Word Retrieval Latencies for Aphasic Syndromes

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Introduction

Word retrieval difficulties are a primary symptom of aphasic involvement (Schuell, Jenkins, Jimenez-Pabon, 1964; Goodglass and Kaplan, 1972). Differences in word retrieval skills among aphasic subjects have received extensive attention in the aphasia literature. In general, it has been shown that this ability is influenced by severity (Marshall, 1976; Schuell and Jenkins, 1961) and type of aphasia (Goodglass, 1981; Benson, 1979), as well as a host of linguistic and perceptual variables. The latter include factors of operativity (Gardner, 1973), picturability (Bisiach, 1966), word frequency (Schuell and Jenkins, 1961), uncertainty (Mills et al., 1979), and semantic field reduction (Goodglass and Baker, 1976) to name a few.

Buckingham (1981) has suggested that to claim that an individual has a word retrieval deficit describes, but does not explain, the behavior. Theoretical explanations of aphasic speakers' word retrieval deficits (Luria, 1966; Benson and Geschwind, 1971) rely heavily on analyses of the types of errors made by aphasic subjects on naming tasks. Somewhat overlooked is the fact that accessing the lexicon takes time, and that a clearer picture of the word retrieval differences among aphasic syndromes and individual patients might emerge from analysis of the time it takes subjects to evoke a desired word. Latency measures have been helpful in the study of normal subjects' lexical searches in naming (Oldfield and Wingfield, 1965, 1964; Rochford and Williams, 1962) and spontaneous speech (Goldman-Eisler, 1968, 1964). There is some reason to believe that similar benefits might be obtained from the use of these measures with aphasic subjects. Studies by Mills et al. (1979) and others (Newcomb, Oldfield, and Wingfield, 1965) have shown aphasic subjects to take longer than normal subjects to retrieve a specific word. The present study extends the use of latency measures to the study of word retrieval efforts of aphasic syndromes, specifically Broca's, Conduction, and Anomic aphasic patients.

METHODS AND PROCEDURES

Subjects

Ten chronic aphasic adults (3 Broca's, 3 Conduction, 4 Anomic) and one nonhospitalized normal control were subjects for this study. Aphasic classifications were based on subjects' performances on the expository speech and auditory comprehension subtests of the Boston Diagnostic Aphasia Exam (Goodglass and Kaplan, 1972). Table 1 provides relevant descriptive information about the 10 aphasic subjects.

Experimental Task Procedures

Each subject was administered a 40-item confrontation naming task. Task stimuli were black and white line drawings of objects (2" by 2" slides) and were presented singly with an Ektagraphic Carrousel slide projector located 8' from a viewing screen. The subject sat at a table in front of the screen

Table 1. Description of Aphasic Subjects

Subjects	Age	Sex	Duration of Aphasia (months)	Etiology	Severity*
Anomic					
1	50	M	8 MPO	Surgery	Mild (N/A)
2	59	M	21 MPO	CVA	Mild (86%)
3	64	M	9 MPO	CVA	Mild (93%)
4	71	M	50 MPO	CVA	Moderate (76%)
Conduction					
1	63	M	12 MPO	CVA	Mild (94%)
2	69	M	64 MPO	CVA	Moderate (84%)
3	59	M	18 MPO	CVA	Moderate (83%)
Broca's					
1	53	F	158 MPO	CVA	Moderate (75%)
2	60	F	46 MPO	CVA	Moderate (87%)
3	71	M	14 MPO	CVA	Moderate (77%)

* Numbers in brackets under severity indicate overall percentile ranking on Porch Index of Communicative Ability (PICA) (Porch, 1967) when scores were available.

beside the examiner. Standardized instructions were used in explaining the task. Coulbourn logic circuitry was employed to activate the projector, to control the stimulus exposure and the interstimulus interval. Each stimulus was exposed for 10 seconds, after which the lamp on the projector shut off for a 10 second interstimulus interval before advancing automatically to the next slide. Subjects' responses were videotaped for subsequent analyses.

