Connected Language Sampling: An Expanded Index of Aphasic Language Behavior

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INTRODUCTION

A few months ago we received two referrals of patients who were complaining of verbal disturbance, but from all outward appearances had no language disorders. Based on a number of neuropsychological and language assessments, we ultimately decided that these patients had mild aphasia. Superficially, these persons would have escaped this diagnosis, since their expressive behavior was relatively normal. In fact, their rates of syllables per minute were in both cases higher than the norms for mildly aphasic persons described by Yorkston and Beukelman (1977). The content rates and mean length of grammatical strings were as high as those for normal geriatric speakers. Our strongest evidence for aphasia come from depressed scores on the Token Test (De Renzi and Vignolo, 1962), the patients' descriptions of their problems, and their relatively good performance on nonverbal reasoning and memory tasks.

In a qualitative sense, there was little that sounded unusual in these patients' connected language. It seemed to the listener, however, that it was sometimes difficult to follow the point or understand the meaning of what they were saying. Their expression was neither tangential nor deviant in content, but phrasing, word-choice and overall movement of the narrative was difficult to follow. Experiences with these two patients and similar cases led us to examine the literature on subtle or mild aphasia to better understand the essence of this disturbance, particularly, the expressive behaviors that are observed in cases of mild aphasia.

Background

Examination of persons with subtle verbal deficits can help us to appreciate the integrative nature of the brain. Disturbances in memory, perception, initiation, inhibition, attention, and emotional state can influence verbal behavior. Token Test performance can be significantly impaired with right hemisphere damaged persons (Wertz, 1979). Frontal lobe infarctions can influence initiation and fluency (Burton, 1966). Right hemisphere damaged persons have been found to have distinct changes in their use and understanding of abstract material (Eisenson, 1959). Occasionally, these patients will report concern for these deficits (Brodal, 1973). It could be said, then, that the Token Test, word fluency measures, or patient reports may not necessarily provide evidence for "aphasic" impairment. The original use of the term "latent aphasia" (Pilhot, 1955) was apparently intended as a description of any of these mild language disturbances (Heilbrun, 1956).

Studies which have specifically examined mild or subtle aphasia have not found expressive samples to be particularly useful in discriminating groups (Boller, 1968; Keenan, 1971). In most studies, however, there was little, if any, systematic assessment of the expressive samples. One notable exception would be DeRenzi and Ferrari's (1962) "Reporter's Test." We felt that if one applied a system of rigid performance criteria to the connected language samples of high-level aphasic speakers, we might elicit an index of behaviors pathognmonic of aphasia. This symptom index would then be useful in arriving at an operational definition of mild aphasia. We currently lack such a definition for a number of reasons. First, due to the subtle nature of the problems, we may not often see these cases in our clinic population. We don't get the referrals. Second, these patients are excluded from research populations, since there may be some question about the diagnosis. Much of what we know about aphasia comes from subject populations which were clearly, not mildly, aphasic. Finally, most standardized tests were not designed to focus on subtle problems. And, even if they did, Darley (1979) reminds us that neither test makers nor test scores can differentiate patient groups.

Purpose

Since we were interested in how mildly aphasic persons differ from other populations in their connected language, we decided to examine similarities and differences in three subject groups: high-level aphasic persons, right hemisphere damaged persons, and normal geriatric speakers. In defining mildly aphasic expression we wanted to find a behavioral complex that was unique or most frequently occurring with persons who had a primary language disorder. We felt that the literature suggested (and our experience indicated) that there should be little that was overtly unusual in the expressive samples of mildly aphasic persons. Their performance deviations should for the most part be those we accept as normally-occurring behavior.

Philosophically, we were looking at aphasia in the manner described by Jenkins, et al. (1975) in their discussion of Schuell's concept of aphasia. They describe the primary symptoms of aphasia as difficulty in perceiving, structuring and synthesizing verbal propositions. They stated that this difficulty was the result of less efficient ability to retrieve the required vocabulary and retain simultaneously these lexical items until they could be "wedded into a well-formed proposition" (p.101).

