Clinical Treatment of Auditory Comprehension Deficits in Acute and Chronic Aphasic Adults: An Experimental Analysis of Within-Message Pause Duration

Anthony P. Salvatore and Kathleen Duffy Davis
Veterans Administration Medical Center, Phoenix, Arizona

Clinical verification of potentially powerful treatment variables in aphasia therapy is an important task. In the last few years, a number of investigators have experimentally demonstrated the common clinical observation that the insertion of long pauses improves the auditory comprehension of spoken messages by aphasic patients (Fehst, 1976; Liles and Brookshire, 1975; Salvatore, 1976). These findings now need to be systematically studied in the clinical setting.

Salvatore (1976), reported a treatment procedure administered to a chronic aphasic patient that was designed to shape auditory comprehension performance by systematically manipulating the pause duration inserted within spoken commands presented to the patient. The procedure resulted in improved performance on training commands, improvement on commands not used in treatment, and on commands that did not contain inserted pause time. A similar procedure was used in the present study. The effects of fading pause duration within spoken commands presented to acute and moderately impaired or chronic and severely impaired aphasic patients was investigated during clinical treatment sessions.

The treatment procedure was designed to improve the subject's performance in responding to spoken messages. The procedure strove for performance at a mean of 14.8, using PICA scoring (Porch, 1967). Only the scores of 6, 13, and 15 were used. The rationale for the use of the stringent criterion of 14.8 was based on the hypothesis that aphasia is a processing problem with at least two components: accuracy (retrieval of correct responses) and promptness (immediacy of responses). The criterion of 14.8 was used in hopes of improving the promptness of the patient's response. It was hypothesized that improving the promptness of a response would result in improvement of the auditory system's ability to comprehend spoken messages.

Procedure

The duration of the pause inserted within the spoken message was gradually reduced from 3 seconds to 2 seconds and 0 seconds. Also, the length of the spoken command and the number of stimulus pictures to be responded to were gradually increased. The message length and complexity were increased as the subject reached the success criterion of 14.8 across the 3, 2, and 0 second pause condition. This procedure was used across all three subjects, although the message length and task complexity differed according to the severity of the subject's auditory processing disorder. Training sessions consisted of sentences presented in blocks of 10 sentences each. In a session, the first block of 10 sentences utilized a long pause, gradually fading over blocks of sentences to a more closely approximated normal pause. This procedure is illustrated in Table 1.

Table 1. Design of experiment.

Level	Verbal Message	Number of items	Progression of pause duration	Criterion at each pause duration
1	"Point to (pause) NOUN."	2	a) 3 seconds b) 2 seconds c) 0 seconds	14.8
2	"Point to (pause) NOUN."	3	a) 3 seconds b) 2 seconds c) 0 seconds	14.8
3	"Point to (pause) NOUN."	4	a) 3 seconds b) 2 seconds c) 0 seconds	14.8
4	"Point to (pause) NOUN."	5	a) 3 seconds b) 2 seconds c) 0 seconds	14.8
5	"Point to NOUN, (pause) and NOUN."	4	a) 3 seconds b) 2 seconds c) 0 seconds	14.8
6	"Point to NOUN (pause) and NOUN."	5	a) 3 seconds b) 2 seconds c) 0 seconds	14.8
7	"Point to NOUN, (pause, NOUN, (pause) and NOUN."	4	a) 3 seconds b) 2 seconds c) 0 seconds	14.8
8	"Point to NOUN, (pause), NOUN, (pause) and NOUN."	5	a) 3 seconds b) 2 seconds c) 0 seconds	14.8

Training probes and generalization probes were used to measure the effects of treatment. A training probe was only administered after a training block was responded to at a mean of 14.8 or better. The probe consisted of a training command with no inserted pause time. Generalization sentences (Table 2) consisted of six different commands which were also used to measure the effects of treatment on more complex sentences. These generalization commands were presented on the average of once a week, following a training session. The six sentences were presented twice during each administration; once, with a 2 second pause inserted and, again, with no pause inserted. The order of presentation was randomized and the order of sentences in each pause condition was different.

