

AN EXPRESSIVE SPEECH PROGRAM FOR A CHILD WITH ACQUIRED APHASIA: A CASE STUDY

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ABSTRACT

This article surveys the case history of an eleven year old aphasic boy with severe deficits in auditory comprehension and expressive speech skills. It traces his past medical, educational and speech history until the present program was initiated. In May 1976, the subject was enrolled in an intensive auditory comprehension and speech production program. This treatment approach is outlined for twelve months, with a final analysis of the specific therapeutic goals, techniques and progress made during that year.

Acquired aphasia in children is an impairment in reception, manipulation and/or expression of previously attained linguistic symbolic content, which hinders the development of additional linguistic competence. In the past, several articles have appeared in our journals describing theoretical models, medical implications and case histories of children with acquired aphasia (Landau and Kleffner, 1957; Worster-Drought, 1971; Gascon et al, 1973). Few researchers, however, have dealt with the paramount problem of constructing therapeutic programs for children with acquired aphasia.

The literature reveals a general paucity of treatment programs for remediating the language deficits of aphasic children. However, one of the few systematic methods for working with aphasic children has been described by Lea (1965). Lea taught receptive vocabulary, sentence structure and concept development using primarily visual presentation. In his scheme the parts of speech and sentence construction were differentiated by color coding. Although his procedure focussed mainly on receptive language development, it supplied the clinician with a well thought out remedial direction in which to take the child. Unlike Lea, most clinicians faced with the task of reteaching speech and language skills to children with acquired aphasia have sporadically adapted procedures from a variety of other programs devised for the dyspraxic, delayed language and learning disabled child. The primary disadvantage to such an approach is that the lack of a preconceived total program can result in inefficient use of treatment time and hinder the advancement of therapeutic goals. The present article describes a structured program for developing both auditory comprehension and expressive speech skills with a specific aphasic child.

CASE HISTORY

Bob, who is the eldest in a family of three children, was born in August 1965. Until the age of 5 years his developmental milestones were reported to be normal. At the age of 5

years 1 month, his parents noted that there was a change in his behavior which was characterized by difficulty with hearing and remembering the names of common objects. At the age of 5 years 4 months, further deterioration was noted and his parents reported that his speech became "disorderly." An extensive medical examination was carried out including biochemical studies which showed no abnormalities. However, an EEG indicated marked excess of epileptiform activity particularly over the left hemisphere.

From January to June of the following year, the parents reported that Bob made a remarkable recovery. His speech became more normal although he still displayed word finding difficulties. At the age of 6 years 1 month, Bob was enrolled in the first grade. He successfully started to learn reading and arithmetic skills. At this time some minor seizures were noted together with further speech deterioration. Consequently in October 1971, Bob was referred to a hospital in Eastern Canada and was given an extensive battery of tests. Among the findings reported at this time was that he achieved a Performance Scale IQ of 128 on the Wechsler Intelligence Scale for Children. The discharge diagnosis was that Bob exhibited Schilders Disease¹ and a course of steroids was recommended.

In March, 1972 at the age of 6 years 7 months, six grand mal nocturnal seizures were observed. Following further hospitalization, the medical opinion was that Bob was suffering from either epilepsy or biochemical derangement, with concomitant acquired aphasia.

In September of that year the parents decided to enroll Bob at the School for the Deaf since the prognosis for Bob ever developing expressive speech or auditory comprehension skills was extremely poor. However, Bob strongly resisted any attempt to teach him sign language. He was then referred to the Glenrose Hospital. There he was placed in a small class setting with intensive involvement from the departments of speech and psychology.

At the time of his admission to the Glenrose it was impossible to administer standardized tests to Bob. Clinical observation indicated that speech had no meaning for him in that he did not even turn to his name when called. In addition, Bob had little awareness of environmental sounds and he demonstrated no ability to process auditory language. In terms of his expressive speech skills, Bob was limited to continuous production of a high pitched /s/ sound. He was able to print the names of a few objects in addition to visually comprehending many written words. Normal puretone thresholds were established by the audiologist. Bob was extremely visually alert, picking up minimal visual cues from the environment and thereby giving a falsely inflated impression of his auditory comprehension skills to casual observers.

