

A Study of the Interdependence of Word Retrieval and Repetition
in Conduction Aphasia

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Conduction aphasia has been described as an impairment of verbal repetition that is disproportionately severe relative to the fluency of spontaneous or conversational speech. Classical theories of cortical language centers and associative pathways have attributed this syndrome to impairment of an auditory-motor association tract subserving the repetition function. This theoretical approach may leave the impression that repetition is impaired independently from other language functions. However, recent accounts of conduction aphasia associate the repetition deficit with other deficits such as word retrieval problems and phonemic paraphasias in spontaneous speech.

We decided to examine the independence hypothesis with a single subject experimental design which requires an assumption of independence between two different behaviors of interest. That is, a multiple baseline design was employed in planning treatment of a patient with conduction aphasia. Before describing this methodology, we shall review the pertinent literature on conduction aphasia.

Conduction Aphasia

Benson and his colleagues presented three basic criteria for a diagnosis of conduction aphasia (Benson, Sheremata, Bouchard, Segarra, Price, and Geschwind, 1973). These criteria are (1) normal auditory comprehension, (2) fluent and paraphasic conversational speech, and (3) repetition disturbance of a significant degree. The functional adequacy of auditory comprehension has been reported by several authors (Goodglass and Kaplan, 1972; Strub and Gardner, 1974; and Brown, 1975). However, the nature of word retrieval and repetition deficits are of greatest interest for our study.

Brown (1972) suggested that the degree of repetition deficit is surprising when comparing it to the patient's conversational ability and preserved comprehension. In fact, repetition was viewed as such an important aspect of conduction aphasia by Benson *et al.* (1973) that the term "repetition aphasia" was used synonymously for this syndrome. Some investigators have found that repetition difficulty affects single words, but that the difficulty is greater for polysyllabic words than for monosyllabic words and is greater for phrases than for single words (Kinsbourne, 1972; Brown, 1972). However, Burns and Canter (1977) suggested that a severe repetition deficit, reaching the level of monosyllabic words, is not typical of conduction aphasia. Their data also indicated that single word repetition is significantly less impaired than confrontation naming. Nevertheless, it appears that the repetition deficit in conduction aphasia is not an all-or-none phenomenon, but that the repetition deficit varies as a function of linguistic complexity.

Naming deficits have been shown to be characteristic of conduction aphasia (Brown, 1975; Dubois, Hecaen, Angelergues, de Chatalier, and Marcie, 1973). Though Dubois et al. (1973) delineated certain differences between the syndromes of conduction aphasia and anomia, the free speech of conduction aphasia may possess features of anomia. Brown (1975, 1976) suggested that conduction aphasia is a deterioration of the anomic syndrome or is a stage in recovery from Wernicke's aphasia to anomia.

Introduction to the Study

Though the nature of conduction aphasia has been studied extensively, we were unable to find any suggestions in the literature on how to treat this symptom pattern. One way of forming a knowledge base from which to develop syndrome-specific treatment strategies is to examine the treatment of one particular symptom of the syndrome. While treating one symptom, we can follow the course of other symptoms as well. In the present study, we treated word retrieval of a patient with conduction aphasia while not treating but continuing to observe the course of his repetition. If these two deficits are independent, we would expect word retrieval to improve with treatment and repetition to remain stable. However, Dubois et al. (1973) stated that naming and repetition recover simultaneously in conduction aphasia. Therefore, it was more likely that treatment of word retrieval might have similar impact on both word retrieval and repetition.

Methodology

Subject. The subject was a 41-year old male who had suffered a left parietal lobe infarct following a gunshot wound to the chest. He was a high school graduate and was self-employed as a refrigerator and air-conditioner repairman. He had been seen initially at the Speech Pathology Service of the Memphis VA Medical Center two months prior to initiation of this study. At that time, five weeks post onset, only the Gestural, Verbal, and Graphic A subtests of the PICA (Porch, 1967) were administered. The verbal subtests revealed an abundance of perseverations and neologisms, unlike his conversational speech. A spontaneous speech sample was more communicative with intelligible function words, occasional verbs, and appropriate intonation. There was a noticeable absence of nouns and the presence of a few neologisms in conversational speech. He wrote "I smoked cigarette" and "I key an door" for Graphic subtest A. Initial treatment was terminated after five sessions due to the debilitating effects of a sacral ulcer infection.

