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AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN

READING DIFFICULTY AND THE NUMBER AND TYPES

OF SENTENCE TRANSFORMATIONS

by

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ABSTRACT

In order for children to understand what they read, they must be able to analyse the written language structures by which information, ideas, and concepts are conveyed. Although children may be fluent in their use of oral language when they come to school, it does not always follow that this fluency will automatically transfer to written language structures. Throughout the years, writers have suggested various factors which they claim tend to increase the complexity of written language. Nevertheless, there is still relatively little information in this area. It was the purpose of this study, therefore, to investigate the number and types of transformations (under the framework of transformational-generative grammar) which were found in the written language of three basal reader series at the grade four level, and to determine by means of the "cloze" technique, the difficulty which these structures presented for pupils aged nine to twelve in grades four, five, and six.

In order to achieve this purpose, the following steps were necessary. Part I consisted of an analysis of the linguistic structures of twenty-one passages chosen randomly from three basal reader series at the grade four level. On the basis of this analysis, a grammar of forty-three transformational rules was formulated which was considered adequate for assigning a structural description to each sentence of the passages selected. The twenty-one passages containing the various transformations were tested by the "cloze" technique.

Part II of this study consisted of three stories drawn randomly from the three basal reader series chosen for investigation in this study (one from each series). Each story was written in four different forms,

each containing twenty transformations. Twelve of these transformations were of one of the four major transformation types - Embedding, Conjoining, Deletion, and Simple, while the remaining eight transformations were chosen from the other three categories. In Part III, there were six stories, each with five forms. These passages were drawn randomly from the same texts used in Parts I and II. The passage as taken from the text was termed the "basic" form. To this was added a sentence or sentences containing a single transformation of one of the four major transformation types. The stories of Parts II and III were also tested by means of the "cloze" technique.

The "cloze" tests were scored by three different methods. One was a "conventional" method and was used mainly for establishing the reliability of the other two. Method 2 was used in deriving difficulty indexes for passages, sentences, and transformation units. The third method was used to investigate changes in the grammaticality of linguistic forms which frequently occurred as students inserted words in the "cloze" tests. The second and third scoring methods were found to be highly reliable.

The data were processed by a number of statistical techniques. Among those used were the computation of correlations (Pearson product moment and rank order), multiple regression analysis, analysis of variance and covariance. In addition to the difficulty indexes of language structures other variables investigated were grade level, chronological age, sex, mental ability, reading achievement, and socio-economic status.

The relationship of both the presence of transformations within written language and the difficulty of these transformations (as measured by the "cloze") was investigated. Results showed that the very presence

of Embedding and Deletion transformations tended to correlate more highly with a difficult sentence or passage than transformations of the other types. The difficulty of the Deletion type transforms was also related to sentence and passage difficulty. Sentence and passage difficulty was more dependent on the difficulty of Simple and Conjoining transforms than on their presence. When the actual difficulty of transforms was measured, it was found that Conjoining transforms were relatively easy so that this type of transform would normally mean an easy sentence or passage. It also appeared that students tended to find easier those written structures which are ordinarily found in oral language - vocatives, expletives, direct quotations, and questions. It was also evident from the findings that sentence difficulty was more dependent on the presence and difficulty of transformations than was the difficulty of the passage.

Although readability formulae have emphasized the importance of the number of linguistic structures (including the counting of words) in a written passage, the findings of this study have shown that the number of transformations per sentence was not a significant factor in determining the difficulty of a sentence. Except for grade five pupils and the total group, the number of words per sentence did not relate significantly to sentence difficulty.

There was a significant relationship between a pupil's ability as measured by "cloze" scores on the various linguistic units (passages, sentences, and transformations) and sex, grade, chronological age, reading achievement, mental ability, and socio-economic status. The only exception was chronological age which did not correlate significantly with "cloze" scores at the grade five level and for the total group.

Among the general findings of the study it was noted that the

language structures (as described by the number and types of transformations) were highly similar in each of the three basal reader series. Embedding transformations tended to occur most commonly (except for Series B), followed by Simple, Conjoining, Position Shift, and Deletion. There was also a remarkable consistency with which students in each of the three grade groups responded to the "cloze" tests by which the difficulty of these structures was measured.

Pupils frequently inserted words in the "cloze" which were grammatically dissimilar to the words which had been present in the original. This finding appeared to be more characteristic of girls than of boys and of grade six students rather than of grade four students. However, the number of such substitutions for the boys of the former grade and the girls of the latter grade, overlapped. Punctuation was often ignored by students in completing the tests.

Although this study was not designed to test the validity of the Derivational Theory of Complexity, findings showed that the number of transformations per sentence did not influence the difficulty of a sentence or passage. When the number of steps or sub-rules within a transformation was considered, however, the results were, at most, controversial.

