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Michael E. Wells
Western Michigan University

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A COMPARISON OF TOTAL COMMUNICATION AND TRADITIONAL
SPEECH TRAINING METHODS WITH HEARING
NONCOMMUNICATING, SEVERELY MENTALLY RETARDED INDIVIDUALS

by

Michael E. Wells

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Michael E. Wells

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The mentally impaired person's limited behavioral repertoire often hampers his ability to convey information and carry out any interpersonal exchange successfully. Because the mentally impaired person's ineffective communication skills further impede the learning process, the development of these communication skills is a crucial topic of instruction for those professionals working with this population. If handicapped individuals are to function independently in the least restrictive environment possible, the development of functional communication skills seems requisite.

The extralinguistic gestures used by normal, speaking adults in conversation appears in the behavioral repertoire of the retarded individual as well. The retarded person often indicates his communication in a variety of ways, some subtle, some not so subtle. For example, tugging at his pants to indicate a toileting need, banging a cup on the table to indicate "more," or bringing a coat to an instructor or a parent when wanting to go outside, are all nonvocal communication behaviors.

Manual expressive training provides the retarded, nonvocal person with two benefits (Snell, 1974). First is a temporary expressive communication system which would act to reduce social retardation by encouraging communication with peers and adults. Second, expressive gestures may lead to an expansion of receptive skills, laying the foundation for later vocal expression.

Despite its admittedly limited audience, American Sign Language has major advantages over other nonvocal systems of communication,

especially those requiring extrapersonal devices and materials (e.g., BLISSymbolics boards, or vocal boards). The individual being taught may find such devices cumbersome and unnatural. In addition, the devices could easily be an additional stigma to persons who already have difficulty assimilating into the general population. Sign language is fluid, flexible, fairly standardized and more closely approximates the spontaneous nature of spoken language. American Sign Language ranks fourth in the United States, after English, Spanish, and Italian and before French and German (Fristoe and Lloyd, 1977).

From a behavioral standpoint there are some reasons why retarded persons can acquire signs more rapidly than vocal language (Sundberg, Milani, and Partington, 1977). First, the form of the response is easier to teach. The learner's hands can be placed in the appropriate position, whereas the vocal musculature can only be altered indirectly. A clearer model of the appropriate response is possible using sign language, and more definite and observable shaping can occur. Vocal behavior involves manipulating the right muscles at the right time. Signing also involves this type of manipulation, however on a much grosser level.

Secondly, the components of the signs often match components of the word (e.g., the sign for "is" is the manual alphabet letter sign "i" moved out from the chin) providing even further assistance to vocalization. There is also a large potential for resemblance of the signs and the controlling variable. Large numbers of signs (iconic signs) do resemble some aspect of the variable controlling the response. For example, the sign for "ball" is made by forming the shape of a ball

with the two hands. Such relationships probably make it easier to develop the added visual cue and may facilitate learning and usage.

Thirdly, unsuccessful attempts at vocal communication are generally punished due to the degree of unintelligibility of the words. This is true especially among individuals who are old enough by normal standards to have developed functional speech. Such histories typically involve frequent failure to attempt to communicate vocally and considerable urging to do so by others. The fact that attempts at vocal behavior could not be understood by the listener not only results in punishment for the entire response class of vocalization, it also makes it impossible for the articulation to be corrected. Pairing signs with verbal approximations increases the likelihood that the attempted communication will be understood and provides the opportunity to immediately model a correct vocalization. This makes it possible to eventually fade the sign when articulation improves to the point that it can be better understood by a listener.

Recently, there has been an increased interest in the use of sign language with noncommunicating, hearing persons. Preliminary research has provided encouraging results. Richardson (1975) reported that a gestural language program developed at Southbury Training School achieved progress in comprehension and expression in 75% of the students, in two years. The residents were profoundly or severely retarded. Fulwiler and Fouts (1976) found that a noncommunicating, autistic child could acquire signs with only twenty hours of training. Results of a study by Bricker (1972) present support for the assumption

that sign-word and sign-object training facilitates the acquisition of word-object associations. However, Bricker examined only receptive association. VanBiervliet (1977) was able to determine that sign-object and sign-word training did result in the acquisition of both receptive and expressive word-object association.

