AN ALTERNATING TREATMENTS COMPARISON OF ORAL AND TOTAL COMMUNICATION TRAINING WITH MINIMALLY VERBAL RETARDED CHILDREN

LORI A. SISSON AND ROWLAND P. BARRETT

WESTERN PSYCHIATRIC INSTITUTE AND CLINIC, UNIVERSITY OF
PITTSBURGH SCHOOL OF MEDICINE

This study was a comparison of the effects of oral speech with total communication (speech plus sign language) training on the ability of mentally retarded children to repeat 4-word sentences. Three children were chosen who used single words to communicate but who did not combine words into complete sentences. Three sentence pairs were trained, with each pair having one sentence trained using oral methods and an equivalent one trained using the total communication approach. Both training procedures involved chaining sentence parts, reinforcement, and prompting. Oral methods involved presenting vocal stimuli and requiring vocal responses whereas total communication methods involved presenting vocal and signed stimuli and requiring vocal and signed responses. For the initial sentence pair with each child, an alternating treatments design was used to determine the relative efficacy of the two language training approaches. This was repeated with a second and third sentence pair using a multiprobe technique within a multiple baseline design. Results pointed to the superiority of the total communication approach in facilitating sentence repetition. Possible explanations of these results are offered and the utility of the alternating treatments experimental design is discussed.

DESCRIPTORS: retarded children, language training, total communication, sign language, alternating treatments design

It is widely accepted that many mentally retarded and autistic persons can benefit from instruction in nonverbal communication (Poulton & Algozzine, 1980). Typically, manual sign language is used (Sisson & Barrett, 1983) and the approach is to sign and speak to the client with the expectation that the client will sign or speak or both following training (Carr, 1979). This approach has been termed total communication training.

In this study, we compared the efficacy of a total communication approach with the more traditional oral method. This has been done by several investigators, with mixed results.

Kahn (1977, 1981) compared sign-alone, oral, and no communication training with mute, mentally retarded children using a group experimental

design. The results showed no differences between sign and oral training groups, although both groups learned significantly more than the control group receiving no communication instruction. Brady and Smouse (1978) used a version of the alternating treatments design in comparing sign-alone versus oral versus total communication training on the receptive language skills of one mute autistic child. They found targeted behaviors to improve most under total communication conditions and least under oral communication conditions.

More recently, Remington and Clarke (1983) assessed sign acquisition via sign-alone versus total communication training by one mute child and one child capable of some verbal imitation. Results of an alternating treatments comparison showed no difference between the two training approaches. Barrera and Sulzer-Azaroff (1983) evaluated the efficacy of oral and total communication methods for teaching vocal skills to echolalic autistic children, also using alternating treatments strategies. Total communication training was found to be superior across three children.

Partial support for this study was provided by the Early Childhood Research Institute under Department of Education Grant #300-82-0368.

Requests for reprints should be addressed to Rowland P. Barrett, Emma Pendleton Bradley Hospital, Brown University Program in Medicine, 1011 Veterans Memorial Parkway, East Providence, Rhode Island.

This study differs from the studies just noted in that the alternating treatments design was used to evaluate the results of oral versus total communication training with three mentally retarded children who exhibited prebaseline vocal communication skills that were more developed than those of children in previous training programs. Each of the children in this study occasionally spoke in short phrases, with mean length of about 1–2 words. Because noun labeling had already been established, the target behavior was the imitation of a 4-word sentence. Although the training was not designed to meet the children's everyday communication needs, an empirical finding that the two training approaches differed in effectiveness might have important ramifications, particularly regarding the selection of the language training approach to be used in actual therapy.

METHOD

Children and Setting

Three mentally retarded children participated in the study. All three children were inpatients in a children's psychiatric treatment program, having received an admission diagnosis reflecting a severe behavior disorder in addition to mental retardation. They were selected for participation primarily because of their delayed language development. Eli was a 7-year-old boy functioning in the moderate range of mental retardation (Stanford-Binet IQ: 34). Mick was 8 years, 1 month old and Tyco was 4 years, 8 months of age; both functioned in the mild range of mental retardation (Stanford-Binet IQ: 54 and 66, respectively). Primary intellectual deficits for all children were found in the area of language development. Language ages were estimated by a speech therapist from performance on relevant items from several speech and language assessment instructions. Eli's expressive language skills fell at the 2-year, 6-month level; Mick's at the 3-year, 6-month level; and Tyco's at the 3-year level.

