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Total Communication with Hearing, Nonvocal Children: The Validation of a Program for Generalization across Settings and Therapists

Ione Milani

TOTAL COMMUNICATION WITH HEARING, NONVOCAL CHILDREN: THE VALIDATION OF A PROGRAM FOR GENERALIZATION ACROSS SETTINGS AND THERAPISTS

by

Ione Milani

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
Degree of Master of Arts

Western Michigan University
Kalamazoo, Michigan
April 1977

ACKNOWLEDGEMENTS

The author wishes to thank Rich Lodge of the Kalamazoo Valley Intermediate School District Program for Severely Mentally Impaired for his continued support and encouragement. Thanks is also extended to Drs. Brian A. Iwata and Galen Alessi, members of my masters committee. In particular, I wish to acknowledge Jack Michael as chairman of my thesis committee for his assistance and comments throughout my masters program. Special thanks is extended to Mark L. Sundberg for his invaluable assistance in designing this study, and to my husband, Thomas A. Nelson, for drawing the graphs presented herein and for his general support and understanding.

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INTRODUCTION

American Sign Language (ASL) as an Alternative in Language Acquisition

Several programs to improve the communication skills of nonverbal populations have been developed. Recently, experimental programs to teach American Sign Language to mentally impaired children (Snell, 1974; Sundberg and Horn, 1976) have been published. Reports have shown some success in the acquisition of signs by severely and profoundly mentally retarded individuals who learned over 400 signs after one year of training (Richardson, 1975) and by autistic children who learned over 50 signs in six months of training (Bonvillian and Nelson, 1976; Fulwiler and Fouts, 1976). Grinnell, Detamore and Lippke (1976) also report improvement in expressive communication with complete grammatical inflection through ASL acquisition in mentally handicapped children. Kopchich, Rombeck and Smilovitz (1975) developed a total communication program for all staff in an institution so that the usage of signs would be stimulated and reinforced.

Advantages of American Sign Language

Manual communication is ordinarily accompanied by the spoken word, (therefore called total communication) and according to some of the above authors this approach has even increased the occurrence of vocal behavior in nonvocal nondeaf subjects (Fulwiler et al., 1976). The manual mode seems to facilitate the vocal mode in addition to providing the child an effective form of expressive language (Kent,

1974). Increases in general communication skills in an institutionalized nonverbal mentally retarded adult population have been reported to result from the usage of ASL (Kopchich et al., 1975). Nevertheless, there were no data found to support the belief that ASL acquisition increases vocal verbal behavior and expressive language.

In language acquisition many programs are concerned, in the beginning phases, with nonverbal motor imitation (Bricker and Bricker, 1972; Kent, Klein, Falk and Gwenther, 1972; Sloane, Johnston and Harris, 1968; Sundberg et al., 1976) since it is considered a basic behavioral mechanism in the acquisition of many other behaviors (Bandura, 1962; Peterson, 1968). The transition from motor to verbal imitation is not always easy. Baer, Peterson and Sherman (1965) used a different technique with children who did not imitate vocal sounds after being trained in extensive motor imitation. The verbal response was paired with an imitative motor response and then vocal imitation was successfully established. Bricker (1972) also suggested that the use of motor movements or manual signing could be attempted as a form of initial language training. He successfully used initative-sign training followed by sign-word and sign-object training to facilitate sign-word-object discriminations.

Criticisms of Sign Language

The major method for teaching verbal behavior in deaf children is oral communication. This is based on the resolution of the International Congress on Deafness in Milan, Italy, in 1880 which stated that the use of manual communications of any kind would restrict or prevent

the growth of speech and language skills in deaf children. The followers of the oral method still prohibit the use of gestures and signs, in spite of much general dissatisfaction with this approach to educating deaf children (Moores, 1974).

British oralists also recommend against the teaching of sign language as an alternative to spoken language, simply stating that it is not a verbal language (Erwing, 1964). A. van Uden (1970) refers to "the dehumanizing influence of the signs themselves," and states that linguistic development may be retarded if signs are used as means of communication.

Reasons for Accepting a Sign Language

According to Stokoe (1972) these critics of sign language consider gestures as a subhuman system. Nevertheless, gestures as well as static positions used by human beings qualify as a language in that a small closed set of distinctive features of bodily action, having no meaning in themselves, combine to form an open, larger set, the sentences of sign language (Stokoe, 1972, p. 12). Analyzing signing as a language, Stokoe presents a number of systems that use such tactics. For instance, facial expressions and bodily attitudes may be signs of fear, anger, and so on. Other systems utilize expressions and gestures in a more specialized way, that is, more than just emotions, but in a complex cultural way to indicate or display interaction.

Vocal Verbal Behavior (Skinner's Analysis) and Sign Language

Several reasons may explain why the use of signs as a language can improve general communication skills. Vocal behavior that is

reinforced by its effects on the speaker and on the listener is defined as verbal, (Skinner, 1957; Skinner, 1974) and signing may be considered a verbal nonvocal behavior which is reinforced in the same way. In the type of verbal behavior called 'the mand' the consequences are appropriate to each spoken word (Skinner, 1974) and to each sign emitted. When someone asks for food by saying or signing "food", the consequence is the receipt of food, given an appropriate listener. In the tact relationship, nonverbal prior stimuli control the response irrespective of the form of the response. A tendency to say or to sign "dog" as a result of seeing a dog is equally verbal from a functional point of view.