The findings of this study have indicated a need for more research in the area of written language complexity and a need for pupil instruction in the analysis of written language structures utilizing the information on the complexity of such structures presently available.

ACKNOWLEDGEMENTS

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CHAPTER I

INTRODUCTION

Communication is essential to the survival of present day society. Although the communication process makes use of a wide range of media, verbal language is still the basis of the communication act. Very early in life, a child (unless afflicted with some severe physical or mental defect) acquires a facility in the use of oral language. Because of the technological advances of today's society, however, an individual is hampered in the amount of progress he can make if he were to rely entirely on his oral language as a means of acquiring knowledge. It is generally an accepted fact that children of most of the world's population are expected to go to school. In school a greater part of the knowledge to be acquired is coded in print or written language which is a representation of oral language — although at times a poor one. The process by which ideas are acquired from written language is termed reading. Facility with oral language does not necessarily mean that students will be equally competent in their experience with written language structures. The nature of written language is not fully understood. Various research studies have shown a variety of characteristics of written language which these writers maintain cause difficulty for a child when interpreting what is written. Bormuth has stated that:

> One of the great challenges to scientists of this
> generation is to learn how to predict and control
> the difficulty of language. It is almost trite to
> say that further improvement of public and private
> life depends upon the ability to transmit ever
> increasing amounts of knowledge to an increasingly
> large proportion of the population. But, unfortunately,

> many adults and children fail to understand what
> they read, not because the concepts are too difficult
> or because they lack the basic reading skills, but
> simply because of the complexity of the language in
> which those concepts are presented.[1]

Before it is advisable to control the complexity of written

language, it is first necessary that those characteristics which

tend to make written language complex be defined as fully as possible.

Ruddell[2] has shown that the greater the similarity between the oral

language patterns of the child and the patterns of written language,

the greater will be the ease of comprehension. However, it is not

always possible nor practical to employ such control in written

material. Robertson gives an alternate solution when she states

"It would be an impossible task to ask writers of children's texts

to revise their products, so the better plan seems to be to give

increased attention to the language of print and through systematic

training make the child aware of this form of his language so he

can use it as an effective means of communication."[3]

Nevertheless the problem of identifying those factors or

characteristics which make for complexity in written language still

remains.

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[1]John R. Bormuth, "Readability: A New Approach," Reading
Research Quarterly, I (Spring, 1966), p.81.

[2]Robert B. Ruddell, An Investigation of the Effect of the
Similarity of Oral and Written Patterns of Language on Reading
Comprehension (unpublished Doctoral dissertation, Bloomington :
School of Education, Indiana University, 1963).

[3]Jean E. Robertson, An Investigation of Pupil Understanding
of Connectives in Reading (unpublished Doctoral dissertation,
Edmonton : The University of Alberta, 1966), p.311.

I. THE PROBLEM

Research has shown that children are generally fluent in their use of oral language when they enter school. That is, they can speak and comprehend many types of sentences. When they begin to read, however, they are faced with a different phase of language – written language. There are differences between oral and written language and one cannot always assume that a child who is fluent orally will experience few problems with the language of print, unless, perhaps, the structures of the written language are similar to those of the child's oral language. With few exceptions this is highly unlikely.

Teaching a child to read involves considerably more than the skill of associating sound and symbol. Information, ideas, and concepts are conveyed in print which consists not only of symbols but symbols in various arrangements and patterns. These patterns are often crucial to the degree of understanding which a child derives from the printed page and if a child is to fully understand what he reads, he must be able to analyse the written language patterns in which the information is conveyed. Deciding what structures to teach children to analyse is a problem since little is known about the types of structures to which children are exposed. In this study the writer proposes to analyse selected passages from grade four basal reader series to determine which transformation rules (within the framework of transformational-generative grammar) were used in the derivation of the sentences. The writer will then attempt to determine if the number of such transformations per sentence and the

types of such transformations affect the degree of comprehension which pupils at the grade four, five, and six levels derive from these sentences and passages.

II. DEFINITION OF TERMS

For the purposes of this study, the following terms will be associated with that meaning given in the definitions below.

Written language is the graphic representation of the English oral language as it appears in handwriting or print. This includes the commitment to writing of the thoughts of a person which have not been uttered in speech (Robertson).

A sentence is a structured string of words and is produced by the rules of the grammar. For the purposes of selecting sentences of the texts for analysis, a sentence is defined as a word or string of words (surface form) that extends from a capital letter which appears after a period, a question mark, or an exclamation point to a period, a question mark, or an exclamation point which immediately precedes a capital letter.

Cloze procedure or technique is the deletion of every fifth word in a printed or written passage.

