

Verbal Context and Comprehension of Difficult Sentences  
by Aphasic Adults: A Methodological Problem

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Spoken discourse, particularly as it affects the auditory comprehension of aphasic subjects, has been a topic of recent interest in aphasiology. It has been shown repeatedly that aphasic listeners demonstrate better comprehension of text (or discourse) material than their performance on single words or sentences would predict (Brookshire and Nicholas, 1984; Stachowiak, Huber, Poeck and Kerschensteiner, 1977; Waller and Darley, 1978). (The words text and discourse are often used synonymously to refer to suprasentential language units (Kintsch, 1978).) Because aphasic listeners seem to understand spoken discourse easily, investigators have questioned whether or not discourse can be used to improve their comprehension of difficult sentences.

The answer to this question is still unclear, largely due to methodological problems. This paper will present one attempt to answer this question, and the methodological difficulty encountered along the way.

To discover the components of discourse that might improve the comprehension of aphasic individuals, we considered factors that affect comprehension by non-brain-damaged subjects. According to Kintsch and his colleagues (Kintsch et al., 1975), a coherent text is one in which each proposition shares an argument with at least one other proposition. A proposition is a basic unit of meaning that conveys a specific idea; it consists of one predicator and one or more arguments. An argument fulfills a semantic role, like agent or patient. Predicators specify the relationships among arguments and are usually expressed in English as verbs, modifiers, or sentence connectors. For example, the sentence The boy chased the dog serves as a proposition. The words boy and dog serve as arguments and the word chased serves as the predicator in this proposition. Kintsch and his colleagues demonstrated that, in a text, it was easier for normal adult listeners to process propositions that were built up from old, already familiar arguments than to process propositions which introduced new arguments into the text. It seemed possible, then, that a target sentence might be easier for aphasic listeners to understand if it was preceded by a text containing the same arguments as the target.

The aim of our investigation was to discover whether the redundancy provided by repeated arguments in short spoken texts would improve the performance of aphasic subjects in comprehending syntactically difficult sentences, and, if so, whether different groups of aphasic subjects (that is, fluent vs. nonfluent speakers and good vs. poor comprehenders) would respond differently to this material.

#### METHOD

Subjects. The subjects were 36 aphasic adults, all at least 1 month post-onset of aphasia. All had sustained a single CVA, all were native English speakers, and all had adequate vision and hearing to perform the

experimental tasks. The subjects were divided equally among four groups: nonfluent - good comprehenders, nonfluent - poor comprehenders, fluent - good comprehenders, and fluent - poor comprehenders. Descriptive information for the subjects is presented in Table 1.

The subjects were judged to be fluent or nonfluent speakers by three speech and language pathologists who were experienced in working with aphasic patients. These judges listened to samples of connected speech that were tape-recorded during administration of the conversational and expository speech subtest of the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1983). Subjects were included in the study only if all three judges agreed on their fluency classification.

Classification of the subjects' comprehension ability was determined by their performance in the control condition of the experiment, which tested comprehension of 10 syntactically difficult sentences. If subjects responded to 5 or fewer of the 10 items correctly they were classified as poor comprehenders, and if they responded correctly to 6 or more items, they were designated as good comprehenders. The boundary for this classification corresponded to the point between random and nonrandom performance based on one-tailed cumulative probabilities for 10 items, each having four possible responses.

Stimulus Materials. Twenty sentences served as target stimuli. The syntactic difficulty of these target sentences was based on their logical reversibility. Ten of the sentences had subjects and objects that could be reversed to form reasonable sentences. For example, The dog chased the boy can be transformed into The boy chased the dog by reversing the subject and object. These sentences were called reversible subject-object sentences. The remaining 10 sentences each contained a word that could serve as an indirect object or as a modifier of the direct object. In the sentences He showed her boys the watch and He showed her the boy's watch, the word boys serves as the indirect object in the first sentence, and as a modifier of the direct object, watch, in the second sentence. These sentences were called reversible object-modifier sentences.