Sign language like vocalizing can be defined as a behavior reinforced through the mediation of another person's behavior. Manipulating their environment by using signs, children easily can obtain reinforcement, since people respond to them in an immediate meaningful way (Sundberg et al., 1976).

Manual Communication and General Improvement

Russian educators, as early as 1938, started to evaluate a combined method, considering a purely oral method as a failure in teaching verbal behavior to deaf children (Moores, 1974). Vernon and Koh (1970) comparing the effects of early exposure to manual communication in genetically deaf children, and supported by the results of previous investigation (Meadow, 1968; Montgomery, 1966; Stevenson, 1964; Stuckless and Birch, 1966; Quigley, 1966), indicated that early manual communication markedly facilitated achievement and linguistic development.

Moores, Weiss and Goodwin (1973) suggested that signs in combination with oral communication may facilitate the acquisition of language Berger (1972) presented a multimodal language program which considers manual signs an essential early step in language acquisition by deaf children.

The Problem of Generalization

To achieve maximum effectiveness, signs must be used in everyday situations. Generalization from training sessions to the natural environment has always been a problem. According to Fouts (Unpublished report, 1973), generalization of signs may be spontaneous from the therapy situation to the outside environment (Fulwiler et al., 1976). However, when fading procedures are not used in a systematic way, the probability of generalizing learned or changed behaviors from the training situation to everyday life is low (Walker and Buckley, 1972). The similarity of the stimuli (including consequences) existing in both situations is apparently the key for generalization (Grauber, 1971; Walker, Hops and Johnson, 1975; Walker et al., 1972).

Generalization is not an automatic occurrence. It should be planned. Unless the maintenance of acquired or changed behaviors is the goal of the program, reversal designs have shown that the dependent variable is controlled by contingencies of reinforcement (Kazdin and Bootzin, 1972). In a program of generalization, a good strategy is to establish as many common stimulus elements between training sessions and the regular classroom or other situations as possible. Recent studies on generalization across experimenters (Corte, Wolf

and Locke, 1971; Redd, 1970; Redd and Birnbrauer, 1969; Stokes, Baer and Jackson, 1974) demonstrated that training by two or three experimenters is necessary to develop and maintain generalization in an acquired behavior such as a greeting response (hand-wave) (Stokes et al., 1974).

Generalization across settings must also be systematically planned. Recent studies have shown clearly that the same stimuli that control responding in therapy situations will control in the extra-therapy settings (Rincover and Koegel, 1975).

The purpose of the present study is to validate the steps necessary to program generalized usage of American Sign Language. This programming is evaluated across subjects, settings and therapists.

METHOD

Subjects and Settings

Six children from the Program for the Severely Mentally Impaired (PSMI) at Kalamazoo Valley Intermediate School District were selected as subjects because of their previous experience with American Sign Language. The present experiment was conducted at the PSMI building, in Kalamazoo, Michigan.

Individual information concerning history and aspects of receptive and expressive language is presented in Table I. All children have lived in institutions for the mentally retarded most of their lives. Presently most of them are living at Kennedy House, a foster care home with eight mentally impaired children supervised by a married couple.

The children attend class five days a week from 9:00 a.m. to 3:00 p.m. Most of this time is spent in the classroom where they have 12 half-hour group or individual sessions, some of which are conducted in a sound attenuated booth. Each classroom is supervised by one teacher who also conducts some individual sessions. However, most of the individual sessions are conducted by graduate and undergraduate students from a local university.

Design

A multiple baseline across children, therapists and situations was used. Four children (S1, S2, S3, and S4) were randomly observed in the individual sessions (one-to-one therapy), three children (S4, S5, and

Table I - Individual Information Concerning History
And Aspects of Receptive and Expressive Language

TABLE I

INDIVIDUAL INFORMATION CONCERNING HISTORY AND ASPECTS OF RECEPTIVE AND EXPRESSIVE LANGUAGE

Subjects	AGE	SEX	Living History	Receptive Language	Expressive Language
S1	18	F	6 months old - Coldwater State Home Presently - Kennedy House	Fair receptive lang.; Understands most commands; Follows instructions.	Some expressive verbal; Acquiring ASL since Fall 1975; ASL repertoire: 19 signs; no sentences.
S2	20	F	3 years old - Fort Custer Home 16 years old - Coldwater State Home 19 years old - McKercher Group Presently - Foster Care Home	Fair receptive lang.; Understands most commands; Follows instructions.	No vocal language; Acquiring ASL since Fall 1975; ASL repertoire: 54 signs.
S3	17	M	Few weeks after birth - Coldwater State Home Presently - Kennedy House	Responsive to most directions and commands.	Unintelligible vocal lang.; Acquiring ASL since Winter 1976; ASL repertoire: 54 signs.
S4	16	F	7 years old - Fort Custer Home 12 years old - Coldwater State Home Presently - Kennedy House	Responsive to most directions and commands.	No vocal language; Acquiring ASL since Fall 1975; ASL repertoire: 60 signs.
S5	14	M	-Allegan County Home 2 years old - Coldwater State Home Presently - Kennedy House	Extensive receptive lang.; Understands almost all commands; Follows instructions.	No vocal language; Acquiring ASL since Fall 1975; ASL repertoire: 40 signs.
S6	10	M	4 years old - Coldwater State Home Presently - Kennedy House	Extensive receptive language skills.	Gestures and grunts; Vocal imitation of all vowels, some consonants and phonemes, some words; ASL (Winter 76): 54 signs.

