Cueing Hierarchies and Word Retrieval: A Therapy Program

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The dimension of aphasic impairment which has perhaps had more rehabilitative effort directed toward it than any other is the near universal reduction in available vocabulary. The clinical literature is replete with reports of therapeutic approaches which have been successfully employed in reducing the word-finding difficulties of aphasic patients (e.g., Wiegel-Crump and Koenigsknecht, 1973; Croskey and Adams, 1969; Keenan, 1966), as well as reports of strategies which these patients employ spontaneously in their efforts to retrieve a desired word (Marshall, 1976). The present paper is a consideration of the rationale and development of a treatment program which employs and seeks to expand on the basic principles of the programmed stimulation approach to aphasia rehabilitation. In addition, the program seeks to foster the use and generalization of the retrieval strategies employed by our aphasic patients. Along with the description of the word-retrieval program, the performance of five of our patients who have participated in it will be discussed.

Rationale and Development

Two principles formed the basis and guided the development of the word-retrieval program. The first principle is an extension of the generally accepted concept that the essence of aphasia rehabilitation is the elicitation of a response. It is suggested that the recovery process is best served by eliciting the desired response with a minimal cue. Thus, in order to achieve maximum benefit from each stimulus presentation, we seek to have our patients retrieve the desired word with no more external facilitation than is essential.

In order to implement this principle, the concept of "stimulus power" as described by Bollinger and Stout (1976) was incorporated. Factors such as the number of repetitions, number of input modalities, contextural constraints, and the form in which these constraints are provided (e.g., descriptive statement; sentence completion) were considered. In the development of the program, cues were drawn from three areas -- verbal, gestural, and articulo-phonetic -- and hierarchically arranged according to stimulus power (see below: A Cueing Hierarchy). What is crucial to note here is that stimulus power is relative to each individual patient; thus the cueing hierarchy that is appropriate for one patient may not be appropriate for another. It is essential, therefore, in implementing this therapeutic approach, that the stimulus power of a wide variety of cues be assessed for a particular patient, and that the cueing hierarchy for each patient be individually structured.

The cueing hierarchy then becomes the means by which the first principle is implemented, for it dictates the order in which successive cues are provided. The cue of lowest stimulus power is presented first, followed by increasingly powerful cues until the desired response is elicited. Note that in this manner the retrieval of the desired word is achieved by presentation of the least

powerful cue capable of eliciting the response.

The second principle which was employed in developing the word-retrieval program is a modification of the concept of stimulus fading. It was felt that the repeated elicitation of the appropriate response with successively less powerful cues would not only provide a highly salient positive reinforcement, but would also optimally stimulate the processes underlying the recovery of the word retrieval process. Thus instead of fading the stimulus over a number of sessions contingent upon reaching criterion at various levels of task difficulty, we chose to fade the stimulus, i.e., reduce the stimulus power, immediately upon elicitation of the appropriate response. As will be described in the next section, this was accomplished by reversing the process of providing increasingly powerful cues after the desired word had been elicited. Thus, once the clinician has worked down the hierarchy until the patient retrieves the appropriate word, she then works back up presenting cues of decreasing power with the patient producing the word at each level. While a repetitive component to this task exists, it is felt that its effect is minimized by not permitting the patient to respond until the complete stimulus has been given. Furthermore, at levels 2 and 3 of the hierarchy presented below, the patient is required to produce the stimulus as well as the response. It is suggested that similar levels be included in all cueing hierarchies based on Marshall's (1976) description of the word retrieval strategies employed by aphasic patients and the teaching of "self-generated cues" by Berman and Peelle (1967). Indeed, the strategies individual patients are observed to employ spontaneously may be incorporated into their hierarchies. In this way, the use and generalization of such strategies may be fostered.

A Cueing Hierarchy

Table 1 lists the ten levels of the hierarchy. At level one, the patient is presented with a line drawing of an item and asked "what's this called?" This cue is of minimal stimulus power and serves only to orient the patient to the task. If he is unable to respond, he is asked to state what he does with the item or to <u>think</u> about what he does with it (level 2). Level 3 requests the patient to demonstrate the function. At level 4, the clinician states the function of the object followed by the lead-in phrase "It's a ....." (e.g., You drink coffee from this. It's a .....). At level 5, the clinician adds a gesture to the function statement. The next four levels all involve sentence completion with an increasing amount of information supplied at each level. Level 6 is an open-ended statement (e.g., "You eat soup with a ....."). At level 7, the first phoneme of the target word is silently articulated by the clinician. If the patient is still not able to produce the desired response, the first phoneme of the word is vocalized following the sentence completion stimulus (level 8). At level 9, the sentence completion item plus the first two phonemes of the word are produced. Level 10 requests the patient to imitate the word.