Understanding or comprehension will refer to the child's ability to insert into blanks in a printed passage the words which have been deleted.

Word difficulty is determined by the proportion of subjects writing the correct word in a blank in a cloze test.

Sentence difficulty is the average of the difficulties of words within a sentence.

Passage difficulty is the average of the difficulties of the words within the passage.

A rewriting rule is of the general form A - - $>$ B, where A is a single nonnull symbol and B is a nonnull string of symbols which is distinct from A.

Derivation involves the sequential applications of the rewriting rules starting with an initial symbol S and continuing with each successive line formed by the application of one rule to one symbol in a string.

A P-marker is a tree diagram which identifies a particular derivation.

Deep structure is the underlying structure of a sentence. (The meaning of a sentence is determined by its deep structure).

Surface structure is the form of the sentence that is normally represented in print (orthographic form) or heard (phonological form). A deep structure becomes a surface structure via transformations.

A transformation rule is one which transforms underlying P-markers into derived P-markers.

Number of transformations refers to the number of transformation rules that have been applied in the derivation of a sentence.

Type of transformation is defined for the purposes of this study as the stimulus (i.e. words in orthographic form) to which pupils are exposed. Type of transformation will refer to those categories and the particular arrangement in which they appear in the surface structure which has been the result of the application of some transformational rule to the deep structure. Since this study deals with sentences as they appear in texts, the categories will be filled

with lexical items. For example, in the following P-marker

```
                        PP
             P                   NP
                           Det   N      #S#
                            |    |    Det   N  be  Adj
            in           the stream  the stream be shallow
```
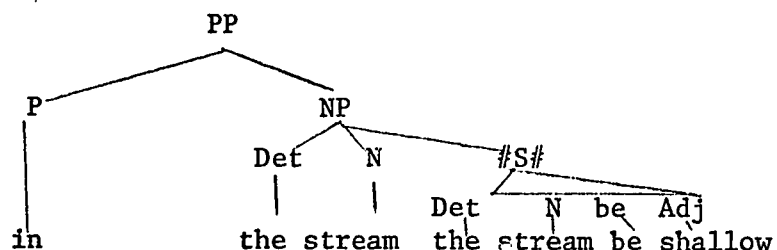
the application of the <u>Adjective</u> (by deletion and obligatory

placement) transformation rule, results in "shallow" being brought

into the surface structure of the PP as "in the shallow stream". The

transformation type will be named by the rule which has been applied.

Thus, "shallow" will be a transformation of the type <u>Adjective</u> (by

deletion and obligatory placement).*

<u>Type of transformation difficulty</u> is the average of the

difficulties of the words (see definition of word difficulty) that

have been brought into the surface structure from the deep structure

of a sentence, i.e., words that have resulted in the surface structure

from the application of a transformation rule.

<u>Derivational Theory of Complexity (DTC)</u>. If a metric were to

be defined for each sentence of a grammar and which would specify the

number of rules or steps required to generate that sentence, then the

complexity of this sentence would be a function of the number of rules

in its derivation. What constitutes a rule or step in the DTC, however,

is not clear from the writings on this topic (see Chapter III for

further discussion). For the purposes of this study it may be defined

in either of two ways. A rule may be a transformational rule as

defined by the grammar of this study or it may refer to one of the

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* See Appendix for a list of types of transformation rules.

elementary operations such as conjoining, deletion, or addition that
do not make up the complete transformation but are parts of the
transformation process. For example, the "adjective" may be considered
as a transformation rule and according to the DTC a sentence with two
adjectives should be more complex than a sentence containing one
adjective. However, the transformational process by which an
adjective is derived from deep to surface structure includes a number
of sub-rules or steps. It first takes a "WH BE form", which is deleted,
and then the adjective is finally front-shifted.

III. THE HYPOTHESES.

From the findings of research studies and in view of what the
writer proposes to do in the present study, the following null
hypotheses have been formulated.

1. There is no significant relationship between presence
of various transformations and the difficulty of a sentence or written
prose passage when difficulty is measured by the "cloze" technique.

2. There is no significant relationship between the difficulty
of various transformations and the difficulty of a sentence or written
prose passage when difficulty is measured by the "cloze" technique.

3. There is no significant relationship between the difficulty
of sentences or of written prose passages and the number of transforms
within these sentences or passages.

4. There is no significant difference in the pupil's
understanding of sentences with different numbers of transforms from
grade four to five to six.

5. There is no significant relationship between a pupil's

understanding of a passage as measured by the "cloze" technique and his reading comprehension as measured by a standardized reading test.

6. There is no significant difference in the difficulty of different transformations over grade, sex, mental ability, and reading achievement.