None of the three children received individual speech therapy or direct sign language training concurrent with participating in the study. How-

ever, all the children were tangentially exposed to some simple, functional signs that were frequently used with their nonverbal peers.

The study was carried out in a small therapy room furnished with a table and chairs for the child and the therapist. The room was wired for sound and had a large Plexiglass one-way observation window.

Materials

Materials included six colored pictures on posterboard. These pictures corresponded to the six descriptive sentences used in the study. For example, a picture of a blue shirt was used when the sentence "The shirt is blue" was trained. Picture cues were used to minimize individual differences of attentiveness and short-term memory.

Procedure and Treatment Interventions

Construction of sentence pairs. Three sentence pairs were constructed; each pair was designed to be equivalent in the following manner. A list of 20 sentences was constructed, all of the form (e.g., "The tree is green," "The shirt is blue.") A speech therapist and a special education teacher rated each sentence, using a 7-point Likert Scale. Raters were asked to consider difficulty of concepts, difficulty of articulation, the fine motor skills needed to form the signs, and iconicity of the signs (i.e., how well the signs symbolize the words) in their ratings. Each sentence was rated twice, once for ease of vocalizing the sentences, and once for ease of vocalizing and signing. The following sentence pairs were determined as equivalent across all rating dimensions and randomly assigned to either oral or total communication training conditions.

1. The shirt is blue.	1a. The tree is green.
2. The fish is long.	2a. The bug is small.
3. The shoe is old.	3b. The coat is wet.

Training procedures. Two training sessions were conducted daily, 5–6 days per week. Oral methods were used during one session, and total communication methods were used during the other. Sessions ranged from approximately 15 to 30 minutes in duration, with session length dependent on the

number of sentences trained and the child's compliance with training procedures. A graduate student in psychology served as therapist for all three children, under both training conditions.

Both training procedures involved chaining sentence parts beginning with a noun label (e.g., "tree") and then an adjective (e.g., "green"). Next, the two were combined (e.g., "tree green"). This pattern was continued until the entire sentence became the target response. Training focused on one sentence part (e.g., "tree") until the child produced four of five correct, unprompted responses. Then, the next sentence part in the sequence (e.g., "green") was trained. For the sentence "The tree is green," the following sequence of criteria was trained: tree, green, tree green, is, tree is green, the, The tree is green.

The training procedures required that the therapist gain the attention of the child at the start of each trial. Prior to the start of the study, compliance training sessions were held, in which praise and candy reinforcement were given to the child for sitting quietly in a chair with hands folded on the table and looking at the therapist.

Once the child was attentive, the therapist showed a picture cue appropriate to the sentence to be trained and modeled the response required. The child was then cued to respond: "Tyco, you say (and show me the sign for) 'The tree is green.'" Oral training methods involved presenting vocal stimuli and requiring vocal responses, whereas total communication methods involved presenting vocal and signed stimuli and required vocal and signed responses. Candy and praise were delivered when the child responded correctly. Once the reinforcer was delivered and consumed, the next trial began. If the child responded incorrectly, or failed to respond within 15 seconds, the trial was terminated and the next trial was begun. On all training trials following an incorrect or failure of response, the child received vocal or manual prompts or both to produce the required response and received the reinforcer accordingly.

Each post-baseline session consisted of five training trials per sentence. Thus, there were 5, 10, or 15 training trials, depending on whether one, two,

or three sentences were being trained. The number of sentences trained varied in accordance with the requirements of the experimental design.

Assessment procedures. Immediately following training of one, and prior to training of a second sentence, five assessment trials were conducted. As in training, each trial was begun only when the child was attentive. The therapist then showed the appropriate picture cue and modeled the response required. During assessment trials, the entire sentence was vocalized, or vocalized and signed, depending on the training condition. The child was then cued to respond. No prompts or reinforcers were delivered under assessment conditions. Once the child had responded, or after 15 seconds, the next trial was initiated. Data derived from the assessment procedure served as the dependent measure across all phases of the study.

Experimental Design

To demonstrate empirically the relative efficacy of the two therapies, an alternating treatments design (Barlow & Hayes, 1979) was integrated within a multiple baseline format using the multiprobe technique (Horner & Baer, 1978). Baseline procedures were identical to those described under *Assessment procedures*. In the alternating treatments phase, the experimental training conditions were introduced and both the training and assessment procedures previously outlined were in effect. The order of presentation of the two types of training was counterbalanced across treatment days. From this phase, the therapy leading to the most rapid acquisition of the target response (i.e., repeating a 4-word sentence) was determined and the more effective training method was used in the training of both sentences of each pair to mastery of the entire sentence.