Because of Bob's inability at that time to imitate sounds and to comprehend oral language, treatment was geared towards three areas: (1) increasing his awareness of sound; (2) helping him to attach meaning to environmental sounds; (3) expanding the scope and complexity of his written language. In terms of developing written language, a systematic program was devised by the speech pathologist, teachers and psychologist, along the lines of the program described by John Lea (1965). Core vocabulary items were established and then a color coding system for the parts of speech was used to expand the structures into grammatically appropriate sequences. Extreme difficulty was encountered whenever the "exceptions" to the rules of grammar or spelling were introduced, because Bob clung tenaciously to the "logic" he had previously perceived. Attempts to teach questions and answer forms required much repetition. A small leather bound notebook and pencil attached to his belt (so that it would be more readily available for him to communicate by writing) was used to emphasize the functionality of

communication in every situation. Bob tended to be reluctant to experiment with his writing skills outside the structured therapy setting for fear of ridicule from his peers. Bob frequently became frustrated and non-compliant because of his total inability to use any expressive speech, and his avoidance of using written expression. All communication with Bob had to be through gesture or written language.

Three years following admission to the Glenrose, Bob had progressed to using written communication in the form of producing six word sentences in structured situations. Spontaneously he tended to produce one and two word phrases in writing. He had become more aware of sound but still had extreme difficulty in comprehending auditory information. He was able to react to and differentiate common environmental sounds, but was completely unable to discriminate consonant and vowels presented auditorily. The continuous production of the high pitched /s/ sound had essentially been eliminated. In addition, he would produce the vocalization /a/ to attract attention. Much of his previous frustration was better controlled, although it was not completely eliminated.

In March 1976, four and one half years post-onset of the second major neurological trauma, Bob's spontaneous vocalizing increased considerably in class. He also began using recognizable approximations of "what", "no", "shut up", "go", "bye", and the numbers one to five. Consequently a new phase in the program was initiated: the gradual molding of those vocalizations into the development of functional expressive speech skills.

¹Schilder's Disease, Characterized pathologically by widespread and usually symmetrical demyelination of the white matter of the cerebral hemispheres, tending to begin in the occipital lobes and spreading forward, and clinically in typical cases by visual failure, mental deterioration and spastic paralysis. The disease is invariably progressive and almost always terminates fatally. Brian, W.R., Clinical Neurology, Oxford University Press, London. (1962).

PROGRAM

In September 1976, Bob was enrolled in an intensive therapy program for one hour sessions five times each week. The speech and language program was divided into two major sections (speech training and language training), with specific goals and objectives being listed in each section. Reinforcement procedures and criterion levels varied throughout the program depending upon which therapeutic objective was being taught. Before teaching a particular level, Bob was given a pre-training probe. This determined the percentage of correct responses already established for those items chosen for training. A criterion level of 80% correct for 2 consecutive days or 90% correct for 1 day was needed to advance to the next level. Throughout the therapy program, the data was recorded in blocks of 10 in which Bob was presented with 10 training items and the percentage correct was computed before progressing on to the next therapy activity.

Initially, the general program goals were to develop Bob's auditory comprehension and verbal expression of single word utterances. Functional words that would help him to communicate in both the classroom and in after-school activities were chosen. Several prerequisite skills needed to be taught before Bob was ready to work on even the most basic aspects of communication. In September 1976, Bob displayed inconsistent auditory discrimination of both consonant and vowel sounds. In addition he had gross production of a few words with very poor intelligibility. Because his speech was severely

apraxic and his auditory comprehension skills were grossly impaired, it was critical to initially construct therapy goals to remediate both these deficits. Therefore therapy activities began with phoneme discrimination.

SPEECH TRAINING

An outline of the treatment program follows. A more detailed description of the teaching strategies is available in Appendices A and B.

Discrimination of Individual Phonemes

On the auditory comprehension level, work began with improving Bob's ability to discriminate between different phonemes. Discrimination activities progressed from teaching 10 different long and short vowel sounds to the training of 10 voiced and 8 voiceless consonants (see appendix A). The voiced consonants were taught first followed by training their voiceless counterparts. This teaching sequence was selected because of Bob's inability to auditorily differentiate between voiced and voiceless consonants. As his auditory discrimination skills developed, the voiced and voiceless groups were mixed together for additional training. The teaching hierarchy was identical for both consonants and vowels and followed a training progression which started with discrimination using both verbal paired with visual cues, and terminated in discrimination using only the auditory component (i.e. **Verbal Cues** — the clinician's production of the phoneme; **Visual Cues** — written version of the phoneme and the information obtained from watching the clinician articulate). After achieving the specified criterion level using both verbal paired with visual cues, the visual components were gradually faded from the training procedures by having the clinician's face hidden by a partition during the presentation and removing the written version of the phoneme from the table. This procedure assured the clinician that Bob was actually using his auditory channel to discriminate rather than his visual channel.