S6) were observed in group sessions and four children (S2, S4, S5, and S6) in the lunch situation. Typically, all children were observed daily. During individual sessions, baseline data were collected for eight days. Following this, the independent variable was implemented in one individual session at a time. In the group sessions, the independent variable was introduced in a group composed of one child of the present study (S4) and three children not participating in the study. The other children (S5 and S6) were in a control group. During the third situation, lunch time, the independent variable was introduced for all children (S2, S4, S5, and S6) after a baseline period.

Procedures

Functional signs were taught to the children prior to the study. A survey of the signing repertoire for each child is presented in Table II. Daily training sessions were conducted by a speech pathologist or a teacher. The settings for this study were sessions other than those used specifically for training of American Sign Language, such as self-care, drawing, animal discrimination, acquisition of concepts, etc.

Observation Procedures

Reliability: A five-minute observation period for each subject in each condition was randomly chosen each day during the half hour study session. For the individual sessions, the therapist did not know when he/she was being observed through a one way mirror. The same was true for group sessions. At lunch time, the teachers could see

Table II - Sign Repertoire

TABLE II

SIGN REPERTOIRE

	S1	S2	S3	S4	S5	S6
1.name	x	x	x	x		x
2.hi			x	x	x	x
3.fine	x	x	x		x	
4.good-bye	x		x	x		x
5.yes	x	x	x	x	x	x
6.no			x	x	x	x
7.ball	x	x	x	x	x	x
8.car		x	x	x	x	x
9.box			x	x	x	x
10.cup	x	x	x	x	x	x
11.book		x	x	x	x	x
12.chair		x	x	x	x	
13.school		x		x		
14.music		x		x	x	x
15.light		x		x		
16.bell		x	x			x
17.table	x	x	x		x	x
18.bathroom		x		x		x
19.wall				x		
20.corner				x		
21.home					x	x
22.baby	x	x	x	x	x	x
23.girl			x	x	x	x
24.boy	x	x	x	x	x	x
25.cat		x		x		x
26.dog		x	x	x		x
27.bird				x		
28.hat	x	x	x	x	x	x
29.socks		x	x	x	x	x
30.shoes	x	x	x	x	x	x
31.coat		x	x	x	x	x
32.pants	x	x	x	x	x	x
33.hair		x		x		
34.ear		x	x	x		x
35.eye		x	x	x		x
36.nose		x	x	x		x
37.mouth			x	x		x
38.hands				x		x
39.face				x		
40.comb	x	x	x	x	x	x
41.toothbrush	x	x	x	x	x	x
42.kleenex	x	x	x	x	x	x

	S1	S2	S3	S4	S5	S6
43.soap		x	x	x	x	x
44.washcloth		x	x	x	x	
45.plate	x	x	x		x	x
46.spoon	x	x	x	x	x	x
47.fork		x	x		x	x
48.knife	x	x	x			x
49.napkin		x	x	x	x	x
50.food	x	x	x	x	x	x
51.hamburger	x	x	x	x	x	x
52.candy		x		x	x	x
53.cake		x		x	x	x
54.ice cream		x	x	x	x	x
55.popcorn			x	x	x	x
56.milk	x	x	x		x	x
57.apple		x		x		x
58.water		x		x	x	
59.salad		x	x		x	
60.vegetable		x			x	
61.meat		x	x	x	x	x
62.cookies	x	x		x		x
63.in				x		
64.on				x		
65.out		x		x	x	
66.beside				x		
67.up			x	x		
68.under				x		
69.top				x		
70.big				x		
71.little				x		
72.bottom				x		
73.time to go	x	x	x	x	x	x
74.time to play	x	x	x	x	x	x
75.time to work		x	x	x	x	x
76.smile		x		x		
77.open		x				
78.bad		x				
79.you		x			x	
80.me		x				
81.stop		x		x		
82.toilet paper		x				
83.toothpaste		x				

when they were being observed. The reliability of the measurement system (interobserver agreement) was assessed at least once for each phase of the study.

Dependent variable: The dependent variable was the frequency of spontaneous usage of signs in sessions other than the specific ASL training situation. Spontaneity is defined as producing signs (non-imitative) or understandable approximations of them, according to the manual "Talk To The Deaf" (Riekehof, 1962). Therefore, a signing response was defined as correct when the child appropriately and spontaneously: 1) answered a question made by the therapist (tact), and 2) asked for something (mand).