Table I. A Cueing Hierarchy

1. "What's this called?"
2. Directions to state the function of the item.
3. Directions to demonstrate the function.
4. Statement of the function by the clinician.
5. Statement and demonstration of the function by the clinician.
6. Sentence completion.
7. Sentence completion + the silently articulated first phoneme of the response.
8. Sentence completion + the vocalized first phoneme.
9. Sentence completion + the first two phonemes vocalized.
10. Say "_____."

Successive levels of the hierarchy are presented until the patient produces the desired word. Once the appropriate response has been elicited, the order of stimulus presentation is reversed. Beginning with the level at which the word was elicited, the cues are then presented in the order of successively decreasing stimulus power through level one. If at any level the patient is unable to respond, the order of stimulus presentation is again reversed and successively more powerful cues provided until the word is produced. Then the order is once more reversed. Experience to date suggests that most patients can go up the hierarchy without requiring the second reversal. When it has been necessary to go back down the hierarchy, a less powerful cue is generally required to elicit the response. Rarely is it necessary to reverse the order of stimulus presentation more than once.

Going up the hierarchy is considered an important aspect of the program in that it permits the patient to respond to cues of decreasing stimulus power. At levels 2 (stating the function) and 3 (gesturing the use of the object), many patients can be taught to use these cues as a self-cueing device. It is not unusual for a patient to use a gesture to assist himself in producing a word in subsequent sessions.

Procedure

Entrance Criteria:

Patients selected for the program met the following criteria: (1) no more than one literal paraphasic error per word on imitation, (2) a Z score of 0 or below on the visual confrontation naming subtest of the Boston Diagnostic Aphasia Examination (BDAE), (3) errors on at least 75% of the items presented

on a pre-probe, and (4) an average Ƶ score not lower than -1 on the auditory comprehension subtests of the BDAE. Additionally, all patients were at least one month post onset when the program was initiated.

Training and Generalization Lists:

The words employed in the program included 20 with a frequency of occurrence of 50 times per million and 20 with a frequency of less than 50 times per million (Thorndike and Lorge, 1944). Additionally, words were selected which were presented in a pre-probe, during which the cues were presented in order of decreasing stimulus power to determine the level at which the patient was able to respond.

Following the pre-probe, a training list consisting of five high frequency words and five low frequency words was selected. During each session, the 10 items were presented with the cueing hierarchy employed in the manner described above. The high and low frequency words were alternately presented.

A second list composed of 10 high and 10 low frequency words was also selected. These words were not part of the training list and were presented after every five therapy sessions in order to assess generalization.

Program Termination Criteria:

The program was terminated when either of the following conditions occurred: (1) the patient demonstrated no improvement for three consecutive generalizations or (2) accurate responses were elicited at levels 1, 2, or 3 on 80% of the generalization items for three consecutive generalizations.

Modification of the Training List:

The training list was modified when accurate responses were elicited at levels 1, 2, or 3 on the same five of the ten training words for five consecutive sessions. When this occurred, three of the five words were replaced with words in the same range of frequency of occurrence.

Results

Individual Patients:

Patient M.S. is a 70-year-old man who suffered the onset of aphasia in April, 1974. At the onset of the treatment program, he had a raw score of 33 (Ƶ = -.75) on the visual confrontation naming subtest of the BDAE and correctly identified only three of the 40 items on the pre-probe. As shown in Figures 1 and 2, respectively, M.S. showed an improvement of approximately two levels on both the training and generalization items over 25 therapy sessions. In addition, the number of items correctly identified at level 1 increased steadily. Finally, it should be noted that during the course of the program, M.S.'s ability to employ gestures improved, and he adopted the strategy of restructuring questions into a sentence completion form for self-cueing. Although M.S. demonstrated improvement, his performance became stable over three generalizations and the program was discontinued.