The use of signs to train language skills has met with considerable resistance from educators who have argued that teaching a manual-sign mode of communication to normally hearing children will result in those children never learning to speak; instead they would communicate only with their hands. This argument, however, has not been substantially supported by empirical research. In fact, limited research indicates that sign language can facilitate rather than inhibit vocalizations in the language deficient child or adult (Lebels and Lebels, 1975; Skelly, Schinshy, Smith, and Fust, 1974; Topper, 1975). In addition, VanBiervliet (1974) suggests that his results indicate that the combined use of manual signs and spoken language may be effective in the training of spoken language to language delayed or otherwise communications impaired individuals. Fulwiler and Fouts (1976) also found that an increase in the use of signs led to an increase in vocalization in both the training situations and outside the training environment. The generalized use of signs and vocal speech was said to have resulted in increased social interaction.

This study will investigate a method to train communication skills in severely mentally retarded individuals by improving articulation. A total communications method will be compared to traditional speech therapy methods of oral gymnastics and vocal imitation. The

total communication system of training is defined by Snell (1974) as the simultaneous presentation of visual-manual language with oral-spoken English. In view of the empirical results summarized above it would seem that the use of a manual language may improve articulation more than traditional speech training methods.

METHOD

Subjects

Three females, ranging in age from eighteen to twenty-six years old served as subjects. During the time of the study they all were enrolled in a public school program for the severely mentally impaired. All were functioning within the severe range of cognitive retardation based on Stanford-Binet scores (ranging from IQ = 24 to IQ = 33) and also within the severe range of adaptive retardation based on the American Association on Mental Deficiency's Adaptive Behavior Scale. These individuals were chosen because they met the three criteria adopted by this study to be used in determining whether or not they would benefit from and should be included in a sign language program. These criteria were offered by Sundberg, Michael, and Petersen (1977), and are as follows:

- 1) It is clear that vocal behavior is ineffective in manipulating the individual's environment.
- 2) Speech therapy techniques have proven to be ineffective or too slow to produce a major impact.
- 3) The person has the physical capabilities to produce the signs.

In addition all these students had received speech training for at least two years under the supervision of a speech therapist. Two had received five years or more of speech training.

Setting

The subjects attended class five days a week from 8:30 a.m. to 2:30 p.m. The majority of their time at school was spent in half-hour small group or individual one-to-one training sessions conducted by graduate or undergraduate students from Western Michigan University or by the classroom staff.

The training sessions took place during one of the half-hours scheduled for programming. The sessions were conducted in a one-to-one experimenter to student ratio. All training and tape recording occurred in a 1.7m X 2.3m X 2.7m sound attenuated booth which contained a .3m X .7m one-way window.

Word Selection

An initial list of thirty-four words was formulated by making observations and determining words which named or described objects, events, or persons which were reinforcing for the subjects (e.g., ball, play, mother, etc.) and words which named or described objects, events, or persons which the subjects came into contact with often (e.g., bed, game, father, etc.). Words on which the subjects had already received speech training were not included. The words were then paired along a difficulty dimension (with the assistance of the program's speech therapist) giving two lists of words which were very nearly equal in

developmental level and difficulty of sounds to articulate. Using a random number table, one word from each pair was randomly assigned to be taught by traditional speech therapy methods of sound imitation and oral gymnastics. The remaining word was taught using the total communication method of simultaneous presentation of visual-manual language (American Sign Language) with the spoken word. The lists of training words are presented in Table I.

Procedure

Prior to training the experimenter tape recorded the subjects' articulation of each of the thirty-four target words chosen according to the selection methods described above. The experimenter gave the command "say (target word)". All subjects made some attempt at imitation each time. The list was recorded twice for each subject, once on each of two consecutive days. The second recording was used as the scored tape.

All training was done by the experimenter. Although not a professional speech therapist, the experimenter had carried out numerous speech therapy programs following training by the speech therapist for the Program for the Severely Mentally Impaired. All training for this study was done under the supervision of the speech therapist who observed training sessions weekly.

