Latency and Utterance Time in Aphasia During Confrontation Naming

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Barbara Dabul recently published the Apraxia Battery for Adults (1979) as an attempt to verify the presence of apraxia of speech among adult patients and to estimate the severity of the disorder. Subtest IV, "Latency and Utterance Time for Polysyllabic Words," is of particular relevance to the present study. Ten polysyllabic words, illustrated in black and white line drawings, are presented to the patient. The stimulus items are ashtray, living room, newspaper, banana, cigarette, potatoes, butterfly, coffeepot, typewriter, refrigerator. The patient is asked to name each picture immediately upon presentation, and two time measurements, latency and utterance time, are determined separately by monitoring a stop-watch.

Dabul defines latency as the period between picture presentation and an attempt at target word production. Latency might consist of silence, social conversation, circumlocutions, incorrect perseverative responses, functional and/or physical descriptions, carrier phrases, extended jargon, neologisms, verbal paraphasias, or vocalizations. Utterance time, on the other hand, represents the interval from initiation of a direct attempt at the target word to its successful completion. Utterance time might include phoneme substitutions, additions, distortions, or omissions in any discernible target attempt (e.g., "fanana" or "balana" for banana), initial sound-syllable repetitions, retrials using different sound combinations, audible articulatory struggle, or groping on target phonemes. Latency and utterance times for the ten words are totalled, compared and represented in a severity profile for each patient in conjunction with the five other subtests of the Apraxia Battery for Adults.

Table 1, reprinted from the test manual, shows how latency and utterance time would be segmented in three different responses to the stimulus pictures ashtray, banana, and potatoes. The numbers 0 to 10 correspond to the allotted response time limit of 10 seconds set by Dabul for each stimulus picture. The responses shown in the table, "frash," "bran-bran," and "po-tee," would all seem to be direct attempts at producing the target words ashtray, banana, and potatoes, respectively. Thus, each of these would be included under utterance time. However, when the patient says, "You use it for smoking--It's a -," as in the first example, or "I can't say it," as in the second example, these would be considered extraneous responses, and therefore thought of as latency time. As mentioned earlier, each utterance is timed until successful completion of the word. For this reason, in the second example, the response by the patient of, "no, it's--," is not included in the measurement since the patient had already correctly finished saying the target, banana.

According to Dabul, latency is expected to represent the patient's word-finding difficulties, while utterance time represents motor speech impairment. Dabul adds that patients may vacillate between word-finding and production attempts or between social conversation and production attempts. These behaviors are differentially separated by the examiner and reported in the appropriate category on the test.

Table 1. Segmentation of latency and utterance times in three different responses. (Reproduced from Dabul, B., Apraxia Battery for Adults, Tigard, OR: C.C. Publications, Inc., 1979)

Examples:

(Seconds)	0	1	2	3	4	5	6	7	8	9	10
	latency							utterance			

(Subject sees ASHTRAY) "You use it for smoking. It's a frash——an ashtray."
Score 6.5 seconds latency time, 3.5 seconds utterance time.

(Seconds)	0	1	2	3	4	5	6	7	8	9	10
	utterance			latency			utterance				

(Subject sees BANANA) "Bran—bran——I can't say it—— banana . . . no, its . . ."
Score 4 seconds latency time, 3 seconds utterance time.

(Seconds)	0	1	2	3	4	5	6	7	8	9	10
	utterance										

(Subject sees POTATOES) "Po-tee. . .potatoes."
Score 0 seconds latency time, 3.5 seconds utterance time.

The Apraxia Battery for Adults was standardized by Dabul on forty male patients. Sixteen of the subjects were aphasic, with no evidence of apraxic difficulties. Seventeen subjects exhibited both aphasia and apraxia, and seven subjects were dysarthric, with various degrees of aphasia (Dabul, 1979). The diagnostic classification system employed by the author was not reported. Her aphasic and apraxic/aphasic patients scored similarly with regard to latency since, as anticipated, both groups of subjects had word-finding problems. However, the apraxic/aphasic patients spent much more time actually attempting to utter the target word (utterance time) than did the aphasic subjects.

