Word Association and the Anomic Response: Analysis and Treatment

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Introduction

Deficient word finding ability is broadly considered to represent a common denominator in the various complexes of aphasia. Pursuing the notion that isolated words are remembered because of their distinctive phonologic, morphologic and semantic features (Cermak and Morienes, 1976), a systematic procedure for the identification and subsequent remediation of selected anomic behaviors has been formulated. The program characterized by the acronym SORRT (semantic, oppositional and rhyming retrieval training) has been previously reported in various stages of its development (Dixon and Logue, 1977; Logue and Dixon, 1978). SORRT utilizes the task of word association to explore the assumption that semantic association, oppositional naming and rhyme are representative functions underlying the basic processes of word retrieval.

The early writing of Jacobson (1956) concerning the syntagmatic-paradigmatic response model as a potential way of characterizing adult aphasic disturbances and the further elaboration and critique of this view in Osgood and Miron (1963) has particularly influenced SORRT design. This approach has been conceptually framed with the more recent neuropsychologically oriented studies of verbal retention and semantic memory (Cermak and Moreines, 1976; Cermak, Naus and Reale, 1976; Cermak, Reale and Baker, 1978; Locke and Deck, 1978; Gardner, et al., 1978). Equally pertinent to the development of our word association procedures are two clinically oriented investigations of word retrieval and the naming response in aphasic adults (Marshall, 1976; Podraza and Darley, 1977).

The purpose of this paper is to summarize the current status of our work by: 1) providing a description of the evaluative and treatment components of the SORRT program; 2) briefly reporting the results of an experimental investigation of the differential word association response as a function of the principle type of aphasic syndrome and 3) detailing the results of a series of case study analyses of anomic patients who have completed various phases of word retrieval training.

Program Description

SORRT Evaluation Probes

The SORRT probes consist of four single word response tasks and one conversational analysis procedure adapted from Marshall (1976). The single response tasks include a "free word" association probe, a semantic association probe requiring a synonymic response, an oppositional association probe

requiring an antonymic response, and a rhyming task requiring a phonologically similar response. Each probe contains 20 word stimulus items.

Word Association Probe. The word association probe is employed to orient the patient to the response task. Considerable training is often necessary. Additionally, this probe provides a mechanism for characterizing the general response mode of the subject according to syntagmatic and paradigmatic continua. The task requires a single word response thereby reducing linguistic context and associated syntactical cues to a minimum. The patient is instructed to immediately say the first word that "comes to mind" upon hearing each stimulus word. The syntagmatic mode reflects a similarity response such as saying "house" to the stimulus "white." The paradigmatic mode is indicative of a contiguous response such as saying "black" or "green" to the stimulus "white" (Osgood and Miron, 1963). The grammatical classes represented in the word association probe include seven nouns, five verbs, five adjectives and three adverbs.

Semantic Association Probe. The semantic association probe is designed to explore via the task of word association the nature of the synonymic response. Twenty stimulus words characterized by the grammatical classes of nouns, adjectives, verbs, and adverbs are presented auditorily and the patient is instructed to respond with a word that is semantically similar. The probe is designed so that at least three correct synonyms are possible for each of the twenty stimulus items presented. Responses can be characterized according to percent accuracy, degree of self correction and specific error pattern.

Rhyming Association Probe. This probe is designed to explore the processes of the phonologically mediated response under conditions of minimal linguistic cueing. The stimulus set consists of 20 words representing five grammatical classes, including ten nouns, six verbs, two adjectives, one adverb and one pronoun. The subject is instructed to generate a rhyming response. The criteria for correctness also includes lexicalness (e.g., the response cannot be nonsensical). The requirement for rhyme is maintenance of the same vowel and terminal consonant as that of the stimulus word. Each stimulus word allows for at least three acceptable rhyming responses. Responses can be analyzed according to percent accuracy, degree of self correction and nonsensical vs meaningful responses.

Oppositional Association Probe. This probe contains a stimulus set of 20 words to which the patient is required to express an antonymic response. All 20 stimulus words were designed to represent only a canonical oppositional pair (Gardner, et al., 1978). Each essentially requires a paradigmatic response. The grammatical word classes represented include ten adjectives, four verbs, three nouns and three adverbs. The noncanonical response is not assessed. Responses are characterized according to percent accuracy, degrees of self correction, delay in response, the number and type of paradigmatic-syntagmatic confusions and the frequency of noncanonical responses.