Table 2. Generalization sentences at 2 and 0 seconds.

1. Put the sun (Pause/No Pause) on top of the pail
2. Put the broom (Pause/No Pause) beside the knife
3. Instead of the sun (Pause/ No Pause) touch the scissors
4. Pick up the pail (Pause/No Pause) after you touch the broom
5. If there is a desk (Pause/No Pause) touch the sun
6. Before you touch the broom (Pause/No Pause) touch the pail

Subjects

Two chronic/severely impaired aphasic adults and one acute/moderately aphasic adult were used in this study. They are described in Table 3. The patients were all diagnosed as aphasic by a speech pathologist and a neurologist.

Table 3. **Subject characteristics.**

Patient's Name	Date of Onset	Etiology	Age	Right Hemi-plegia	Handed-ness	Fluent/ Non-fluent	Overall PICA %ile
J.D.	9/78	CVA	54	--	Right	Fluent	63
J.R.	8/77	CVA	49	+	Right	Non-fluent	38
B.R.	7/72	DVA	70	+	Right	Non-fluent	31

Results

Preliminary results are discussed in three areas: 1) decisions regarding when to move to the next level of the training procedure; i.e., when did the subject's performance stabilize, 2) effects of training on training probes and 3) the effects of training on generalization commands.

The preliminary results indicate that during training longer pause durations demonstrated more stable functional control over the accuracy and promptness of the response than shorter pause durations. This was true across all three subjects. On training probes, the subjects made accurate responses, but their performance was not stable with reference to the promptness of the response. The subjects showed mixed results on generalization commands.

Three forms of data are presented for each patient. First, training data, followed by training probe data, and finally data from generalization tasks.

Patient 1. Figure 1 shows that the patient's mean score performance was stable in the 3 and 2 second condition but less stable in the 0 second condition.

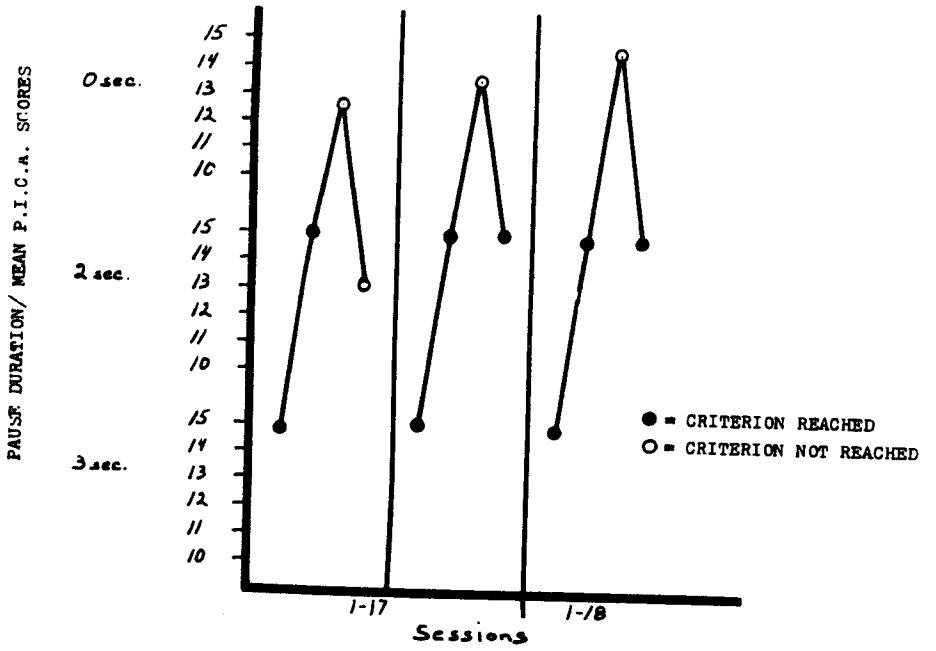

Figure 1. Auditory comprehension training, 3-stage commands, 5 stimulus choices.

