The Effects of Repetition of Token Test Commands on Auditory Comprehension

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Introduction

Impairment in auditory comprehension traditionally has been recognized as a significant component of the symptomatology of aphasic individuals. Over one hundred years ago, in 1874, Wernicke pointed out the importance of auditory receptive problems. Today the relevance of auditory factors forms the core of some theories of aphasic impairment (Schuell, Jenkins and Jiménez-Pabón, 1964). Current literature in aphasiology reflects a rennaissance of interest in auditory processing in relation to both diagnosis and treatment:

Several recent studies have demonstrated that auditory functioning of aphasic subjects can be facilitated by manipulations such as:

1. Reducing overall speaking rate (Sheehan, Aseltine and Edwards, 1973; Weidner and Lasky, 1976).
2. Judicious use of interphrase pause (Salvatore, 1974, 1976; Liles and Brookshire, 1975).
3. Altering semantic redundancy (Gardner, Albert and Weintraub, 1975).
4. Increasing response delay (Yorkston, Marshall and Butler, 1975).
5. Minimizing syntactic complexity (Parisi and Pizzamiglio, 1970); (Shewan and Canter, 1971).

Another strategy for facilitating auditory comprehension is repetition, which apparently is commonly employed in aphasia treatment. Schuell, et al., (1964) emphasized the need for repetition during treatment when she listed it as one of the principle therapeutic devices for altering the potency of stimulus presentation. Schuell's work has been enormously influential in aphasiology, and her principles of treatment are widely embraced by clinicians.

Others have recognized repetition of stimuli as an important tactic for increasing responsiveness of aphasic individuals. For example, Porch (1967) includes "responsiveness" as one of the principle dimensions of patient behavior included in the design of the scoring system of the PICA. Repetition of task instructions is part of the standard procedure of administering this test. This is based on the assumption that increased patient responsiveness will result.

Though the use of repetition has been practiced widely and long advocated, some writers have claimed that the assumption of the beneficial effect of repetition is doubtful (Martin, 1977). Rollin (1964) found no difference in responses between the first and second presentation of a question in a sample of 32 aphasic subjects and suggested that an aphasic

patient who answered a question incorrectly the first time would probably do so the second time. He notes, however, that a significantly high inter-subject variance was evident in his study which would tend to obscure any differences found among experimental conditions. We concur, and in fact feel Rollin was remarkably restrained in his qualification.

Statement of Problem. The question of repetition as a facilitating strategy was addressed as a secondary issue in the study of Rollin (1964), with rather unclear results. In spite of the wide use of repetition as a facilitator to comprehension and the apparent acceptance of it by clinicians, little or no research has been done on the effects of such repetition, although Salvatore reported on the effects of stimulus repetition as a part of one of his pause-time studies (Salvatore et al., in press).

Questions remain unanswered as to whether or not repetition facilitates performance of aphasic patients. Further, specific issues such as maximal number of repetitions, location of repetitions in relation to patient response, and the influence of feedback on subsequent attempts on the same item, remain unstudied.

Purposes of the Study. The purposes of this study were twofold:

(1) to discover if repetition of verbally presented commands facilitates auditory comprehension in aphasic subjects, and
(2) to explore the effects of pre-response and post-response repetition, number of repetitions, and the relationship of repetition performance to a variety of subject variables.

Specific questions addressed in this study include:

(1) If a Token Test command is failed, does repetition cause subsequent performance to improve or remain unchanged?
(2) Does pre-response repetition of commands facilitate performance when compared to single presentation?
(3) Are there any performance differences which result from two versus four pre-response command presentations?
(4) Is there a relationship between amount of auditory comprehension and performance under conditions of repetition?
(5) Is there a relationship between type of aphasia (fluent vs. nonfluent) and performance under conditions of repetition?

Methods and Procedures. Twelve aphasic subjects (6 fluent and 6 nonfluent) who ranged in age from 37 to 66 ($\bar{x}$ = 55.75) and ranged in months post-onset from 1 to 35 ($\bar{x}$ = 11.92) were selected from our current and recent clinical caseload. All subjects suffered left hemisphere thromboembolic CVA's.

The test employed was a 40-item modified version of the Token Test (LaPointe et al., 1971). The test was given to each subject under two conditions. In Condition I, repetition of commands was implemented only upon failure of an item. Subsequent failures on a specific item elicited further repetition, up to a ceiling of five presentations.

Under Condition II, repetition of each command preceded a subject's response. For half of the items, two repetitions were provided and for the other half, four repetitions were used, in counterbalanced order.