We have methods which examine content retrieval and rate of verbal expression (Yorkston and Beukelman, 1977). However, the use of non sequiturs, disjointed structures or hesitation phenomena are not captured by current methods. They are, if you will, those behaviors that fall "outside of the brackets." This presentation will describe similarities and differences among our study populations in their connected language and the use of an expanded index of aphasic language in connected sampling.

METHOD

Subjects. The subjects in this study included three experimental groups. Group I included ten high-level aphasic persons. Five persons in this group were fluent and five were nonfluent. Their overall PICA percentiles (Porch, 1971) ranged from the 79th to the 95th percentile. These subjects were

clearly aphasic but represented a high-level group. The second group (Group II) included ten persons who had sustained right hemisphere damage. Each of these subjects had a cerebrovascular accident no less than six months prior to this sampling. Group III consisted of ten normal geriatric speakers. Tables 1 and 2 provide descriptive summaries for the brain-injured subjects.

Expressive Language Samples. Connected language samples were gathered following the procedures described by Yorkston and Beukelman (1977). This procedure requires the subject to describe a pictured stimulus, the "Cookie Theft" picture (Goodglass and Kaplan, 1972). Each sample is transcribed and timed for quantification of the number of syllables per minute, content units, content units per minute, grammatical strings and mean length of grammatical strings within the sample. To expand these procedures, we examined other methods of connected language sampling, looking for a way to capture disturbances in movement and flow of verbal propositions.

Performance Deviations. Committee reports and studies among teachers of English have provided perhaps the greatest amount of systematic analysis of connected discourse. A great deal of effort has been given to devising methods to measure the evolution of language from kindergarten through high school. This work is cited in the references (Hunt, 1965; Loban, 1976; and O'Donnell, et al. 1967). These authors have described similar methodologies in their analysis of fluency, syntax and grammar in the maturation of language. Hunt's methods were used by Ulatowska (1979) and her coauthors in their analysis of written discourse of aphasic persons. These analysis procedures are similar to Yorkston and Beukelman's methods in a number of aspects. The basic unit of measurement is the "terminal unit" or t - unit which is roughly equivalent to a grammatical string. Loban (1976) expanded this analysis by counting the occurrences of performance deviations. We felt this had particular application to the disturbances one might find with mildly aphasic persons. Appendix A has a list of descriptions of Loban's performance deviations. More explicit examples can be found in the appendices of Loban's report.

The first of Loban's categories denoted disturbances in movement within phrases or words. This behavior would be evidenced by an aposiopesis, or complete break-off within a phrase or word, or an anaculathon (revision of a phrase or word). The second type of deviation Loban identified was called "sequence interrupters." These included the use of non-contentive utterances in non-initial position within a phrase or word. Loban felt that whenever these structures occurred they represented a pause for decision-making (p.131). In our study, we counted the occurrences of interrupted or revised phrases and words and the occurrences of non-contentive utterances such as, "uh's" and "I means" as they occurred. Many of these non-contentive structures occurred simultaneously with a break-off or revision, but there was not necessarily a one-to-one ratio. The third category of performance deviation described by Loban dealt with deviations in grammar, syntax or morphology. This category included any non-standard structure, word-agreement, or grammatical form identified within a grammatical string or phrase. In addition to these three performance deviations we added the category "phonemic error," which accounted for any phonemic substitution, omission, or unintelligible phoneme.

Scoring Reliability. We conducted two reliability comparisons. To assess the accuracy of the Yorkston and Beukelman measures, we compared our scoring to

Table 1. Descriptive information for aphasic subjects (Group I).