The decision to move on to the next level of complexity was based on the data shown in Figure 1. This decision was based on the fact that the patient's responses appeared stable within the 2-second condition. This was a clinical judgment. A more objective criteria could be investigated. For instance, one could require the patient to replicate his configuration of successful performance at 3 seconds, 2 seconds, failure at 0 seconds and return to successful performance at 2 seconds. The probability of replicating this configuration five times would give a P less than .05, which seems reasonable. However, this hypothesis of 5 replications needs to be investigated in terms of the patient's success at the next level of training. That is, will the patient have less difficulty at the next level with or without the objective replication criterion?

Figure 2 shows the patient's performance on training probes. These data points are mean scores. A probe was only presented following a successful (mean of 14.8) training block. The patient showed potential for accuracy in responding initially and gradually showed improvement in promptness of his responses over time.

Figure 3 shows the patient's performance on the generalization commands. The data suggest that the patient performs better within the 2 second pause condition than the 0 second pause condition. Furthermore, his performance appears more stable over time in the 2 second pause condition.

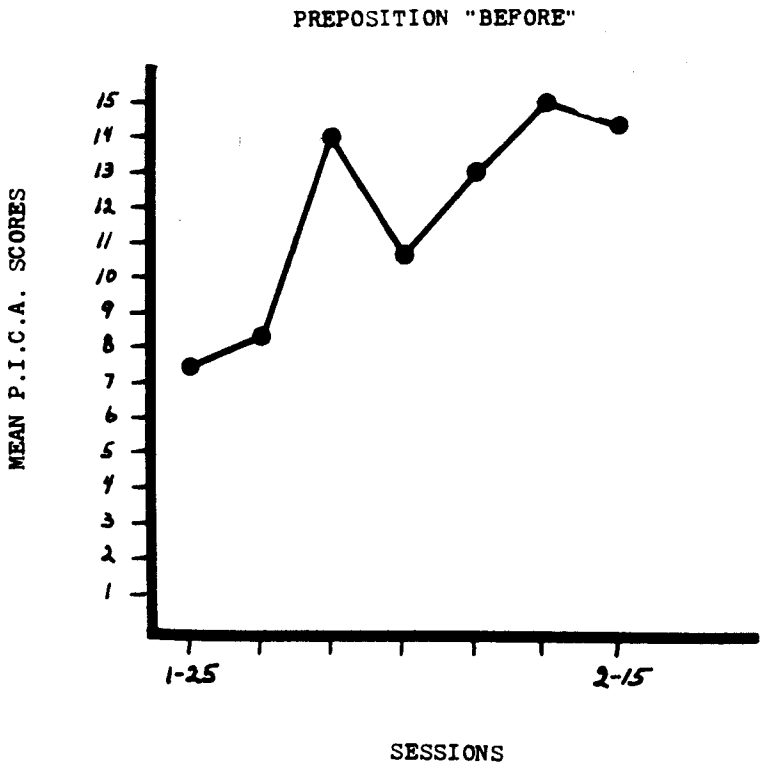

Figure 2. Auditory comprehension training: Probe presented at 0 sec.