Stimuli. Naming task items were selected to represent high and low levels of uncertainty. An item that evokes several different labels from a group of subjects would have high uncertainty; one that consistently elicits the same name would have low uncertainty. There were 20 high and 20 low uncertainty items randomly distributed within the naming task. Stimuli were selected from a pool of 200 items for which uncertainty values had been ascertained following procedures described by Lachman (1973).

Latency Measures

The Coulborne logic circuitry also contained a voice switch, microphone, and multichannel printout counter. Presentation of the slide started the counter. Production of a verbal response by the subject closed the switch, stopped the counter, and registered a hard copy printout (m/sec.) on a paper strip. The attack time, decay time, and sensitivity settings of the voice switch were adjusted so that a printout was obtained for each of the subject's verbalizations. This was necessary since subjects often emitted more than one verbalization when naming a stimulus and/or the first effort of the subjects was not always the correct or final response or that accepted by the subject. A separate switch (under experimenter control) allowed the experimenter to indicate, via a printout on a separate channel, when the subject had responded correctly.

All subjects' responses were transcribed verbatim from the videotape. The videotape was then replayed, and the digital printout and verbatim transcriptions were matched (see Appendix A) so that the experimenter could ascertain which verbalizations were and were not a part of the response. From these data two latency measurements were taken for each response (see Appendix A). Initial Response Time (IRT) was defined as the time in msec between presentation of the stimulus and the production of the first verbal response that indicated activation of the lexical retrieval process. Final Response Time (FRT) was defined as the time in msec between presentation of the stimulus and the production of an accurate, intelligible response that was accepted by the subject.

RESULTS

Normal Subject

The performance of the normal control subject is summarized in Figure 1. All naming responses for this subject were correct. Generally, the IRT latencies for the normal subject ranged from 100 to 200 msec regardless of whether the stimulus was a high or a low uncertainty item. In most cases IRT and FRT times were identical, indicating that the normal subject produced the correct name with a single response effort. This tendency prevailed for both the high and the low uncertainty stimuli.

