The Influence of Context on the Auditory Comprehension of Aphasic Subjects

Marcie R. Waller
Purdue University
West Lafayette, Indiana

Frederic L. Darley
Mayo Clinic and Mayo Foundation
Rochester, Minnesota

The subject of receptive language has become a focus of increased research in aphasia. A number of investigators have examined the effects of syntactic complexity on auditory comprehension, while others have incorporated processing variables such as rate of utterance and pause time (Parisi and Pizzamiglio, 1970; Shewan and Canter, 1971; Gardner, Albert and Weintraub, 1975; Liles and Brookshire, 1975; Lasky, Weidner and Johnson, 1976). These investigations similarly indicate that syntactic complexity can be detrimental to comprehension, more so than a simple increase of length, but slower rates and strategically placed pauses are facilitative. Such reports provide important guidelines for the presentation of auditory linguistic stimuli to aphasic patients. However, little research has focused on the verbal context of the message (Boller, Kim and Mack, 1977).

Recent studies in the psycholinguistic literature have suggested a crucial role of context and reference in comprehension and retention (Bransford and Franks, 1971; Bransford, Barclay and Franks, 1972; Haviland and Clark, 1974; Carpenter and Just, 1977). Investigators have stressed the integrative and inferential processes involved in comprehension, giving less emphasis to isolated word and sentence level stimuli. As stated by Haviland and Clark:

> We very rarely process sentences in isolation, and although we can understand such sentences, this is not what we normally mean by "understanding" or "comprehension" at all. In ordinary language, these words refer to the way we take in the meaning of a sentence and integrate it with information we already know - from context and from past memory. (1974, p.512)

Of interest to the topic of receptive deficits are those studies which have manipulated the ease of normal subjects' comprehension and recall by the provision of prior information. Bransford and Johnson (1972) found that prior pictures and verbalizations enhanced subjects ratings as to "depth" of comprehension, as well as the number of facts that they retained. In other investigations, Haviland and Clark (1974) presented subjects with a series of sentences preceded by direct and indirect verbal antecedents. Subjects were asked to press a button when they "understood" a sentence. As anticipated, reaction times for sentences provided with direct antecedents were faster.

Haviland and Clark (also in Clark and Haviland, 1976; Clark and Clark, 1977) related these findings to a mechanism entitled the Given-New strategy. They proposed that the redundancy of our language, or given information in an utterance, serves an important role in the integration of new information

during communication. If a listener lacks information to match the referents in an utterance, he needs to develop an indirect bridge to other knowledge and the ease of comprehension will be reduced.

The majority of studies concerned with the auditory comprehension of the aphasic patient have utilized word and sentence level stimuli - partly because of frequent reductions of retention span in this population. Much of the stimuli have been unrelated words and sentences, presented with little or no linguistic context. As indicated previously, normal subjects responded better to material in which a context was provided. With severely impaired aphasic patients, Green and Boller (1974) found that two and three word antecedents (e.g., "Here's something") enhanced auditory comprehension. Aphasic patients have also been reported to benefit from increased sentence redundancy (Gardner et al., 1975). These patients are particularly in need of therapeutic strategies for dealing with receptive deficits. The usefulness of antecedents appears a viable area of exploration.

In this study we investigated the effect of prior contextual information on aphasic subjects' performance of paragraph (Experiments 1 and 2) and sentence comprehension tasks (Experiment 3). Of interest was whether visual and/or auditory prestimulation would influence a subject's performance on subsequent measures of comprehension and recall.

Method

Subjects. Twenty aphasic subjects participated in the study. They ranged in age from 22 to 75 years, with a mean of 55 years. Aphasia was of vascular etiology in 12 cases, traumatic in 2, and neoplastic or surgical in 6. Each subject had been reported by his clinician to have a deficit in auditory comprehension. Prior to the experimental task, all aphasic subjects were given the Token Test (De Renzi and Vignolo, 1962) and subtests VI and X of the PICA (Porch, 1967). On the two PICA subtests, 16 of the aphasic subjects had average scores of 14 to 15 (mean 14.6) and the remaining four subjects had averages of 13.6. Token test errors ranged from 7 to 52; no specific cutoff criterion was applied in subject selection. Control subjects consisted of two groups of 16, a younger group with a mean age of 22 and an older group with a mean age of 55 years.