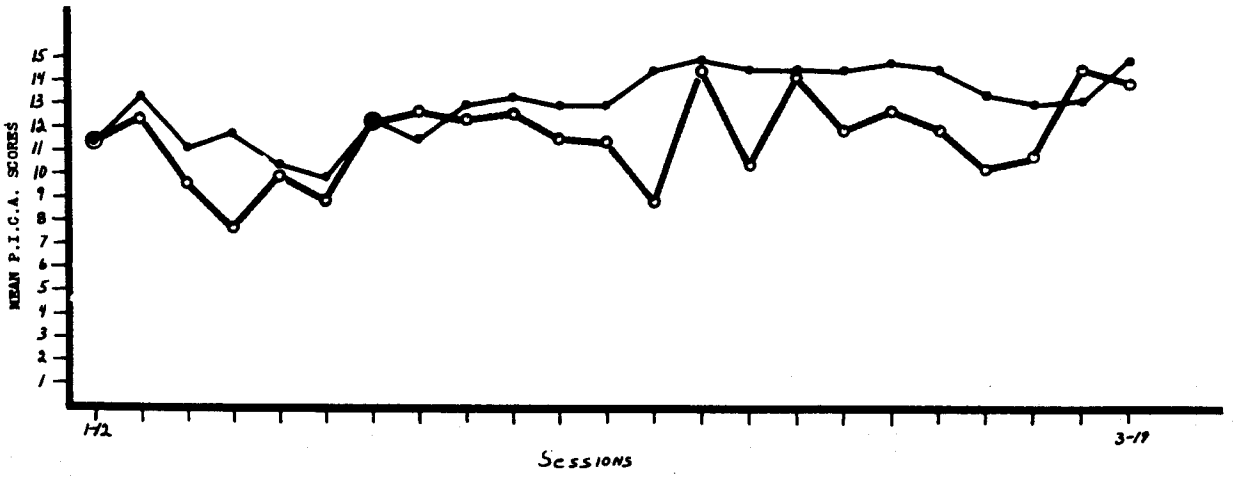

Figure 3. Auditory comprehension generalization with untrained sentences at pause duration of 2 (●) and 0 (○) sec.

Patient 2. Figure 4 shows that the patient's performance is better in the 3 second condition than the 2 second condition. In the 2 second condition, the patient performs better than in the 0 second condition. Again, the question arises as to how many replications of this performance are clinically desirable.

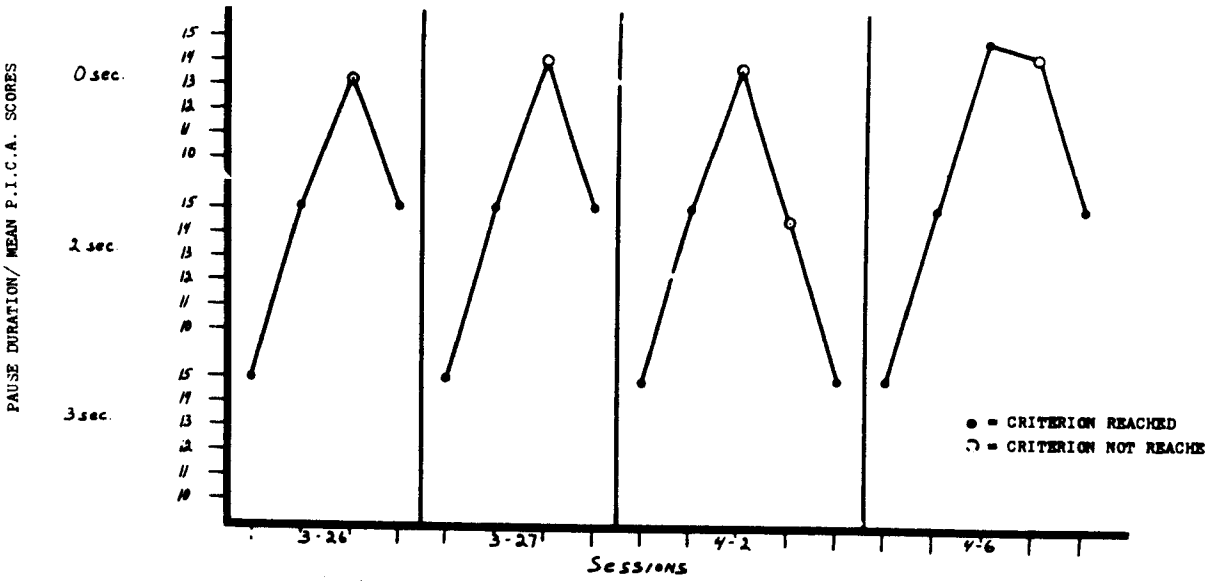

Figure 4. Auditory comprehension training, 3-stage commands, 4 stimulus choices.