Subject #	Age	PICA OA %iles	Aphasic Type	Etiology
1	45	95	Fluent	Embolic
2	57	79	Fluent	Thrombo/embolic
3	63	80	Non-fluent	Hemorrhagic
4	53	84	Non-fluent	Hemorrhagic
5	67	80	Non-fluent	MVA
6	59	86	Fluent	MVA
7	63	90	Non-fluent	Thrombo/embolic
8	35	89	Fluent	Trauma
9	70	85	Non-fluent	Thrombotic
10	85	84	Fluent	Thrombo/embolic
mean=	59.7	85.2		

Table 2. Descriptive information for non-aphasic, right hemisphere damaged subjects (Group II).

Subject #	Age	Etiology
1	53	Thrombo/embolic CVA
2	54	Thrombo/embolic CVA
3	71	Embolic CVA
4	67	Embolic CVA
5	57	Embolic CVA
6	69	Thrombo/embolic CVA
7	52	Thrombo/embolic CVA
8	47	Thrombo/embolic CVA
9	67	Thrombo/embolic CVA
10	65	Thrombo/embolic CVA
mean=	60.2	

research personnel in their laboratory. Agreement (according to product-moment correlations) ranged from .91 to .99. We also computed percent of agreement between two scorers counting the total number of each performance deviation within a randomly selected sample of 10 persons. Agreement ranged from 88 to 100%, depending upon the category. These data are listed in Table 3. The data in this study represent a composite analysis of two research assistants.

Table 3. Inter-rater agreement percentages for Loban's (1976) performance deviations.

Error Category	Percent of Agreement
Phrase Interruptions or revisions	96.3%
Word Interruptions or revisions	100.0%
Sequence interrupters in phrases	100.0%
Sequence interrupters in words	98.1%
Morpho/syntactic deviations	88.0%
Phonemic errors	98.3%

RESULTS AND DISCUSSION

Group means and standard deviations were computed for all of the measures taken (Tables 4 and 5). Inter-group comparisons on Yorkston and Beukelman's (1977) measures were conducted with a one-way analysis of variance and Newman-Keuls Test for significant differences (Table 6 and 7). Chi squares were used to examine the number of subjects within each group found to have a particular performance deviation. These data are found on Table 8.

There were no significant differences among groups in the total content within the sample (Table 7). The aphasic group was just as proficient as the other two groups in conveying content in this descriptive task. When content rate was measured, however, the aphasic group was at a distinct disadvantage. The other two groups did not differ on these measures. All groups were significantly different on measures of mean string length and syllable rate, with the most depressed scores occurring for the aphasic group, the right hemisphere damaged group demonstrating somewhat higher scores, followed by the normal geriatric group.

Figure 1 illustrates the total occurrences of sequence interrupters. Generally the use of non-contentive words like "I mean," and "well" in non-initial position was rare among the non-aphasic groups. Aphasic persons exhibited this behavior in both phrases and words. This behavior did not occur in the words of nonaphasic speakers.

