retarded*, 1978, **13**, 393-397.
- Scheerenberger, R. C. A survey of public residential facilities. *Mental Retardation*, 1976, **14**, 32-35.
- Schiefelbusch, R. L. Summary. In R. L. Schiefelbusch, & L. L. Lloyd (Eds.), *Language perspectives: Acquisition, retardation and intervention.* University Park Press: Baltimore, 1978.
- Stokes, T. F., Baer, D. M., & Jackson, R. L. Programming the generalization of a greeting response in four retarded children. *Journal of Applied Behavior Analysis*, 1974, **7**, 599-610.
- Topper, S. T. Gesture language for a nonverbal severely retarded male. *Mental Retardation*, 1975, **13**, 30-31.

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