Independent variable: The teachers and the university students who worked with the children were asked to learn and to use the same signs learned by the children in the training sessions. The university students were more cooperative than the teachers. No specific contingencies were arranged for the teachers and students, however, following the onset of the study, cooperative therapists were periodically praised in a weekly communique sheet. A written program was given to teachers and students which specified the steps to follow in order to facilitate generalization of the signs by the children. By asking the children questions which could be answered by signing, the therapists gave them verbal prompts and visual signs to be imitated if necessary. Verbal prompts consisted of questions such as "What is the sign for...?; Show me the sign for...; How can you say...?". At lunch time, the questions were "What do you want?" or "What time is it now?" The program also consisted of explanations and demonstrations by the

experimenter to the therapists about how to introduce the signs in the sessions. For instance, if the session was about the acquisition of concepts, the therapist would begin to present the sign while saying the word for the concept. However, if the child had already learned that sign, the therapist would ask the child to give the sign for that word. The therapists were also shown how to have more interaction with the children through conversation with them in such a way that the children could participate in expressive language by signing. The independent variable was assessed by the frequency of discriminative stimuli (verbal prompts, such as questions and signs) given by the therapists to the children.

Reinforcement was provided to the children in the form of social approval in several different ways: 1) by showing the children that they (the therapists) understood what the child was expressing through signing; 2) by repeating the sign and saying the word contingently upon the signing behavior; or 3) by saying: "Good, (name of the child), you know the sign for...".

RESULTS

Reliability

Interobserver agreement was calculated by dividing the number of agreements by the total number of agreements plus disagreements. The mean percent agreement for the three months of data collection was: for one-to-one sessions 98% (range of 93% to 100%); for group sessions 95% (range of 77% to 100%); and for lunch time 97% (range of 75% to 100%).

Individual Data

Table III shows the mean frequency of usage of spontaneous signs during the daily five-minute observation periods, for each phase, for each child, and for all experimental conditions.

Figure 1 shows for the daily five-minute observation period frequency of usage of spontaneous signs by each of the four children across all experimental conditions. The frequency of verbal prompts (signs) given by the therapists is also shown in Figure 1. During the baseline, the children rarely used spontaneous signs. As Figure 1 indicates, the frequency of usage of spontaneous signs only increased concomitantly with the initiation of verbal prompting and reinforcing by the therapists during the intervention phase when the program was introduced. From a baseline average of 0.17, S1's signing behavior as shown in Figure 1 gradually increased in frequency to an average of 6.65 when the intervention phase began. Although it

Table III - The Mean Frequency of Usage of Spontaneous Signs During the Daily Five-Minute Observation Periods

TABLE III

THE MEAN FREQUENCY OF USAGE OF SPONTANEOUS SIGNS DURING THE DAILY FIVE-MINUTE OBSERVATION PERIODS

	INDIVIDUAL THERAPY			GROUP			LUNCH		
Subjects	Baseline	Intervention	Follow up	Baseline	Intervention	Follow up	Baseline	Intervention	Follow up
S1	0.25	6.92	6.00	x	x	x	x	x	x
S2	0.00	6.22	1.50	x	x	x	0.23	3.93	3.00
S3	0.00	1.93	3.00	x	x	x	x	x	x
S4	0.16	7.40	18.00	2.00	12.37	10.00	0.23	3.87	2.50
S5	x	x	x	0.00	-	0.00	0.23	4.87	3.00
S6	x	x	x	0.00	-	0.00	0.14	5.30	3.00

Figure 1. Individual Graphs Showing Therapist's Prompting And Child's Signing Behavior During One-to-One Sessions