Contextual Speech Analysis. If at all possible, a contextual speech sample of 300 words or more is obtained from each patient and analyzed according to a system adapted from that described by Marshall (1976). The most commonly employed retrieval strategies are identified according to the categories of delay, semantic associate, phonological associate, description, and generalization. Those retrieval strategies most effectively used in conversation and connected speech are ascertained. From these data a general word retrieval accuracy score is obtained. Pre-treatment, intra-treatment and post-treatment testing is done for purposes of assessing the patient's ability to generalize from single word response tasks to that of conversation.

The SORRT Training Component

Having completed the above described analyses, the clinician has baseline data regarding: 1) primary type of response, 2) primary retrieval behavior employed and 3) retrieval skills seldom used or used inaccurately. Remediation is undertaken with the intent of developing the patient's deficient retrieval behaviors, thereby inflating his repertoire of word association, conceptual and organizational skills. Three levels of training are employed: 1) discrimination training, 2) selective matching, and 3) expressive-generative training. The patient receives remediation initially in his primary deficit area. For example, if semantic association is the weakest area, the patient may begin here prior to proceeding to oppositionalization and rhyme. However, if the patient is capable of working across classes, all may be trained together with major emphasis placed upon the weakest retrieval skill.

Auditory Discrimination Training. Lists of 30 pairs of rhyming words, synonyms and antonyms have been designed with the training objective of correct auditory discrimination via the yes/no response. Criterion for advancement to the next level is 90% accuracy maintained over a minimum of two consecutive training sessions. The patient is instructed to indicate whether the words presented sound alike (rhyme) are opposites (antonyms) or are similar in meaning (synonyms). Each of the three categories is trained separately. The procedure is designed so that the word lists employed in the training phase are not the same as those included in the evaluation probes.

Visual Selective Matching.[1] When the patient has reached the above specified criterion for auditory discrimination he is advanced to the selective matching task. Index cards are designed; each containing four printed words with the stimulus word heading the list. The patient is required to visually select the appropriate rhyming word, antonym or synonym corresponding to the stimulus word. Criterion for advancement is 90% accuracy maintained over two consecutive sessions.

Generative Training. When the patient has demonstrated according to specified criteria, that he can auditorily discriminate and visually discriminate the stimulus items in each of the three categories represented, he is advanced to the expressive phase of word association training. Here, the patient is required to demonstrate the expressive ability to rhyme, to synonymically respond and to antonymically respond via a series of word association tasks. Twenty stimulus words comprise each category set and criterion is 90% accuracy.

Across-Class Sorting. The final training step of the program requires an ability to demonstrate an understanding of differences between semantic association, oppositionalization and rhyme. The methods used are similar to those previously described. The patient must demonstrate this sorting skill via auditory discrimination, visual matching, and the spoken response. The final task in the across-class sorting phase requires that the patient, from a single stimulus word, generate a correct rhyming response, a correct opposite and a correct synonym. Such a task is recognized as extremely rigorous and it is proposed that correct responding in this final phase

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[1]If the patient demonstrates alexia judged as too severe for task performance, an alternate auditory task is used.

demonstrates highly accurate and functionally intact word association skill.

Study 1: A Comparative Analysis of
Word Association Strategies[2]

Purpose

The purpose of this study was to determine if there were notable differences in the spoken responses of anterior/nonfluent vs posterior/ fluent subjects to three SORRT word association probes: oppositionalization, semantic association, and rhyme.

Method

Subject Selection. From an original data pool of 20 aphasic subjects, 13 subjects were selected for study. All subjects were required to meet relatively rigorous neurological confirmation of site of lesion (e.g., left hemisphere, predominantly posterior or predominantly anterior). Neuropsychological and neurolinguistic characterization of principle aphasia type was derived from profile analyses from the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1972).

The seven subjects in the posterior group ranged in age from 31 to 71 years. They were all native speakers of English, had no speech or language impairments prior to the onset of aphasia and reportedly used the right hand for writing and were judged as generally alert. Two of the seven posterior patients had an appreciable degree of hemiplegia but both were ambulatory and reported as responding favorably to physical therapy. Neurologic evidence indicated post-rolandic damage, although in three cases the damage possibly extended into the frontal lobe. Communicatively, the patients in the posterior group demonstrated varying degrees of semantic or nominal forms of expressive aphasia. All were thoroughly pre-tested to ascertain that they could perform the word response tasks.