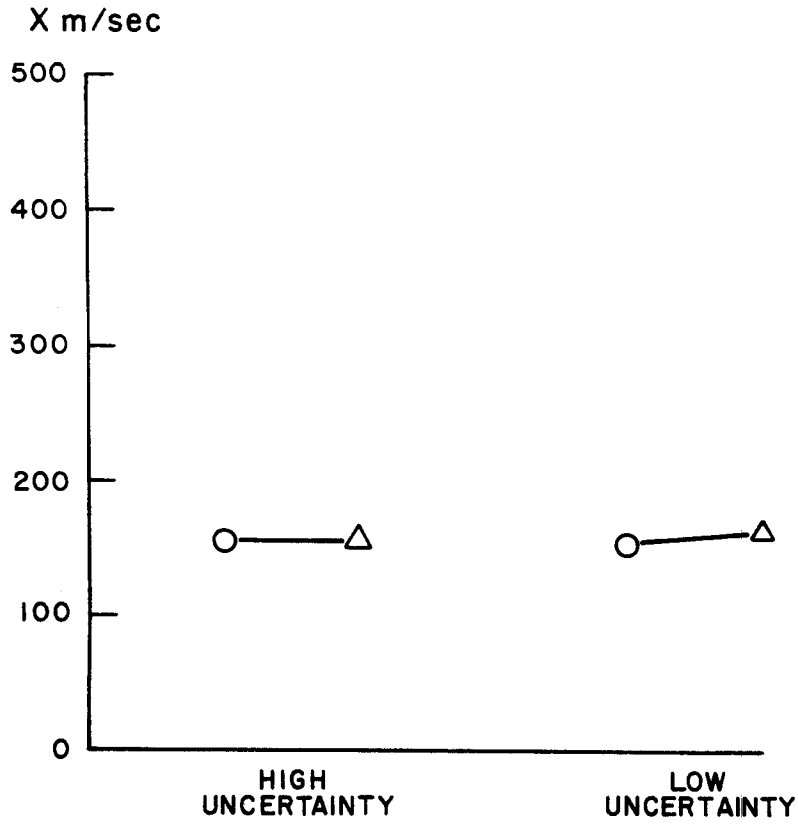

Figure 1. Mean initial (IRT) and final (FRT) response latencies for the normal subject for high and low uncertainty stimuli.

Aphasic Subjects

The aphasic subjects participating in this study were moderately to mildly impaired. Their relatively high level of ability is shown in their high percentages of correct naming responses on the naming task (Table 2). All aphasic subjects except two performed better on the low uncertainty items than on the high uncertainty items. Of the 58 errors made by the aphasic subjects 26 (45%) were semantic errors, 11 (19%) phonemic errors, 13 (22%) rejections, and 8 responses (14%) occurred after the allowed time limit.

Latency Patterns

Latency measures were restricted to the correct responses made by each subject. Inspection of the mean latencies of the aphasic subjects were categorized into four patterns as depicted in Figure 2. These patterns were designated as Normal, Delay-Normal, Normal-Delay, and Delay-Delay. The Normal pattern parallels that of the normal subject (Figure 1). Specifically, this indicates a mean IRT less than 200 msec and a mean FRT essentially equal to the mean IRT. The Delay-Normal pattern reflects a mean IRT in excess of 200 msec, with a mean FRT equivalent to the mean IRT. The Normal-Delay reflects a mean IRT less than 200 msec with a markedly deviant mean FRT. Finally the Delay-Delay pattern is depicted by a mean IRT greater than 200 msec, as well as a discrepant mean FRT.

Table 2. Percentage of correct responses for subjects on 20 high and 20 low uncertainty items of the naming task.

Subjects	High Uncertainty %	Low Uncertainty %
Normal control	100%	100%
Anomic		
1	95	100
2	75	90
3	95	90
4	75	80
Conduction		
1	85	95
2	60	70
3	90	80
Broca's		
1	80	95
2	80	85
3	80	95

