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# THE EFFECT OF DELETION PRODUCED SYNTACTIC STRUCTURES ON READING COMPREHENSION

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This study investigated the effect of deletion produced sentence structures, as defined by transformational generative grammar, on reading comprehension. It also investigated the occurrence of deletion produced sentence structures in a selected grade seven social studies text, *Native Tribes of Canada* (Note 1). In addition, it examined the effect of syntactic information in sentence structures in relation to the presence of contentive information on reading comprehension.

The information-processing capacities of the beginning reader are more heavily taxed than those of the more proficient reader. Seldom can the novice reader identify words and meanings directly and mediated word identification (sounding out the word) and mediated meaning identification (word identification must occur as a basis for comprehension) is necessary. Until this time, the beginning reader relies more heavily on visual information, and, therefore, reads slower and with less comprehension until he has learned to use syntactic and semantic cues with facility. As the reader matures, his cue resource expands. The use of minimal language cues in reading culminating in decisions to confirm, reject, or refine, becomes highly selective as the reader matures. To a degree, at least, he is limited or aided by the language structures under his control.

Until Logan's (1952-1963) longitudinal study of children's language any reference to the interrelationships between reading and language were little more than speculative. Logan's findings, that children high in language ability also tended to be high in reading achievement, marked a milestone in reading-language research in that it lent the first empirical evidence of an interrelationship between the two processes. While the findings pointed to little more than a global relationship, they set the stage for research into the nature of these relationships. Strickland's (1962), Ruddell's (Note 2), Hildreth's (1964), Robertson's (1966), Braun's (Note 3), and Tatham's (1970) studies, to name a few, lent further support to Logan's findings when they investigated various sentence patterns and their relationship to comprehension.

The importance of the learner's familiarity with syntactic patterning was given additional weight by Chomsky's (1965) model of transformational generative grammar. Such a grammar postulates that a deep structure is

generated into a surface structure as a consequence of the interaction and application of certain transformations. Within this transformational framework, this study viewed transformational rules as "formal devices in the grammar which express relationships among sentences" (Chomsky, 1965, p. 18).

Chomsky's model opened a new avenue for analyzing reading as it related to comprehension. In an attempt to examine more specifically the nature of the language-reading process, Fagan (1971), working within a transformational-generative grammar framework, investigated the relationship between reading comprehension and numbers and types of transformations in passages from grades four, five and six basal material. Forty-three transformations were identified and grouped into five categories: embedding, conjoining, deletion, simple and position shift. Results showed that the presence of deletion and embedding transformations were significantly correlated with comprehension difficulty of sentences or passages. It appeared that pupils had difficulty processing the information of these structures and consequently experienced difficulty in understanding the sentences in which they appeared. In analyzing the transformations in terms of their difficulty and presence, Fagan found that written language was generally more difficult to understand when deletion transformations were present.

A further study investigating the effect of deletion produced structures, as defined by transformational generative grammar, on word identification and comprehension of first and second grade pupils was carried out by Cosens (Note 4). Results of her study showed that deletion of words had a much greater impact on comprehension than on word identification. She also found a tendency for deletion produced structures to be more difficult to comprehend than the intact form. Comprehension of difficult deletion produced structures tended to be enhanced by inserting words affected by deletion transformation rules. The deletion of redundant contentive information on the comprehension task required pupils to provide more information themselves and comprehension was negatively affected. Deletion of syntactic markers had far less impact on comprehension.

It appears, then, that reading comprehension is dependent upon the type of syntactic structure of the printed language. Cosens and Fagan's studies produced evidence to show that deletion produced structures do affect reading comprehension at the primary and intermediate levels. If deletion produced structures were found to cause difficulties in comprehension at the primary and elementary levels, it seemed logical to assume that these same structures would have some effect on reading comprehension at the junior high level. Therefore, this study focused on one class of structures, those produced by deletion transformations, to determine what effect they had on the comprehension of seventh grade pupils.

In order to investigate the effect of deletion produced structures on the reading performance of seventh grade pupils the following questions were posed:

1. What is the difference in comprehension of sentences in prose passages containing deletion produced structures and those containing intact structures when the number of correct responses in cloze tests are considered for transformations as a group?
2. What is the difference in comprehension of sentences in prose passages containing deletion produced structures and those containing intact structures when the number of correct responses are considered for each particular transformation rule?

### *Procedures of the Study*

To achieve the major purpose, this study was conducted in two stages. The first stage involved the linguistic analysis of sentences in selected passages in the text, *Native Tribes of Canada* (Note 1). This text was chosen from a wide variety of grade seven social studies materials because of its more common use in comparison to other grade seven social studies reading materials. Four of the deletion transformations formulated for Cosens' study (Note 4) were used in investigating the sentence structures. The results of the linguistic analysis and examination of the effects on comprehension of the twelve deletion transformations formulated for Cosens' study served as a basis for selection of the four transformation rules investigated in this study. The second stage involved the collection and analysis of data.

Research instruments were constructed to assess the effect of deletion produced structures on comprehension. Representative passages were selected from the text and subjected to linguistic analysis. Five passages were then reconstructed to include two test sentences for each of the four transformation rules. Two versions of each passage were constructed with half of the test sentences presented as deletion produced structures and the other half in intact form. In the first version, test sentences two, four, six and eight were presented as deletion produced structures, while test sentences three, five, seven, and nine were presented with elements which could be deleted left intact. Version two of each passage was a mirror image of version one with test sentences two, four, six and eight presented as intact structures and sentences three, five, seven and nine presented with elements deleted. The introductory and concluding sentences were left intact and were not used as test sentences. The cloze procedure was employed as the main dependent variable. This technique was applied to the two versions of each test passage resulting in ten forms of each and fifty research tests. To avoid contamination of results, which would occur if any subject read the same passage more than once, ten groups were required, and a counterbalanced research design was used.