The training sessions were broken into two fifteen minute training segments. One segment consisted of training using traditional speech therapy methods for two words found on the traditional speech method list. The other segment consisted of training using the total

communication method for two words found on the total communication list. The order of presentation as well as selection of the words to be trained from each list was randomized. Responses were considered correct, and reinforced when they were judged, by the experimenter, to be as good or better than previous production of the same word during traditional training. Responses were correct and reinforced when they consisted of the American Sign Language sign for the word accompanied by a vocal approximation in the total communication training segments. No improvement criteria was required for vocalizations in the total communication segments. The second training segment immediately followed the first and the order of methods used for each session was alternated. Following ten training segments on each method, the subjects were again asked by the experimenter to say the target word that had just been trained and the response was tape recorded. During the training day immediately following the post-training recordings, training began on a new set of words from the two lists.

Data was collected on the number of reinforcements given per segment. Reinforcement in all cases was social praise. Reliability on the correct, incorrect scoring was taken once on each pair of words. Reliability was taken without the knowledge of the experimenter by the teacher of the subjects' classroom. The reliability was computed by dividing agreements by agreements plus disagreements and multiplying by one hundred to give a percentage of agreements. Reliability ranged from 88% to 95% with an average of 92%.

Following completion of training on eight words from each list for subjects A and C and six words from each list for subject B, an

additional recording was made to be used in the articulation evaluations. Using a random number table, pre-training and post-training, responses previously recorded for all three subjects were recorded in random order. Fifteen graduate students from the Department of Speech and Hearing with training in articulation evaluations listened to the scoring tapes and scored each response on a scale of one to five, with five being an easily understood, well articulated word and a one being an unintelligible response. The scorers had a list of the responses in the order they occurred on the scoring tape so that they were aware of which word was being attempted; however, scorers did not know the nature of the study nor the degree or type of training used with each word.

Table I
Target Words Listed by Method of Training

Target Words-Total Communication	Target Words- Traditional
time	dime
plate	black
hat	baby
run	close
ball	play
please	foot
father	game
comb	mother
paper	pet
class	toast
give	glass
blue	have
bath	fall
love	tooth
taste	keep
bed	room
good	like

RESULTS

Total number of reinforcements for correct responses (as defined above) in the traditional training segments differed very little from total communication segments. Reinforcement was defined as a single episode of social praise which followed a correct response. For subject A, total communication segments netted a mean of 13.8 reinforcements per segment while traditional segments netted a mean of 13.2 reinforcements per segment. In the case of subject B, mean reinforcements per segment was 14.7 for total communication segments and 14.8 for traditional segments. Subject C received a mean of 12.4 reinforcements per segment for both training methods.

Training took place on eight words from each list for subjects A and C and six words from each list for subject B. The entire list was not trained due to time constraints and the loss of one subject from the program.

By comparing the mean articulation score for each untrained word with the mean articulation score of the same word, spoken by the same subject following training, a difference score was obtained. From the difference scores for each word a mean was calculated for each training method, by subject, yielding a mean difference for total communication trained words and a mean difference for traditionally trained words, for each subject. In all but one case the difference was a positive change indicating improvement in articulation. Mean difference scores showed greater improvement took place in the articulation of the target words trained by the total communication method over words trained by

the traditional speech therapy method. Difference scores for each subject were analyzed using the standard two-tailed t test (degrees of freedom for subjects A and C = 14 and for subject B = 10), and found to be significant at the .05 level of significance. Details of the t test analyses can be found in the Appendix.

Subject A showed a mean improvement of 1.6 points (on the five point scale) for total communication trained words, compared to a mean improvement of .37 for words trained traditionally. Figure I illustrates subject A's mean articulation scores for each target word, before and after training. Improvements in scores following training with the total communication method is seen in each case. The difference in pre-training and post-training scores is not as pronounced with words trained traditionally.

Subject B made a mean improvement of 1.0 point on the total communication trained words while traditionally trained words showed no mean improvement. Subject B's mean articulation scores for each target word_x before and after training are seen in Figure 2. There is an improvement apparent in the articulation scores following total communication training. Traditional speech training resulted in no change at all for four of the six words trained using that method.