Recording and Reliability

The therapist served as primary data collector in the study. During training, the following information was recorded on each trial: the criterion level, whether the trial was prompted, and whether the child responded correctly, incorrectly, or not at all. During assessment, the following information

Figures 1, 2 and 3. Mean number of sentence parts learned by Eli, Mick, and Tyco, respectively, during baseline (no intervention), alternating treatments (oral versus total communication training), and total communication (Eli and Mick only).

was recorded on each trial: whether the child vocalized, signed, or vocalized and signed the responses and by which method each of the sentence parts were expressed.

During both training and assessment, correct vocalization was scored if articulation was clear enough to afford reliable recognition of the word or words trained. Correct signing was scored if the child displayed the critical components of the sign or signs trained.

Assessment data were scored in the following way: one point was assigned to each word vocalized correctly, in the proper sentence order, for sentences 1, 2, 3; one point was assigned to each word vocalized and signed correctly, in the proper sentence order, for sentences 1a, 2a, and 3a. Total points per trial were then averaged across the five assessment trials with the session mean plotted as the dependent measure.

A trained observer was present during at least 53% of both oral and total communication training sessions for each child. The observer viewed the sessions from behind a one-way observation window and collected data independent of the therapist.

Data collected during training served as an indirect measure of compliance with the training procedures. These data showed that the therapist consistently complied with the procedures specified earlier. Disagreements in scoring responses as prompted, correct, incorrect, or no response occurred during only 1%, 3%, and 0% of oral training and 0%, 2%, and 0% of total communication training sessions for Eli, Mick, and Tyco, respectively. In no case did errors in scoring result in failure to advance or in premature advancement to subsequent criterion levels.

Data collected during assessment provided a re-

liability check on the dependent measures. Reliability was calculated using the standard percent agreement formula: $[\text{agreements}/(\text{agreements} + \text{disagreements})] \times 100$. Agreements were scored if both the therapist and the observer recorded the same response. Responses were considered word-by-word across the five trials of each assessment session. Overall, reliability was high, with percent agreement falling below 80% during only two sessions across all children and all sessions. Reliability coefficients of at least 96% were obtained for both oral and total communication training sessions for each child.

RESULTS

The mean numbers of sentence parts repeated by the three children are presented in Figures 1, 2, and 3. Correct total communication responses generally increased more rapidly than correct oral speech responses. Indeed, for Eli and Mick, it was clear that total communication training facilitated 100% mastery of the target response, whereas oral training methods yielded no (in the case of Eli) or small (in the case of Mick) gains. This observation is further substantiated by the rapid acquisition of sentences 1, 2, and 3 (originally trained via oral methods) once total communication training was applied. For Tyco, the differential effects of treatments were somewhat less clear. However, even though both approaches resulted in 100% mastery of the sentences, in two of the three cases, total communication training was clearly more facilitative of this goal.

Training data, in the form of training sessions to criterion, are presented in Table 1. These data also show the superiority of total communication programming for the three children. In the cases of Eli and Mick, large differences in training effects became evident when the target response was three words in sequence (Criterion 5). Neither were able to master the complete, 4-word sentence without the aid of signs. Tyco's responding was more inconsistent. Looking at sessions to 100% mastery, a large difference (25 sessions) was observed with

sentence pair 1, with total communication methods clearly the treatment of choice. A small difference (11 sessions) was apparent with sentence pair 2, still favoring total communication training. No difference was observed in number of sessions to criterion for sentence pair 3.

DISCUSSION

Results of this study demonstrated that the total communication approach was more effective than strictly oral methods in facilitating sentence repetition with three minimally verbal, mentally retarded children. These findings provide additional support to the results of similar studies by Barrera and Sulzer-Azaroff (1983) and Brady and Smouse (1978), that total communication programming is an effective treatment alternative for use with language-deficient populations.

It should be emphasized that in the three cases described, oral communication was one component of the targeted response in the total communication condition. Use of signs plus speech by therapist and child improved the children's speech *and* signing. This is contrary to the supposition of many clinicians that sign training may inhibit vocalizations in a verbal individual. In fact, sign training appeared to facilitate appropriate oral speech.