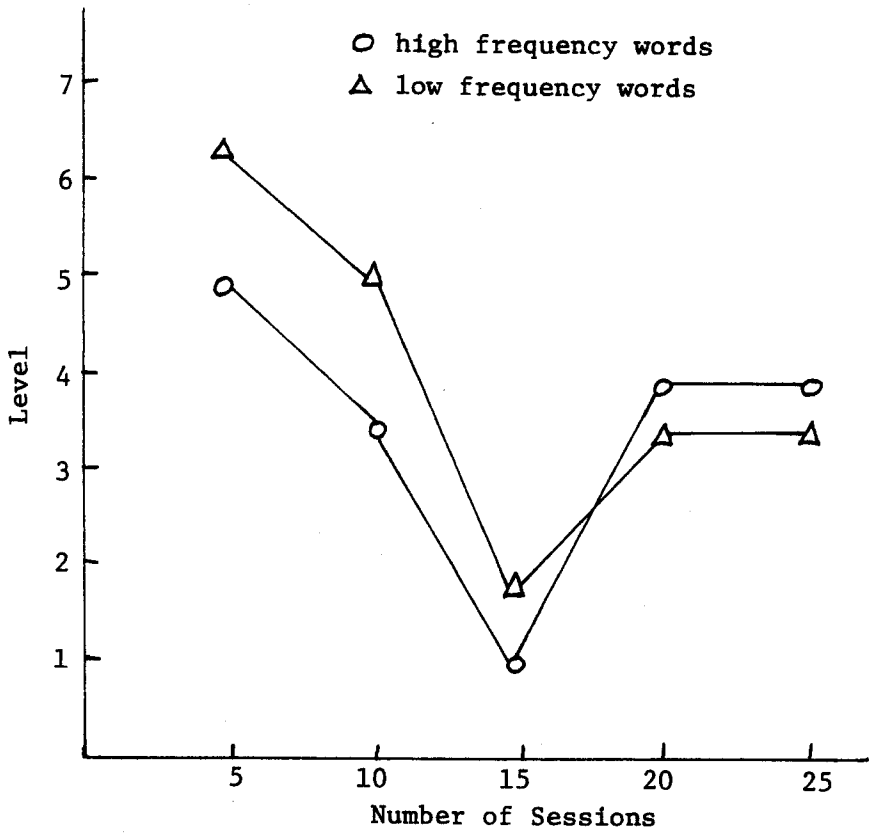

Figure 1. Patient MS: Training Words

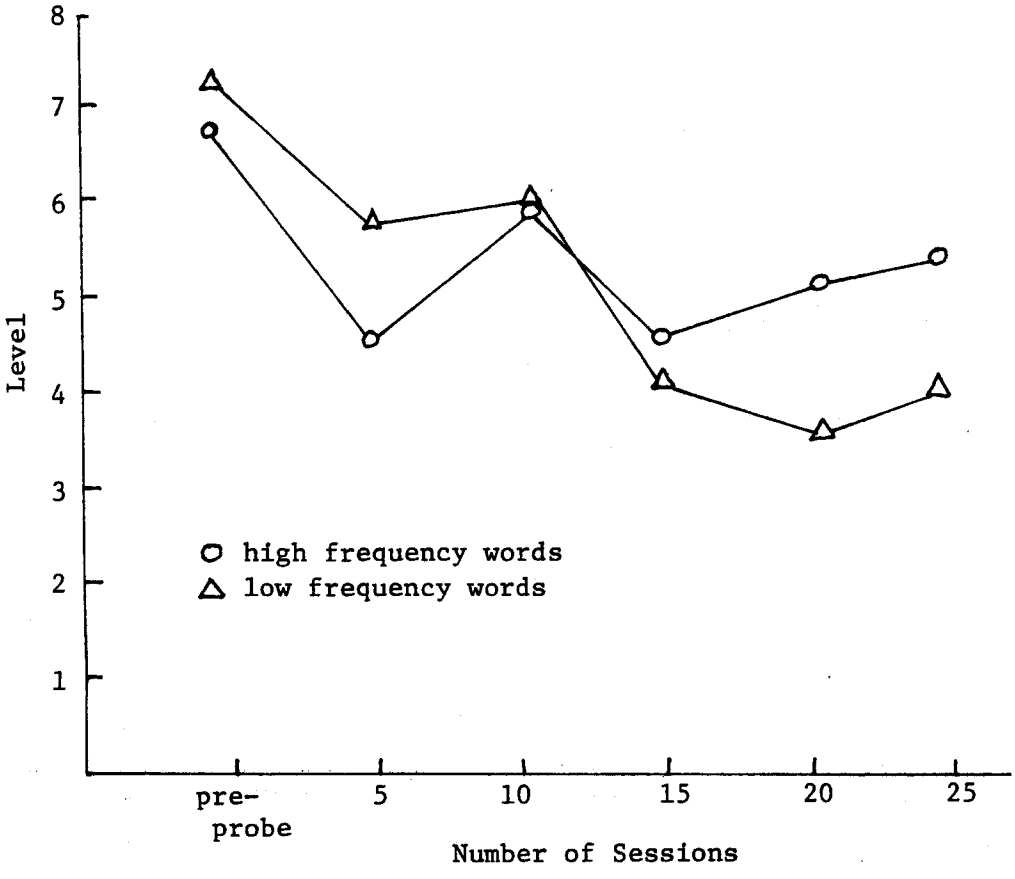

Figure 2. Patient MS: Generalization

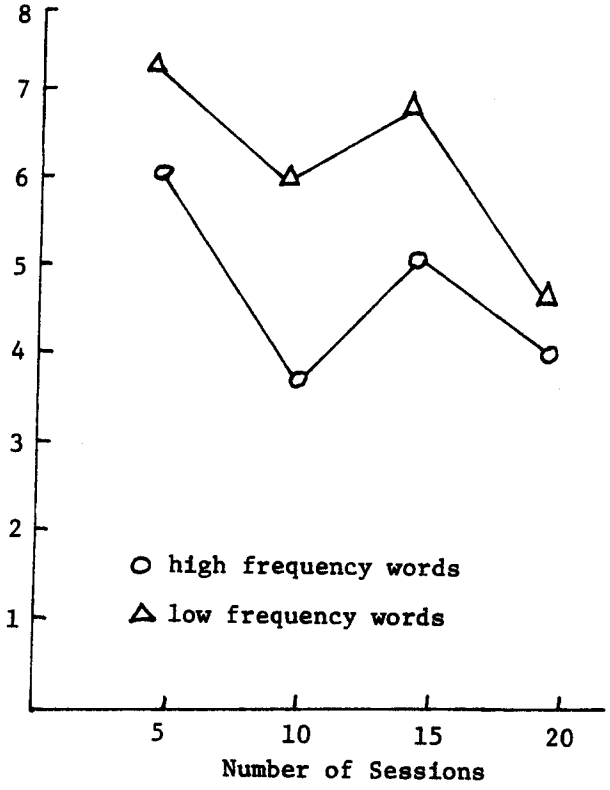

Figure 3. Patient BH: Training Words

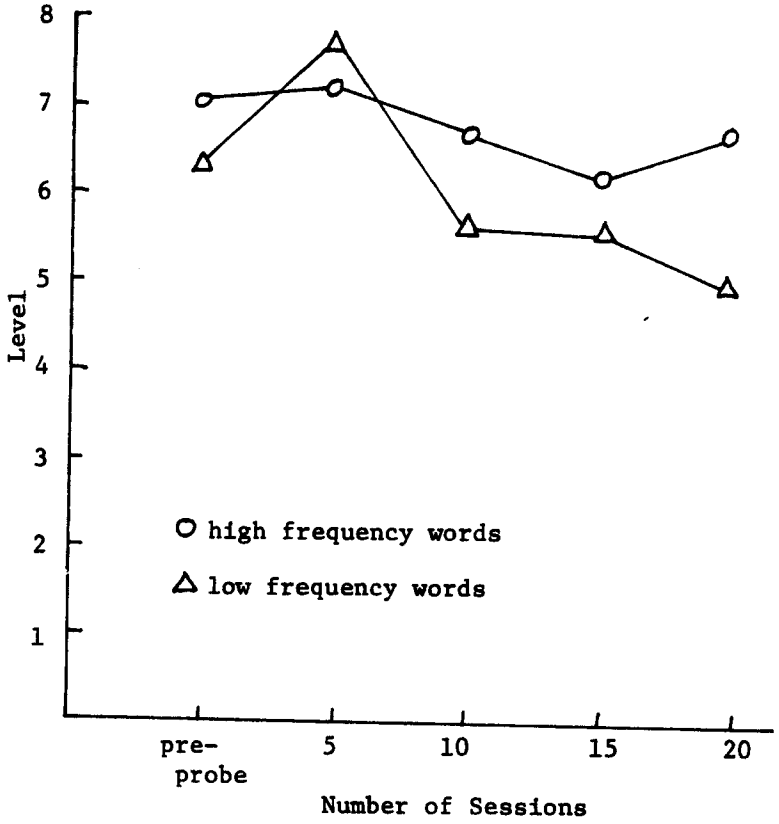

Figure 4. Patient BH: Generalization

Patient B.H. is a 72-year-old woman who has had aphasia since September, 1975. Prior to the initiation of the word retrieval program, she had a raw score of 27 ($\bar{z} = -.9$) on the visual confrontation naming subtest of the BDAE and was able to identify two of the pre-probe items. Over 20 sessions, B.H. has shown an improvement of approximately two levels on the training words (Figure 3) and one level on the generalization list (Figure 4). The self-cueing strategy which she employs most effectively is gesture.