Two months later and roughly three months after onset the patient was re-evaluated and this study was begun. His conversational speech was fluent and devoid of substantive nouns. He used appropriate verbs and used neologisms only in attempts to name objects. For example, when describing his method for transferring from his bed to his wheelchair, he said, "I get over to this side and then I put my (neologism) here." In spite of this extended speech, he was unable to repeat names of objects, numbers, or phrases. Along with adequate functional auditory comprehension, these symptoms are suggestive of conduction aphasia. His PICA scores at the beginning of the study, shown later in Table 2 of results, do not reflect this superiority of conversational speech over repetition, as the Verbal Subtest I score was similar to the repetition subtest (XII).

Multiple Baseline Design. Treatment was planned over time to conform to a basic multiple baseline single case research design (Hersen and Barlow, 1976; LaPointe, 1978). In the present case, two behaviors—word retrieval and repetition—were selected for study. The study consisted of three phases carried out in sequence for seven weeks. The first phase consisted of three baseline measures of each behavior taken on three consecutive days. The second phase was three weeks of word retrieval drills with no treatment involving repetition. Both behaviors were measured, as they were during the first phase, six times during the three week period. The third phase was three weeks of treatment for word retrieval and repetition. The same measures of each behavior were taken five times during this phase.

Measurement Procedures. Two measurement probes, one for word retrieval and one for repetition, were taken 14 times across the three phases as described previously. These probes were independent of the treatment procedures. Each probe consisted of 20 items with matching content. The repetition probe consisted of an even distribution of monosyllabic and bisyllabic words, and two- and three-word phrases. The word retrieval probe was always administered first, to avoid providing cues for the subsequent repetition probe. Two forms, A and B, of each probe were alternated to minimize learning effects due to the frequency of probe administration.

A six-point scoring scale was devised that would be sensitive to small changes across the three experimental phases (see Table 1).

Table 1. Six-point scoring scale used for the word retrieval and repetition probes.

- 5: Correct target response, or a non-target response correctly conveying idea
 - 4: Close approximation of target response, including phonemic paraphasias
 - 3: Two parts of three-word phrase
 - 2: One part of two- or three-word phrase
 - 1: Inaccurate
 - 0: No response
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Results

PICA's were administered before and after the seven-week experiment (see Table 2). Improvement in mean response level of over one point occurred only for repetition (XII) and two reading subtests (V and VII) not shown in Table 2. Results of the experiment led to a decision about where to focus treatment, and, therefore, substantial verbal gains are shown from a PICA given five months after the experiment.

Table 2. Pertinent PICA mean response levels observed before and immediately after the experiment and, then, five months after the experiment. Two overalls were not obtained because Graphics were not completed.

	<u>PICA</u> subtests								
	<u>OA</u>	<u>Gest</u>	<u>VI</u>	<u>X</u>	<u>Verbal</u>	<u>I</u>	<u>IV</u>	<u>IX</u>	<u>XII</u>
Pre	-	13.70	15.0	14.8	5.20	4.2	6.4	5.7	4.5
Post	-	14.24	15.0	15.0	5.75	5.1	5.9	5.6	6.4
5-mos.	13.45	14.89	15.0	15.0	8.55	9.0	7.5	9.0	8.7

Raw score totals for each probe are shown in Figure 1 across the three experimental phases. It is important to keep in mind that these scores are