7. There is no significant relationship between a pupil's "cloze" scores on passages containing various transformations and:

        a) grade

        b) chronological age

        c) mental ability

        d) reading achievement

IV. ASSUMPTIONS

It is assumed that the sentences chosen for analysis are illustrative of the type of sentence generally found within grade four basal readers.

A second assumption is that randomization of the subjects into five groups for each of the five cloze forms over a passage will not produce any considerable bias in scores of any one form.

V. LIMITATIONS OF THE STUDY

The sentences chosen for analysis are from basal readers at the grade four level only.

The sentences chosen for analysis are taken, not from the total text, but from selected samples from each of the basal readers.

The sentences used for analysis are chosen from basal readers only and not from other texts at the grade four level.

The analysis of sentences for number and type of transformations will be limited to the method of analysis used by Bateman and Zidonis[4] with some possible modification.

VI. SIGNIFICANCE OF THE STUDY

Though the majority of pupils in our school systems appear to have the ability to achieve at their respective grade levels, many of them have reading problems. The causes for such problems are many and varied. One possible cause of reading difficulty on which little research has been conducted is the language syntactical factor. It is possible that the structure of various syntactic units may cause pupils difficulty in understanding sentences and passages in which these units are contained. It is hoped that this study will provide information on the degree of difficulty a selected sample of grade four, five, and six pupils have with sentences when one considers the number and type of transforms that have been used in the derivation of the sentence structures.

Very little is known about the nature of the language units used in basal reading series. If the type of language unit influences a student's success in learning to read, and since basal readers constitute the main material in teaching reading, a knowledge of different language structures would be of value. This study attempts to determine on the basis of prose samples from four basal reading

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[4]Donald Bateman and Frank Zidonis, The Effect of a Study of Transformational Grammar on the Writing of Ninth and Tenth Graders (Champaign, Illinois: The National Council of Teachers of English, 1966).

series information about sentence structures regarding the number of transforms and the types of transforms writers of the selections in these readers use.

The findings should provide added information on the readability of written material. Those interested in devising readability formulas will gain information on the possible effect that the number of transforms per sentence and the types of transforms may have on the difficulty of selected prose passages.

Finally, the transformational-generative theory of grammar, though fairly new, appears to be the most powerful theory of language so far produced which explains how an individual can speak and understand sentences he has not heard previously. The results of this study should provide information on the understanding which pupils have of sentences that contain different numbers of transforms. Results should also indicate whether different types of transforms pose greater difficulty for pupils in understanding a written prose passage.

VII. OVERVIEW OF THE INVESTIGATION

This study consisted of three separate but related phases. These were :

1. An analysis of sentences of passages drawn randomly from three basal reader series. On the basis of this analysis a grammar of 43 transformation rules for the purposes of this study was formulated and a description of the linguistic structures of the basal readers was made.

2. The construction of materials including the modification

of selected passages. Cloze tests were constructed on all passages.

3. The administration of these "cloze" tests and of standardized tests to pupils age nine to twelve years in grades four, five, and six in Newfoundland schools to try and identify those structures which tend to relate to the difficulty of written language.

In chapters II and III the writer will sketch the theoretical framework under which the study was conducted. Research in the fields of reading and language pertinent to the problem will be reviewed.

Chapter IV will provide a description of the "cloze" technique - the main testing instrument of this study, while Chapter V will provide information on the analysis of basal readers, the formulation of the grammar and the construction of stories for testing purposes.

The experimental design of the study will be the concern of the writer in Chapter VI. Information on the sample, the administration of the tests, and the variables chosen for investigation will be given.

The results of the experiment will be analysed and explained in Chapters VII to X.

The final chapter will contain the summary, conclusions, and implications.

CHAPTER II

A REVIEW OF THE LITERATURE: READING COMPREHENSION AND READING AND LANGUAGE SKILLS

It is the purpose of this chapter to provide a background for the investigation of the relationship between the difficulty of sentences in terms of the number of the transformations which they contain, the difficulty of the types of transformations and reading comprehension. Reading comprehension has been investigated by scores of writers, and a multitude of factors has been posited as contributing to the difficulty in comprehending printed passages. Since the 1920's language has been intensively studied as a factor to be considered in the reading comprehension process. The term "language" was defined in various ways and linguistic measures were often crude. With the advent of the structural linguists in the late 1940's and the transformationalists in the 1950's, a greater refinement of techniques for investigating linguistic structures became available. The transformationalists provided a theory by which various linguistic elements could be explained.

The first section of this chapter will consider the reading process in its entirety and the comprehension component of this process. The aim is to try and place reading comprehension in proper perspective. The necessity of considering language skills in the reading process will be discussed in section two, while the third section will contain a summary of the various linguistic elements which have been considered by researchers to be influential in their effect on the ease or difficulty of the reading comprehension process.