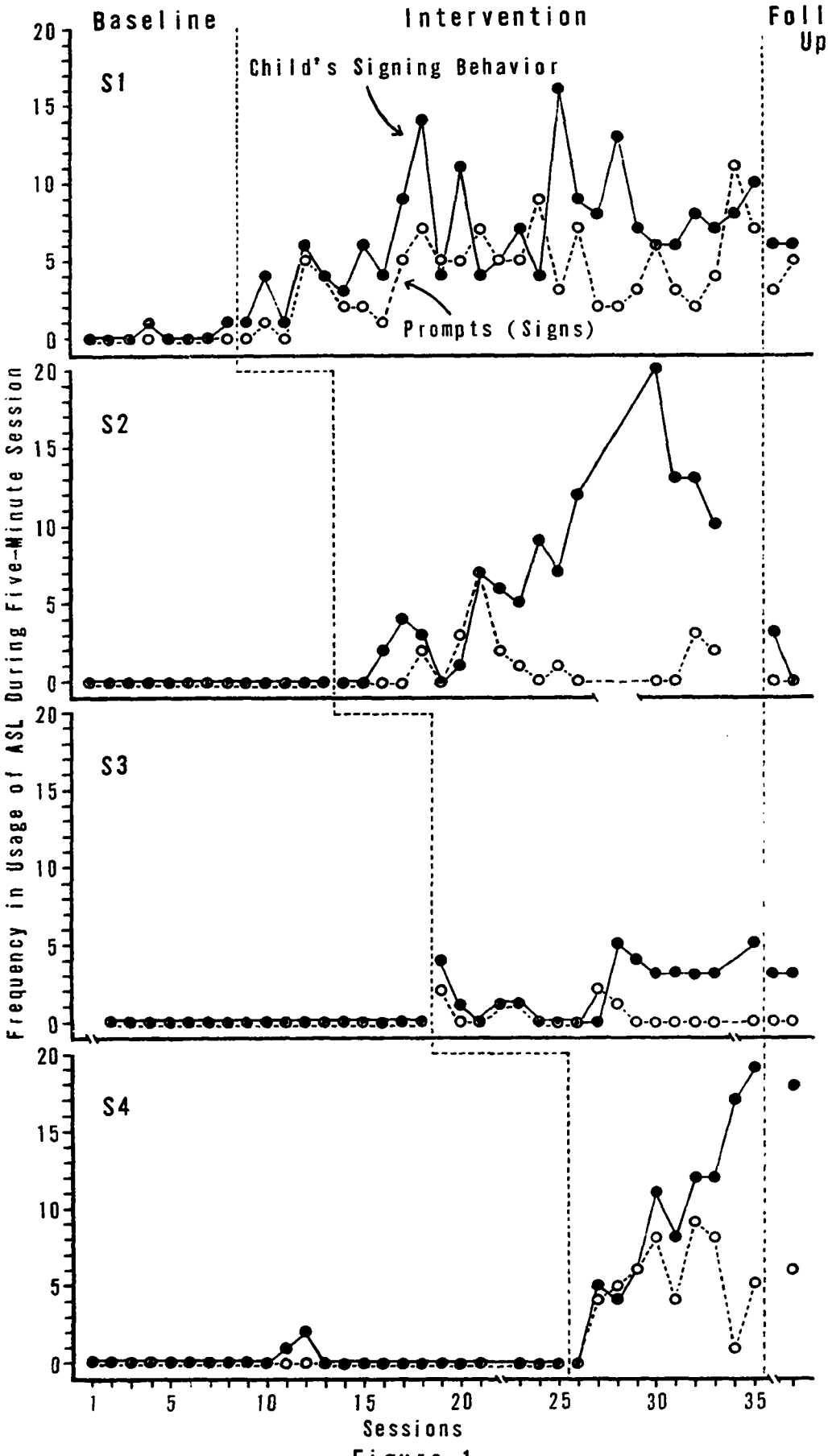

Figure 1.

appears that after a three-week period this frequency decreased, it never fell below the baseline average. S1 required more verbal prompts and cues than did the other children. The session for S1 consisted of training in chewing behavior. The subject was required to give signs (tact) for the food and for the utensils that he used during the lunch time as well as to sign (mand) when he wanted to choose the food.

Figure 2 shows the results of S4 in three situations. The group situation was a learning session for the acquisition of concepts. The therapist had already started using signs in this session during the baseline period although he was not requiring the child to use signs nor was he reinforcing their usage. The most frequently used signs in this session were: beside, in, on, under, big, small and corner. From a baseline average of two signs, the frequency gradually increased to an average of 12.37 signs in the intervention phase. S4 did not require many prompts (signs) by the therapist. The one-to-one session was concerned with training in drawing.

Figure 3 shows a multiple baseline across therapists and settings for the S2. The individual session was on self-care. Increased rate is demonstrated only after the therapist had become aware of their responsibility for the low rate during the baseline period. The slow progress during the first two weeks of intervention was followed by an abrupt increase in the rate.

Figures 4 and 5 show the data collected for S5 and S6 respectively. During lunch time the children were required to name by signing all the different kinds of food in order to receive their lunches.

Figure 2. Frequency of Spontaneous Usage of ASL for Subject 4 During Five-Minute Session in Group Situation, Lunch Time and One-to-One Therapy