The six patients in the anterior group (meeting the same selection criterion and pre-test requirements) ranged in age from 43 to 75 years. All had varying degrees of hemiplegia. Three of the patients were ambulatory. In three of the six anterior patients the diagnosis of apraxia of speech according to the criteria specified by Darley, Aronson and Brown (1975) was possible. The other three subjects in the anterior group demonstrated obvious nonfluent forms of aphasia (i.e., Broca's type). Expressive language was telegraphic and agrammatical; however, the coexisting symptoms of apraxia of speech were not discernible.

All subjects reflected minimal auditory comprehension deficits and demonstrated their ability to perform the task on a series of preliminary word association probes. Each subject was tested individually and administered the semantic association probe, the oppositionalization probe and the rhyming probe previously described. Order of administration was randomized.

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[2]This study is only briefly described here since it will be published in its entirety elsewhere.

Percent accuracy scores were computed for each subject; the data were pooled according to subject groups and then statistically and descriptively analyzed.

Figure 1, 2 and 3 are presented to provide a summary of group and individual data between and within the three probes administered. The
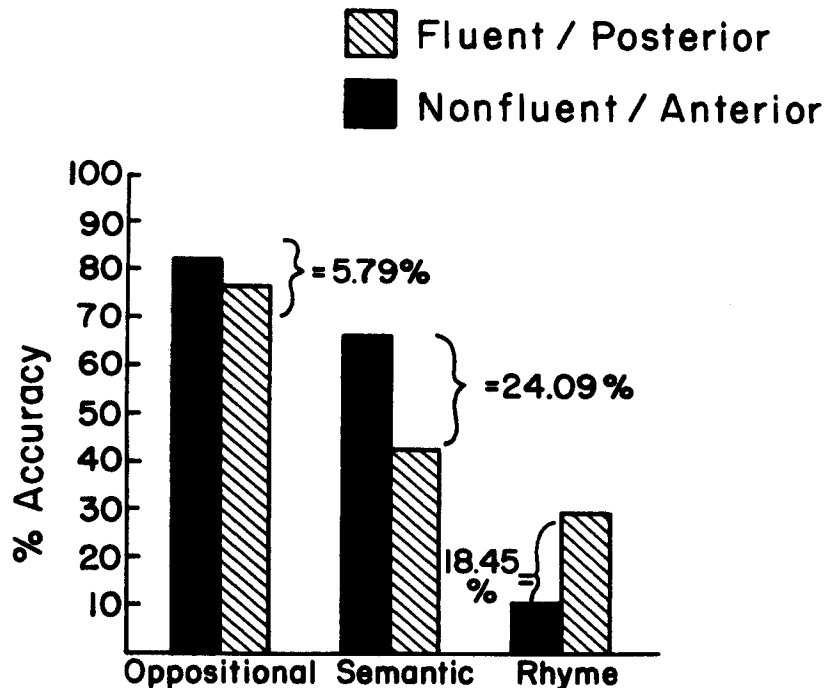

Figure I. SORRT- Comparison of the percentage of correct responses for nonfluent/anterior and fluent/posterior subject groups.

results can be summarized as follows. Oppositionalization, that task requiring a canonical word pairing, appeared to be the most accurate of the three tasks for both subject groups. These data appear to be relatively comparable to those recently reported by Gardner, et al. (1978). On the semantic association task, requiring demonstrated knowledge of the synonymic response, the differences between groups becomes more evident. The anterior group had a mean percentage accuracy score of 66.6 while the posterior group yielded an appreciable lower mean score of 42.5. The posterior group, as expected, had appreciably more difficulty in semantic association. These patients, who could be characterized according to a generally "typical anomic profile" demonstrated obvious difficulty in semantic field organization required for synonymic correctness. On the third task, that of rhyming, the data indicate obvious and marked problems for both subject groups. However, the posterior vs anterior trend, seen in semantic association is reversed. That is, the posterior group had a mean score of 29.3, whereas the anterior group performed significantly lower, yielding a mean score of 10.8. It was
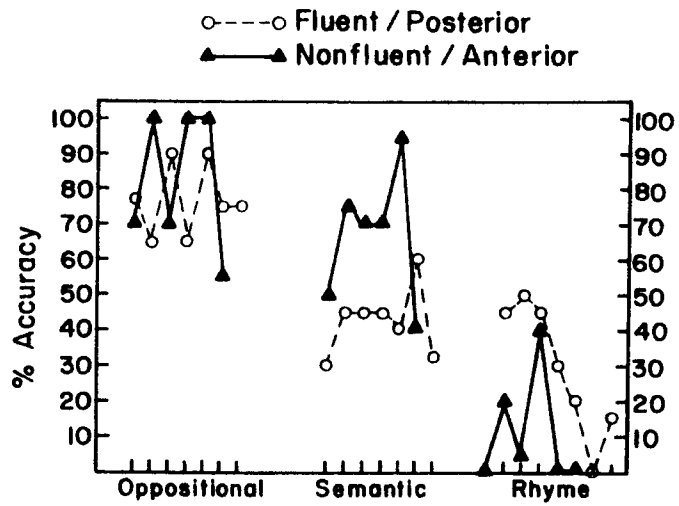
o----o Fluent / Posterior
▲——▲ Nonfluent / Anterior