Figure I

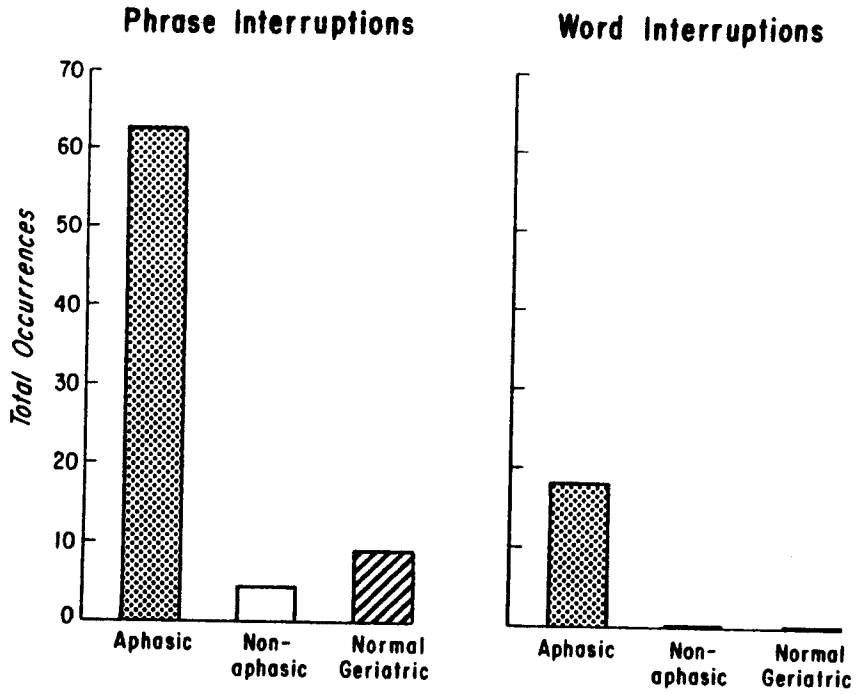

Figure 1. Total occurrences of sequence interrupters for aphasic, nonaphasic, and normal geriatric subjects.

Figure 2 illustrates the number of phrases either interrupted and left incomplete or revised. Phrase interruptions occurred in the right hemisphere damaged nonaphasic group as well as in the normal group, but were much more frequent among the aphasic group. Word interruptions with words left incomplete or revised rarely occurred for either nonaphasic right hemisphere damaged sample or normal geriatric speakers.

Looking at the total occurrences of phonemic errors or errors in grammar, syntax or morphology, a similar pattern emerged (Figure 3). The total occurrences of these behaviors was greater among the aphasic group. The nonaphasic groups had occasional errors in syntax, grammar or morphology but made no phonemic errors in this sample.

Chi square analyses (Table 8) provided evidence to support the relationship between the occurrence of performance deviations and aphasia. The number of subjects with these performance deviations was consistently greater in the aphasic group, while the other two groups did not differ.

Table 4. Group means and standard deviations for content (total), content per minute, syllables per minute and mean string length.

Group	Total Content		Content/min		Syllables/min		MSL	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
I	14.1	4.0	14.2	7.95	93.2	61.9	4.1	1.81
II	14.4	4.15	29.1	9.71	151.7	29.8	6.19	.88
III	17.3	6.4	27.4	10.94	191.1	26.3	7.95	2.10

Table 5. Mean scores and standard deviations for each performance deviation (occurrences per minute).

Group	Interruptions or Revisions		Sequence Interrupters		Morpho/syntactic Errors	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
I	6.31	2.64	8.8	4.7	4.08	1.84
II	1.20	1.09	.57	1.4	1.29	1.86
III	1.54	1.74	.72	1.61	1.2	1.03

Table 6. One-way analysis of variance for inter-group differences.

Variable	SS	df	MS	F
Total Content				
Total	731.9	29		
Between subjects	62.5	2	31.25	1.26
Within subjects	669.4	27	24.79	
Content/Minute				
Total	3819.7	29		
Between subjects	1323.7	2	661.9	7.16**
Within subjects	2495.9	27	92.4	
Syllables/minute				
Total	97,331.03	29		
Between subjects	48,544.33	2	24,272.1	13.43**
Within subjects	48,786.70	27	1,806.9	
Mean String Length				
Total	150.51	29		
Between subjects	74.30	2	37.15	13.17**
Within subjects	76.21	27	2.82	

Table 7. Newman-Keuls Test for significance of intergroup differences.