Figure 5 shows that the patient was not stable on the training probes. However, he did show the potential for responding accurately with no pause. He did not show improvement over time, although the last few

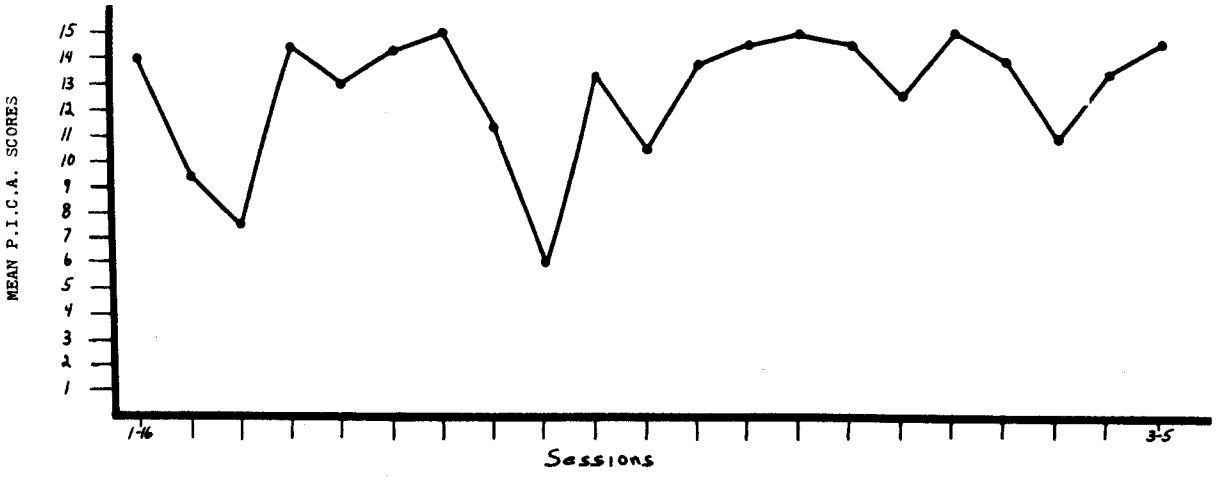

Figure 5. Auditory comprehension probe within sessions at 0 sec. 2-3-stage commands, 4-5 stimulus choices.

sessions do suggest the development of stability in the dimension of accuracy, but not in the dimension of promptness. That is, his mean scores tended to be at the 13 level rather than at the 15 level.

Figure 6 shows that the patient did not improve his performance on the generalization commands in either the 2 second or 0 second condition.