Figure 2. SORRT— Comparison of individual subject data across oppositional, semantic and rhyming categories.
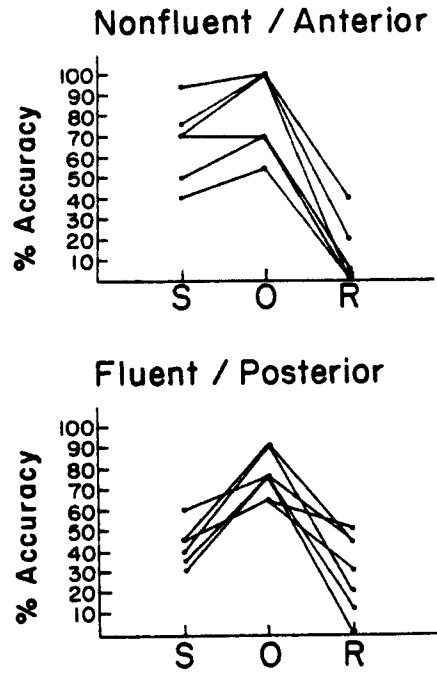
Nonfluent / Anterior

Fluent / Posterior

Figure 3. SORRT —Comparison of individual subject data by category.

quite obvious that the anterior patients simply could not rhyme. The phonologic mediation and organizational skills necessary for this task would seem to be particularly aberrant in anterior system lesions. Figures 2 and 3 depict individual subject differences within and across groups.

In summary, both groups performed highest on opposites, a paradigmatic task, and lowest on rhyme, a phonologically mediated task. It should also be noted that those anterior patients with accompanying apraxia of speech showed no appreciable difference in their overall performance from the non-apraxic anterior patients, except on rhyme. As indicated in Figures 2 and 3 in all three cases the rhyme scores were zero.

Study 2: Facilitation of Word Retrieval:

Case Studies

Three posterior fluent anomic patients were selected for case study analysis from a group of seven patients who have completed or are currently undergoing SORRT training. Changes in word association accuracy shown by comparison of pre and post-treatment probe scores are illustrated in Figure 4.
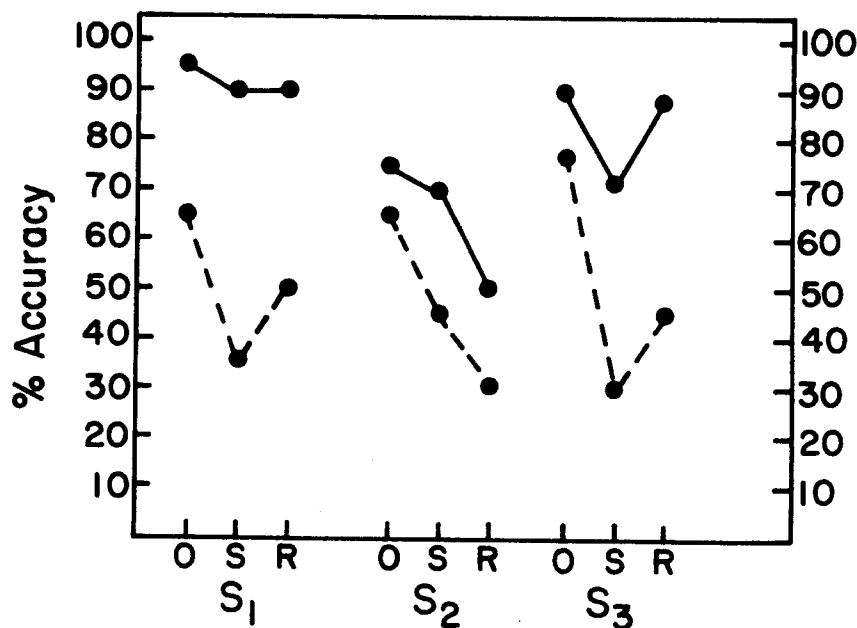
Figure 4. SORRT— Pre and post treatment comparisons of three primary anomic patients.