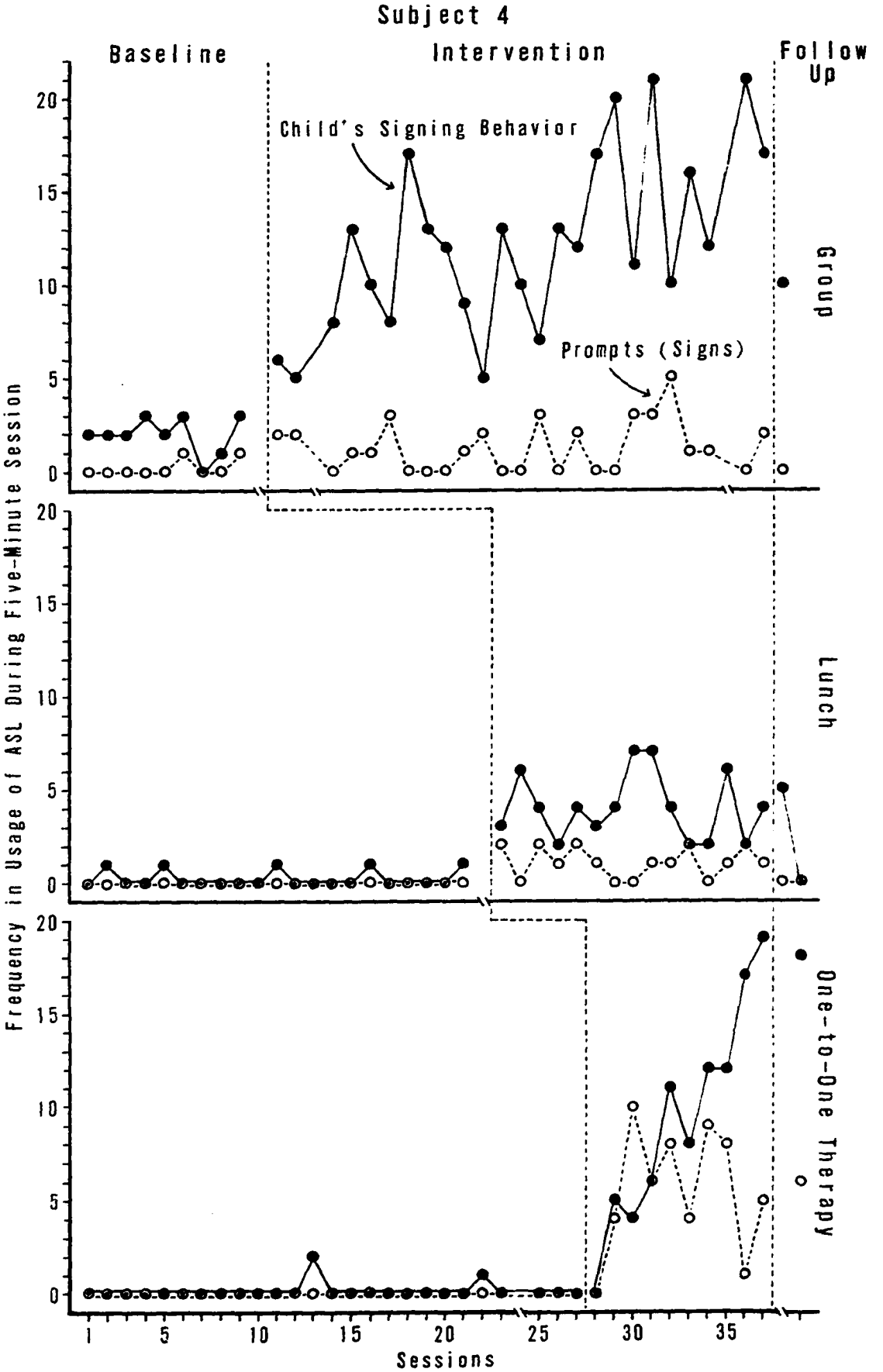

Figure 2.

Figure 3. Frequency of Spontaneous Usage of ASL for Subject 2 During Five-Minute Session in One-to-One Therapy And Lunch Time