Variable	Groups compared	Level of significance
Content/minute	I to II	$p < .01$
	I to III	$p < .01$
	II to III	ns
Syllables/minute	I to II	$p < .01$
	I to III	$p < .01$
	II to III	$p < .05$
Mean string length	I to II	$p < .01$
	I to III	$p < .01$
	II to III	$p < .05$

** Significant at $p < .01$

Table 8. Chi square comparisons for inter-group differences with each performance deviation.*

Variable	Groups compared	phi	χ^2	sig
Incomplete phrases or revisions	I/II	.612	7.49	.01
	I/III	.436	3.80	.05
	II/III	.204	.833	ns
Incomplete words or word revisions	I/II	.8	12.8	.001
	I/III	.8	12.8	.001
	II/III	0	0	ns
Sequence interrupters in phrases	I/II	.816	13.33	.001
	I/III	.816	13.33	.001
	II/III	0	0	ns
Sequence interrupters in words	I/II	.816	13.33	.001
	I/III	.816	13.33	.001
	II/III	0	0	ns
Morpho/syntactic deviations	I/II	.577	6.66	.01
	I/III	.42	3.52	.05
	II/III	.204	.83	ns
Phonemic errors	I/II	.655	8.5	.01
	I/III	.655	8.4	.01
	II/III	0	0	ns

*Comparisons were based on number of subjects with at least one occurrence within each performance category compared to the number of subjects with no performance deviations within that category.

Figure 2

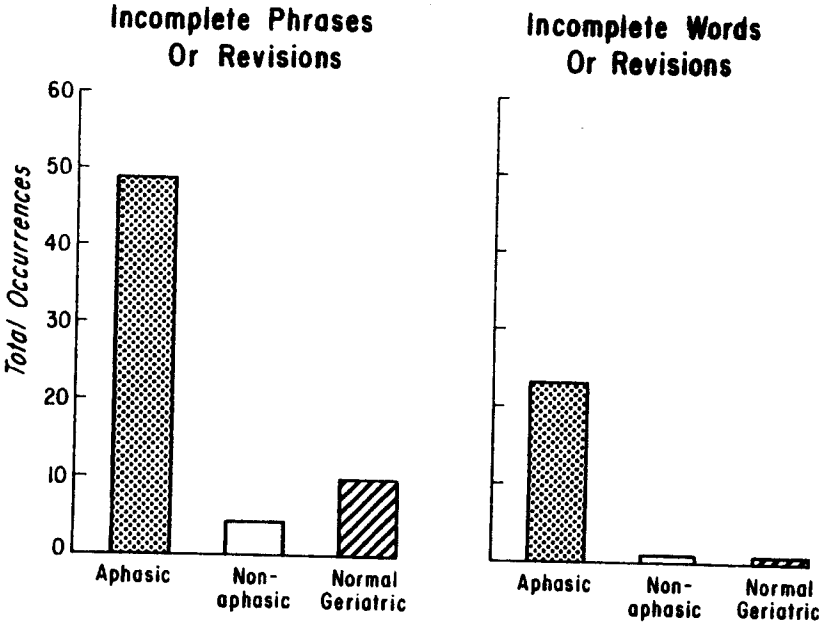

Figure 2. Number of phrases interrupted and left incomplete or revised for aphasic, nonaphasic, and normal geriatric subjects.