All testing was carried out in a sound treated therapy room. All subjects were screened to determine if they were able to match color, shape and size of tokens, and all subjects presented no inordinate hearing acuity difficulties which would prevent their participation in the study. Subject

responses to the Token Test commands in both conditions were scored by the examiner in two ways: (1) accuracy of response, and (2) number of critical elements (size, color, shape, and preposition). Subjects' responses were recorded on suitable forms, and order of conditions was counterbalanced for the subject sample.

Results

All subject responses were treated statistically by either two-sample or paired difference t-tests. In addition, correlational coefficients were run on appropriate variables.

Table 1. Condition I (Repeat Upon Failure) Scores.

PRESENTATIONS				
1	2	3	4	5
Mean Score	Mean Gain	Mean Gain	Mean Gain	Mean Gain
9.75	5*	4.5*	2.17	1.75

Group Gain by Repetition
Range = (3-26) Mean = 13.42 S.D. = 6.64
* = Significant ($P < .05$)

Table 1 illustrates the performance of all 12 subjects under Condition I. As you can see, mean score for the group after one presentation was 9.75 correct items. With presentation two (actually, the first repetition of the missed item) the mean gain in correct responses for the group was five commands. For presentation three, the group gained 4.5 items; 2.17 for the fourth presentation; and 1.75 for presentation five.

As you can see, statistically significant improvement in performance was achieved with both presentation two and presentation three. Improvements in performance were shown, but they failed to reach statistical significance, for presentations four and five.

The group gain in correct items under this condition ranged from 3 to 26 with a mean gain of 13.42 commands. The reasonable standard deviation of 6.64 indicates that the gain was distributed fairly evenly throughout the sample and was not a skewed distribution caused by just a few subjects.

Table 2. Summary of Score Change (in Percentage).

	No Repetition	Repetition
Raw Score Mean	9.75	23.17
Percent of Items	24%	58%

Another way of viewing performance under Condition I is in percentage. The mean score with no repetition for our group was 9.75 correct responses

(Table 2). This is 24% of the total 40 items. Under the "repeat upon failure to a ceiling of five" condition, mean number of correct responses increased to 23.17 or 58% of the 40 items. Our interpretation of these data is that repetition of a command upon failure does indeed facilitate performance, with the most significant gains being made on the 1st and 2nd repetitions.

Individual subject performance in Condition I is presented in Table 3.

Table 3. Individual Subject Performance: Condition I

Subject #	PRESENTATIONS					Total Gain
	1	2	3	4	5	
1	13	5	6	1	4	16
2	5	1	8	8	1	18
3	5	5	2	0	3	10
4	11	7	2	2	1	12
5	10	13	8	4	1	26
6	13	9	6	2	1	18
7	20	9	7	1	1	18
8	21	4	11	3	0	18
9	4	3	0	1	4	8
10	1	0	1	0	2	3
11	12	3	2	3	0	8
12	2	1	1	1	3	6

All subjects improved their performance if failed items were repeated. The "total gain" column reflects the gain of each subject.

Table 4. Condition II (2 or 4 Pre-response Repetitions) Scores.

Mean Correct (No Repetition)	Mean Correct (Pre-Response Repetitions)
9.75	12.25
Differences are not statistically significant	

Table 4 contrasts "no repetition" performance with Condition II, which consists of either 2 or 4 pre-response command repetitions. Our subjects did better with pre-response repetition and the mean score increased from 9.75 to 12.25; but this difference failed to reach statistical significance. Further, under Condition II, no significant differences existed between 2 and 4 repetitions.

Analysis of individual subject performance under this condition revealed some interesting patterns (Table 5). Most subjects showed little difference between the "no repetition" format (or the usual manner of Token Test administration) and Condition II. However, two subjects,

Table 5. Individual Subject Performance: Condition II (Pre-response Repetitions).

Subject #	TT Score		Cond. II Score
1	13		13
2	5		3
3	5		8
4	11	Noise build up?	4
5	10	Slow rise time?	28
6	13		16
7	20		25
8	21		26
9	4		3
10	1		3
11	12		13
12	2		5

Numbers 4 and 5, evidenced dramatic differences when their performances under these two conditions were contrasted. Subject 4 did remarkably poorer when commands were repeated before allowing his response. We might speculate, once again, that this represents one of the patterns of auditory impairment suggested by Brookshire (1972), LaPointe et al. (1973), Porch (1967) and others. Perhaps "noise build up" is being evidenced by subject 4. Subject 5, on the other hand, apparently benefited from the repeated, pre-response stimulation as his score increased from 10 with no repetition, to 28 under Condition II. Perhaps this suggests the auditory pattern of "slow rise time."