Patient Descriptions

Subject 1. Subject 1 is a 71 year old Caucasian female who suffered an occlusive CVA in December, 1977. She is a college graduate and had been active in a professional career. She is right handed and monolingual. Performance on the Boston Diagnostic Aphasia Examination (1 month post CVA)

resulted in a relatively clear diagnosis of primary anomia. SORRT training was initiated 1-1/2 months post CVA. Pre and post treatment data are summarized in Table 1.

Table 1. Training-related changes in retrieval accuracy. Subject 1.

Time of Sampling	Retrieval Variable			
	O	S	R	TRA[a]
Pre-treatment	65%	35%	50%	20%
Post-treatment	95%	90%	90%	80%

[a]TRA = Total Retrieval Accuracy computed from a contextual speech sample.

As can be noted, although the patient reflected problems in all three categories, deficient synonymic responding was the greatest area of deficiency. Subject 1 progressed through levels of discrimination training, selected matching, generative training and across-class training in 52 forty-five-minute sessions. Pre-treatment analysis of conversation indicated that delay was the most frequently attempted retrieval strategy. The patient total word retrieval accuracy prior to treatment was 20%. Analysis of a post treatment conversational sample indicated marked improvement in the successful use of a number of retrieval strategies including delay, semantic association, and phonologic association. Accuracy scores were appreciably improved. The total word accuracy score obtained post-treatment was 80%.

Subject 2. Subject 2 is a 45-year-old black female who suffered an aneurysm to the left internal carotid artery. Educational level was eighth grade. The patient is a mother and housewife. She was reportedly right handed and monolingual. Initial communication analysis conducted one month post-insult indicated marked deficits in all areas and resulting global aphasia. Follow-up evaluation three months post-insult revealed marked improvement, particularly in auditory and visual comprehension skills. The diagnosis was posterior fluent aphasia characterized by predominating anomia. SORRT training was initiated four months post-insult. Pre and post-treatment data are summarized in Table 2.

Table 2. Training-related changes in retrieval accuracy. Subject 2.

Time of Sampling	Retrieval Variable			
	O	S	R	TRA[a]
Pre-treatment	65%	45%	30%	14%
Post-treatment	75%	70%	50%	80%

[a]TRA = Total Retrieval Accuracy computed from a contextual speech sample.

Subject 2 has not completed all phases of the word retrieval training program. She has progressed successfully through the levels of discrimination training, selective matching and generative training for semantic association and oppositionalization in 36 sessions. The patient is currently in the rhyming-generative phase of training. Results of a recent SORRT probe indicates significant changes in the areas trained (see Table 2). Extremely poor word retrieval accuracy was evident pre-treatment. The patient's primary retrieval attempts were those of delay and semantic association. Following 36 sessions of training the patient has demonstrated markedly increased fluency and word retrieval accuracy. A recent analysis indicated that the patient employed the retrieval strategy of delay with approximately 75% accuracy and that of semantic association with 100% accuracy. Her total word retrieval accuracy score computed post-treatment was 80%.

   Subject 3. Subject 3 is a 62 year old Caucasian male active in the ministry until September, 1977 when he suffered an occlusive CVA. Neurological testing resulted in a clear diagnosis of left hemispheric lesion. Site of lesion was noted to be in the left fronto-temporal-parietal juncture. Results obtained from the Boston Diagnostic Aphasia Examination yielded the diagnosis of primary anomia. Pre and post-treatment data are summarized in Table 3.

Table 3. Training-related changes in retrieval accuracy. Subject 3.

Time of Sampling	Retrieval Variable			
	O	S	R	TRA[a]
Pre-treatment	77%	30%	45%	15%
Post-treatment	90%	72%	88%	80%

[a]TRA = Total Retrieval Accuracy computed from a contextual speech sample.