Experiments 1 and 2

Materials. The four paragraphs in Experiment 1 (A-D) were each 130 words in length, of 5th and 6th grade reading level (Dale and Chall, 1948), and equated as to syntactic complexity and the amount of factual information they contained. Paragraphs were preceded by either a no antecedent control condition (C) or one of the following contextual antecedents: picture (P), verbal (V), or picture and verbal combined (P+V). For example, prior to a story about the crossing of Antarctica the verbal antecedent was as follows:

> This story is about a man named Charles Fredricks who wanted to cross Antarctica. At that time no one had yet done it. Antarctica was a cold and barren continent.

Visual contexts were realistic 8- by 10-inch color pictures portraying the main theme and locale of each of the corresponding stories. The following slide indicates the picture for the Antarctica story (photograph of a man traveling in a dogsled across a snow-covered region in Antarctica - from National Geographic magazine).

In Experiment 2, a second set of paragraphs (E-H) were developed in which facts were presented in a less redundant, more disjointed fashion. After analyzing aphasic subjects' high scores on paragraphs A-D in a pilot study, the conjecture arose that the stories themselves provided such strong internal context that the effects of prior information could not be adequately assessed. The propositional analysis of Kintsch (1974, 1975) was utilized in the development of the second group of less cohesive narratives. (Kintsch divides text into semantic propositions, each containing a predictor which is analogous to the verb and various arguments.) According to Kintsch, ease of recall decreases as the number of different arguments in a passage increases. Paragraphs E-H were constructed so as to change arguments every four words on the average, as opposed to every six in paragraphs A-D. In addition, only verbal (V) and control (C) conditions were contrasted since pilot data means were lowest following the picture condition.

Comprehension was evaluated primarily by performance on a series of 16 yes-no questions. In an effort to reduce the effects of chance, each fact tested in a yes-no question was tested in a second question using wording synonymous though not identical with the first. Credit was restricted to instances in which both of the paired questions (8) were answered correctly. In addition, comprehension was assessed, when possible, by having patients verbally retell what they could of the individual stories.

Procedures. Subjects listened to paragraph sets A-D and E-H on consecutive days. The paragraphs and questions were presented on audiotape, while task instructions and verbal antecedents were presented live. All stimuli were spoken at a slower than normal rate, approximately 120 wpm. In the antecedent presentations, subjects received one of the contextual antecedents, followed by the narrative with minimal time delay; and in the no antecedent condition, they simply heard the narrative. After each paragraph, the tape recorder was turned off and subjects attempted to retell what had happened in the story, then they answered the 16 yes-no questions.

Results and Discussion

Experiment 1. Among the control subjects, differences between contextual conditions (mean correct question pairs) were significant only in the older subject group ($P < 0.05$). Both P and C conditions, each with means of 5.6 (out of a possible total of 8), were significantly lower than the V condition, with a mean of 6.6. Performance on the P+V condition was intermediate, with a mean of 6.25. The younger control subjects exhibited a similar pattern but slightly higher P and C scores. Thus control subjects appeared to have been aided somewhat by the verbal context, while the pictures were of no apparent consequence.

With the aphasic subjects, treatment differences were significant ($P < 0.05$) but the pattern differed. There was no ascending progression from P (3.45) to C (3.80) to V (4.15) to P+V (4.40) conditions. Pairwise contrasts differentiated the P+V from the P condition ($P < 0.01$) and the V from the P condition ($P < 0.05$). The P+V versus C contrast approached significance ($P = 0.09$).

Of considerable interest here is the increased difficulty that the aphasic subjects exhibited in the picture condition and the degree of difference between their mean scores on P versus P+V presentations. Considering the verbal impairment of the aphasic group, pictures had seemed an especially useful method of prompting. A possible explanation for the low P condition score can be found in the verbal learning and memory literature.

Current research supports the tendency for subvocal recoding of visually-presented material for retention in short-term memory (Deutsch and Deutsch, 1975). When aphasic subjects were presented with the pictures, they probably did not treat them solely as visual stimuli but may have attempted to recode them verbally. Unlike the control subjects, aphasic subjects would have to use an inefficient verbal channel, which may have made the task more difficult and may have negatively influenced their performance on the paragraphs. In light of the significant differences between P and V scores, prestimulation in a verbal modality appeared to have been preferable in this experiment. With verbal prestimulation, greater specificity and complexity of input is also more easily accomplished, and the possibility of developing misleading story expectations reduced. Averages on the V and C conditions were, however, quite close, which indicates that the verbal antecedents were of questionable practical value in Experiment 1.

