

Semantic Relations in Aphasic Adults

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Investigations concerning the grammar of aphasic adults have described agrammatism and paragrammatism. Agrammatism is believed to be a component of Broca's or hypofluent aphasia. Briefly, agrammatic characteristics include simplification or reduction of grammatical constructions through omission of articles, connective words, auxiliary verbs, and inflectional morphemes (Goodglass and Berko, 1960; Goodglass, et al., 1972). Closer examination of the linguistic deficits associated with agrammatism include inability to initiate sentences with unstressed functors (Goodglass, 1975), inability to generate interrogative reversals, dependence on over-learned, frequently occurring, sentence types (Goodglass, op cit), and exclusive use of contentive words, primarily nouns and verbs (Goldstein, 1948; Howes and Geschwind, 1962). Those syntactic structures determined to be relatively easy to produce include negatives, Wh-questions, imperatives, simple past tense, and adverbs of time (Goodglass, 1968; Goodglass, et al., 1972). While phrase length and grammar is reduced, the relative overrepresentation of content words often provides the aphasic with adequate expression of intent.

Paragrammatism differs from agrammatism in that it is associated with hyperfluent or fluent aphasic syndromes. Grammatical errors also appear to be of a different nature. Inappropriate sequences, i.e., verb tense confusions, case and gender errors, and incorrect choice of preposition are frequent in paragrammatism (Goodglass, 1975). Other paragrammatic errors include an increase (above normal usage) of interstitial words (Howes and Geschwind, 1962) and an increase in the number of common verbs, indefinite pronouns, and subject pronouns.

For the most part, aphasic deficits have been analyzed along traditional grammatical (morpho-syntactic) lines. However, within the past decade, an alternate protocol has been devised to describe linguistic performance. Fillmore (1968) and Brown (1973), among others, have elaborated on case grammar or semantic relations and their application to the structural description of language. It was the purpose of this investigation to examine the nature of semantic relations breakdown in a large sample of aphasic persons.

PROCEDURES

Subjects. Participating in the investigation were 126 aphasic adults. All subjects demonstrated medical stability, pre-morbid right-handedness, English as a native language, and no previous history of neurological damage. Ninety-four subjects were male and 32 female. Age ranged from 21 to 86 years with a mean of 60.3 years. Time post onset ranged from 2 weeks to 183 weeks with a mean of 11.7 weeks.

Subjects were classified along two dimensions: 1) hypofluent/hyperfluent and 2) Broca's, Wernicke's, and anomic aphasia. Classification was completed at the time of testing by the examiner through the use of a spontaneous language sample, articulation, repetition, and word retrieval tests, plus assessment of auditory comprehension. The following speech and language guidelines were agreed upon by the investigators for classifying subjects:

Hypofluent/ Broca's Aphasia	Effortful, halting speech, impaired articulation, characterized by apraxia of speech, agrammatism, reduced phrase length, and intact auditory comprehension relative to expressive skills.
Hyperfluent- fluent/Wernicke's	Effortless speech, paraphasia (phonemic and semantic), often the presence of jargon, increased phrase length, paragrammatism, press of speech, poor auditory comprehension.
Anomic	Effortless, well-articulated speech, normal to near normal phrase length, no observable difficulty with grammar, severe word retrieval difficulty relative to other expressive skills, often an empty, circumlocutory style of output, good auditory comprehensive.

Classification yielded the following breakdown of subjects: Hypofluent=66, Hyperfluent=60, Broca's=66, Wernicke's=33, Anomic=27.

Method. Two spontaneous language samples were elicited from each subject. One was discourse with the examiner concerning the subject's job, hobbies, interests, sports, and current events. The second was a more discrete task through which a specific set of responses could be produced--"The Cookie Theft" from the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1972). No minimum or maximum number of responses were imposed on any subject. However, each subject was given the same amount of time for each task: seven minutes of discourse, three minutes of "Cookie Theft." In some situations, prompting was necessary to encourage a subject to respond. Such prompts took the form of open-ended questions, as, "Tell me more about this.", "How was that?" At no time was prompting used to aid subjects through word retrieval latencies, paraphasic, or apraxic errors.

