Syntactic Simplification and Context: Effects on Sentence Comprehension by Aphasic Adults

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A number of methods for facilitating auditory comprehension of aphasic adults have been investigated. In 1973, Goodglass, Blumstein, Gleason, Hyde, Green, and Stratlender compared aphasic listeners' comprehension of compact, syntactically complex sentences with their comprehension of expanded, syntactically simplified versions of the same sentences. Of the seven types presented, only embedded clause and comparative sentences showed a significant facilitating effect of expansion.

In recent years, a number of studies have demonstrated that aphasic listeners perform better in discourse comprehension than would be predicted from their comprehension of isolated sentences (Waller and Darley, 1978; Pashek and Brookshire, 1982; Brookshire and Nicholas, 1983; and Wegner, Brookshire, and Nicholas, 1983). At this time, it is not known whether comprehension of sentences which are difficult to comprehend in isolation will be less difficult to comprehend when they occur within spoken discourse. This study was designed to compare the effect of simplifying syntactically complex sentences with the effect of placing such syntactically complex sentences at the end of short spoken narratives.

METHOD

Subjects. Subjects were 12 aphasic adults who were at least one month post onset of a single left hemisphere lesion and four non-brain-damaged adults. Aphasic subjects were independently classified by the two investigators into three groups representing disfluent, fluent, and mixed aphasia, based on standardized test results and a conversational speech sample. Only subjects for whom there was agreement on group assignment were included in the study. The mean Z score on the auditory subtest of the Boston Diagnostic Aphasia Examination (BDAE) were similar for the three aphasic groups. Characteristics of the aphasic subjects are presented in Table 1.

Stimulus Materials and Procedures. Five comparative and five embedded clause sentences were presented in each of three conditions: Syntactically Complex (compact); Syntactically Simplified (expanded); and Syntactically Complex (compact) In Context, where the target sentence appeared as the final sentence of a short spoken narrative. All sentences were reversible. Examples are:

The woman was taller than the man. (Comparative, compact.)

The woman was tall and the man was short. (Comparative, expanded.)

A man was standing at a bus stop reading a newspaper. A woman was waiting for the same bus. The woman quietly stepped over behind the man and began to read the newspaper over his shoulder. She could read the paper easily. The woman was taller than the man. (Comparative, compact, in context.)

The girl pushed by the boy was eating an apple. (Embedded clause, compact.)

Table 1. Characteristics of aphasic subjects

SUBJECT	AGE	TIME POST-ONSET (Months)	BDAE AUDITORY SUBTESTS (Mean Z Score)
Disfluent			
DF_1			
DF_2	49	87	+1.0
DF_3	57	55	+0.7
DF_4	50	68	+1.0
DF	54	121	-0.5
Mean	52.5	82.8	+ .6
Fluent			
FL_1			
FL_2	64	3	+1.0
FL_3	60	24	+0.9
FL_4	62	180	0.0
FL	60	108	+0.5
Mean	61.5	78.8	+ .6
Mixed			
MX_1			
MX_2	48	2	+0.5
MX_3	63	16	+0.7
MX_4	47	2	+0.6
MX	59	1	+0.8
Mean	54.3	5.3	+ .7

The girl was eating an apple and she was pushed by the boy. (Embedded clause, expanded.)

School was over and several children were standing in line waiting for the school bus. Three girls were at the front of the line, talking and laughing. Suddenly, a boy ran up and pushed one of the girls out of line. The girl pushed by the boy was eating an apple. (Embedded clause, compact, in context.)

For each sentence, subjects were asked to choose, from a set of three pictures, the one that best represented the meaning of the sentence. In one foil picture, a reversal of the two individuals described in the sentence was pictured. In the other foil picture, a different individual was substituted for one of the people described in the sentence (i.e., man for woman, boy for girl). Sentences and narratives were tape recorded at approximately 120 wpm with natural stress and intonation. A pure tone was recorded one second before the beginning of each taget sentence in all three conditions. The tone served to alert subjects to the imminent delivery of the sentence and picture choices. Sentences were presented to each subject at a comfortable listening level which was determined during a brief training session. Pictures and target sentences were presented simultaneously.

RESULTS

The results of a Groups X Conditions by Levels Analysis of Variance showed that all main effects and interactions were significant ($P. < .05$). Newman-Kuels analyses on individual cell totals generated the following results.

For comparative sentences, none of the differences between conditions were significant for any group of subjects. The performance of non-brain-damaged subjects on comparative sentences was error-free and that of aphasic subjects was nearly error-free in all three conditions.