Each phoneme was trained in groups of four. During Discrimination Level 1 (using verbal paired with visual cues) the clinician stated "point to _____", and Bob responded by pointing to the appropriate written phoneme. Discrimination Level 2 (using only verbal cues) again trained each phoneme in groups of four, however, this time the clinician asked Bob to "write _____", rather than point to a particular phoneme eliminating the chance of him using the written symbol as an additional cue.

Production of Individual Phonemes

It has been suggested that the errors apraxic children display in speech sound sequencing are partially caused by their inability to stabilize a correct articulatory posture for the individual phoneme (Dabul and Ballier, 1976). The next section of the program was devoted to mastery of individual vowel and consonant productions. Vowels were taught before consonants. The same hierarchy of teaching strategies were used in teaching both consonants and vowels. As previously stated, consonants were divided into voiced and voiceless groups. During the initial training of individual phoneme production, Bob had difficulty in producing voiceless consonants. Therefore, voiced consonants were taught before their voiceless counterparts. As Dabul and Ballier (1976) stated, this unitary level of production is quite logical in the process of sequencing phonemes into connected speech, in much the same way as one would first learn the alphabet before attempting to read.

To enhance the production of each phoneme, Bob progressed through a learning hierarchy of four separate teaching steps. Initially, the written form of the phoneme was presented accompanied by the clinician's verbal production of the sound. During Production Level 1, Bob also had the opportunity to receive information from watching the clinician's face during presentation of the sound. The command "say _____" was given and he was required to imitate the same production. If Bob was unable to achieve correct production from imitation, additional distinctive feature cuing was provided. Production Level 2 consisted of giving the same command "say _____", however the written symbol of the phoneme and the facial cues from the clinician were no longer available. Bob had to produce the sound purely from the auditory stimulus presented by the clinician. Production Level 3 attempted to transfer production from imitation to spontaneous verbalization using only visual cues. Bob was asked "what sound _____?" as the clinician pointed to the written version of the phoneme. Although this Level enhanced his ability to spontaneously approximate a sound without an auditory stimulus, there was still a problem with latency between the command and his actual production of the phoneme. In addition, the number of correct productions was very inconsistent in structured situations. In an attempt to decrease the time between command and utterance, increase the percentage of correct output, and expedite the transfer of phoneme articulation from structured to unstructured activities, Production Level 4 used rapid repetition of each phoneme in isolation. With this particular child it seemed that the difficulties related to preparatory set and latency period were significantly reduced through the use of rapid repetition of each phoneme in isolation. In addition, this technique facilitated Bob's ability to automatize the correct production of several different phonemes at the isolation level. A criterion of 30 repetitions per 15-second trial was achieved before progressing to other levels of the program.

Sound Sequencing

Although individual phoneme production is an important remedial step, the child must be able to sequence various sound patterns together for the final process of spontaneous speech. The initial step in teaching sound sequencing was to combine all consonants (Appendix A) with the vowel /a/. Dabul and Ballier, (1976) stated that the ability to make the transition quickly from one articulatory posture to another is crucial to the rapid articulatory adjustments of spontaneous speech. Consequently the vowel /a/ was selected for training since it required the greatest downward excursion of the mandible, thereby forcing Bob to relocate to the desired articulatory posture from an open mouth position.

When the consonant plus /a/ was mastered, Bob was asked to produce the CV combination in rapid repetition to a criterion level of 30 CV repetitions per 15-second trial (Dabul and Ballier). Next, activities were constructed to expand syllables using several different consonants and vowels. The use of varied consonants and vowels gave Bob critical training in transferring from one articulatory posture to another. In this section, CV-CV combinations (i.e. ka-pa), and CVC combinations (e.g. pap) were used. Criterion was set at 20 repetitions per 15-second trial (Dabul and Ballier 1976).

LANGUAGE TRAINING

The acquisition of sound sequencing production skills in isolation cannot lead to functional communication. Structured language content must be woven into the treatment program. Because of Bob's specific language deficit, it was necessary to depart from traditional language training techniques. It was important to choose remedial

activities that would be functional in his day-to-day life rather than following a developmental sequence in training language skills.