Samples were transcribed and analyzed according to the semantic relations categories outlined by Brown (1973). Included were the ten following relations: nomination, recurrence, non-existence, action-agent, action-locative, entity-attribute, and demonstrative-entity. Each utterance was scored for the number of semantic relations, mean length of utterance (MLU) in morphemes, and total number of words. The total number of utterances was also computed for each language sample.

RESULTS

The patterns of semantic relations breakdown found in this study are similar to those reported involving grammatical breakdown of aphasic adults (Goodglass and Berko, 1960; Goodglass, 1968; Goodglass, et al., 1972;

Goodglass, 1972). In short, semantic or grammatical disruption is similar regardless of aphasic type. Initially, comparison of fluent vs. hypofluent subjects yielded significant differences ($p < .01$) for all ten semantic relations. It is obvious from inspection of means (Table 1) that differences can be attributed to disparity in the number of words, MLU, and total number of utterances between hypofluent and fluent aphasics. While this indicates a strong quantitative difference, it does little to detail expressive skills or isolate the nature of aphasic semantic breakdown.

Table 1. Means for expressive language measures: 10 semantic relations, number of words and utterances per corpus, mean length of the hypofluent (N=66) and fluent (N=60) aphasic groups.

Measure	Hypofluent	Fluent
Nomination	4.79	8.37
Recurrence	0.14	0.43
Non-Existence	3.97	6.48
Agent-Action	6.76	19.95
Action-Object	3.89	12.19
Action-Locative	1.82	4.56
Entity-Locative	1.42	3.44
Possessor-Possession	1.62	4.73
Entity-Attribute	6.67	16.76
Demonstrative-Entity	0.91	3.19
MLU	4.96	8.10
Words/Sample	79.18	207.16
Words/Utterance	5.02	7.46
Utterances/Sample	15.77	27.98

Semantic relation performance was also examined along classic connectionistic lines, i.e., comparisons of Broca's, Wernicke's, and anomic aphasia (Table 2). Anomic aphasics displayed significantly greater usage in five out of ten semantic categories than the Wernicke's aphasics. Both groups exhibited a greater number of appropriate semantic relations than the Broca's group ($p < .01$).

While these results again suggest quantitative differences among aphasic groups, they do little more than further illustrate the "numbers game" that was in evidence in the hypofluent/fluent group comparisons. Little is offered regarding the nature of linguistic deterioration.

To this point in our analysis, differences reflect the relative amount of "talking" by aphasic groups. Therefore, a more discrete analysis of data was performed using analysis of covariance (Nie et al., 1976). The fluency-associated variables of MLU, number of words, and number of utterances were employed as covariates. With the influence of fluency partialled out, results (Table 3) demonstrated no significant qualitative linguistic differences among aphasic groups for nine of ten semantic relations. The only relation achieving significance was that of Demonstrative-Entity ($p < .01$).

Table 2. Means for expressive language measures: 10 semantic relations, number of words and utterances per corpus, mean length of utterance (MLU), and number of words per utterance for three (Broca's, Wernicke's, and Anomic) aphasic groups.

Measure	Broca's	Wernicke's	Anomic
Nomination	(3)* 4.79	(4)* 7.70	(4)* 9.04
Recurrence	(10) 0.14	(10) 0.45	(10) 0.41
Non-Existence	(4) 3.97	(5) 6.51	(5) 6.44
Agent-Action	(1) 6.76	(1) 18.12	(1) 21.78
Action-Object	(5) 5.89	(3) 11.30	(3) 14.07
Action-Locative	(6) 1.82	(6) 4.61	(7) 4.52
Entity-Locative	(8) 1.42	(9) 3.21	(8) 3.67
Possessor-Possession	(7) 1.62	(8) 3.97	(6) 5.48
Entity-Attribute	(2) 6.67	(2) 13.94	(2) 19.59
Demonstrative-Entity	(9) 0.91	(7) 4.27	(9) 2.11
MLU	4.96	7.29	9.22
Words/Sample	79.18	195.48	218.70
Words/Utterance	5.02	6.90	7.92
Utterance/Sample	15.77	28.30	27.63

*Indicates rank order.

Table 3. Anocova of ten semantic relations for three aphasic groups covarying MLU, number of utterances, and number of words.