I. THE READING PROCESS AND READING COMPREHENSION

If one were asked to identify a common factor in the findings

of the various research studies on the reading process within past

decades, in all likelihood, the common factor would be that the reading

process is a complex activity. Kingston in an introductory address

to the Pre-Convention Institutes of the International Reading

Association in 1966 states this viewpoint as follows:

> The complexity of the reading process has been
> recognized by researchers and classroom teachers
> alike. During the past two decades the reading
> process has been examined from a myriad of viewpoints
> which range from instructional methods to elaborate
> systems of factor analysis. In the course of such
> explorations reading ability has been correlated with
> most of the human characteristics we are able to list
> as well as many of the environmental forces in which
> the human organism functions. Such studies have
> served both to intrigue and to frustrate. They
> intrigue because they prove the complexity of reading
> behaviour, but also frustrate because often many
> more questions are raised than answered.[1]

In an attempt to solve some of the problems which make for

the complexity of the reading act, researchers have begun to

formulate theories of reading. "Models" have been constructed

in an attempt to "simplify" the phenomena involved. Models often

allow one to see more clearly the relationships between various

underlying phenomena of the reading act and to more successfully

control certain variables while studying the functioning of others

during the process of reading.[2] In order to develop a more adequate

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[1]Albert J. Kingston, *Highlights of the 1966 Pre-Convention Institutes* (Newark: The International Reading Association, 1966), p.3.

[2]*Ibid*.

conceptual framework of reading and language difficulty, Wiener and

Cromer[3] identified and discussed a number of issues which they

believed were pertinent to this task. The identification of what they

believed to be the crucial issues resulted from an analysis of the

various definitions for reading and the many explanations for reading

difficulty. Four issues were specified: identification versus

comprehension, acquisition versus accomplished reading, relative versus

absolute criteria, and reading versus language skills. It is important

to bear in mind (and this point is made by the authors) that these

are four interrelated issues. In their own conceptualization of

reading, Wiener and Cromer maintain that reading is a two stage process,

involving first identification and then comprehension. A number of

other writers recognize this dual division of the reading process

though they are not always in agreement as to the relationships of the

two parts[4][5]. Walcutt[6] visualizes reading as a threefold process -

Reading 1, Reading 2, and Reading 3. However, his Reading 3 may be

considered an extension of Reading 2 (comprehension). It deals mainly

with the aesthetic aspect of reading, particularly in the field of

literature. For the purposes of this paper, reading will be considered

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[3]Wiener and Cromer, op.cit.

[4]John Dawkins, "Reading Theory - An Important Distinction," Elementary English, XXXVIII (October, 1961), pp.389-392.

[5]Paul Witty, "A Forward Look in Reading," Elementary English, XXXVIII (March, 1961), p.152.

[6]Charles C. Walcutt, "Reading - A Professional Definition," Elementary School Journal, LXVII (April, 1967), pp.363-365.

a two stage process similar to that outlined by Wiener and Cromer.

According to these authors, the first stage or identification

> . . . means "word naming" in the context of a
> transformation of stimuli. Identification
> presupposes a discrimination of one graphic
> symbol from others and a transformation of these
> symbols from one form (usually visual) to a
> second form (usually auditory). The original
> visual forms and the transformed auditory forms
> are considered to be equivalent, different only
> in that the referents are represented in different
> modalities. The two symbol forms are considered
> equivalent in that they contain the same information
> for members of a communication group. Essentially
> then the major critical antecedents of identification
> are the discriminations among the original symbols,
> the discriminations among the transformed symbols,
> and a 'knowledge' of the principles of transformation
> from one form to another. Implicit in this
> conceptualization is that the transformed symbols
> (i.e. words as said aloud) can become an input
> for another individual. Implied also is that there
> is some consensual basis to assess the adequacy
> of the identification, the group using the particular
> language or dialect.[7]

A great deal of research has been conducted at the identification

level. Jenkinson notes that it has been stated in the Sixty-Seventh

National Society for the Study of Education Yearbook "that . . . there

is a plethora of research into beginning reading and particularly word

recognition . . ."[8] Perhaps some of the finest research in this area

has been documented by Gibson.[9]

In contrast to the volume of research available on stage one of

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[7]Wiener and Cromer, op.cit., p.635.

[8]Marion D. Jenkinson, "Basic Elements of Reading Comprehension"
Paper presented to the Second World Congress on Reading, Copenhagen,
August, 1968.