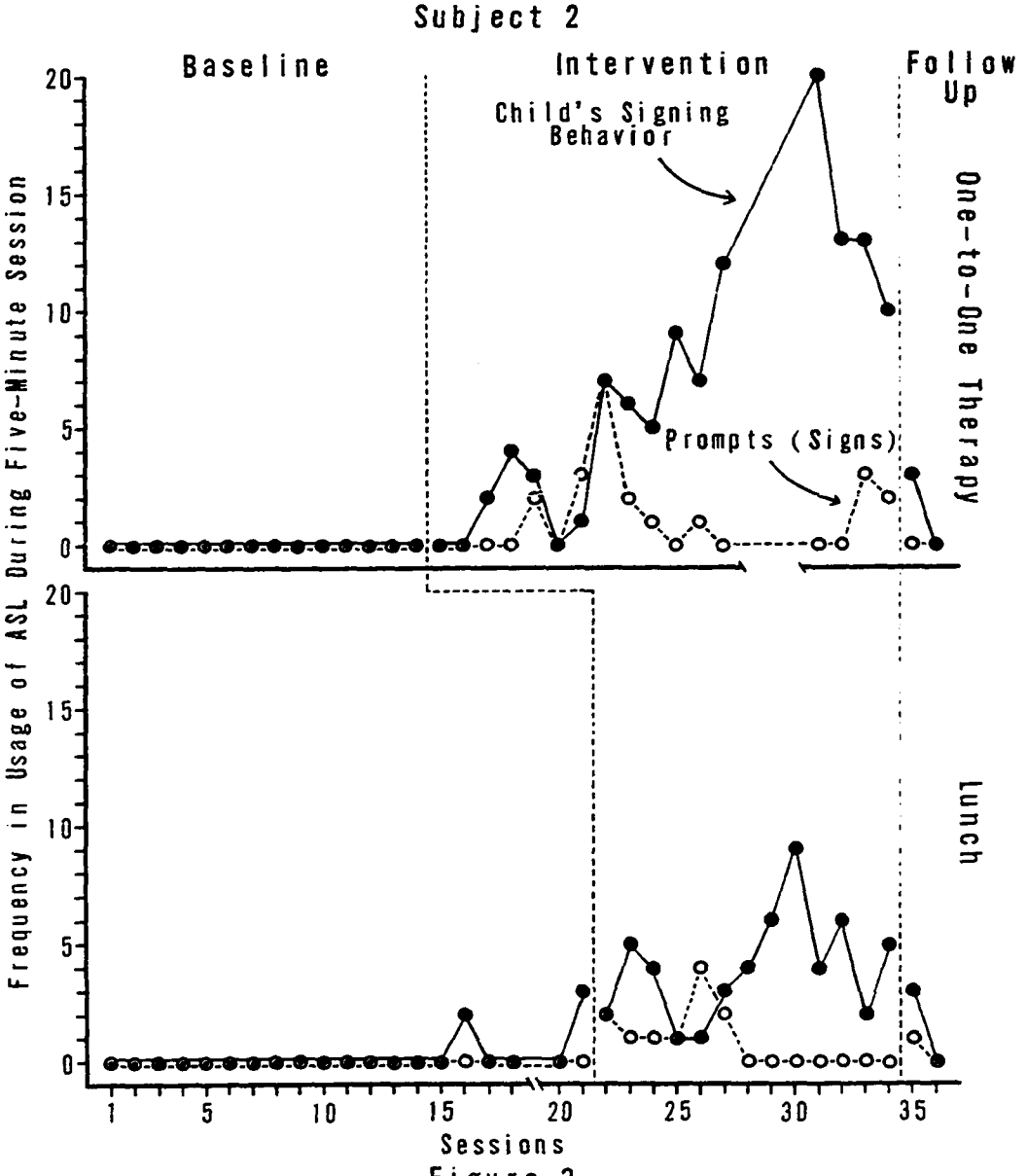

Figure 3.

Figure 4. Frequency of Spontaneous Usage of ASL for Subject 5 During Five-Minute Session in Lunch Time And Group Situation

Figure 5. Frequency of Spontaneous Usage of ASL for Subject 6 During Five-Minute Session in Lunch Time And Group Situation

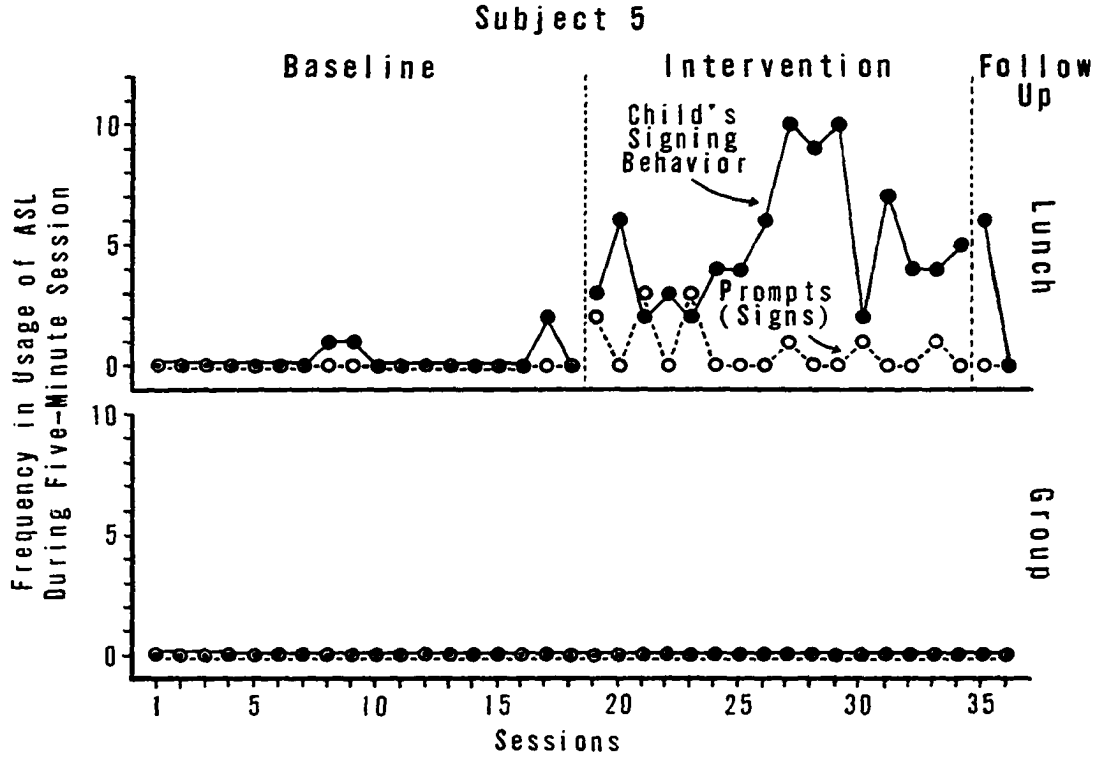

Figure 4.