In view of the lack of homogeneity characteristic of naming errors produced by aphasic or apraxic adults, a number of verbal and nonverbal behaviors must be anticipated when measuring latency and utterance times during visual confrontation naming tasks. With the exception of the printed instructions and definitions presented in the test manual, no formal training or practice is required as a prerequisite for obtaining these measurements within the Apraxia Battery for Adults. However, we found that, prior to the present study, repeated pilot investigations between two speech and language pathologists performing Dabul's procedure yielded poor interjudge reliability for latency and utterance times. The examiners concluded that the awkward manipulations imposed by the stopwatch and attempts at recording on-line measurements presented marked difficulty, especially when patients vacillated between latency and utterance attempts. These two factors, combined with the differing reaction times characteristic of each tester, were judged to be the most probable reasons for the unreliable test results.

The present research was motivated by the need for carrying out measurements of latency and utterance time for diagnostic purposes.

Inherently, the concepts of latency and utterance time would seem to have clinical utility in understanding the speech and language processing functions of the aphasic or apraxic patient. The present study was developed to investigate further the suitability of such an approach for the delineation of speech and language disturbances in neurologically brain damaged adults. Given our experienced difficulties with on-line measurement in the analysis of complex patient responses, this investigation implemented a more sophisticated approach in segmenting the latency and utterance time characteristics of each response. The following questions were addressed:

1) What is the interjudge and intrajudge reliability for repeated measures of latency and utterance times?
2) Are latency and utterance time measurements consistent across repeated trials?
3) Is there a difference in magnitude between latency and utterance times in visual confrontation naming responses?
4) Are there differences in magnitude between latency and utterance times for nonfluent (with coexisting apraxia of speech) versus fluent aphasic patients?

PROCEDURE

Ten male aphasic patients were selected from Fort Howard (Maryland) Veterans Administration Medical Center. Patients ranged in age from 47 to 66 years, and all had incurred a left hemisphere cerebral vascular accident from one year to six years prior to the time of testing. Diagnostic classification (fluent/nonfluent) was based on results from the Boston Diagnostic Aphasia Examination and/or the Western Aphasia Battery and the clinical judgments of certified and experienced staff speech and language pathologists at Fort Howard VA Hospital. Each nonfluent aphasic subject exhibited at least one of the behaviors specified by Deal and Darley (1972) as characteristic of apraxia of speech.

The picture stimuli for the study were taken from the Apraxia Battery for Adults. The experimental task was administered in a single session, in a quiet room free from visual distraction. The examiner was seated to the right of the patient at a table, and stimulus cards were presented on the table at a comfortable viewing location for each patient. The pictures were presented individually in the order designated in the test manual. Test instructions were:

> I will show you some pictures. As soon as you see the picture, try your best to name it. Remember, try to name the picture as soon as you see it.

The pack of ten stimulus cards were placed face-down on the table. The examiner then turned them face-up, one at a time. As the examiner turned over each stimulus card, she operated a hand-clicked signal. The patient was permitted to attempt to name each card for a maximum of sixty seconds, after which the picture was removed by the examiner, who then proceeded to the next item. If the patient did not succeed in a correct attempt at the target and signalled completion prior to the sixty-second time limit, the examiner proceeded to the following item. A five-second interval was interposed between each stimulus. The patient was given a twenty minute break period following the presentation of the ten items, and a second administration of the same ten stimuli was conducted in a manner equivalent to that used for the first presentation of the ten stimuli.

Patients' responses were audiotape recorded using a Sony electret lavaliere microphone worn by each subject and a Nagra IV tape recorder. The tape recordings containing the subjects' responses were later played on an Ampex tape recorder connected to a continuous loop playback system through a headset. The experimenter continued listening to the repeated response until positive identification of latency and utterance characteristics of the response was attained. The tape loop system was routed to a Bruel and Kjaer Level Recorder (Type 2307) by which the waveform of the speech signal was charted via a pen stylus, as shown in Figure 1. The experimenter listened to the response segment as it was being charted and operated an event marker stylus when response intervals changed from latency to utterance or utterance to latency. A total of 200 responses was obtained for analysis (10 words x 10 subjects with 2 trials each).