Short narrative paragraphs were constructed as texts for each sentence. Each text consisted of six context sentences followed by the target sentence. The context sentences were comparable for syntactic structure, number of words, and frequency-of-occurrence of words. They provided the setting and action for which the target sentences served as conclusions. Each text contained at least two repetitions of arguments that would occur in the final target sentence. Following is one example:

Mrs. Brown just returned from her trip to Europe. Her two boys stayed with her neighbor while she was away. Mrs. Brown brought back presents for her boys. She took the presents to her neighbor's house. No one answered the door when Mrs. Brown knocked. Just then, her boys came around the corner. She gave her boys the presents.

A plate of four line drawings was made for each of the 20 sentences. Each plate contained one accurate depiction of the target sentence and three foils. The foils were: the logical reverse of the sentence, substitution of a main lexical item not present in the target, and substitution of one character of different gender than in the target. Figure 1 shows the picture plate for the target sentence She gave her boys the presents.

Table 1. Descriptive information for aphasic subjects.

Group	Subject	Sex	Handedness	Diagnosis	Age	Years of Education	Months Post Onset
Nonfluent-Good Comp.	1	F	R	LCVA	63	12	61
	2	M	R	LCVA	72	12	20
	3	M	R	LCVA	68	13	2
	4	M	R	LCVA	75	19	13
	5	F	R	LCVA	48	12	5
	6	M	R	LCVA	61	12	44
	7	F	R	LCVA	48	16	93
	8	F	R	LCVA	79	9	21
	9	F	R	LCVA	55	17	32
				Mean	63.2	13.6	32.3
Nonfluent Poor Comp.	1	M	R	LCVA	74	12	5
	2	F	R	LCVA	74	10	2
	3	F	R	LCVA	72	12	8
	4	M	R	LCVA	69	12	1
	5	M	L	RCVA	65	8	9
	6	M	R	LCVA	68	8	5
	7	M	R	LCVA	67	12	5
	8	M	R	LCVA	74	19	11
	9	M	R	LCVA	54	16	12
				Mean	68.6	12.1	6.4
Fluent Good Comp.	1	F	R	LCVA	67	14	46
	2	M	R	LCVA	53	14	8
	3	M	R	LCVA	76	11	17
	4	M	R	LCVA	61	12	1
	5	M	R	LCVA	66	10	14
	6	F	R	LCVA	38	16	2
	7	F	R	LCVA	57	16	96
	8	M	R	LCVA	71	12	28
	9	M	R	LCVA	84	12	2
				Mean	63.7	13.0	23.8
Fluent Poor Comp.	1	F	R	LCVA	63	12	7
	2	M	R	LCVA	74	12	4
	3	F	R	LCVA	69	12	1
	4	F	R	LCVA	71	12	21
	5	F	R	LCVA	77	10	5
	6	M	R	LCVA	68	16	14
	7	M	R	LCVA	84	13	8
	8	M	R	LCVA	47	12	4
	9	M	R	LCVA	62	8	20
				Mean	68.3	11.9	7.1



Figure 1. Picture plate for the reversible object-modifier sentence **She gave her boys the presents.** The four pictures show: a gender error in the upper left quadrant, the correct choice in the upper right quadrant, a lexical error in the lower left quadrant, and a word-order error in the lower right quadrant.

In order to show that these materials are easily interpretable by normal adults, the test items were presented to 5 non-brain-damaged adults (4 females and 1 male) who were comparable to the aphasic subjects in age and education. None made any errors on the experimental tasks.

Procedures. There were two conditions--the Isolation Condition and the Context Condition. The Isolation Condition served as the control. In this condition, only the target sentence was read aloud. The subject was then shown the picture plate and asked to choose one of the four pictures. In the Context Condition, a text was read aloud with the target as the final sentence, and then the picture plate was shown. Each subject heard half of the sentences in isolation and the other half at the ends of the texts. The particular sentences used in isolation and at the ends of the texts were counterbalanced across all 36 subjects. Half the subjects heard the Isolation Condition first and half heard the Context Condition first.

## RESULTS

Table 2 shows the scores for each subject in each condition. The results of a repeated-measures Group x Condition x Sentence Type analysis of variance, shown in Table 3, indicated that all four groups of aphasic subjects performed better with the linguistic context than without it. The absence of any significant interactions indicated that this was true regardless of group membership or sentence type. The significant main effects obtained for group and sentence type were not of interest, since they merely showed that the good comprehenders scored higher than the poor comprehenders (as indicated by the results of Tukey's Honestly-Significant-Difference Test shown in Table 3), and that reversible object-modifier sentences were harder than reversible subject-object sentences.