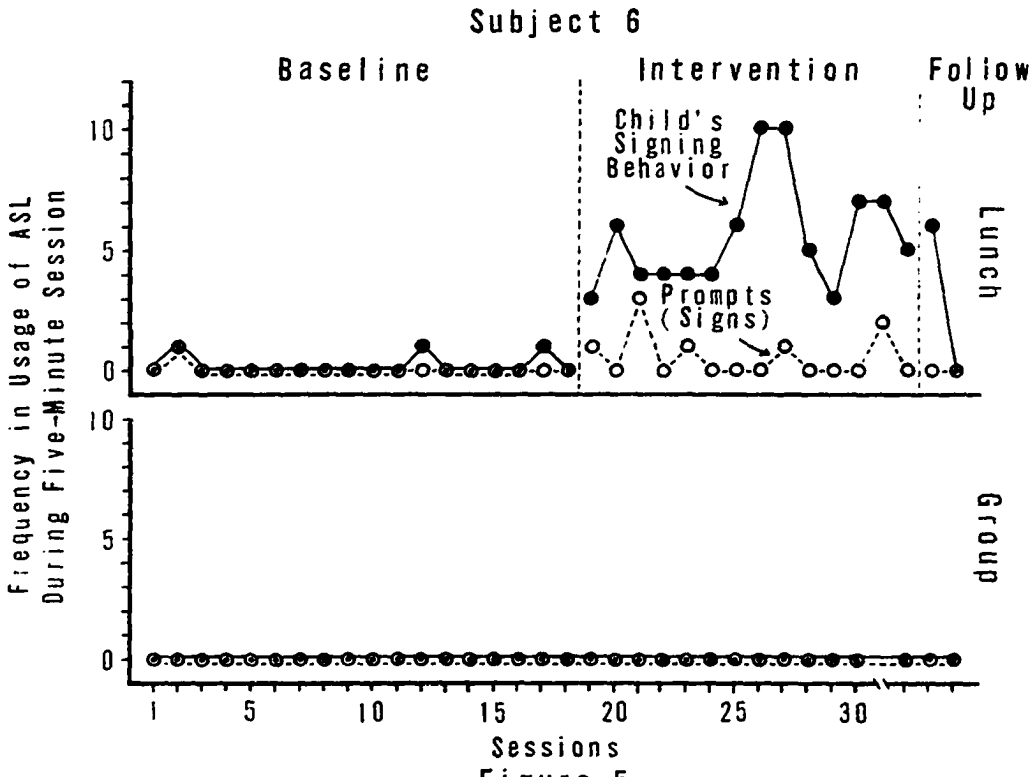

Figure 5.

Follow up data were collected three weeks later after the last intervention session. The results are shown in Table III. For some sessions, results were found similar to those of the intervention phase.

DISCUSSION

The results of the present study demonstrate that severely mentally impaired children can learn American Sign Language and maintain their performance level in different settings and with therapists other than those who have trained them. The usage of spontaneous signs can be generalized across settings and therapists when a systematic program for generalization is planned and established. These findings are consistent with the results of Stokes et al. (1974), who found that training by two or three experimenters is necessary to develop and maintain generalization in an acquired behavior.

Fouts (1973) mentions that generalization of signs may be spontaneous from the therapy situation to the outside environment. However, the results of this study shown in Figures 1 through 5 demonstrated that generalization across settings only occurred when prompting was introduced.

Hart and Risley (1968) point out that it is not reasonable to teach skills to the children at school and return them to an unsystematic environment where that skill will never become functional. Manipulating the consequences of the children's use of language by presenting social reinforcement and by making access to materials contingent on a specified form of verbal behavior will insure that what is "known" will be "used". By establishing a structured environment the above authors developed the use of descri tive adjectives in the spontaneous speech of "culturally deprived" children.

In the present study, children were diagnosed as severely mentally impaired in part because they could not express their needs verbally and could not "use" what they "knew". It would appear that, to some extent, it is the environment that is "impaired".

Most of the children in the present study had an extensive repertoire of signs and were still learning ASL at the time of this study. Nevertheless, none were required to use these signs in everyday situations. For instance, naming different kinds of food is not functional, unless the access to their lunches is contingent upon the children's signing behavior. The first step is to require them to respond correctly when asked. However, this is not sufficient; spontaneous occurrence is the ultimate criterion for considering a skill learned and maintained (Hart et al., 1968).

This study has some further implications. It appears to be reinforcing to the children that they are being "understood" by receiving attention for their signing behavior. Reinforcing the usage of spontaneous signs seemed to improve the children's expressive language since they began to sign short sentences, such as "I want food, please;" "Time to go home;" "Time to go, bye;" "Please, I want you (stand) up:" "I want (to) work;" "I want apple."

In spite of the fact that there are no data recorded here for improvement in academic achievement through the use of signs, the trainer in the sessions for concept acquisition demonstrated a high interest in using American Sign Language in those sessions because it became easier to maintain the children's attending behavior and to teach them concepts. He said that he was being reinforced for

using ASL with the child (S4). It would be interesting to investigate the effects of the spontaneous use of signs on academic achievement as well as on disruptive behavior. The latter might decrease as a result of the children's being able to manipulate the environment more easily to obtain reinforcement.

A more effective program might implement the usage of American Sign Language during all sessions as well as require everyone who works with the children to learn and use the same signs.

The procedure has two other advantages. It does not require a specific therapist for each experimental condition and for different settings, since the same therapists assigned for the ordinary training sessions can prompt and reinforce the signing behaviors, and it is an economical procedure since it does not require primary reinforcers.

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