The event marker produced a mark at the upper margin of the print-out (Figure 1). The vertical lines separating latency (LAT) and utterance (UT) were drawn with a pencil directly onto the chart paper. The audible click signal produced by the examiner to designate time of stimulus presentation can be seen in the figure as the initial pen deflection which appears prior to the charted waveform. Given a known paper speed of 10 millimeters per second, the segmented latency and utterance periods were measured in millimeters and converted to seconds.

Figure 1 depicts a sample response typical of patients who engaged in several unsuccessful but discernible target attempts at the word "typewriter," with intervening silences and verbal searching. The tracings contained in the latency segments indicate off-target verbal or vocal behavior.

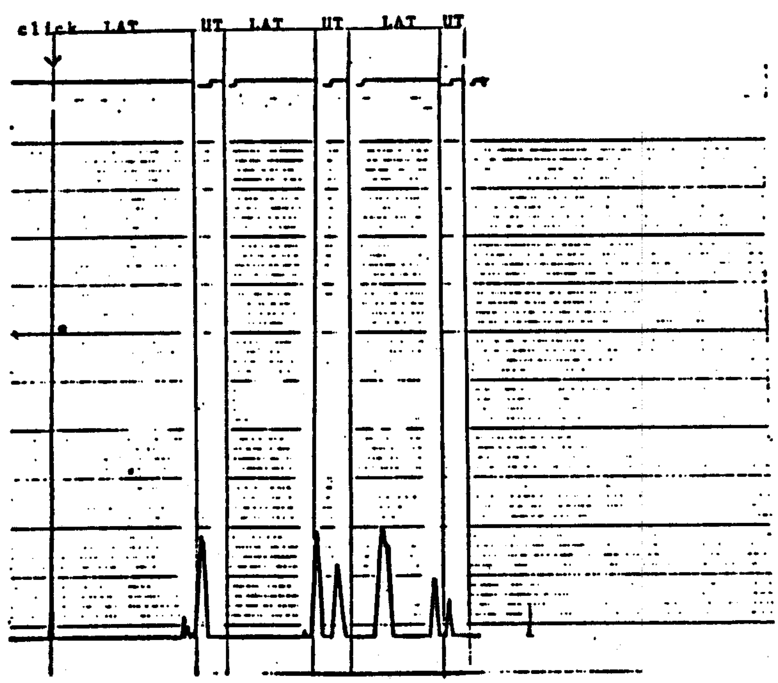

Figure 1. Example of charted speech signal showing segmentation of latency and utterance. (Stimulus word = "typewriter". Total latency time = 1.9 seconds.)

RESULTS

Thirty responses were selected randomly by the second author to resegment and remeasure for determination of intrajudge reliability. The first author also segmented and measured the latency and utterance times of these same 30 responses for determination of interjudge reliability. Pearson correlation coefficients of .99 were obtained for both sets of reliability data, suggesting very high agreement in segmenting and measuring latency and utterance times.

Table 2 reports the mean latency and utterance times for all ten subjects. These were derived by averaging the latency times and utterance times recorded for each subject in response to the ten stimulus items during trial one and trial two. This table shows that the mean latency time for nonfluent aphasic subjects in trial one was 9.11 seconds, and the mean utterance time was 1.03 seconds; and for trial two, these values were 5.79 seconds and 1.03 seconds, respectively. For fluent aphasic subjects, the mean latency time for trial one was 6.02 seconds, and the mean utterance time was .61 seconds; and for trial two, these values were 5.34 seconds and .73 seconds. Thus, it can be seen that latency times are considerably longer than utterance times for both groups of subjects.

There was a slight tendency for nonfluent subjects to have longer latency times ($\overline{x}$ = 7.45 seconds) than the fluent subjects ($\overline{x}$ = 5.68 seconds). However, these differences are quite small and may be in agreement with Dabul, who found that both aphasic and apraxic subjects had similar latency measures. In the present study, there was a trend for utterance time to be slightly longer for nonfluent subjects ($\overline{x}$ = 1.03 seconds) than for fluent subjects ($\overline{x}$ = .67 seconds), which also is in agreement with Dabul. However, the differences we noted between the two groups were very small and probably inconsequential. Therefore, the feasibility of identifying a patient as presenting apraxia of speech based only upon long utterance times appears questionable.