## DISCUSSION

We found a significant difference in performance when reversible sentences were presented at the ends of texts. Does this mean that the linguistic context helped the aphasic subjects to understand the reversible sentences?

No necessarily! An astute reviewer pointed out that we had failed to include a crucial control condition: namely, presenting the context sentences without the targets at the ends. This condition would have enabled us to determine if the subjects were actually comprehending the target sentences in the Context Condition, or if they were simply receiving enough information from the texts to allow them to predict the target sentences without comprehending or, indeed, even hearing them.

Unfortunately, at that point, it was impossible to run such a control condition on the subjects who had participated in the study. Instead, to assess how predictive our tests were, we asked 7 non-brain-damaged adults who were not familiar with the test materials to listen to the texts without the targets at the end, and to guess what would happen next by choosing one of the four pictures. For 14 of the 20 texts, all 7 subjects could predict the outcome without ever hearing the target. On each of the remaining six texts, one to four of the subjects made an error. These six texts, then, were less predictive than the others.

The response data from the aphasic subjects for these six items were extracted. Results of a repeated-measures analysis of variance showed no difference between the Isolation Condition and the Control Condition for

Table 2. Aphasic subjects' scores on the Isolation and Context Comprehension Conditions.

Group	Subject	Isolation Condition	Context Condition
Nonfluent Poor Comprehension	1	1	2
	2	4	3
	3	3	6
	4	5	4
	5	1	4
	6	1	3
	7	3	3
	8	5	5
	9	5	6
	Means	3.11	4.00
Fluent Poor Comprehension	1	3	2
	2	4	6
	3	1	4
	4	5	7
	5	5	4
	6	4	4
	7	3	4
	8	2	5
	9	3	1
	Means	3.33	4.11
Nonfluent Good Comprehension	1	8	7
	2	6	8
	3	9	9
	4	7	9
	5	6	5
	6	6	8
	7	9	10
	8	10	10
	9	9	8
	Means	7.78	8.22
Fluent Good Comprehension	1	6	8
	2	9	10
	3	7	9
	4	8	7
	5	7	10
	6	10	10
	7	8	9
	8	6	3
	9	8	7
	Means	7.66	8.11

Table 3. Source table for the analysis of variance and results of Tukey's Honestly-Significant-Difference Test.

Source Table for the Analysis of Variance					
Effect	SS	df	MS	F	Probability
Comprehension Condition	3.674	1	3.674	5.290	<.028
Group	167.021	3	55.674	27.130	<.001
Sentence Type	10.562	1	10.562	11.929	<.002
Condition x Group	.354	3	.118	.170	<.916
Condition x Sentence	2.507	1	2.507	2.507	<.123
Group x Sentence	.354	3	.118	.133	<.939
Condition x Group x Sentence	.743	3	.248	.248	<.862

  

Tukey's Honestly-Significant-Difference Test on Main Effect of Group					
	Mean	NP	FP	FG	NG
NP	3.55	-	0.17	4.33*	4.45*
FP	3.72	-	-	4.16*	4.28*
FG	7.88	-	-	-	0.12
NG	8.00	-	-	-	-

\* Significant at the .01 level of probability

NP = Nonfluent-Poor Comprehension  
 FG = Fluent-Good Comprehension

FP = Fluent-Poor Comprehension  
 NG = Nonfluent-Good Comprehension

these six items. Therefore, at least based on these post-hoc procedures, we can't conclude that linguistic context improves comprehension of difficult sentences for aphasic listeners. We can only suggest that many aphasic listeners understand a message better when it's presented as a predictive spoken text than when it's presented as a reversible sentence.

Other investigators (Cannito, Jarecki, and Pierce, 1986; Waller and Darley, 1979) have also found that linguistic context that is not predictive does not help aphasic subjects to understand difficult sentences. In fact, these results had suggested to us that predictability is a natural and important element of spoken discourse. When you relate an event, the outcome usually does become more predictable as you speak. We reasoned that perhaps these investigators did not find a context effect because their contexts, having eliminated predictability, were not typical of spoken discourse. Therefore, we had decided not to restrict the predictive nature of our texts.