Table 6. Correlation Coefficients among subject scores in experimental conditions and subject characteristics.

	Age	Education	PICA	MPO	TT	Cond.I Total	Cond.II Total	Cond.I Gain
Age					*-.61			
Education								
PICA					* .66	* .72	* .81	* .63
MPO								
TT Score (No Repeats)						* .89	* .79	* .59
Cond. I Total							* .86	* .89
Cond. II Total								* .74
Cond. I Gain								

* ($p < .05$)

Several correlational analyses reached statistical significance as illustrated in Table 6. First, a significant inverse relationship existed between age and Token Test score (without repetition). Older subjects achieved lower scores. Second, PICA Overall Score related positively to Token Text score, as it has in many previous studies. Additionally, severity

of aphasia, as measured by PICA overall percentiles, correlated positively with both repetition conditions as well as gain in score with repetitions. This, along with analysis of our individual subject data, suggests that at least in this sample, the less severe the language impairment, the more probable was the gain from repetition. The remaining high positive correlations simply indicate a relationship between the two repetition condition scores and improvement with repetition. For the other variables on this matrix, the empty cells simply mean no significant correlation existed.

The final question relative to subject variables was whether fluent or non-fluent aphasic subjects benefited differently from repetition. The answer is that no differences were found.

Summary

In summary, we tested 12 aphasic subjects, 6 fluent and 6 nonfluent, on the Token Test under two conditions: repetition upon failure and pre-response repetition. We did this to discover if repetition of verbally presented commands facilitates auditory comprehension and to explore the effects of a pre-response and post-response format; as well as to discover the relationship of performance under repetition to a variety of subject variables. We concluded that, for our sample:

(1) When a command was failed, repetition led to significantly improved performance.
(2) This improvement was greatest on the first and second repetitions; but continued through five repetitions.
(3) Though some improvement was noted, no significant differences existed between pre-response repetition and single presentation performances.
(4) No differences existed between two and four pre-response repetitions.
(5) Several significant relationships were observed, including performance under conditions of repetition with severity of auditory comprehension and overall severity of aphasia.
(6) Though group data revealed significant benefit from repetition, comparison of fluent vs. non-fluent subjects revealed no differential effects. Fluent aphasic subjects were just as likely to benefit from repetition as were non-fluent subjects.

The results of this study document the frequently made clinical observation that repetition of material facilitates auditory comprehension. Also revealed are patterns of gain in performance; as well as the locus and type of repetition for the facilitation of optimal performance. No doubt future work in the crucial area of auditory processing will continue to aid us in the refinement of our treatment strategies designed to help our aphasic patients understand what is said to them.

Discussion

Q. How did the comprehension scores for the fluent and nonfluent patients compare?

A. In this study, we found our nonfluent patients to have just a little bit better comprehension scores than the fluent subjects. No great differences though.

Q. You mentioned you used a revised version of Token Test, one of 40 questions. Were there differences in the length or difficulty of the questions?

A. In our revised version of the Token Test, we have maintained the five subtests. We dropped a few items from subtest V and several out of each of the other subtests, but we have tried to maintain the integrity of the original Token Test in terms of complexity and overall design.

Q. Did the relationship between the decrease in comprehension scores as a function of repetition change in the different parts of the Token Test?

A. We really thought it would. We thought there may be some patients who, in the easier or shorter sections of the Token Test, would pick up a lot more. On the other hand, we speculated that perhaps on some of the longer sections of the Token Test there would be some sort of retention or cumulative effect and with repetition they would store part of a command and then on the next repetition performance would improve. We found, however, no relationships to the various subtests of the Token Test with repetition gain.

Q. That's surprising. I would think that on more complex tasks, repetitions would be more beneficial.

A. Well, that's what we thought too, but our data in this study did not support it.

Q. This is in respect to group data. Did you find individuals who showed different patterns with respect to different parts of the test?

A. No we did not. Nothing statistically significant or no patterns which appeared clinically significant.

Q. Have you considered that repetition conditions not only facilitate comprehension but that repetition might alleviate some of the patient's anxiety? Brookshire talks about when the patient makes it and is going through the test, you are giving him extra chances; he is getting more of them right, and so he improves his performance.

A. You are suggesting that there might be another interpretation as to why repetition of commands facilitates performance. Maybe the release of anxiety or the ordering of items has an influence. I think that is a plausible speculation.

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