[9]Eleanor J. Gibson, "Learning to Read", Science, CXLVIII
(May, 1965), pp.1066-1072.

the reading process, there is little available on the comprehension aspect. Even Wiener and Cromer[10] are vague in their definition of this term. They state that it "refers to the addition of some form of meaning associated with the identifications or discriminations, that is, the words elicit shared associations, or consensual indication responses to or about the referent or a synonymous response". According to Jenkinson one of the reasons for the lack of research in this area "lies in the nature of the complexity of this activity, for its performance is usually less overt and much has to be examined indirectly by inference."[11]

In discussing the reading process, Strang[12] talks about the product and the process of reading. The product includes, among other things, comprehension which Strang defines as

> the ability to derive meaning from words in sentences, paragraphs, chapters, and larger units. These abilities enable the individual to "read the lines".
> However, the mature reader must do more than get the literal meaning of a passage. He must be able to interpret the author's thought and to make critical judgments, evaluations, and inferences. This is reading "between the lines." "Reading beyond the lines" involves drawing conclusions, forming generalizations, and applying the ideas gained from reading.[13]

Most writers agree with Strang that the end product of

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[10]Wiener and Cromer, op.cit., p.638.

[11]Jenkinson, op.cit., p.1.

[12]Ruth Strang, Invitational Addresses to the International Reading Association (Newark: The International Reading Association, 1965).

[13]Ibid., p.50.

comprehension is the acquisition of meaning – which Strang[14] considers as occupying three different levels. Comprehension, however, may involve more than meaning as Strang describes it. Coulter maintains that the "function of reading is not complete until there is a reaction to the ideas presented,"[15] while Jenkinson states that "some attention has been directed to the affective domain which must be part of appreciation."[16]

Strang[17] also maintains that "process" may be discussed on a number of levels. Within the psychological level she includes conceptualization. According to Strang "a new word is an 'empty category' which can be invested with more and more meaning as new experiences enter the mind. This is the beginning of abstract thinking and the basis for generalization."[18] A number of other writers[19] [20] [21] [22] have agreed that thinking including conceptualization

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[14]Ibid.

[15]Marian L. Coulter, "Concept Development and Reading Instruction", Education, LXXXVI (April, 1966), pp.490-493.

[16]Jenkinson, op.cit., p.3.

[17]Strang, op.cit.

[18]Ibid., p.59.

[19]George D. Spache, "What is Comprehension?" Eleventh Yearbook of the National Reading Conference (Milwaukee: The National Reading Conference, Inc., 1962), pp.17-19.

[20]Jack A. Holmes, "Speed, Comprehension and Power in Reading," Eleventh Yearbook of the National Reading Conference (Milwaukee: The National Reading Conference, Inc., 1962).

[21]David H. Russell, "Research on the Processes of Thinking with Some Applications to Reading," Language and the Higher Thought Processes (Champaign, Illinois: The National Council of Teachers of English, 1965), pp.9-18.

[22]Russell G. Stauffer, "Reading as a Cognitive Process," Elementary English, XLIV (April, 1967), pp.342-348.

is involved in the process of reading comprehension. Russell[23] identifies six types of thinking which he claims can be applied directly to learning to read. The types of thinking are perceptual thinking, associative thinking, concept formation, problem solving, critical thinking, and creative thinking. Spache[24] would fully agree with Russell that reading is a thinking process but he would prefer the types of thinking in terms suggested by Smith[25] and Guilford[26]. These are cognition; memory; convergent production; inductive reasoning; divergent production; deductive reasoning; evaluation; critical thinking. There is some overlap - but there are also some differences. It is Stauffer's[27] contention that children bring with them to school many opinions and concepts which the child can use in his reading if the teacher directs it as a thinking process while Holmes[28] believes that educators underestimate the conceptual capabilities of children and he advocates the introduction of "reading textbooks that have not only a graded list of words, but a graded list of concepts."

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[23]Russell, op.cit.

[24]Spache, op.cit.

[25]Donald E.P. Smith, "Reading Comprehension: A Proposed Model", Ninth Yearbook of the National Reading Conference for Colleges and Adults (Forth Worth, Texas: Texas Christian University Press, 1960), pp.21-27.

[26]J.P. Guilford, "Three Faces of the Intellect," American Psychologist, XIV (August, 1959), pp.469-479.

[27]Stauffer, op.cit.

[28]Holmes, op.cit., p.14.

Holmes[29] distinguishes between comprehension and power of reading. His substrata factor theory holds that individuals receive information through auditory, visual, and kinesthetic avenues. Such information is stored in the brain in cell assemblies which form centers with different functions. During the act of reading, comprehension occurs if these cell assemblies become activated and the impressions derived from the description of concrete objects are reassembled in the mind. Power of reading may occur simultaneously and does so as a result of increased cerebral activity brought about by increased concentration. By the process of comparing and contrasting the incoming information with relevant information already stored from past experiences, new conceptual abstractions are formed. In an experiment to determine what abilities would be found making up the substrata levels of his theory, he concluded from his findings that the "power of reading" is greatly dependent upon a knowledge of words and the concepts that they symbolize. Jenkinson also discusses the importance of the word knowledge factor which she terms "the bedrock of comprehension."[30]

Weaver[31] is in agreement with Kingston[32] that reading may be defined as a process of communication by which a message is transmitted

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[29]Ibid.