The subjects for the experiment were one hundred seventh grade pupils from the total population of a large junior high school in a suburban middle class community in the city of Calgary were randomly selected to form the experimental sample. The sample was then randomly stratified

into ten groups on the basis of reading comprehension scores obtained on the *Canadian Test of Basic Skills* — Form 1, (King, 1967).

After responses on cloze tests had been scored in terms of exact replacements, the data were combined across test sentences for each version of each transformation rule and the combined data were converted to proportion scores. To determine the significance of the difference between mean cloze scores of pupils on deleted and intact sentence structures, t-tests for related measures were applied to the data.

#### Summary of Findings and Conclusions

The summary of findings, and conclusions drawn from these findings are presented in relation to the two stages of the study. The results of the analysis revealed a high incidence of sentences produced by deletion transformations in the social studies text, *Native Tribes of Canada* (Note 1). In the passages analyzed in this study, 43.2 percent of the sentences were deletion produced structures. Of the 43.2 percent deletion produced structures, 13.6 percent were applicable to the "WH + BE deletion," 12.8 percent to the "noun phrase + verb + other elements deletion," 8.8 percent to the "comparative deletion" and 8.0 percent to the "verb phrase deletion." As a relatively small sample of social studies material was analyzed, results cannot be interpreted conclusively.

Table 1 presents the results of analyses relative to the reading difficulty of deletion and intact structures.

Table 1

Means, Standard Deviations and t-Test Results of Comparisons Between Number of Exact Cloze Replacements on Deleted and Intact Sentence Structures with Inserted Words Considered.

Transformation Rule	<i>Deleted</i>		<i>Intact</i>		"t"
	Mean	Standard Deviation	Mean	Standard Deviation	
WH + BE deletion	.355	.379	.399	.416	2.95**
Comparative deletion	.450	.464	.418	.504	1.85
Verb phrase deletion	.409	.441	.449	.465	2.41*
Noun phrase + verb + other elements deletion	.431	.448	.462	.472	2.05*
Combined rules	.410	.419	.446	.455	4.28**

\* Significant at the .05 level

\*\* Significant at the .01 level

When deletion transformations were considered as a group, differences, significant at the .01 level, between comprehension of deleted and intact structures, favored the intact form. When deletion transformations were considered relative to one another, differences between comprehension of deleted and intact structures, significant at the .01 and .05 levels, favored the intact form of the "WH + BE," "verb phrase" and "noun phrase + verb + other elements" deletions, respectively. Differences, although not significant, were in the direction of the intact form for sentences produced by the "comparative deletion."

Table 2 presents the ranked mean proportions of cloze replacements with words that could be affected by deletion transformations.

Table 2

Deletion Transformations Ranked from Most to Least Difficult in Terms of Mean Proportion of Exact Cloze Replacements with Words That Could be Affected by Deletion Transformation Rules Considered.

Transformation Rule	Mean
WH + BE deletion	.355
Verb phrase deletion	.409
Noun phrase + verb + other elements deletion	.431
Comparative deletion	.450

The table suggests that the "WH + BE" was found to be the most difficult deletion for subjects to understand. Sentences produced by the "verb phrase deletion" ranked second in order of difficulty, while the "noun phrase + verb + other elements deletion" ranked third in order of difficulty. The "comparative deletion" ranked fourth in order of difficulty.

On the basis of these findings, it was concluded that grade seven pupils find deletion produced structures to be more difficult to understand than those with all words left intact. This conclusion corroborates the results reported by Fagan (1969) and Cosens (Note 4).

The findings concerning the effect of the presence of syntactic information in relation to contentive information on the comprehension of grade seven pupils indicated that insertion of information to the intact form of deletion transformations, whether syntactic or contentive, increases comprehension scores. The obvious conclusion to be drawn, within the constraints of the limited sampling in this study, was that insertion of this information enhances comprehension.

## Discussion

This study has several implications for educational practice. It appears that specific deletion produced structures present in the social studies material analyzed in this study impede comprehension for grade seven pupils. Authors and educators responsible for preparing social studies materials might consider a careful examination of controlling more the incidence of specific deletion produced structures in print. Sentences should be presented in intact rather than in deleted form. Findings from this study showed that the presence of syntactic and contentive information in the intact form of sentence structures tends to make material easier to understand.

The training of teachers should include an adequate linguistic component in order that teachers may possess some linguistic knowledge. Teachers who have a basic knowledge of linguistics and of the syntactic structures in the English language would have a greater awareness of deletion produced structures and the difficulties caused by them. Such a background would enable them to provide direct and developmental instruction to assist pupils in understanding deletion produced sentence structures.

The insertion of redundant information enhanced comprehension of written material for pupils in this study. The subjects involved were able to make effective use of the semantic and syntactic cues in the material presented. Such findings are consistent with Goodman's (1970) and Smith's (1971) models of reading.

Findings from this study indicate that the seventh grade reader has learned strategies to select the "most productive cues." They are able to make use of the semantic and syntactic redundancies in written language. They are less able to process strings with deleted elements.

The presence of redundant contentive information in the material presented provided several cues to the same information. This was an aid to readers for when they failed to gain meaning when the information was presented in one form, they were able to see it again and gain understanding when it was prepared in an alternative form.

This study viewed reading as an active language processing activity. As children strive to comprehend, they develop strategies for handling the surface structure, which in turn leads to sampling, predicting and testing in order to understand the deep structure of the written language (Wheat and Edmond, 1973). How the control of oral language of the individual interacts with the degree of graphic information required for direct passage from print to meaning awaits further research.

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