Initially, 50 nouns including body parts, clothing, farm animals, family members and food were chosen for training. Many of these nouns were taken from his previously learned written vocabulary. Additional nouns were taught as the program progressed, however mastery of these initial 50 nouns was required before proceeding on to the verb training section.

Table 1 presents the 7 step hierarchy of training procedures which were used for teaching all parts of speech including nouns, verbs, prepositions, pronouns and adjectives.

Table 1. Training hierarchy for vocabulary building
1) Matching words and pictures.
2) Auditory discrimination.
3) Imitation of the clinician's production of the word.
4) Word attack training by individual phoneme and syllable.
5) Spontaneous production of the word with only visual cues (pictures and words — no spoken model).
6) Spontaneous production with only the written word.
7) Spontaneous production with only pictures.

Step 4 as listed in Table 1 (word attack training) was a procedure for producing each phoneme individually and then blending the isolated sounds into separate syllables and then words. The development of this skill was essential for improving the intelligibility of these productions. Bob derived considerable placement information from the graphic representation of the words. He was unable to make the jump between spontaneous production of the word with picture and written cues, to production with no cues at all. Consequently, visual cues in the form of written words had to be inserted to facilitate this transition.

Bob's learning rate varied considerably depending on the modality used (visual vs. auditory) and types of task attempted. Combined use of his visual and auditory channels when learning new comprehension and expression items enhanced the rate at which these skills were acquired and retained. The visual components were faded from each training step as soon as each task was learned.

After the initial 50 nouns were learned successfully, 25 basic verbs were introduced. Selection of the verbs was determined by their level of functionality for classroom and related activities. (Appendix B.) Verbs were taught using the same 7 step training hierarchy shown in Table 1. These 75 words formed the core vocabulary for the expansion to noun and verb combinations. Vocabulary training for all parts of speech was an on-going process. Therapy goals next turned to the expansion of his mean length of utterance (MLU). Again a training hierarchy was constructed for teaching all expansion phrases which ranged from simple noun and verb combinations to more complex seven word combinations (e.g. the+noun+is/are = verb(ing) + preposition + the + noun "The boy(s) is/are running down the street".)

Table II Training hierarchy for expansion of mean length of utterance.

- 1) Auditory discrimination by pointing using both visual and auditory cues.
- 2) Auditory discrimination by writing the appropriate phrase on the blackboard. During this step Bob used only the auditory cue.
- 3) Imitation of the clinician's production of the phrase.
- 4) Spontaneous production of the phrase using pictures and the written phrase.
- 5) Spontaneous production using only pictures.
- 6) Spontaneous production in response to "wh" question (e.g. Clinician: "what is the boy doing?"
Bob: "boy combing.")

This hierarchy of training procedures differed slightly from the one constructed for vocabulary building. Certain procedures were altered in an effort to put more emphasis on spontaneous production of the various grammatical phrases.

When noun + verb(ing), and noun + verb(ing) + verb phrases had been successfully trained, pronouns were introduced to the program. The training strategies described in Table I were again used for teaching the pronouns. However, as soon as each pronoun was taught, it was inserted into a combination phrase such as "I want ball." Next, prepositions (in, on, under, beside, behind, in front) and basic adjectives (encompassing size, color and number), were presented in the same fashion (Table I). Again, these new vocabulary words were put into phrases as soon as they were mastered individually. From this point on, the program was concerned with vocabulary building and phrase expansion. Appendices A and B describe in detail the therapy goals, materials and techniques which were used in training each section.)

Table III Sequence of Phrase Expansion

- 1) noun + verb
- 1a) noun + verb (ing)
- 2) noun + verb (ing) + noun
- 3) pronoun + verb + noun
- 4) noun + preposition + noun
- 5) noun + verb (ing) + preposition + noun
- 6) copula "is/are"
- 6a) noun + is/are + adjective
- 7) auxiliary "is/are"
- 7a) noun + is/are + verb(ing) + noun
- 7b) noun + is/are + preposition + noun
- 7c) noun + is/are + verb(ing) + preposition + noun
- 8) definite article "the"
- 8a) (The) + noun + is/are + verb(ing)
- 8b) (The) + noun + is/are + verb(ing) + noun
- 8c) (The) + noun + is/are + preposition + (the) + noun
- 8d) (The) + noun + is/are + verb(ing) + preposition + (the) + noun
- 8e) (The) + adjective + noun + is/are + preposition + (the) + noun
"The blue car is in the garage."