The most striking difference was obtained by Subject C with a 2.5 points mean improvement for total communication trained words and a mean decline of .25 points for the traditionally trained words. As Figure 3 illustrates a very definite improvement took place in the mean articulation scores following total communication training in every case. Equally apparent is the lack of positive change in the

scores for traditionally trained words.

Figure 4 gives a clear comparison of the change in mean articulation scores of all three subjects for the two methods of training. In every case the improvement in articulation scores of words trained using the total communication method was of greater magnitude than that of words trained traditionally.

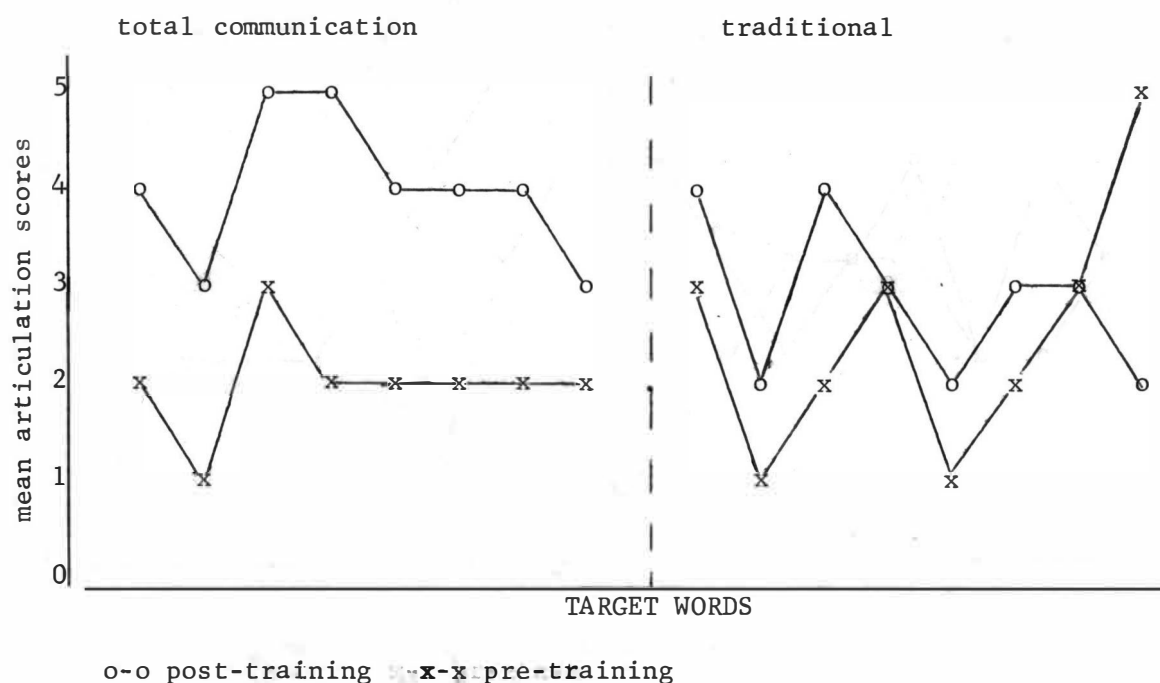


Fig.1 Mean articulation scores for target words in pre-training and post-training conditions for subject A.