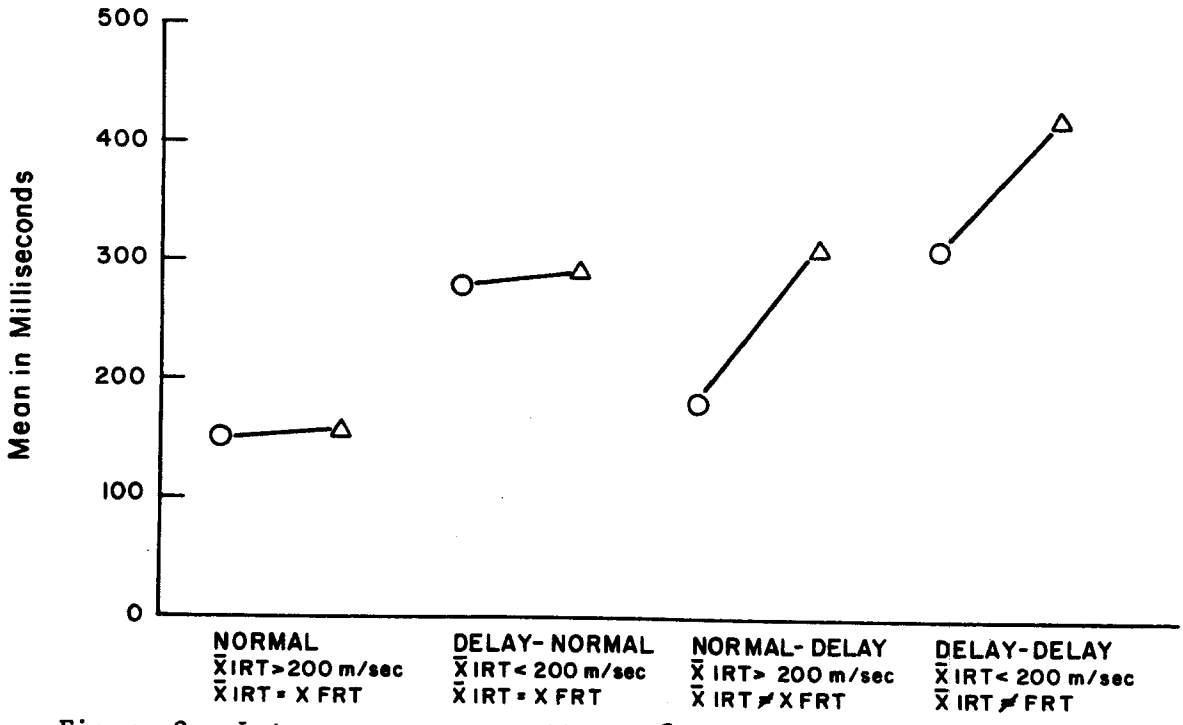

Figure 2. Latency response patterns for aphasic subjects.

Figure 3 shows the mean IRT and FRT time for the individual aphasic subjects and the normal control subject on correct responses to high uncertainty items. Table 3 shows that three of four anomic subjects exhibited a Delay-Normal pattern, and one a Normal pattern for high uncertainty stimuli. All three Broca's patients reflected the Delay-Delay pattern. Two conduction subjects illustrated a Normal-Delay pattern and one exhibited the Delay-Delay pattern.

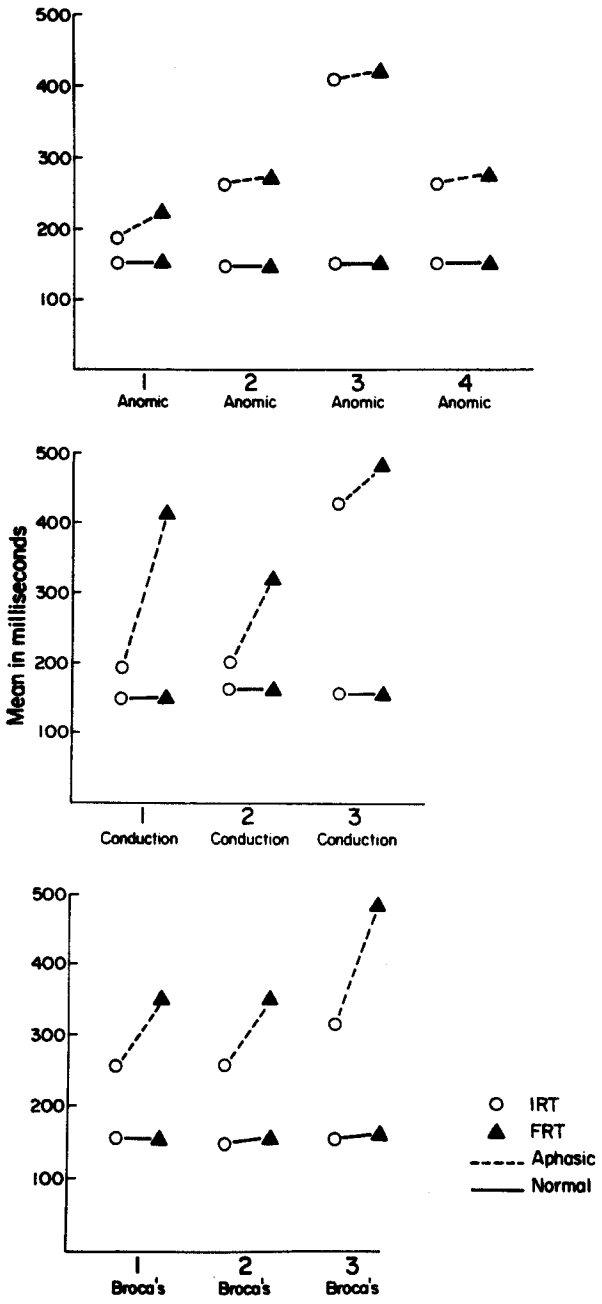

Figure 3. Mean initial (IRT) and final (FRT) response latenci for individual aphasic subjects and the normal control subject for correct responses to high uncertainty items.