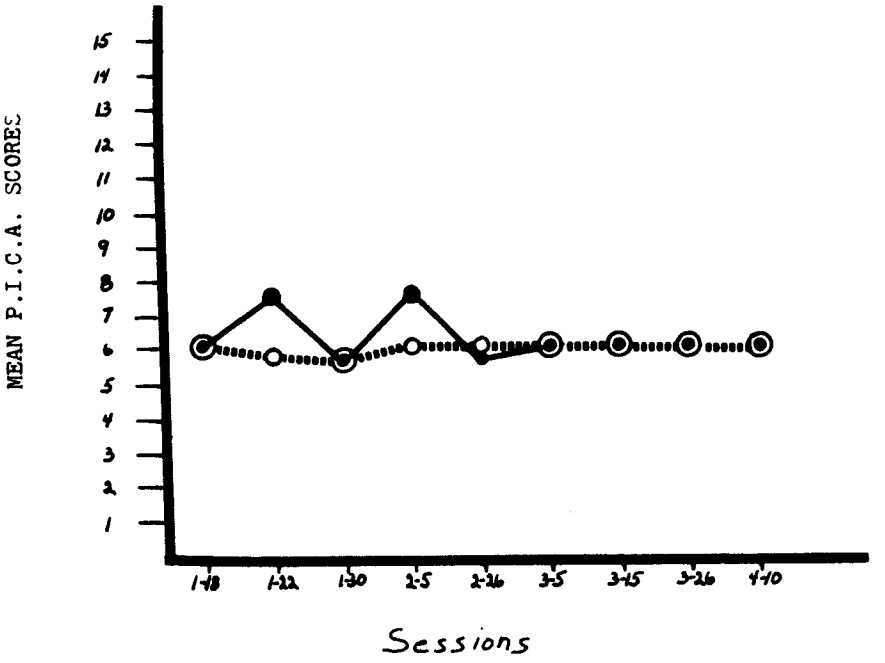

Figure 6. Auditory comprehension generalization with untrained sentences at pause duration of 2 (●) and 0 (○) sec.

However, he did improve naming pictures used during the generalization task, as shown in Figure 7.

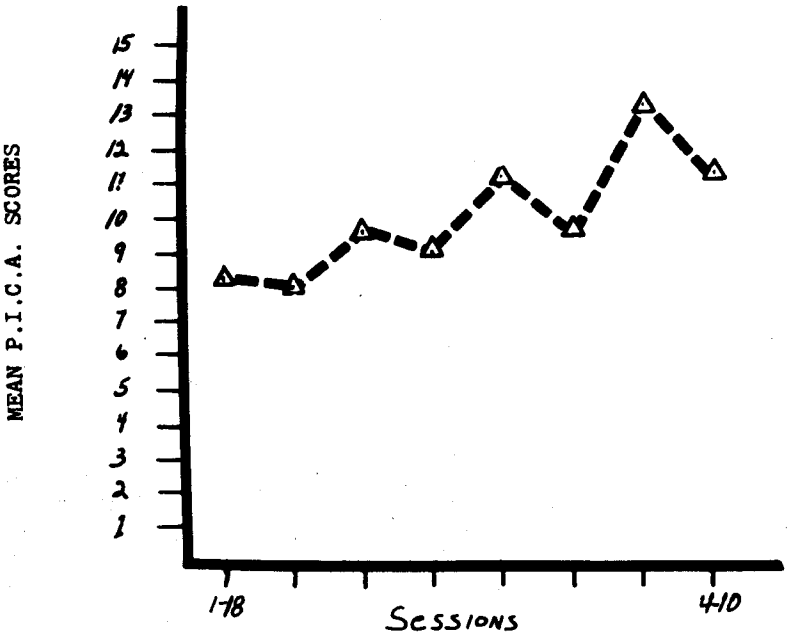

Figure 7. Naming of pictures used in generalization (5 pictures).

Patient 3. This patient, as shown in Figure 8, had the most difficulty demonstrating stability at shorter pause durations during training. Although he was stable in the 3 second pause condition, his performance in the 2 and 0 second pause condition was variable. He was moved on to the next level of difficulty following the performance shown in Figure 8. This, again, was a clinical judgment made in reference to his past performance.