Table 3 suggests that there may be a trials effect. This table gives the amount of change in seconds for both latency and utterance times from trial 1 to trial 2 for each subject. A minus sign (-) indicates that the subject shortened the designated times from trial 1 to trial 2, and a plus sign (+) indicates he increased the time. As can be seen from Table 3, although subjects did change their latency and utterance times from one trial to the next, there was no consistent pattern in the direction of change. A subject might increase length of utterance time but decrease latency time, or vice versa. Also, there is no apparent difference between the two groups of subjects in the direction of change. It is of interest, however, that the size of the change from trial 1 to trial 2 for the latency segment generally seems to be smaller for fluent subjects than for nonfluent subjects.

Dabul arbitrarily set the maximum time limit for responding to each word at 10 seconds. If a subject had not successfully completed a response by that time, the stimulus plate was removed and latency and utterance times were recorded. In her standardization study, she found that each of her apraxic subjects had a <u>total</u> utterance time of at least 12 seconds out of a possible total of 100 seconds (10 seconds x 10 stimuli = 100 seconds). No aphasic subject had a total utterance time of more than 11.5 seconds. In our study, however, each subject was allowed a maximum of 60 seconds to respond to each of the ten items, for a total possible time of 600 seconds.

Table 2. Mean latency and utterance times in seconds for all ten subjects.

NONFLUENT SUBJECTS

Subject No.	Trial 1 Latency	Trial 1 Utterance	Trial 2 Latency	Trial 2 Utterance
1	10.72	.86	6.79	1.11
2	10.75	.44	3.63	.60
3	2.47	1.18	7.15	.99
4	16.37	1.68	9.64	1.55
5	5.23	.99	1.75	.90
$\bar{X}$	9.11	1.03	5.79	1.03

$\bar{X}$ Latency (Trial 1 and Trial 2) = 7.45

$\bar{X}$ Utterance (Trial 1 and Trial 2) = 1.03

FLUENT SUBJECTS

Subject No.	Trial 1 Latency	Trial 1 Utterance	Trial 2 Latency	Trial 2 Utterance
6	4.1	.65	5.4	.55
7	14.79	.80	9.25	1.34
8	1.12	.43	1.51	.55
9	7.86	.56	7.41	.58
10	2.25	.59	3.11	.61
$\bar{X}$	6.02	.61	5.34	.73

$\bar{X}$ Latency (Trial 1 and Trial 2) = 5.68

$\bar{X}$ Utterance (Trial 1 and Trial 2) = .67

Table 3. Amount of change in seconds for latency and utterance times from trial 1 to trial 2.

Subject No.	Latency	Utterance
	NONFLUENT SUBJECTS	
1	-3.93	+.25
2	-7.12	+.16
3	+4.68	-.19
4	-6.74	-.13
5	-3.48	-.09
	FLUENT SUBJECTS	
6	+1.30	-.10
7	-5.54	+.54
8	+0.39	+.12
9	-0.45	+.02
10	+0.86	+.02

The total utterance time in seconds for the ten stimulus items in trial 1 and 2 was calculated for each subject and is presented in Table 4. It can be seen that only two of the ten subjects had a total utterance time which equalled or exceeded 12 seconds, and one of these subjects, interestingly enough, was a fluent aphasic subject.

Table 4. Total utterance times for each subject.

Subject No.	Trial 1	Trial 2
	NONFLUENT SUBJECTS	
1	6.9	10.0
2	4.0	4.8
3	11.8	9.9
4	10.1	12.4
5	9.9	9.0
	FLUENT SUBJECTS	
6	6.5	5.0
7	5.6	13.4
8	4.3	5.5
9	5.1	5.3
10	5.9	6.1

The mean latency and utterance times for each stimulus item in trial 1 and trial 2 were also computed. Examination of Table 5 shows that latency times were different for different items. The most appreciable difference observed was the latency time for stimulus item 2, "living room." The mean latency time for this item was 16.84 seconds, a time period which more than doubled that latency time obtained for any of the other stimuli.

Table 5. Mean latency and utterance times for each stimulus picture item.