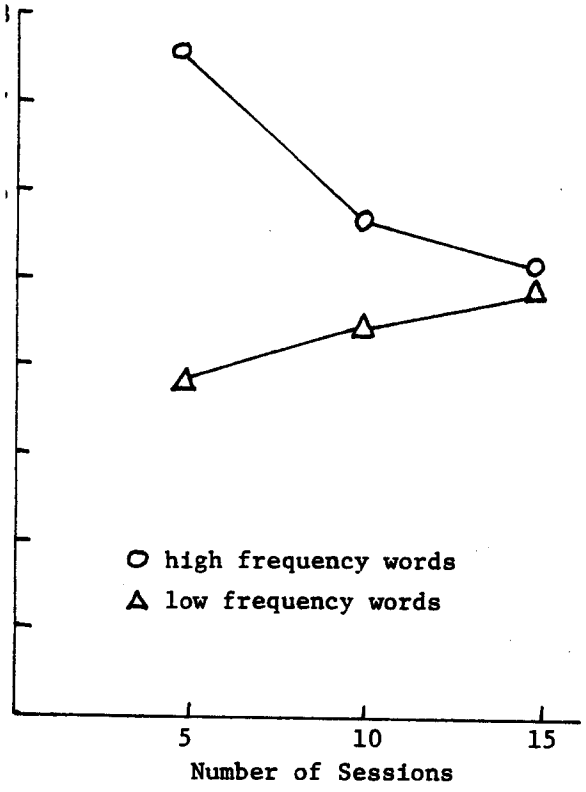

Figure 5. Patient CS: Training Words

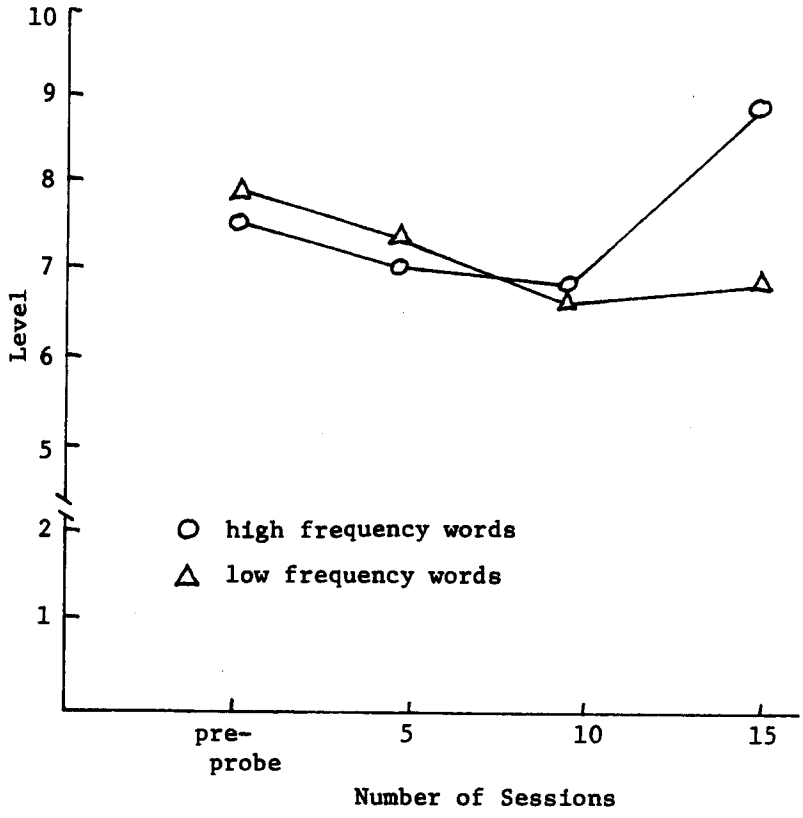

Figure 6. Patient CS. Generalization

Patient C.S. is a 52-year-old male who has been aphasic since December, 1975. At the beginning of the treatment program, he had a raw score of 0 on the visual confrontation naming subtest of the BDAE and correctly identified only one of the items on the pre-probe. Figure 5 shows that his performance on the training items improved by approximately one level over fifteen sessions. Figure 6, which charts his generalization scores, reveals a modest gain over the first ten sessions. His poor performance on the generalization following session 15 may be attributed to any of a wide range of factors.

Patient T.T. is a 67-year-old male who has been aphasic since March of this year. At one month post onset, T.T. scored 27 ($\bar{z} = -.1$) on the visual confrontation naming subtest of the BDAE and named 10 of the items on the pre-probe. As shown in Figure 7, T.T. improved approximately one level on the training items. Figure 8 shows that he has improved nearly 4 levels on the generalization list. T.T. continues to participate in the therapy program and more frequently uses gestures and function cues to assist himself with word retrieval.