Table 3. Distribution of aphasic subjects' latency patterns for correct high uncertainty stimuli.

Response Patterns	Anomic (N=4)	Conduction (N=3)	Broca's (N=3)
Normal	1		
Delay-Delay		1	3
Normal-Delay		2	
Delay-Normal	3		

For low uncertainty items aphasic subjects tended to have short mean IRT and FRT times (Figure 4). Two anomic subjects improved their performance so that it was indistinguishable from that of the normal subjects, one continued to perform normally, and one did not change but continued to perform as he did on high uncertainty items. Two of the three conduction patients improved their performance to near normal standards; one did not change but maintained the Delay-Delay pattern seen for high uncertainty stimuli. Two of three Broca's patients switched from the Delay-Delay pattern seen on high uncertainty items to a Delay-Normal pattern; one did not change (Table 4).

Table 4. Distribution of aphasic subjects' latency patterns for correct low uncertainty stimuli.

Response Patterns	Anomic (N=4)	Conduction (N=3)	Broca's (N=3)
Normal	3	2	1
Delay-Delay		1	
Normal-Delay			
Delay-Normal	1		2

DISCUSSION

The findings of this study should of course be interpreted cautiously in light of the fact that no statistical analyses were performed, and sample size was limited. Moreover, only aphasic patients of mild-to-moderate severity were able to perform the 40-item naming task thereby excluding severely involved patients and other aphasic syndromes that have difficulty with naming tasks. Nevertheless, the groups examined show some unique trends in the time it takes them to retrieve a desired word.

Anomic subjects exhibited delayed initial response time in naming. Final response times, however, were equivalent to initial times, suggesting that these subjects simply need more time to access the lexicon. The amount of time needed by anomic patients seems to be related to the uncertainty of the stimulus item. For items that might have one or more labels, they need extra time; for those that are labeled similarly, they perform like normal subjects. One anomic patient performed identically on high and low uncertainty items. This perhaps suggests a poorer prognosis for improvement of naming skills for this subject. Interestingly, this patient was suffering from headaches and was suspected of having TIAs at the time of his participation in the study.

Broca's patients illustrated a Delay-Delay pattern on high uncertainty items, indicating that they not only need more time to access the lexicon, but that something occurs between the time they attempt to name the stimulus and their retrieval of the desired word. Examination of the behaviors of Broca's subjects revealed that their final responses were often preceded by various production difficulties; self-correction, articulatory groping, revision, and self-cuing. This was particularly true on high uncertainty items. On low uncertainty stimuli Broca's patients tended to exhibit the access problem but not the production difficulties.