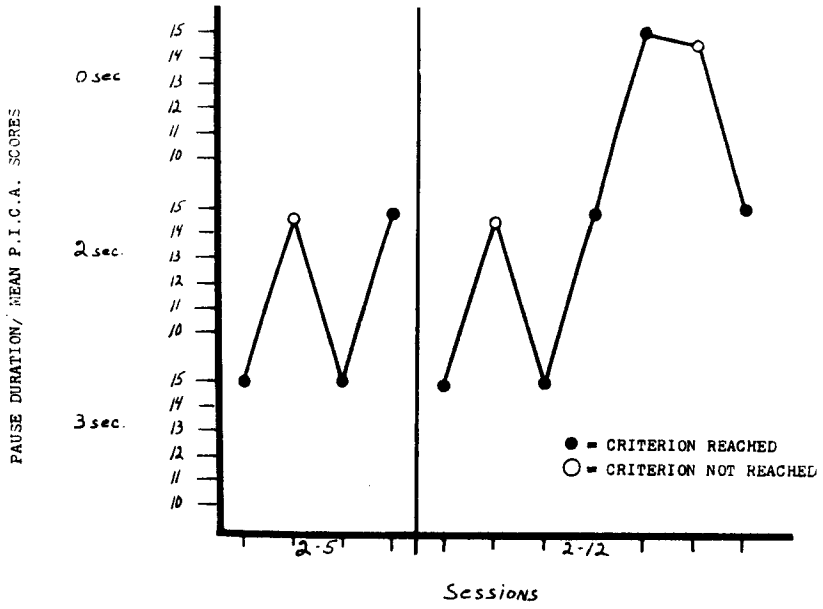

Figure 8. Auditory comprehension training, 2-stage commands, 5 stimulus choices.

On the training probes (Figure 9), the patient also showed a lack of stability. While he showed the potential for accurate performance, he did not improve the promptness of his responses.

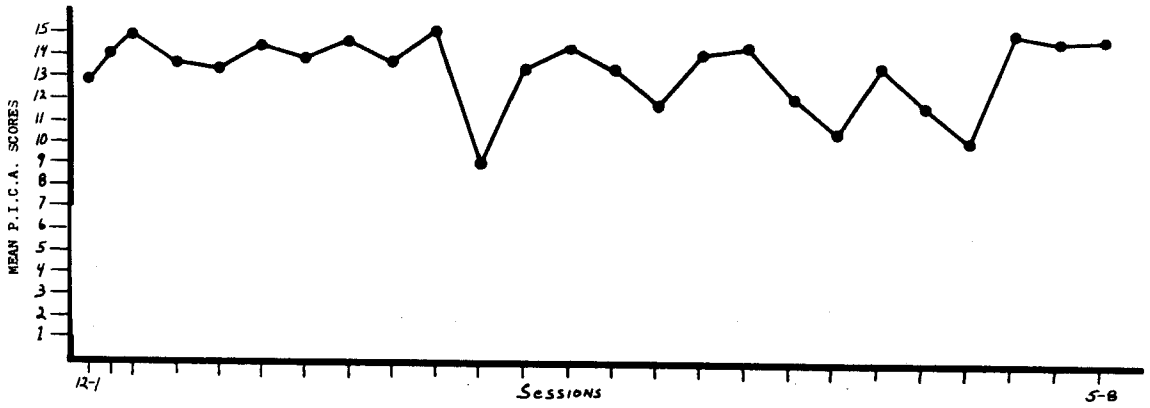

Figure 9. Auditory comprehension probe within session at 0 sec.]-2-3-stage commands, 3-4-5 stimulus choices.

Figure 10 shows that performance on the generalization commands was not stable and showed no differentiation on the 2 and 0 second conditions.