For embedded clause sentences, disfluent aphasic subjects showed the only significant differences between conditions. The performance of non-brain-damaged subjects on embedded clause sentences was nearly error-free in all three conditions (Figure 1). Disfluent aphasic subjects demonstrated significantly better performance on expanded sentences and on compact sentences in context than on compact sentences in isolation (Figure 1). All four subjects showed this pattern with two of the four (Disfluent Subjects 1 and 4) showing no difference in the facilitating effects of expansion and context. No subject in this group responded correctly to more than one compact sentence in isolation.

All four fluent aphasic subjects performed better on expanded sentences than on compact sentences in isolation. This difference was not significant (Figure 1). Fluent Subjects 1 and 2 benefitted equally from expansion of compact sentences and from hearing compact sentences in context. Fluent Subjects 3 and 4 performed the same on compact sentences in isolation and in context. The two subjects who did not show improved performance with context had BDAE auditory subtest mean Z scores which were lower than the two subjects who did benefit from context.

Three of the four mixed aphasic subjects performed better on expanded sentences than on compact sentences in isolation. All four subjects performed better on expanded sentences in isolation than on compact sentences in

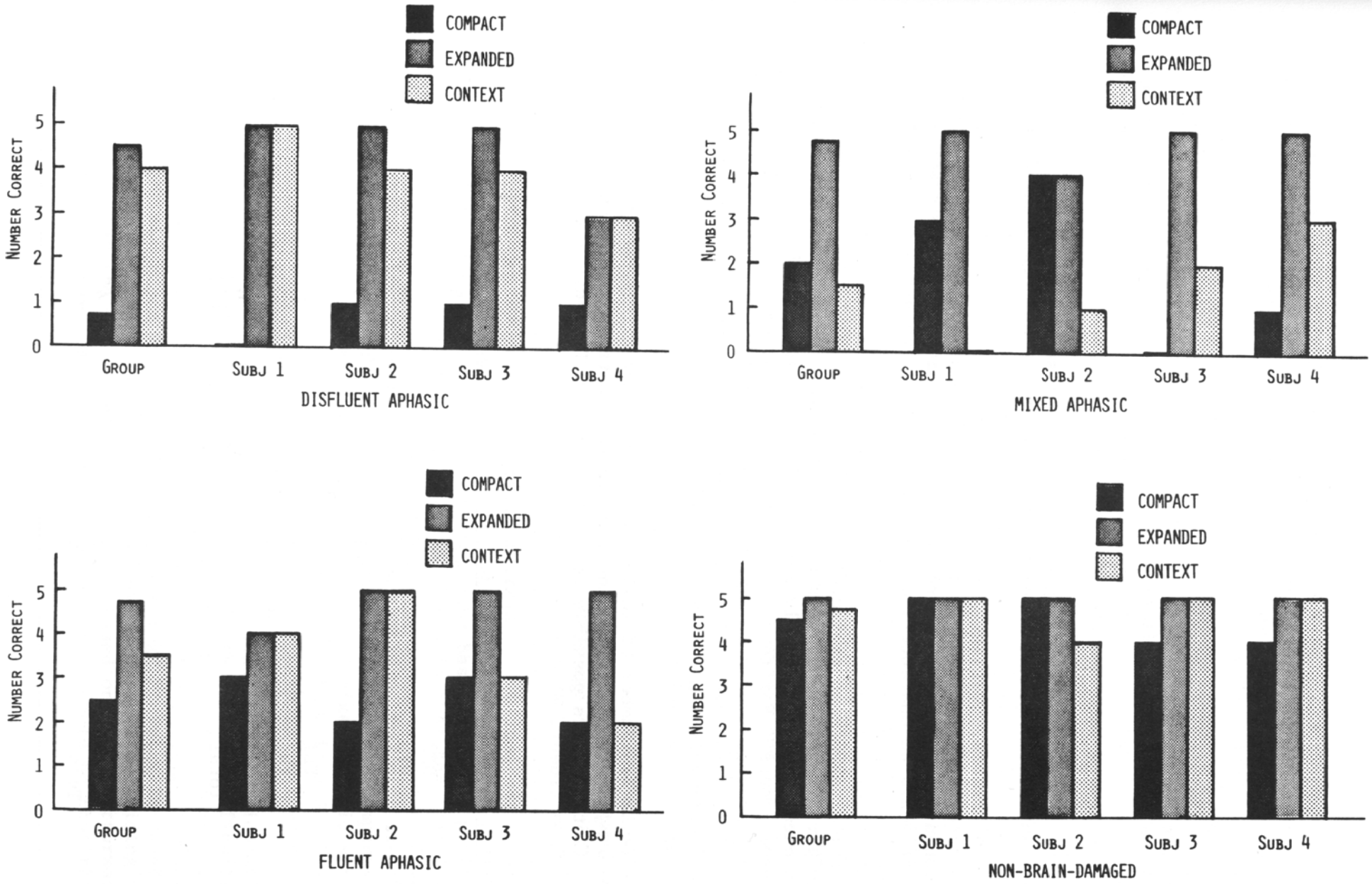

Figure 1. Number of correct responses for embedded clause sentences in three conditions: Syntactically complex (compact), syntactically simplified (expanded), and syntactically complex (compact) in context. (N = 5 for each condition)