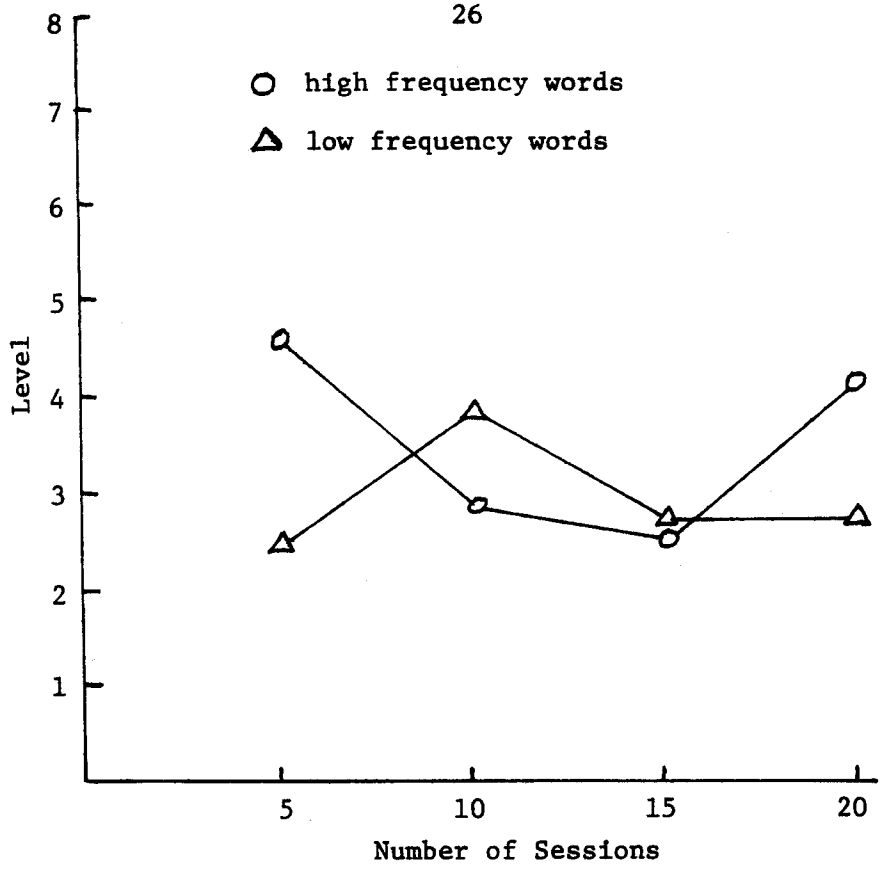

Figure 7. Patient TT. Training Words

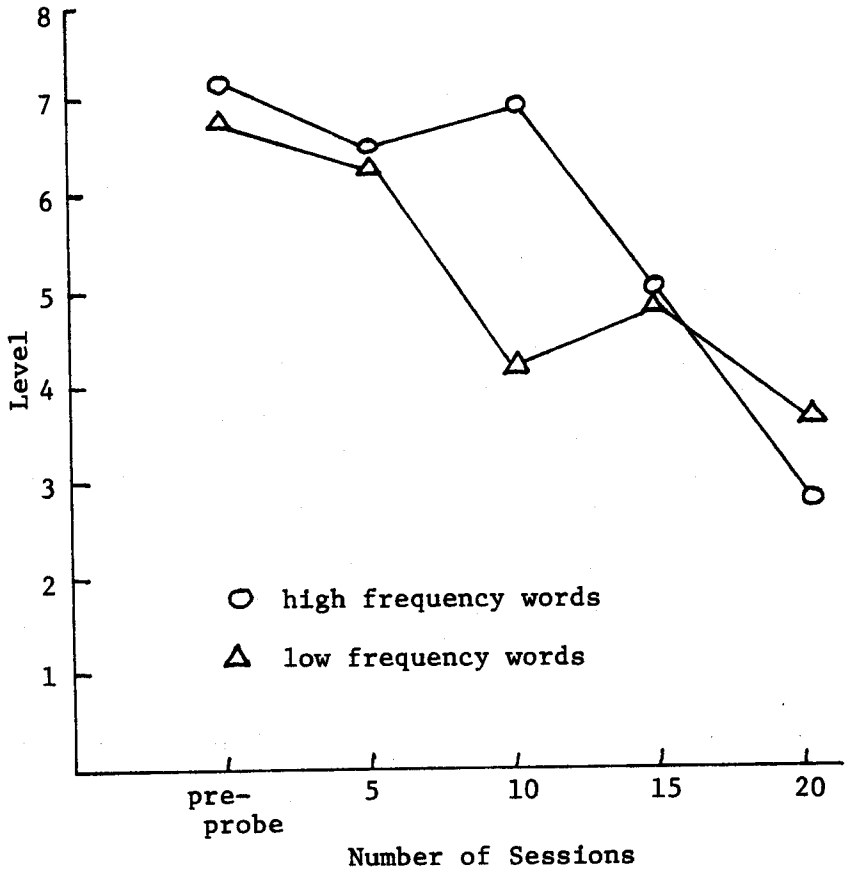

Figure 8. Patient TT. Generalization

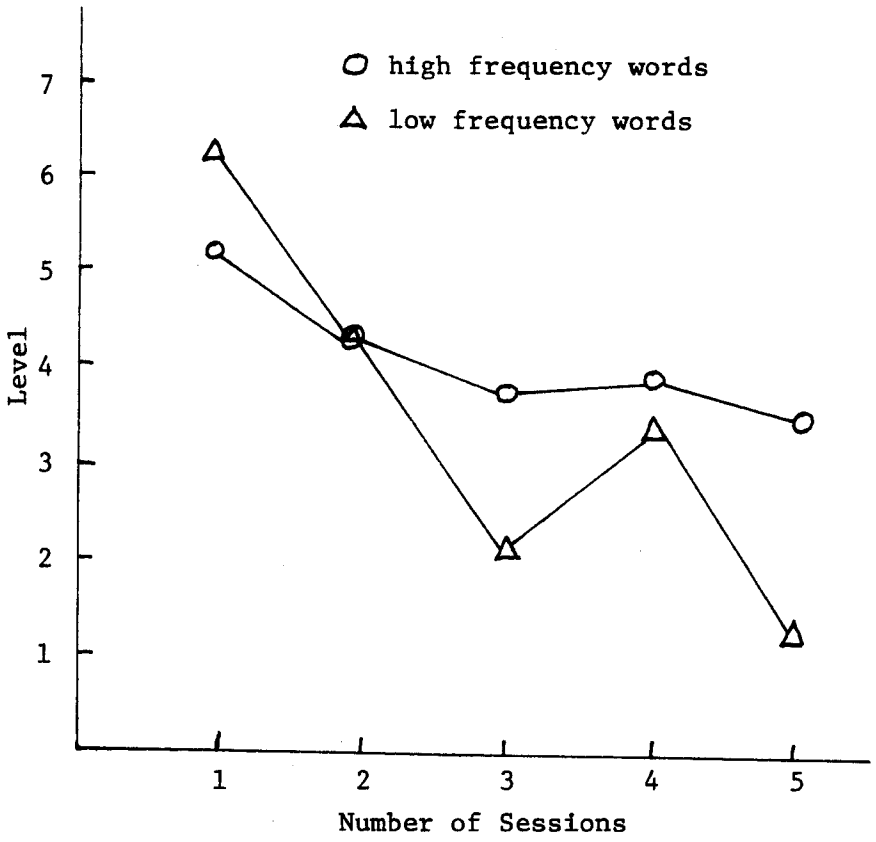

Figure 9. Patient KH. Training Words

Patient K.H. is a 46-year-old female who first developed aphasia in January, 1977. Because she became easily frustrated during formal testing, we did not administer the visual confrontation naming subtest. Her score on the responsive naming subtest of the BDAE was 9 of a possible 30 and she correctly identified 4 of the items on the pre-probe. Figure 9 is a display of K.H.'s performance on the training items over five sessions. As shown, she steadily improved over the five sessions, changing her mean score by three levels on the training items. Figure 10 shows her performance from the initial pre-probe to the first generalization, approximately one month later. On this generalization, she responded accurately on 15 of the items. K.H.'s substantial improvement during the one month in which she participated in the program is striking. Perhaps the highly structured nature of the program contributed to the reorganization of