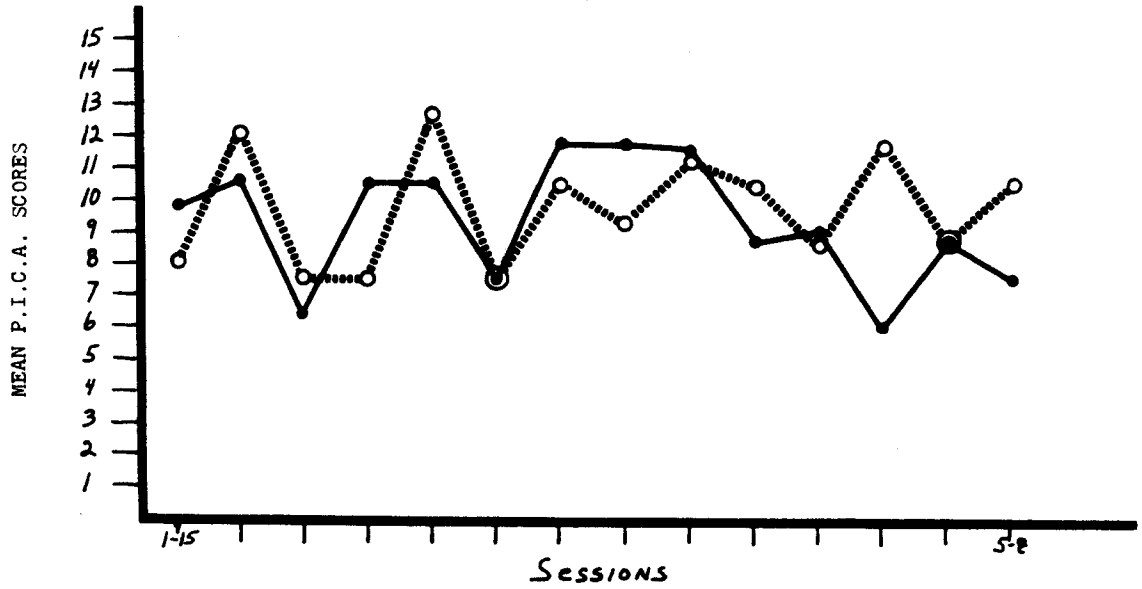

Figure 10. Auditory comprehension generalization with untrained sentences at pause duration of 2 (●) and 0 (○) sec.

Reliability Measures. Reliability measures were made on the examiner's pause accuracy during the training sessions and on the accuracy of the examiner's scoring of the patient's responses. Accuracy of the examiner's pausing during the 2 second pause condition showed a mean of 2.1 seconds, SD = .26 seconds, and a Range = 1.6 - 2.8 seconds, and during the 3 second pause condition a mean = 3.0 seconds, SD = .13 seconds and a Range = 2.5 - 3.2 seconds. A reliability measure of .99 was obtained for the dimensions of "accuracy" and "promptness" between the examiners' and an observer's scoring of the patient's responses.

Discussion

During training sessions, pause durations of 3 and 2 seconds were the most successful in producing a performance at a mean score of 14.8 than was the 0 second pause condition. The 3 second pause was more successful and stable than the 2 second pause condition for all three patients.

Only the acute and moderately aphasic patient was sensitive to the dimension of promptness of response in the training probes and generalization commands. That is, over sessions, he made more 15 responses than 13 responses. The two chronic and severely aphasic patients showed accurate responses during the training probes but did not develop promptness of response over time. They also did not show improvement in accuracy of responses to the generalization commands.

The training procedures described here allowed the authors to generate specific information needed to develop hypotheses about auditory processing and its relation to a reasonable response criteria and pause time. Is there

a difference in the auditory processing of acute or less severely involved patients and chronic, or more severely involved patients? If so, can the same criteria of accuracy and promptness be used with each kind of patient? Our data indicate that a less severely involved and acute patient may be sensitive to treatment which is aimed at improving his latency of response as well as his accuracy. On the other hand, it may be necessary to direct treatment for a more severely involved and chronic patient toward the dimension of accuracy alone. A severely aphasic or chronic patient may not have the capacity to produce accurate and prompt responses at such a stringent criteria. To illustrate this, the two chronic patients' responses were re-scored in a plus-minus system. The two patients showed 100% accuracy at 3 and 2 second pause durations and 88% accuracy at 0 second pause durations. Thus, inserted pause time did not facilitate the promptness of the chronic patients' responses, but did facilitate their accuracy.

Further investigations are required to determine appropriate treatment stability criteria. Clinical judgments made in this study require empirical verification. We recognize the probable need for flexibility in using objective stability criteria based on the nature of the aphasic patient's training history. That is, as the patient's facility in comprehending spoken messages improves, he may require less stringent stability criteria as he moves through the treatment procedure.

Finally, the nature of the auditory comprehension deficits in these patients suggest that repeated exposure to increased pause time does not result in successful performance at more normal speech rates. To perform at optimal levels, these patients may always need to be provided more processing time.

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