DISCUSSION AND IMPLICATIONS FOR TREATMENT

The etiology of this rare and unusual type of acquired aphasia is unknown. It would certainly appear, in this instance, to be related to the reported episodes of convulsions and cerebral dysrhythmia. However, the predisposing factors for the seizures remain a mystery. The most fascinating and productive conjectures in relationship to the particular case described, must be associated with the reasons why Bob's verbal output improved suddenly four years after the second neurological insult.

Several case studies have appeared in recent years that discuss a number of children who developed receptive and expressive aphasia between ages 4 and 6 years after having normal language development up until that time (Landau and Kleffner, 1957; Worster-Drought, 1971; Shaumaker et al, 1974). Although all these authors differ in their speculation of possible etiologies, most of the children have many similar characteristics. In most of the children, major or minor seizures occurred before the onset of the aphasia. In all cases there was a spiked dysrhythmia, usually bilateral, more prominent in the temporal regions. Each child's language deficit varied, but a severe language disorder persisted in all of the children beyond a 6 month period. The most interesting clinical observation noted by all three authors was that speech and language functioning increased as the electroencephalogram abnormality decreased. Recent EEG results revealed that Bob's cerebral dysrhythmia is now within normal limits. Does this imply that during the previous four years, the dysrhythmia was the root cause of the aphasia? According to Landau and Kleffner (1957) this could well be the cause of aphasia. They stated that aphasia may be caused by a "functional ablation" of the basic cortical language areas by constant discharges in these regions. This theory was also supported by Sato and Dreifuss (1973) who postulated a second theory for explaining the persistence of aphasia. They mention the possibility "that the EEG discharges are a cortical manifestation of a lower level subcortical deafferenting process". This theory infers that the spike wave discharges are a secondary rather than a primary causation factor and therefore are not directly responsible for the aphasia. Landau and Kleffner (1957) stated that improvement in expressive speech and EEG abnormalities may be related to anticonvulsant drugs and/or speech therapy. Unlike many other children with the same disorder, it is not possible to relate the reduction of Bob's cerebral dysrhythmia with any change in medication since he received anticonvulsants for only a short period of time immediately following onset of the disorder. However, the more stable EEG now means that Bob's prognosis for functional oral communication has greatly improved. Potentially, he now possesses the competence for learning receptive and expressive language. The implications of this much delayed improvement are that constant vigilance should be exerted with patients significantly beyond the usual 6 month period of spontaneous recovery. While it may be impractical to contemplate continued therapeutic intervention with a patient who is not making gains, it should be possible to alert the immediate family to the potential signs of change so that they may request a review should specific signs appear.

In terms of the progress Bob has made, it appears that the systematic nature of the program played a significant part in its success. The structured approach of breaking the activities down into their smallest components, and the overlearning of each step prior to expansion to the next phase ensured that Bob did not lose specific skills as others were acquired. This aspect of overlearning would appear to be essential in such situations. Small step progression prevents the frustration to clinician and patient from an unsuccessful advance being attempted. There must be an indicator of potential success before a new phase is introduced.

Time alone will tell how far Bob will be able to progress using oral communication. He continues to make gains at this time — the most significant aspect being that he is using oral language spontaneously in many non-therapy related situations.

His speech is difficult to understand because of his need to break up each word into separate syllables thereby destroying the prosody of his utterances. In addition he tends to omit final consonants which reduces the intelligibility of his speech. Work done with aphasic children at Moor House School in England has shown that their language skills deteriorate significantly once they leave the school and no longer receive regular structured language therapy. Consequently it would seem imperative that the family constellation are integrated into the therapy program so that they not only comprehend the goals of therapy, but are intimately aware of the functional level of the patient and can demand continued performance at that level. In addition, a regular monitoring system must be established between clinician and patient so that therapy can be reinstated whenever potential danger signals are perceived. In the ideal situation, regular (if not frequent) contact would be maintained with the patient ad infinitum. Bearing in mind the considerable time (and thereby financial) investment which has already been expended with such patients, it would seem prudent to continue minimal contact if this will prevent deterioration of skills acquired.

ACKNOWLEDGEMENTS

The authors would like to express their appreciation for the support and cooperation of the Speech Pathology and Audiology Department at the Glenrose Hospital. Portions of this paper were presented to the Canadian Speech and Hearing Association National Convention, Victoria, British Columbia, May 4 - 7, 1977.