Semantic Relation	Mean Score	F	P
Nominative	20.10	0.77	0.47
Recurrence	0.14	0.33	0.72
Negation	7.43	0.85	0.43
Agent-Action	70.66	2.16	0.12
Action-Object	40.64	1.83	0.16
Action-Locative	4.17	0.65	0.52
Entity-Locative	1.77	0.63	0.53
Possessor-Possession	7.72	1.17	0.31
Entity-Attribute	103.24	3.18	0.05
Demonstrative-Entity	48.71	8.11	0.01

Finally, a Spearman Rank Order Correlation was used to estimate the strength of relationship in semantic relations breakdown between groups. As shown in Table 2, a similar rank ordering of the frequency of occurrence of semantic relations existed for each aphasic group. Correlation coefficients for group comparisons were as follows:

Broca's x Wernicke's $Rho = .95$
 Broca's x Anomics $Rho = .96$
 Wernicke's x Anomics $Rho = .95$ ($p < .01$)

In conclusion, these findings further support the thesis that qualitative differences in symbolic breakdown do not exist among aphasic groups and again elucidates the contention that "aphasie est une" (Marie, 1906).¹

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DISCUSSION

- Q: Did you do a contextual analysis to come up with the semantic categories, or did you just select a preexisting system?
- A: We employed the 10 categories from Brown (1973). We did not do contextual analysis. Depending upon the length of an utterance, there can be from one to multiple two-term relationships. If we had uncovered differences among groups we would have gone back and analyzed context.
- Q: Whose criteria did you use to define an utterance?
- A: We tried to locate boundaries based on thoughts or ideas. If pauses occurred due to apractic, paraphasic, or anomie errors, we continued to the end of the idea.

¹It should be noted that the authors recognize and appreciate the many modality specific dimensions upon which aphasic syndromes vary. The focus of the present study was solely on semantic symbolization in aphasic persons.

- Q: Depending upon the statistical analysis that is employed one can find the results one wants. So, before saying "aphasia is one," perhaps one might wonder whether your statistical method is not sensitive to the differences that may exist.
- A: This may be true for a lot of research. What we used was a post hoc procedure, used reliably in child language research, matching on the dimensions of length. We performed this method after the fact, through an ANACOVA. Most of the time, if you were doing this up front, you would be taking normal children with a certain MLU and putting them with disordered children with the same MLU. Then you'd study the syntax or the rules of what they're saying. If differences exist, then you may conclude that there are differences between symbolic systems. We tried this with our aphasic groups because our initial analyses revealed a fluency dimension, i.e., hypo- vs hyperfluency.
- Q: Why was demonstrative-entity significantly different among the groups?
- A: There is an implication that the examiner knows the answer to the question in this case relation. The highest frequency of occurrence of demonstrative entity appeared in the Wernicke patients where the examiner would logically be asking, "does this patient comprehend?" and, "can he express the appropriate response?"
- Q: Have there been semantic relations studies performed on normals?
- A: The concepts applied to child language were drawn from adult data.
- Q: Since the format of semantic relations is employed more frequently with children, is it not possible that it may not lend itself well to aphasia?
- A: That is a good point. It may well be children up into the pre-school years function using a morpho-syntactic-grammatical model. This should also be true of adults.
- Q: To take 126 subjects and be able to classify them into fluent/nonfluent and Broca's, Wernicke's, and anomic strikes one as a bit unusual. Did you have to eliminate some subjects because they were unclassifiable or did you force yourself to classify all the subjects?
- A: From clinical experience, if I had to classify these patients, I could sort them. Based on the behaviors that were manifest (repetition, auditory comprehension, and naming, etc.) we were able to classify them. It is a clinical definition more than a hard neurological one.
- Q: Is it possible that your approach biased your results, shaping the types of responses, especially for demonstrative-entity?
- A: This may be true and may have skewed demonstrative entity into being significant where it was in fact not so. If we were guilty of this, then there would be zero relationships which achieved statistical significance.
- Q: What do your results mean on a theoretical basis--regarding semantics and morphosyntax and language in aphasia?
- A: To analyze adult language through two-term relations, if differences arose among groups, there would be more difficulty with the implications of your results.