context. Both of these differences approached significance (Figure 1). Two mixed aphasic subjects (Subjects 3 and 4) benefitted from hearing compact sentences in context, but two (Subjects 1 and 2) performed worse on compact sentences in context than in isolation. No disfluent or fluent aphasic subject showed this pattern of worse performance on compact sentences in context than in isolation. BDAE auditory subtest mean Z scores for these four subjects were nearly equivalent.

Overall, 11 of 12 aphasic subjects benefitted from expansion of compact embedded clause sentences. Eight of 12 aphasic subjects performed better on compact embedded clause sentences in context than in isolation.

Error Analysis. In a recent study, Gallaher and Canter (1982) investigated the auditory and reading comprehension of sentences by ten Broca's aphasic subjects. In selecting the picture which best represented the stimulus sentence, subjects could make either subject-object reversal errors or lexical errors. Gallagher and Canter found that subject-object reversal errors occurred significantly more frequently than lexical errors. They questioned whether this pattern of errors was unique to Broca's aphasic subjects or would be characteristic of any group of aphasic subjects with mild-to-moderate comprehension impairments.

All 12 of the aphasic subjects in our study made more noun-order errors than lexical errors on embedded clause sentences (Table 2). T-test analyses of the performance of subjects by type of aphasia showed that noun-order errors occurred significantly more frequently than lexical errors for each of the three groups. For reversible, embedded clause sentences at least, it would appear that syntactic errors in comprehension occur more frequently than lexical errors for any group of aphasic subjects with mild to moderate auditory comprehension impairment, and not just for individuals with a disfluent or Broca's aphasia.

Table 2. Number of lexical and noun-order errors by aphasic subjects on embedded clause sentences in three conditions. (Total errors possible per subject = 15. DF = disfluent, FL = fluent, MX = mixed)

Subject	Lexical Errors	Noun-order errors
DF1	0	5
DF2	0	5
DF3	1	4
DF4	2	6
Total	3	20
FL1	1	3
FL2	0	3
FL3	0	4
FL4	0	6
Total	1	16
MX1	0	7
MX2	1	5
MX3	3	5
MX4	2	4
Total	6	21

DISCUSSION

The results of this study suggest that disfluent aphasic adults will benefit from both simplification of syntactically complex sentences and from hearing such sentences in context. The results also suggest that adults with mixed aphasia will be more likely to benefit from simplification of syntactically complex sentences than from hearing them in context. The results are less clear for fluent aphasic adults. An additional study, which would control for the overall severity of auditory comprehension impairment, might help in determining which fluent aphasic subjects will benefit from context and which will not.

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DISCUSSION

Q: One of the things that we have done in studies like this is to divide the subjects into high and low comprehension groups based on their performance on the no context condition. What we have found is that the facilitating effect of context has shown up primarily for subjects in the low comprehension group. If you look at your data in that way, you will see that the disfluent aphasic subjects all did fairly poorly in the compact, no context condition, whereas, most of the fluent and mixed aphasic subjects did better in this condition. We have found that there is a poor relationship between standardized measures of comprehension such as the Boston auditory subtest and syntactic comprehension.

A: We did look at our data in a similiar way and found that, particularly with the mixed aphasic groups, there were subjects who had difficulty with the compact sentences in isolation and did not benefit from context. The disfluent aphasic subjects, on the other hand, all had difficulty with the compact sentences in isolation and showed significantly improved performance with context. The problem that I would have with dividing subjects into high and low comprehension groups based on their performance on the syntactically complex sentences in isolation would be that that is

such a limited aspect of their overall comprehension impairment. It doesn't seem like an adequate basis for grouping subjects.

Q: If you are mainly interested in how much context improves comprehension, why not use performance in the no context condition to group subjects?

A: In addition to that though, I think that we need some standardized overall measure of subjects' auditory comprehension so that we have an idea of their level of performance in relationship to a group of aphasic subjects.

Q: Why do you think that providing context helped aphasic subjects to comprehend syntactically complex sentences? Was it just using the same words a lot? Obviously, one study can not deal with everything but it seems important to find out what it is about the contextual information that is facilitating.

A: Yes, there is definitely a need now for additional studies to determine what it is about this type of context that facilitates syntactic comprehension. I also think that we need to explore further why some aphasic subjects do not benefit from this type of context.