APPENDIX A: SPEECH TRAINING PROGRAM

Discrimination Training

Discrimination 1. Vowel discrimination training used both visual and auditory cues. Visual cues consisted of the written symbol for the vowel, as well as allowing Bob to watch the clinician's face while the clinician produced the sound. Once Bob had learned to recognize several vowels, four written symbols were placed on the desk, and Bob had to point to the appropriate symbol when the clinician produced a vowel. Responses were recorded and a criterion level of 80% correct for two consecutive days was necessary before advancing to the next stage of the program.

Discrimination 2. Vowel discrimination using only an auditory cue i.e. the production of the vowel by the clinician. The written symbol card had been removed, and the clinician's face was hidden by a partition. This procedure assured the clinician that Bob was actually using his auditory channel to discriminate rather than his visual channel. Bob responded by writing the appropriate vowel on the blackboard. Criterion levels for all discrimination steps were the same as listed under step D.1.

Vowels used in discrimination training				
-	-	-	-	-
a	e	i	o	u
a	e	i	o	u

Discrimination 3. Consonant discrimination using visual and auditory cues. Correct or incorrect responses were again determined by having Bob point to one of the phonemes placed on the table.

Discrimination 4. Consonant discrimination using only auditory cues. Writing the vowels which the clinician presented verbally was recorded as a correct response.

Consonants used in Discrimination Training	
Voiced:	m n g w v d z b l r
Voiceless:	f h t p k s

Sound Production — vowels and consonants

The following hierarchy of 4 training steps was used with both vowel production and consonant production. For stimulus material see Discrimination section.

Production 1. Imitation of the clinician's model using both visual and auditory cues. For steps P.1, P.2, and P.3 a criterion level of 80% correct for two consecutive days was necessary before advancing to the next stage of the program.

Production 2. Imitation of the clinician's model using the clinician's production as an auditory cue. All visual cues were removed during this step.

Production 3. Spontaneous production of the phoneme using the written symbol of the sound as a visual cue.

Production 4. Rapid repetition of each phoneme in isolation. The criterion level was 30 repetitions per 15 second trial.

Sound Sequencing

Production 5. The first step in training sound sequencing was to combine all the previously taught consonants with the vowel /a/. Bob produced the CV combination spontaneously using only the written symbols. The vowel /a/ was selected for training since it required the greatest downward excursion of the mandible, thereby requiring

Bob to relocate to the desired articulatory posture from an open mouth position. The clinician used a hand counter and stop watch to record the number of correct productions and to control the amount of time Bob had to perform the activity. A criterion level of 30 repetitions per 15 second trial was required before Bob could progress to the next stage of therapy.

Production 6. Next, CV-CV combinations such as /do-ge/ and CVC combinations such as /dag/ were introduced to the program. The same basic training procedures that were explained in step P.5. were employed in this step. However, in step P.6. several different vowels (D.2) were combined with all consonants. Criterion level was set at 20 two-syllable repetitions per 15-second trial. Nonmeaningful material was used to eliminate the controversy over voluntary vs. automatic responses.

APPENDIX B: EXPRESSIVE LANGUAGE TRAINING AND PHRASE EXPANSION

Language Training 1. Noun training. Initially 50 nouns were taught including body parts, clothing, family members, furniture, toys, animals and foods. Additional nouns were taught as the program progressed. Mastery of the initial 50 nouns was required before advancing to the verb training section. Below is the 7 step hierarchy of training procedures which were used for teaching all parts of speech including nouns, verbs, prepositions, pronouns and adjectives.

Training hierarchy I for vocabulary building

- 1) Matching words and pictures.
- 2) Auditory discrimination — selecting picture in response to spoken stimulus.
- 3) Imitation of the clinician's production of the word.
- 4) Word attack training by individual phoneme and syllable.
- 5) Spontaneous production of the word with only visual cues (pictures and words — no spoken model).
- 6) Spontaneous production with only the written word.
- 7) Spontaneous production with only pictures.

Criterion level was 80% correct responses for two consecutive days, or 90% correct for one day.

Language Training 2. Training single word responses to "WH" questions using only auditory cues.

Examples:

- a. **What** is that? "car"
- b. **Who** is that? "mama"
- c. **What** is boy doing? "sitting"
- d. **Where** is girl? "bed"

Language Training 3. Verbs were trained by using the same 7 steps as in hierarchy I. Twenty-five verbs chosen on the basis of their level of functionality were trained.