Figure 3

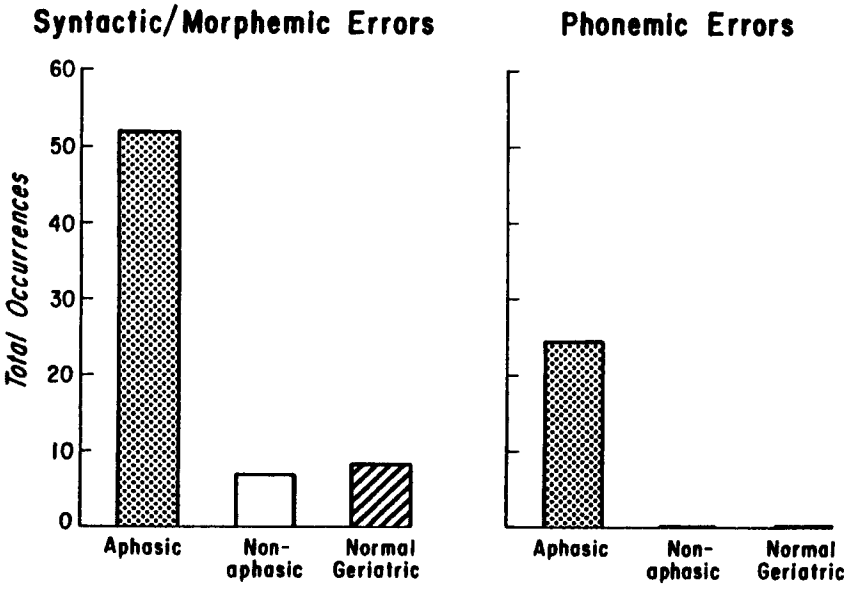

Figure 3. Occurrences of phonemic errors or errors in grammar, syntax, or morphology for aphasic, nonaphasic, or normal geriatric subjects.

Clinical Implications

This study suggested to us that one can reasonably expect to find disturbances in syllable rate and mean string length among right hemisphere damaged persons. Content rate may also be depressed when compared to normals. This observation can be viewed in light of the evidence for some depression in Token Test performance found among right hemisphere damaged persons (Wertz, 1979). Consequently, mildly depressed performance in verbal fluency and comprehension is not necessarily an indication of the language disturbances found among persons with left hemisphere damage or primary language disturbances.

In looking for a primary language disorder we feel it may be useful to identify problems in the ability to both synthesize and structure verbal propositions as well as retrieve lexical items. Baseline measures of performance deviations may be a useful means for examining the outcome of treatment if the efficient use of expressive language is a concern in treatment. We submit that some of these performance deviations may be due to mild motor speech impairments that go unnoticed in single-word tasks. When we made t-test comparisons of our fluent and nonfluent aphasic groups, we found that they differed only on the occurrences of word or phrase break-offs and revisions. The use of sequence interrupters, phonemic errors, and morpho-syntactic deviations was no more frequent within our nonfluent than our fluent groups.

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DISCUSSION

Q: Did you use anything other than the "Cookie Theft" picture in your sample?

A: No.

Q: Did you use this approach with demented patients?

A: Yes, and it wasn't all that helpful in discriminating the groups. The few demented patients who I looked at with this analysis had mean occurrences, or mean rates of performance deviations that were greater than our mildly impaired aphasic groups. Performance may be a function of the degree of dementia. I think that this kind of analysis, along with other evidence, could support a diagnosis of an "organically-based" problem like dementia in comparison to pseudo-dementia or depression in the elderly.

Q: Would you review your findings in regard to the content differences?

A: There were no differences among the three groups in total content, while content rates did differentiate the groups.

Q: Do you feel that this was a result of the task not being difficult enough?

A: Well, when you look at rate of content the aphasic group was at a definite disadvantage.

Q: What I'm thinking is that your overall content score does not show a difference, but the efficiency is lower. I'm interested in the implications. Do you feel like the content or the semantic system is just having trouble realizing itself and that this is reflected in a grammatical problem?

A: I think that Jenkins et al. were describing what we were finding; in aphasia it takes time to retrieve from a lexical store, it takes time to synthesize and put words together in propositions. That kind of inefficiency shows up in structure.

Q: You might conclude from this that an aphasic is having trouble in the grammatical or syntactical area. Do you feel aphasics have a primary problem in syntax or semantics? What do you think the underlying problem is?

A: I really think that these two disturbances cannot be separated, at least in this kind of sample. I think that one disturbance is going to be reflected in another. There is an interrelationship that can't be separated.

Q: I was impressed by the data you gave in Table 5 for the normals. If I were to speculate as to what categories of deviations would be most frequent, I would expect them to be sequence interruptors. That's the kind of thing we all do in discourse. I'm wondering if maybe that's a sign that pictures aren't the way to get a legitimate sample of what we would expect of people in daily life.

A: I would agree with you. This was one way to begin to systematically look at these behaviors. I think the results support your contention, though.

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