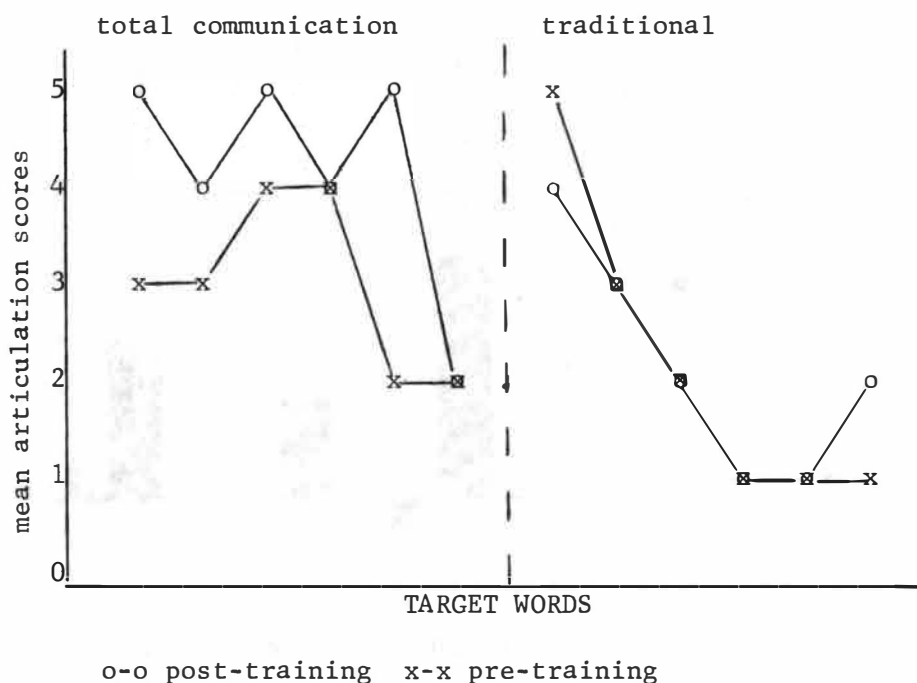


Fig.2 Mean articulation scores for target words in pre-training and post-training conditions for subject B.

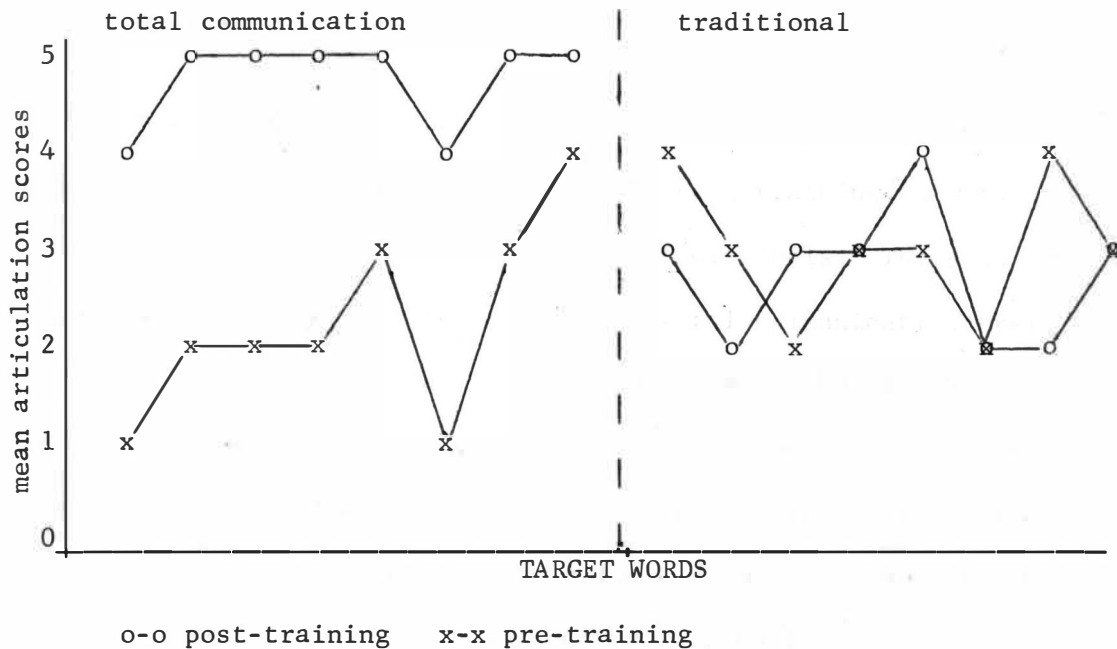


Fig.3 Mean articulation scores for target words in pre-training and post-training conditions for subject C.