   Remediation was initiated approximately four months CVA. Analysis of attempted conversation, measured before treatment began, indicated grossly deficient retrieval skills. The patient attempted retrieval primarily through the use of delay, semantic association and phonological association. Pre-treatment total word accuracy was 15%. Figures 5, 6, 7, 8 and 9 depict the patient's progress through various phases of word association training. Pre and post test comparative data are shown in Figure 9. The patient's duration of training was five months, requiring 43 sessions. He progressed through all levels of the program, but it should be noted that he did not reach criterion on the final phase of SORRT, requiring across class generalization. A post-treatment analysis of a conversational sample indicates marked improvement. The patient utilized the retrieval strategy of delay with 100% accuracy and the retrieval strategy of phonologic association with 100% accuracy. The patient's post-treatment total word retrieval accuracy score was 80%.
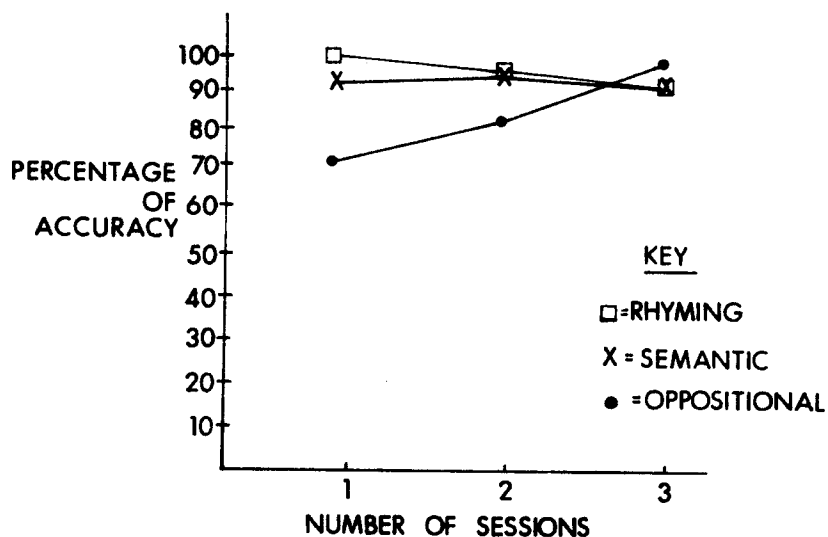
Figure 5. SORRT discrimination
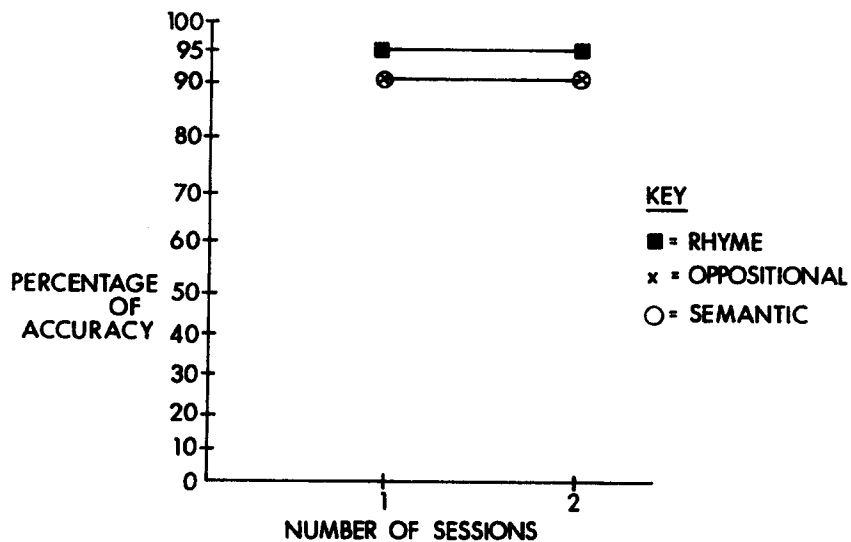training. Achievement of Criterion
(3 sessions)