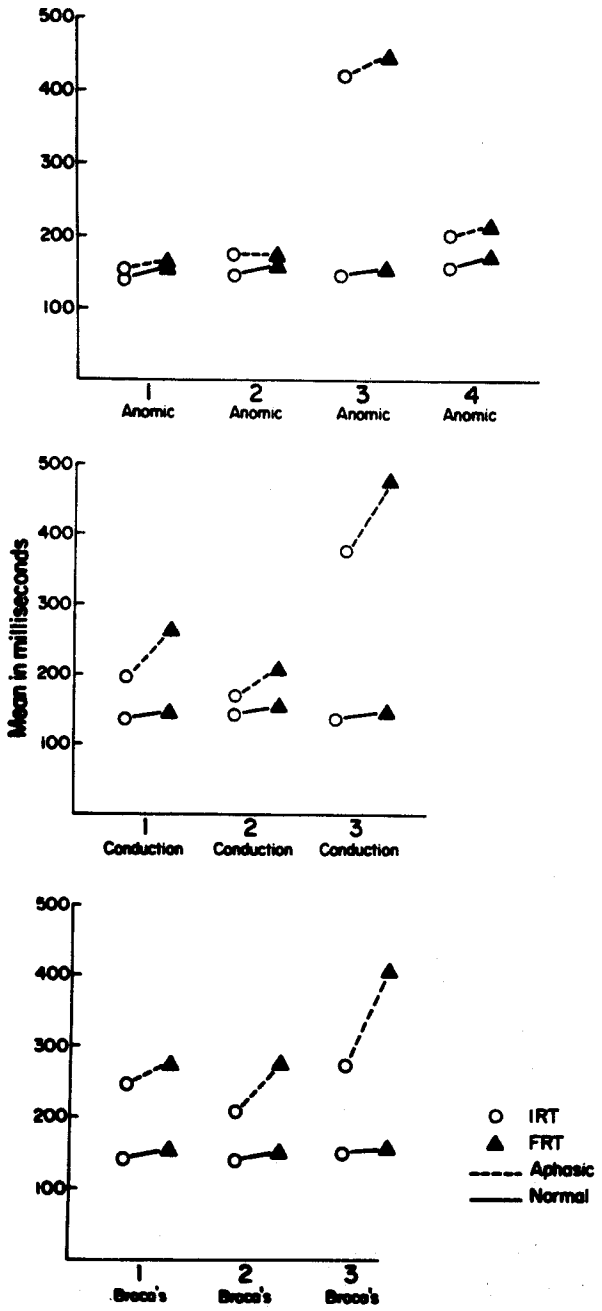

Figure 4. Mean initial (IRT) and final (FRT) response latenci for individual aphasic subjects and the normal control subject for correct responses to low uncertainty items.

Two of three conduction patients had mean IRT latencies that were equivalent to those of the normal subject on high uncertainty items. This suggests that conduction patients recognize the stimulus immediately or show what may be termed an "I know it" phenomenon. These patients seem to have a difficult time getting to the end product, however. Final responses of these patients were markedly delayed and often preceded by struggle, self-correction, and multiple efforts. The one conduction subject who showed the Delay-Delay pattern for both high and low uncertainty items had received a substantial amount of speech and language treatment. It is possible that this subject had learned to inhibit a tendency to respond quickly. Similar to other syndromes, uncertainty had a predictable effect on conduction subjects.

For the clinician the findings of this study offer the following suggestions: (1) Aphasic syndromes exhibit identifiable latency patterns in word retrieval. Anomic patients may be helped by systematically reducing the time given them to respond to the stimulus to an optimum level. Conduction patients, conversely, might be encouraged to take more time to respond so as to avoid unwanted overcorrection and struggle. (2) Control of stimulus uncertainty needs to be considered in working on word retrieval activities for all aphasic patients. Most patients improved, many to within normal standards, when stimuli consisted of low uncertainty items. For Broca's patients the clinician might first work on low uncertainty items, since this seems to eliminate production difficulties for these patients. (3) Finally, it appears that latency measures might effectively be employed as measures to promote treatment efficacy. These measures may allow the clinician to focus on what is "right" about the patient. They seem particularly promising in the study and evaluation of milder patients.

ACKNOWLEDGMENT

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APPENDIX A

Verbatim transcription, initial and final response time of subject B3 to stimulus "hat."

Measure	Time in msec	Transcription
Stimulus presentation	0-00000	
Initial response time	0-00169	"It's"
	0-00215	"man's"
	0-00260	"man's"
	0-00378	"man's"
Final response time	0-00428	"hat"
Experimenter control	3-00479	