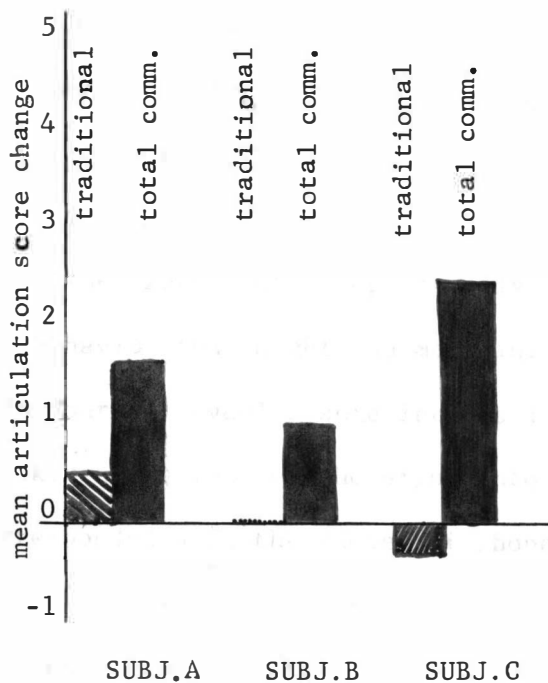


Fig.4 The mean articulation score change from pre-training to post-training condition for the two different training methods shown for each subject.

DISCUSSION

The purpose of this study was to compare the effect of total communication training versus traditional speech training on word articulation in severely mentally retarded individuals. The study was undertaken in an effort to discover if total communication training was indeed a reasonable alternative to a system that has been ineffective for so many hearing, noncommunicating retarded persons. An analysis of the change scores from the pre-training articulation to the post-training articulation revealed a significant difference in favor of the total communication method, suggesting that the procedure of training sign language in conjunction with vocal approximations operated as a facilitator for improvements in articulation. The fact that reinforcement per segment and training time per segment remained approximately equal rules out amount of reinforcement and amount of time as possible explanations for the difference in change scores.

The experimenter kept a daily journal throughout the study noting any behavior that might add more information relevant to the study. This journal revealed some interesting facts. Subject C was observed breaking down many of the signs into the number of movements which corresponded with the number of phonemes in the word it was associated with. For example, the sign for "plate", which is a circle formed with the two hands, was broken into three distinct parts. The "pl" sound corresponded with forming the hands into semicircles as they were raised from the lap or sides; the "a" sound corresponded with putting

the hands together to form a circle; the "t" sound corresponded with bringing the hands down into the table or just in front of the subject. The three movements and the three sounds were very deliberately done and were very distinct. "Plate" was said and the sign was formed in a point to point chain. Two of the subjects made up their own signs for words in the traditional list initially. For example, for "baby" subject C folded her arms as if holding a baby. These actions seem to suggest that it was facilitating to the subject to use signs along with their vocalizations and further that it was helpful to pair production of the individual sounds with a gross motor action. The generalized use of the acquired signs, with their vocal associates, in situations outside the training setting and with persons other than the experimenter was wide spread with all three subjects in this study. These uses of sign and vocalization were reinforced by other school staff but they did not request the signs. The increased vocalizations and resulting socialization which the subjects of this study exhibited had been previously reported in studies by Lebel and Lebel (1975) and Fulwiler and Fouts (1976).

The teaching of sign language to the retarded is a relatively new research area. Results are encouraging and further research should be conducted. This study does not address the question of why the signs are helpful although several possibilities are suggested by the actions of the subjects as described above. The use of signs to teach reading to those who have difficulties learning to read is a possibility as well. It is not possible to assess the degree of comprehension each of the

methods explored here may allow, from the present study but this is an area that bears further examination. Expanded and more effective instructional strategies should be developed. The area of evaluation needs further examination in order to develop more objective measures of the vocal responses particularly with regard to articulation. The increased use of manual language to facilitate speech should permit the retarded or handicapped person to communicate more effectively and function more independently.