In contrast, when P and V antecedents were combined, means were higher than on any of the other contextual conditions. Here the pictures appeared to have been slightly facilitatory. Possibly the immediate presentation of the verbal context reduced inefficient or inaccurate coding of the picture. In addition, if one adheres to the dual coding theory of Paivio, Rodgers and Smythe (1968), namely that visual and verbal coding both occur with visual materials and that the former serves as an aid to retention in long-term memory, possibly the picture facilitated processing of the verbal antecedent and provided some type of mnemonic aid to the aphasic subjects. Another plausible explanation for the P+V superiority might be related to the literature on facilitation from multimodality stimulation though single-subject analysis suggests caution here (Gardiner and Brookshire, 1972; LaPointe and Williams, 1972).

The verbal report data of 16 of the 20 aphasic subjects was also analyzed as to treatment effects. Points were given for all comprehensible verbal responses that indicated a piece of factual information from the story. As expected, analysis of variance indicated non-significant treatment effects and high subject variability. The verbal report data did, however, provide further indication of aphasic subjects' comprehension of the paragraphs.

Experiment 2. With the less cohesive paragraphs in Experiment 2, only verbal (V) and control (C) conditions were contrasted. (A cross-over design was utilized in the analysis of variance.) The younger control subjects exhibited a marginal treatment effect ($P = 0.06$). They responded somewhat better to the verbal antecedent condition with an average of 6.5 question pairs correct in the V condition as compared to 5.9 in the C condition.

The aphasic subjects demonstrated significant treatment effects ($P < 0.01$). Mean treatment values were 4.7 and 3.9, respectively, for the V and C conditions. Inspection of single-subject data indicated few instances in which an aphasic subject's V score was lower than his C condition score (3 out of 16 cases). A somewhat surprising finding was the equivalency of correct question pairs in Experiments 1 and 2. Both control and aphasic subjects, whether as a function of the experimental stimuli or some type of learning effect on day 2, did not exhibit increased difficulty with the paragraphs in Experiment 2. The ability of the aphasic subjects to comprehend these paragraphs may also indicate retention of basic inferential capabilities, which supports the findings of Stachowiak et al. (1977). No definitive answer can be given to the question of whether the context was more effective prior to this second set of paragraphs; however, the contrast between verbal and control conditions was more robust for the aphasic subjects with paragraphs E-H.

Experiment 3

Materials and Procedures. In a third manipulation, subjects participated in a sentence comprehension task. The stimuli were 20 sentences, each containing a syntactic structure reported to be difficult for aphasic patients (e.g., passive, negative passive, direct object, indirect object, and before/after). Prior to each target sentence, subjects received either a verbal antecedent (A) or no antecedent (N). The following is an example of an antecedent-sentence pair:

Antecedent: You'll see some people reading newspapers. Some of them will also be eating.

Target sentence: The newspaper was read by the man eating lunch at the counter.

In A presentations, subjects heard the live-voice verbal antecedent, then the tape-recorded signal "show me," followed by the sentence; and in the N condition, simply "show me," followed by the target sentence. Subjects were then asked to select the appropriate picture from a page of four possible choices (black-and-white Clip-Art drawings, 12.5 cm square).

Results and Discussion

Analysis of variance indicated that the effects of the antecedents were not significant in any of the subject groups. Control subjects failed on one or two sentences. (Inspection of single-subject data indicated trends for slight facilitation in the A condition.) Aphasic subjects were about 76% accurate, missing four or five sentences on the average. The A and N scores of the individual aphasic subjects were closer than those of the individual control subjects, indicating that the verbal prestimulation was neither an overload nor of any demonstrable benefit to them. One might speculate that the difficulties of the aphasic subjects with the syntactic analysis reduced the consequence of any antecedent information. Another concern relates to the antecedents themselves, as they were of a somewhat general nature (those used by Haviland and Clark were more specific) so as not to assist the subjects in eliminating the pictorial alternatives. Thus the verbal antecedents did not aid the aphasic subjects in deciphering the complex relational information in these sentences, but questions remain as to their role.

Conclusions

Definite trends for facilitation of paragraph comprehension with verbal and combined picture and verbal antecedents were exhibited. Prior verbal information did not, however, demonstrably affect aphasic subjects' performance on a sentence comprehension task. Contextual prestimulation needs to be investigated further with aphasic patients. In addition, the isolated words and sentences used frequently in therapy do not promote the integrative aspects of comprehension espoused in the psycholinguistic literature. The performance of the aphasic subjects on the paragraph tasks suggest the feasibility of further utilization of text materials in the treatment of aphasic patients.

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