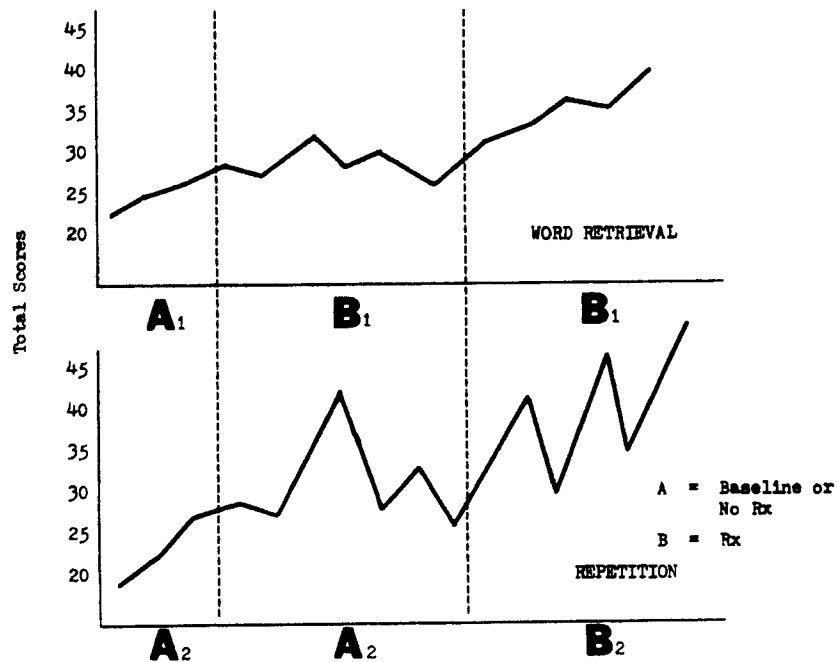


Figure 1. Comparison of word retrieval and repetition scores across baseline and two treatment conditions.

not plotted according to real time. The baseline phase represents only three days, while the two treatment phases represent three weeks each. The first phase shows ascending trends for word retrieval and repetition. The second phase, in which only word retrieval was treated, shows a level trend for word retrieval and a variable trend for repetition. The third phase, in which both behaviors were treated, shows an ascending trend for word retrieval and a variable but ascending trend for repetition across a three week period.

The regular alternating variability of the repetition scores coincided with the alternating presentation of two different lists of the repetition stimuli, in spite of attempts to match these lists according to difficulty. Though isolating one form decreases the number of data points almost by half, the results with form B, shown in Figure 2, show clearer trends in the repetition data. With form B, repetition shows an ascending trend in

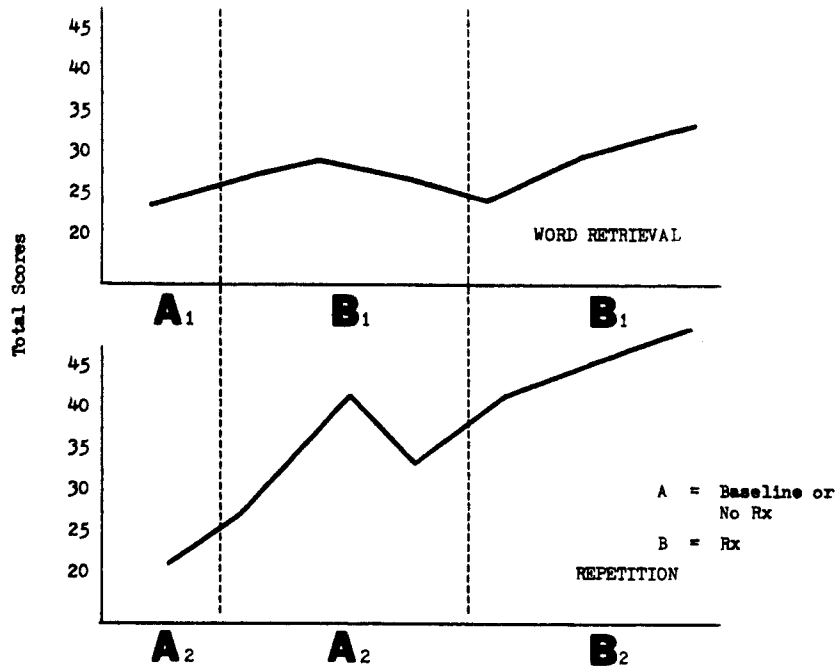


Figure 2. Comparison of word retrieval and repetition scores across baseline and two treatment conditions with Form B.

the third phase. The word retrieval trends with Form B, along with both probes using Form A, which are not shown here, were similar to the word retrieval trends in Figure 1.

Discussion

From these results, it was concluded that treatment of word retrieval alone had little impact on both word retrieval and repetition as measured by our two probes during the second phase of the experiment. The ascending trends in the third phase indicate that adding treatment of repetition had a positive impact on both behaviors. Therefore subsequent treatment was focussed on repetition, with improvement of the verbal mean response level on the PICA of 2.8 points.

Second, the similarity of trends between word repetition and retrieval during the second phase, when only word retrieval was treated, indicates that these two behaviors were not independent in this patient with a pattern of conduction aphasia. Also, the period of later treatment focused on repetition showed substantial gains in other verbal performances on the PICA.