[30]Jenkinson, op.cit., p.1.

[31]Wendell W. Weaver, "On the Psychology of Reading," Thirteenth Yearbook of the National Reading Conference (Milwaukee: The National Reading Conference, Inc., 1964), pp.67-74.

[32]Kingston, op.cit.

graphically between individuals. Weaver[33] lists five components of
communications systems - a source, a transmitter, a channel, a receiver,
and a destination. Weaver claims to be chiefly interested in the
originator and the destination of the message. It is his contention
also that the reading process culminates in meaning. Meaning, as
defined by Weaver is "the application of prior codings of the organism
to the present decoding task."[34] These prior codings of the organism
are not entirely dependent upon input sources external to the organism
but may have been produced internally from the interaction of previous
codings. When the source and destination are in equivalent states,
communication takes place, that is, the coding of the message approaches
relevant coded structures within the organism. Under some circumstances,
however, there may be meaning without communication. This occurs when
the written stimuli activate structures in the receiver not congruent
with structures the same coding activates in the source. The activated
structures are controlled by the internal organization of the
destination rather than by the internal organization of the source of
the message. This condition is referred to by the terms "misreadings"
or "variant readings."[35]

Perhaps one of the better summaries of definitions of reading
comprehension is provided by Rankin[36] in a paper aptly titled "The

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[33]Weaver, op.cit.

[34]Ibid. p.71.

[35]Ibid.

[36]Earl F. Rankin, Jr., "The Definition of Reading Comprehension,"
The First Yearbook of the North Central Reading Association (Minneapolis:
The University of Minneapolis Press, May, 1962), pp.16-31.

Definition of Reading Comprehension." He considers the empirical, statistical, and operational definitions of reading comprehension. Empirical studies have largely shown that reading comprehension involves a large number of separate factors. Rankin cites as an extreme instance a quote from Burkhart who found that ". . . reading is not a single act but is a complex activity made up of at least 214 separate abilities . . ."[37] In contrast to the findings of empirical studies, the application of factor analysis techniques has led educators to the conclusion that reading is composed of a relatively small number of skills. Comprehension, according to statistical analysis, is a two factor process - vocabulary or word meanings, and seeing relationships. The importance of the word meaning factor has already been discussed.

"By an operational definition is meant a statement of the operations required to measure the phenomena under consideration."[38] Such operations are usually found as test exercises. However, one must keep in mind that sub-test headings may not be valid descriptions of what the test measures.

Summary

Reading is a complex act. There is general agreement, however, that reading is a two stage process involving identification of graphic symbols and comprehension which involves getting meaning from what is read. Comprehension has been variously defined. Though the authors

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[37]Ibid., p.16.

[38]Ibid., p.24.

of all writings reviewed agree that comprehension implies meaning, they disagree on the quality and quantity of the meaning involved. Empirical studies have normally shown that reading comprehension is a complex of a myriad of sub-skills, while factor-analysis tends to show a much smaller range of factors in the comprehension component. Comprehension in this study is measured by means of the "cloze" procedure. The term "comprehension" may be considered as defined operationally in the sense that there is available considerable research data on what the "cloze" procedure purports to measure. The "cloze" is unlike other tests of comprehension, however, in that it varies with the passage on which it is used. Jenkinson[39] used the "cloze" as a measure of comprehension in her doctoral study. Based on an analysis of research findings to that date, she gave a number of reasons as to why she used the "cloze" as a comprehension measure. The writer has not found any studies which have refuted these statements and thus considers them still valid. The reasons are stated in Chapter IV which is devoted to a description of the "cloze" procedure.

II. READING VERSUS LANGUAGE SKILLS

In their analysis of definitions of reading in order to find issues pertinent to the task of reading, Wiener and Cromer[40] have identified language as an important factor in reading. They maintain

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[39]Marian D. Jenkinson, Selected Processes and Difficulties of Reading Comprehension (unpublished Doctoral dissertation, the University of Chicago, Chicago, 1957).