Additional verbs were taught as the program progressed. Below are the 25 initial verbs and additional verbs were taught throughout the program.

Verbs		
1) stand	10) want	19) match
2) sit	11) clap	20) shake
3) look	12) drink	21) wave
4) get	13) eat	22) cut
5) show me	14) hit	23) write
6) point to	15) jump	24) laugh
7) match	16) open	25) cry
8) put	17) four	
9) take	18) sleep	
Additional Verbs		
26) baking	36) writing	
27) coming	37) driving	
28) dressing	38) hammering	
29) eating	39) looking	
30) making	40) cutting	
31) seqing	41) painting	
32) sweeping	42) taking	
33) taking	43) riding	
34) telephoning	44) sawing	
35) washing		

As soon as 50 nouns and 25 verbs were trained, therapy goals next turned to the expansion of Bob's mean length of utterance. A training hierarchy was constructed for teaching all expansion phrases. The 6 step hierarchy is presented below followed by the specific phrases in the order they were trained.

Training hierarchy II for expansion of mean length of utterance

- 1) Auditory discrimination by pointing, using both visual and auditory cues.
- 2) Auditory discrimination by writing the appropriate phrase on the blackboard. During this step Bob only used the auditory cue.
- 3) Imitation of the clinician's production of the phrase.
- 4) Spontaneous production of the phrase using pictures and the written phrase.
- 5) Spontaneous production using only pictures.
- 6) Spontaneous production in response to a "wh" question which was appropriate to the level at which Bob was working. Clinician "what is the boy doing?" Bob: "boy combing").

Criterion level was 80% correct for two consecutive days or 90% correct for one day.

Language Training 4. Expansion to noun + verb phrases

e.g. car go
boy sit
cat run

For training procedure see hierarchy II.

Language Training 5. Expansion to noun + verb(ing) phrases

- e.g. Dad eating
- Lisa combing
- dog swimming

Language Training 6. At this stage of the program pronouns were introduced. Below are the 9 pronouns which were chosen. For specific training procedures see hierarchy.

Pronouns	
I	she
you	it
me	we
my	they
he	

Language Training 7. Expansion to noun + pronoun + noun phrases.

- e.g. "I want ball"
- "You go home"

Procedures as in hierarchy II.

Language Training 8. Next, prepositions were introduced. Below are the 8 prepositions that were trained. Procedures as in hierarchy I.

Prepositions	
in	under
on	behind
up	beside
down	in front

Language Training 9. Expansion of noun + preposition + noun phrases.

- e.g. "car on table"
- "ball beside table"
- "apple in box"

Procedures as in hierarchy II.

Language Training 10. Expansion of noun + verb(ing) + preposition + noun phrases

- e.g. "dog sitting under chair"
- "boy sleeping in bed"

Procedures as in hierarchy II.

Language Training 11. Adjectives were then introduced into the program. The adjectives were chosen from the categories of **size**, **color** and **number**.

Procedures as in hierarchy I.

Language Training 12. Training copula "is/are" usage. Noun + is/are + verb(ing) + noun.

- e.g. "Ball is blue"
- "Balls are blue"

Procedures as in hierarchy II.

Language Training 13. Training auxiliary "is/are" usage.

- a. noun + is/are + verb(ing) + noun
 - e.g. "girl is running home"
 - "girls are running home".
- b. noun + is/are + preposition + noun
 - e.g. "toy is on table"
 - "toys are on table"

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- c. noun + is/are + verb(ing) + preposition + noun
e.g. "boy is standing on chair"
"boys are standing on chair"

Procedures as in hierarchy II.

Language Training 14. Expansion of the use of definite article "the".

- a. (the) + noun + is/are + verb(ing)
e.g. "The cat(s) is/are playing"
- b. (the) + noun + is/are + verb(ing) + noun
e.g. "The rabbit(s) is/are hopping home."
- c. (the) + noun + is/are + preposition + (the) + noun
e.g. "The car(s) is/are in the garage."
- d. (the) + noun + is/are + verb(ing) + preposition + (the) + noun
e.g. "The car(s) is/are going in the garage."
- e. (the) + adjective + noun + is/are + verb(ing) + preposition + (the) + noun
e.g. "The blue car(s) is/are going in the garage".

Procedures as in hierarchy II.

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