Figure 6. SORRT Selective Matching
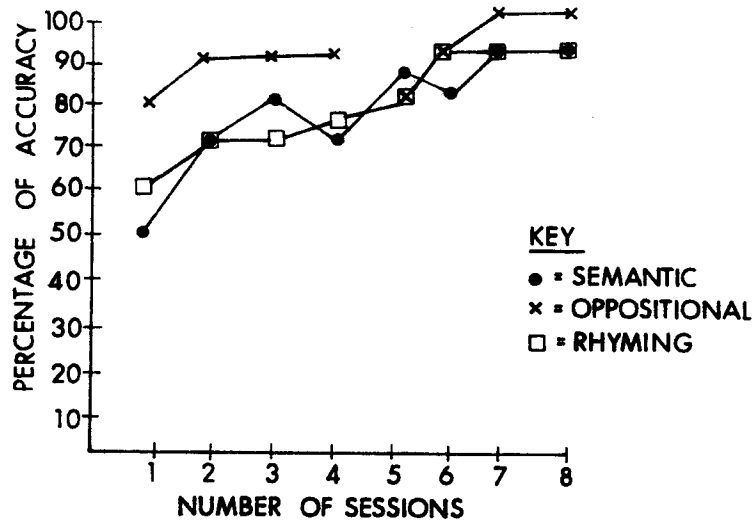Achievement of Criterion (2 sessions)

Figure 7. SORRT Generative
training (within class) Achievement
of Criterion (semantic = 8 sessions,
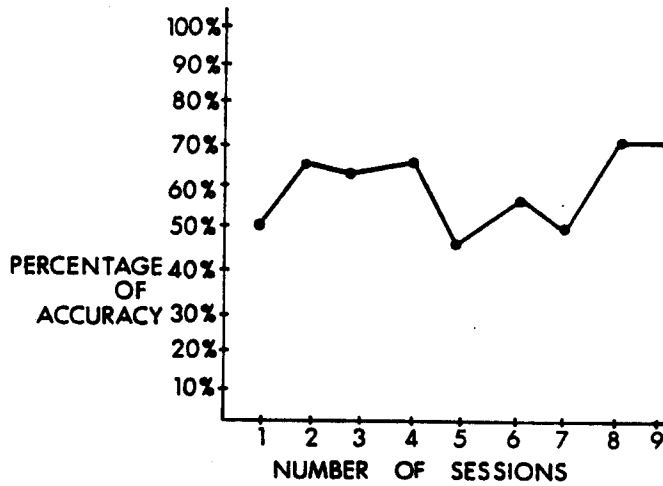rhyming = 7 sessions, opposites = 4 sessions)

Figure 8. SORRT Generative
training (across class)
Criterion not achieved.

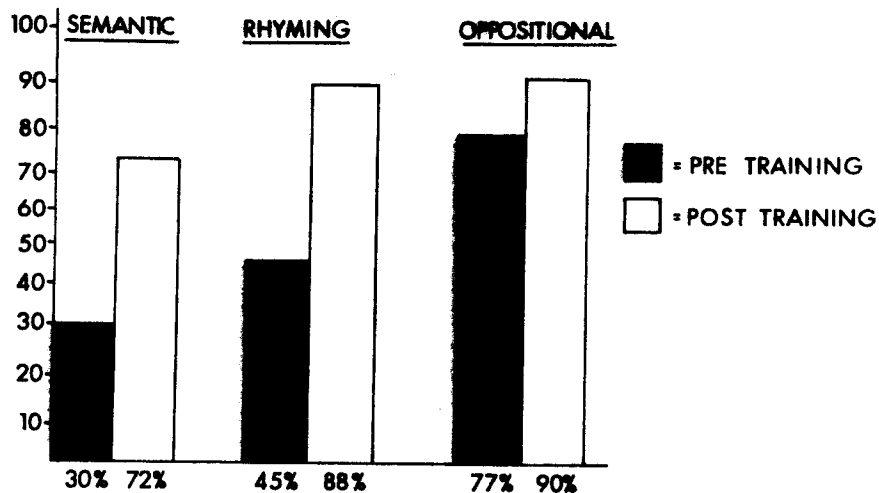FIGURE 9. Pre and Post Test data
comparison SORRT — Case Study.
Duration of training = 5 months
(January '77 to May '77)

Summary

A systematic procedure for the identification and subsequent remedia-
tion of selected forms of word retrieval deficit has been described. The
method allows for the exploration of synonymic, antonymic and rhyming
response behaviors as representative functions underlying the basic processes
of word retrieval. The word association probes have been shown to be dis-
criminating regarding the type of aphasic syndrome and more importantly the
specific form of word retrieval deficit. The program contains a systematic
remediation component that has clearly demonstrated significant facilitation
of word retrieval strategies in anomic patients, and most importantly,
generalization from specific word association to conversation and the use
of naming in context.

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