Published investigations which have used predictive contexts (Nicholas and Brookshire, 1983; Pierce and Beekman, 1985), ran afoul of the same methodological problem that we did: they did not include a control condition to assess how subjects would have responded to the context material alone. (In fact, it was Dr. Brookshire who eventually made us aware of the problem in our study.) Their conclusions that verbal context can improve the comprehension of difficult sentences by aphasic listeners must therefore be viewed with caution.

In conclusion, it seems clear that linguistic context that is not predictive does not help aphasic listeners to understand difficult sentences. We don't know whether predictive context helps them to understand difficult sentences or if it merely provides enough information to make those sentences superfluous. Future studies which assess how linguistic context affects comprehension of difficult sentences should include a control condition which presents the context material alone, so that its effect on comprehension of the target sentences can be more clearly assessed. In the end, though, we may discover that rather than trying to improve comprehension of difficult sentences by preceding them with spoken discourse, we should simply abandon the difficult sentences and restate the ideas contained in them in the form of predictive discourse.

#### REFERENCES

- Brookshire, R.H. and Nicholas, L.E. Comprehension of directly and indirectly stated main ideas and details in discourse by brain-damaged and non-brain-damaged listeners. Brain and Language, 21, 21-36, 1984.
- Cannito, M., Jarecki, J., and Pierce, R. Effect of thematic structure on syntactic comprehension in aphasia. Brain and Language, 27, 38-49, 1986.
- Goodglass, H. and Kaplan, E. The Assessment of Aphasia and Related Disorders. Philadelphia: Lea and Febiger, 1983.
- Kintsch, W. Comprehension and memory of text. In W.K. Estes (Ed.), Handbook of Learning and Cognitive Processes, Vol. 6: Linguistic Functions in Cognitive Theory. Hillsdale, NJ: Lawrence Erlbaum Associates, 1978.
- Kintsch, W., Kozminsky, E., Streby, W.J., McKoon, G., and Keenan, J.M. Comprehension and recall of text as a function of content variables. Journal of Verbal Learning and Verbal Behavior, 14, 196-214, 1975.

- Nicholas, L.E. and Brookshire, R.H. Syntactic simplification and context: Effects on sentence comprehension by aphasic adults. In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings, 1983. Minneapolis, MN: BRK Publishers, 1983.
- Pierce, R.S. and Beekman, L.A. Effects of linguistic and extralinguistic context on semantic and syntactic processing in aphasia. Journal of Speech and Hearing Research, 28, 250-254, 1985.
- Stachowiak, F.J., Huber, W., Poeck, K. and Kerschensteiner, M. Text comprehension in aphasia. Brain and Language, 4, 177-195, 1977.
- Waller, M.R. and Darley, F.L. The influence of context on the auditory comprehension of paragraphs by aphasic subjects. Journal of Speech and Hearing Research, 21, 732-745, 1978.
- Waller, M.R. and Darley, F.L. Effect of prestimulation on sentence comprehension by aphasic subjects. Journal of Communication Disorders, 12, 461-479, 1979.

#### DISCUSSION

- Q: How much do you know about how your patients understood these particular sentence types?
- A: It's been shown by other investigators that aphasic subjects have great difficulty understanding sentences that are reversible, which are the kinds of sentences we used.
- Q: It's also been shown that that difficulty is not absolute. Some patients are very bad at these kinds of sentences, others are less bad, and others are good. One possibility is that the nonpredictive context would help patients at a certain level of disability. One possibility that occurred to me in listening to your paper is that there might be a subset of patients for whom nonpredictive context is useful, namely those that are having some difficulty with these sentences, say, getting them right three-quarters of the time, and who might rely on the context because it's used to stabilize lexical meaning, or whatever.
- A: That was part of the reason why we chose to look at the isolation condition itself to separate our subjects into good comprehenders and poor comprehenders. But I see what you're saying. It might be even more helpful to know for each particular sentence type.