her language skills. During the initial therapy session, she was frustrated by the hierarchy, apparently because she rarely succeeded until several cues had been presented. However, as she worked back up the hierarchy, K.H. experienced success and learned to use sentence completion cues as a self-cueing device. Unfortunately, the patient moved following the first generalization and was unavailable for additional follow-up.

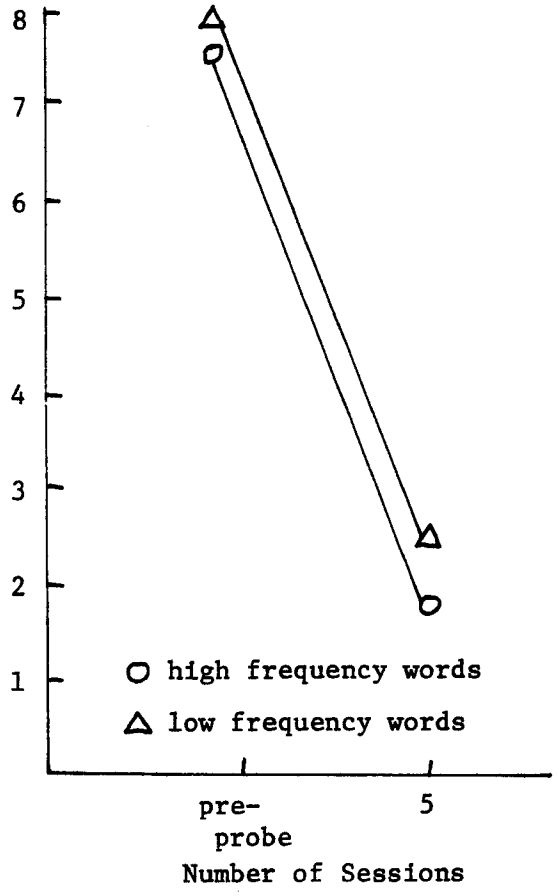

Figure 10. Patient KH. Generalization

Training vs. Generalization Words:

Nearly all of the patients who have been exposed to the word retrieval program have shown approximately the same amount of improvement on the generalization words as they have on the training words. Indeed, two patients, K.H. and T.T. showed greater improvement on the generalization words. In addition, nearly all of our patients have shown greater improvement on low frequency as opposed to high frequency words. We interpret these findings as an indication that the program facilitates the word retrieval process as a whole rather than merely facilitating the recall of those specific words which are worked on in therapy.