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APPENDIX I

Analysis of Difference Scores for Subject A
Using the Two-Tailed t Test

Traditional Training
Scores

1
 1
 2
 0
 1
 1
 0
 $\Sigma X = \frac{-3}{3}$
 $\Sigma X^2 = 17$
 $\bar{X} = .375$
 $n = 8$
 $SS = 15.9$

Total Communication Training
Scores

2
 2
 3
 2
 2
 2
 1
 $\frac{2}{16}$
 34
 2.0
 8
 2.0

$$df = 14$$

$$t_{\text{obtained}} = 2.90$$

$$t_{.05} = 2.145$$

$$t_{.01} = 2.97$$

APPENDIX II

Analysis of Difference Scores for Subject B
Using the Two-Tailed t Test

Traditional Training
Scores

Total Communication Training
Scores

	-1		2
	0		1
	0		1
	0		0
	0		2
	1		0
$\Sigma X =$	0		6
$\Sigma X^2 =$	2		10
$\bar{X} =$	0		1
$n =$	6		6
$SS =$	2		4

df= 10

$t_{\text{obtained}} = 2.231$

$t_{.05} = 2.228$

APPENDIX III

Analysis of Difference Scores for Subject C
Using the Two-Tailed t Test

Traditional Training
Scores

Total Communication Training
Scores

	-1	3
	-1	3
	1	3
	0	2
	1	3
	0	2
	-2	1
	0	3
X=	$\frac{-2}{8}$	$\frac{20}{8}$
$X^2=$	8	54
$\bar{X}=$	-.25	2.5
n=	8	8
SS=	7.5	22

df= 14

$t_{\text{obtained}} = 3.77$

$t_{.05} = 2.145$

$t_{.01} = 2.977$

APPENDIX IV

Ranges of Scores from all Evaluators for Subject A

target words	Total Communication Trained Words	
	pre-training	post-training
1	1.5- 2.5	3.5- 4.5
2	1.0	2.5- 3.0
3	2.0- 3.5	4.5- 5.0
4	1.0- 2.0	5.0
5	1.0- 2.5	3.0- 4.5
6	1.5- 2.0	3.5- 4.0
7	1.0- 2.5	3.0- 4.5
8	1.5- 2.0	2.0- 3.5
	Traditional Trained Words	
1	2.0- 3.5	4.0- 4.5
2	1.0- 1.5	1.5- 2.5
3	1.0- 2.0	3.5- 4.5
4	2.0- 3.0	3.0- 3.5
5	1.0- 1.5	1.5- 2.0
6	1.0- 2.0	2.5- 3.5
7	2.0- 3.5	3.0- 3.5
8	4.5-5.0	1.5- 2.0

APPENDIX V

Ranges of Scores from all Evaluators for Subject B

target words	Total Communication Trained Words	
	pre-training	post-training
1	2.0- 3.5	4.5- 5.0
2	2.5- 3.5	3.5- 4.5
3	3.5- 4.5	5.0
4	3.5- 4.0	3.0- 4.5
5	1.5- 2.5	4.0- 5.0
6	1.0- 2.5	1.5- 2.0

Traditional Trained Words		
1	4.5- 5.0	4.0- 4.5
2	2.5- 3.5	2.5- 3.0
3	1.5- 2.5	1.0- 2.5
4	1.0- 1.5	1.0- 1.5
5	1.0	1.0
6	1.0	1.5- 2.5

APPENDIX VI

Ranges of Scores from all Evaluators for Subject C

Total Communication Trained Words

target words	pre-training	post-training
1	1.0- 1.5	4.0- 4.5
2	1.5- 2.0	5.0
3	1.5- 2.0	4.5- 5.0
4	1.0- 2.0	5.0
5	2.0- 3.5	5.0
6	1.0- 1.5	4.0- 4.5
7	2.5- 4.0	4.0- 5.0
8	3.5- 4.0	4.5- 5.0

Traditional Trained Words

1	3.0- 4.5	2.0- 3.0
2	2.5- 3.0	1.5- 2.5
3	1.0- 2.5	2.0- 3.5
4	2.5- 3.0	2.5- 3.0
5	3.0- 3.5	3.0- 4.0
6	1.5- 2.5	2.0- 3.0
7	3.0- 4.0	1.5- 2.0
8	2.0- 3.5	2.0- 3.5