At least three aspects of this experiment require that our interpretations be considered with caution and are instructive as to the

implementation of single subject research. First, an ascending baseline makes it difficult to say that subsequent improvement is due to treatment. However, we are not sure that this patient's baseline trend was truly ascending because it was gathered across a much shorter time than subsequent phases. Ideally, the baseline phase should be equal in time to subsequent phases, though this achievement in design is usually not practical clinically. Furthermore, the trends did not continue to ascend during the second phase, with a clear shift from level performance to ascending performance occurring between the second and third phases.

Second, the scoring scale for the probes was quite demanding and could not be applied consistently between single words and phrases. Great care needs to be exercised in creating such scales.

Third, if two forms for a probe are to be used to minimize learning effects from repeated administration, these forms should possess demonstrated similarity of difficulty.

Nevertheless, this study demonstrates how our knowledge base regarding treatment can be refined by using single case experimental designs. The notion that repetition drill is the treatment of choice for conduction aphasia needs to be examined further by other clinicians repeating this experiment with other patients possessing similar symptoms. In addition, single case design strategies can be employed simply to make decisions regarding optimal treatment strategies as a matter of routine clinical procedure. However, we need more practice in refining these strategies before they can become an integral part of treatment planning.

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Discussion

- Q: Do you have any feelings about what goes wrong in conduction aphasia as a result of doing this treatment and seeing these treatment effects? Most of the explanations for conduction aphasia are localizationist, which doesn't help us all that much in treatment. I wonder if you have any speculations about underlying disturbed mechanisms, as a result of your experience with that patient.
- A: No, I don't. As I watched this patient, I could see his strategies for improvement when we worked on repetition and I could speculate as to what was happening during treatment. As to what happened to create this type of impairment itself, I can't say.
- Q: I want to comment about the ascending baseline. I think the only reasonable thing to do is to insure that it's stable and not ascending, whether it's taken over three sessions in one day or three sessions over three days, or whatever situation you're forced into.
- A: Yes, I agree with you.
- Q: Related to that issue of ascending baseline, I think there are technologies emerging for dealing with that, though they are troublesome. Technologies such as trend analysis. As long as you get enough observations to estimate trend, you might, in fact, be able to plot degree of slope and not worry about the fact that the baseline ascends.
- A: With regard to both your comments, we were aware that this baseline was ascending as we were gathering data. We questioned whether we should go on with baseline determination until it was stable. I think the thing that is somewhat misleading here is that these numbers are raw score points. What we were seeing was two correct responses out of twenty the first day, and three correct responses on the second day. We thought this would average out over the three days of data gathering because of our scoring system. Retrospectively, we found that, with plotting, the baseline was indeed ascending rather than stable.
- Q: I'm very interested in how you trained word retrieval and what the nature of your stimuli was.
- A: We had a hodge-podge variety of tasks. "Word retrieval drills" was the best way I could describe it during the presentation, as we were not promoting a particular therapy protocol. We used confrontation naming, completion tasks, picture description, and conversational tasks such as speaking on a topic related to the patient's environment. Cueing was used as long as phonemic or imitative cues were avoided. As you can see, there was no specific type of therapy.

Q: Did you use word association as part of this package?

A: No, we did not.

Q: What was the power of the phonemic cue?

A: It was powerful as we progressed through the repetition phase, but not initially. No matter what we did in the beginning, repetition was not facilitated. Just giving a phonemic cue was not an effective facilitator until the patient had progressed with repetition skills.

Q: At ten-months post-onset was this patient apraxic or Broca's or are you still calling him conduction aphasia?

A: I would still call him a conduction aphasic. He certainly did not have Broca's aphasia. I can't call him apraxic although he had apraxic-like symptoms. There were certainly programming problems, but he was a fluent speaker. During conversational speech, he did not exhibit apraxic characteristics. I saw one pattern with repetition and another pattern with conversational speech where he only omitted nouns. During repetition drills, we saw the programming or struggle behavior not evident in spontaneous speech.

Q: Wouldn't it be nice if you had a video tape so we could see just what he looked like. It would help us all to know what you mean by conduction aphasia. Also, I want to ask you what are the ordinates of your graphs? Are these percentage scores?

A: No, these are raw scores based on our scale. What we see here is only minimal improvement. On the first graph, his total score based on a possible 100 derived from twenty items with a maximum score of 5 points each, was 23. This increased to about 36 during the study. On the second graph the increase was to about 46 for repetition. We didn't see a lot of change with this patient but we did see a trend with repetition being somewhat more easily facilitated than word retrieval.