Future Directions

In addition to applying the word retrieval program as it is presently constituted to a larger number of patients, we plan to investigate the efficacy of a number of variations. A wider assortment of cues (e.g., partial and complete graphic representations, paired associations) will be employed along with different procedures for stimulus fading. From this we hope to develop more comprehensive guidelines for the utilization of cueing hierarchies and increase the overall efficiency of the program. In addition, we are

currently exploring the use of cueing hierarchies for areas of deficit other than word retrieval.

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Discussion

Q. How was the hierarchy of cueing determined? Was it varied across subjects?

A. The hierarchy that we presented today was determined largely on the basis of what worked for each of our patients. We formulated the sequence incorporating specific cues for task orientation (level 1), to foster self-cueing (levels 2 and 3), and to insure the elicitation of an appropriate response (level 10). The gestural cues were included for all patients for empirical reasons and to provide a demonstration of a possible self-cueing strategy even though they were of minimal stimulus power for some.

I really think that determining stimulus power is the critical feature in developing a hierarchy. You need to look at your individual patient and determine which cues are effective for him. We have another patient that we are getting ready to start (he has not yet met entrance criteria) for whom graphic cues will be very powerful. We need to look at it patient by patient.

Q. I think you have started to answer my question. About writing and why written cues of some kind didn't appear in the program for citation. Was it because it wasn't a powerful cue for citation? (The use of graphic cues or the lack of it?)

A. The only patient of the ones you saw for whom graphic cues were at all

effective was the second woman on the tape, B.W., and they were not as powerful as the others. Basically it's a question of power.

Q. Could you go into a little more detail on exactly how you arrived at a hierarchy; giving an example of one of these patients and maybe indicating how long it took to arrive at the hierarchy? What you did in order to determine what you felt was reliable valid hierarchy?

A. Let me use the first patient as an example. He was the first patient to go into the program. What we had done over a period of 3 months was to present a number of different items along with a wide variety of different cues. We then sat down and looked at the particular cues and the number of times a given cue facilitated word retrieval. For example, we were using sentence completion and vocalized first phoneme type cues. We would present a number of items providing sentence cues for some and 1st phoneme cues for others. Over a number of sessions we alternated the cues so that any given item would be presented with both of these cues. The relative power of the cues was determined according to the number of times each elicited the correct response. A protocol for developing cueing hierarchies is currently being formalized.

Q. Did the patients get better in self-cueing and in word retrieval in spontaneous speech?

A. MS's and BH's performance has improved significantly in our aphasia group. Unfortunately I can't say the same for CS who is also in the group. I'm not sure what's holding him back.

Comment: Another thing that we've found is that along with word retrieval our patients' ability to use gestures communicatively has improved.

Q. What measures were used to measure spontaneous speech?

A. We have undergraduate students who've been trained in a charting system which differentiates among spontaneous, "indirectly cued" (stimulus presented to the group as a whole), and "directly cued" (stimulus presented to a specific individual) responses. The charting system also includes notations for verbal and nonverbal self-cueing behaviors and various forms of external facilitation provided by the clinician. We were interested in determining if patients in the group were producing higher percentages of appropriate spontaneous and indirectly cued responses, which in fact they are.

Q. Jason Brown suggests that there is some kind of stable hierarchy that may reflect levels of processing or steps in processing of the patient. Do you have any feeling from results of your work about this hierarchy or the idea that with few exceptions there might be a stable general hierarchy?

A. I do not think there is a stable general hierarchy. As I understand Jason, he's seeking to describe correlations between linguistic processing and neuroevolutionary principles that I do not think are applicable to the cueing hierarchy. To my knowledge, the hierarchy we've presented does not parallel anything having to do with language acquisition or strategies found to be effective with developmental disorders. I believe that external facilitation as employed in the cueing hierarchy is not dependent on levels of processing, but rather is dependent on stimulus power which is

relative to each individual. Perhaps with the accumulation of additional data (see Love and Webb, JSHD 42, 170-178, 1977) a cueing hierarchy which is applicable to a majority of patients with word retrieval difficulty will emerge.