	Mean Latency (secs.)	Mean Utterance (secs.)
ASHTRAY	7.80	.99
LIVING ROOM	16.84	.52
NEWSPAPER	2.42	.75
BANANA	2.06	.64
CIGARETTE	2.06	.54
POTATOES	4.73	.77
BUTTERFLY	7.24	.72
COFFEEPOT	7.71	.75
TYPEWRITER	8.15	1.03
REFRIGERATOR	8.30	.86

DISCUSSION

We really do not know what aphasic or apraxic patients are doing internally during the time segments identified as latency. Dabul suggests that they are involved in active word retrieval. They may also be carrying out rehearsal strategies, internal monitoring, or inhibiting a potential error from occurring. At any rate, all of our subjects devoted more time to this latency than to direct attempts at producing the target words.

According to Dabul's study, aphasic and apraxic subjects scored similarly on latency because all apraxic subjects in that study were also aphasic. However, her apraxic subjects spent most of their time attempting to utter the target word, resulting in long utterance times relative to latency times. Since patients presenting nonfluent aphasia present a naming function which is impaired but superior to their level of fluency (Goodglass and Kaplan, 1972), it was predicted that the nonfluent aphasic patients in our study would present elevated utterance times relative to their latency times due to the nature of their speech production impairment, according to Dabul's interpretation of latency (word retrieval) and utterance (motor speech impairment). In contrast, fluent aphasic subjects demonstrate a naming function below their fluency level (Goodglass and Kaplan, 1972). Therefore, it was predicted that these patients would present longer latency times relative to their utterance times because of their word retrieval difficulties, if response latency does indeed represent word finding problems as claimed by Dabul. In the present investigation, however, longer utterance times were not characteristic of the nonfluent (apraxia of speech) patients. Rather, both subject groups demonstrated elevated latency times relative to utterance times.

All of the apraxic subjects in our study were also aphasic, and perhaps the long latency times were attributable to the depressed naming ability of all aphasic types. The apraxic subjects in Dabul's study also exhibited varying degrees of aphasia, but her apraxic subjects spent more time at target attempts.

The discrepancy between the studies could have resulted from several differences, such as differing methods of patient classification or different analysis procedures for measuring latency and utterance segments of a response. Perhaps Dabul's relatively gross method of timing response segments with a stopwatch is subject to uncontrolled variables such as examiner reaction time or inaccuracy of on-line recording.

A second explanation for the disparity in results could be differences in severity levels of apraxia characteristic of subjects participating in the two studies. Deal and Darley (1972) suggested that latency and severity of apraxia of speech are directly related. The term, "latency," as described by them, however, included only the time, in seconds, from a cued signal to the beginning of any oral response, which differs from Dabul's definition. Their patients with severe apraxia of speech demonstrated long response latencies. If latency periods occurring between production attempts, as described by Dabul, are also directly related to the severity of apraxia of speech, then expanded response latency rather than expanded utterance times may be characteristic of patients with severe apraxia of speech.

Identical stimuli and presentation order were used in both Dabul's and the present studies. Other than the fact that the ten stimulus nouns are polysyllabic, selection criteria for word stimuli were not reported in Dabul's test manual. Our analysis of patients' responses revealed long latency times for stimulus item 2, "living room," relative to the other nine items. If inflated response latency time does indeed represent word retrieval difficulty, patients demonstrated problems retrieving the verbal label for this item. In fact, patients often named all of the individual objects in the pictured "room" rather than attempting the collective target noun, "living room." Perhaps in this particular case, long latency time resulted not from inability to retrieve the target, but from the ambiguous nature of the stimulus. Further, patients frequently confused the pictured "potatoes" (stimulus item 6) for "boulders," "peanuts," or "rocks." These patients usually signalled completion after their naming "error" response, but were not considered to have any utterance time because their productions were not discernible target attempts. These uncontrolled variables may have been operating during the naming attempts of our patients, thereby influencing their latency and/or utterance time.

Due to the conflicting results obtained in the two studies, it seems apparent that continued investigation is warranted to determine the validity of latency and utterance time measures during confrontation naming before we can use the concepts as criteria for diagnostic classification. Variables such as the classification of patients, severity levels of apraxia and aphasia, and the nature of the stimuli should be controlled in subsequent research.

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