The methodology used in this study also supports the usefulness of the alternating treatments design in choosing an effective treatment strategy. Typically, mentally retarded children are simply placed in whatever language training program is available when it becomes evident that speech development is not progressing as it should. In far too many instances, years pass with little or no progress under a single language training approach, perhaps to allow every opportunity for benefits to be realized, or perhaps because there are currently no criteria to show when one approach should be terminated and another introduced. Alternatively, some mentally retarded children are sequentially exposed to one language training program after another until one approach seems intuitively to work better than the others. Clearly, neither of these situations is

Table 1
Training Data

Criterion	Speech	Number of sessions to criterion							
		Total commun.	Total commun.	Speech	Total commun.	Total commun.	Speech	Total commun.	Total commun.
	1	1	1a	2	2	2a	3	3	3a
Eli									
1	4	1	2	1	1	1	1	1	2
2	5	2	4	2	2	2	2	2	3
3	9	3	5	15	3	5	3	3	5
4	12	4	11	16	4	6	4	4	6
5	30	5	16	21	5	9	8	5	7
6	31	6	17	22	6	10	10	6	8
7	*(55)	7	29	*(28)	7	11	*(20)	7	11
Mick									
1	1	1	2	1	1	1	1	1	2
2	2	2	3	2	2	3	2	2	3
3	3	3	10	4	3	6	3	3	5
4	4	4	12	5	4	7	4	4	6
5	*(63)	5	15	42	7	11	25	7	16
6	*	6	16	43	8	12	26	8	17
7	*	8	28	*(52)	9	22	*(38)	9	18
Tyco									
1	1		2	1		2	1		1
2	2		6	2		3	2		2
3	3		12	3		4	3		3
4	4		15	4		5	4		4
5	54		35	10		8	5		7
6	55		37	11		9	6		8
7	71		46	27		16	10		10

* Criterion never met under specified treatment condition. Number in parentheses is number of sessions under speech therapy procedures. Following this, total communication training was used.

desirable. In the three cases described in this study, the alternating treatments design allowed for the simultaneous application of two language training approaches in such a way that direct comparisons between them could be made and an effective approach to treatment determined. Future work should further explore the applicability of the alternating treatments design to the assessment of which children should get what language training program.

REFERENCES

- Barlow, D. H., Hayes, S. C. (1979). Alternating treatments design: One strategy for comparing the effect of two treatments in a single subject. *Journal of Applied Behavior Analysis*, 12, 199-210.
- Barrera, R. D., & Sulzer-Azaroff, B. (1983). An alternating treatment comparison of oral and total communication training programs with echolalic autistic children. *Journal of Applied Behavior Analysis*, 16, 379-394.
- Brady, D. O., & Smouse, A. D. (1978). A simultaneous comparison of three methods for language training with an autistic child: An experimental single case analysis. *Journal of Autism and Childhood Schizophrenia*, 8, 271-279.
- Carr, E. B. (1979). Teaching autistic children to use sign language: Some research issues. *Journal of Autism and Developmental Disorders*, 9, 345-359.
- Horner, R. D., Baer, D. M. (1978). Multiple-probe technique: A variation of the multiple-baseline. *Journal of Applied Behavior Analysis*, 11, 189-196.
- Kahn, J. V. (1977). A comparison of manual and oral language training with mute retarded children. *Mental Retardation*, 15, 21-23.

- Kahn, J. V. (1981). A comparison of sign and verbal language training with nonverbal retarded children. *Journal of Speech and Hearing Research*, **24**, 111-119.
- Poulton, K. T., & Algozzine, B. (1980). Manual communication and mental retardation: A review of research and implications. *American Journal of Mental Deficiency*, **85**, 145-152.
- Remington, B., & Clarke, S. (1983). Acquisition of expressive signing by autistic children: An evaluation of the relative effects of simultaneous communication and sign-alone training. *Journal of Applied Behavior Analysis*, **16**, 315-328.
- Sisson, L. A., & Barrett, R. P. (1983). A review of non-speech communication systems with autistic and mentally retarded individuals. In Breuning, S. E., Matson, J. L., & Barrett, R. P. (Eds.), *Advances in mental retardation and developmental disabilities*. Vol. 1 (pp. 97-123). Greenwich, CT: JAI Press.

Received September 7, 1983

Final acceptance August 13, 1984