[40]Wiener and Cromer, op.cit.

that once the visual forms are transformed to auditory forms, comprehension can take place provided that the appropriate language skills are available. Comprehension is likely to occur when the reader's auditory transformations (identifications) correspond to his available auditory language forms. Some instances cited by Wiener and Cromer[41] where comprehension does not take place after auditory transformation are as follows: (1) The printed word, when spoken, may elicit no referent since the word is not a part of the child's vocabulary as may occur with the word "kite" for some children. (2) It may be that the child has had experience with the referent but the amount of verbalization normally used differs from that used in the text. For example, the child may say the word "ball" in a particular tone and with particular gestures which may stand as a substitute for "Give me the ball," "I want the ball," or "May I please have the ball." (3) The sound of the word as read may not correspond to the sound of the word as used in the child's language. For example, for some Southern United States children "y'all" may be the commonly heard form of "you," plural. Thus the child may not transfer the sound of "you" to the meaning of "y'all." (4) The reader's language and that of the writer may differ, particularly in structure. This is illustrated by the following passage of a description of Harlem, a line of which reads: "On school: Everyone shouting and screaming and nobody care about what is going on." (5) Finally, the meaning of the graphic material may be different from the meaning typically elicited in the individual

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[40]Wiener and Cromer, op.cit.

[41]Ibid.

(for example, slang expressions, and poetry).

The above instances reflect the generality of the term "language" as used by Wiener and Cromer. In their summary they state that "language can include not only meaning but also those subjects typically dealt with by linguists (patterns, grammars, sequences, meaningful units, and so on)."[42] The importance of linguistic structure to comprehension is emphasized by Goodman who says

> Most words have lexical (or dictionary) meaning. However, it is the devices which signal the structural meaning that makes communication intelligible. The meaning of an utterance is not the sum of the lexical meanings of the words in it.[43]

Joos[44] supports this viewpoint when he says that the misconception that longer sentences are more difficult to read than shorter ones is based on the belief that the longer sentence has more words and each added word is a thought to add to the weight of the reading task. Goodman maintains that nothing short of comprehension is reading. He assumes that "all reading behavior is caused. It is cued or miscued during the child's interaction with written language."[45] Goodman's "miscues" appear to be very similar to Weaver's[46] "misreadings"

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[42]Ibid., p.638.

[43]Kenneth S. Goodman, "A Communication Theory of the Reading Curriculum," Elementary English, XL (March, 1963), p.291.

[44]Loyal W. Joos, "Linguistics for the Dyslexic," The Disabled Reader (Baltimore: The Johns Hopkins Press, 1966), pp.83-92.

[45]Kenneth S. Goodman, "Linguistic Study of Cues and Miscues in Reading," Elementary English, XLII (October, 1965), p.639.

[46]Weaver, op.cit.

or "variant readings". The latter writer attempts to explain how these occur. He assumes this is part of the decoding process. Language elements in a neurophysiological code entering the central nervous system perform different functions - one being a control function which relates incoming elements to elements already present in the internal environment of the organism. This control function seems to be a property of the structure of language.

The awareness of grammatical structure as a facilitating factor in reading comprehension has been the subject of a number of studies. One of the purposes of a study by Gibbons[47] was to determine if there was any relationship between the ability to see the relationships between parts of a sentence and the ability to read as determined by a standardized reading test. A disarranged phrase test was used to measure the ability to see the relationship between parts of a sentence, and sentence completion and question tests were used to measure the ability to understand the sentences used in the disarranged phrase test. The subjects were divided into groups on the basis of their scores on the disarranged phrase test. She found that the children who scored highest on the phrase test also made higher scores on the standardized reading tests. Thus, she concluded, "the ability to understand sentences depends somewhat upon the ability to see relationships between the parts of a sentence."[48] A study by Strom[49] was concerned with the relationship

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[47]Helen D. Gibbons, "Reading and Sentence Elements," Elementary English Review, XVIII (February, 1941), pp.42-46.

[48]Ibid., p.46.

[49]Ingrid M. Strom, "Does Knowledge of Grammar Improve Reading?" English Journal, XLV (1956), pp.129-133.

existing between the ability to read materials of an informative

nature and the ability to analyse (at a more conscious level than in

the Gibbons study) the syntax and grammar of the sentences read. Her

findings showed that there were little if any relationships between

these factors. A more recent study by O'Donnell[50] investigated the

relationship between the awareness of grammatical structure and ability

in reading comprehension. Taking the structural linguistic approach

to English grammar, he analysed the grammatical structure in terms of

certain basic relationships ·within the sentence (subject-predicate,

predicate verb-complement, etc.). In order to avoid the direct use of

grammatical terminology, he had his subjects match sentences in which

similar relationships occurred. Statistical correlations between the

level of comprehension and awareness of structure were low. O'Donnell

concluded that the relationship was not significant enough to warrant

the teaching of grammatical structure as a major means of developing

reading comprehension.

Summary

Evidence appears to favor the inclusion of language as a factor

in reading comprehension. How this language factor operates is not at

all clear, though there have been hypotheses put forth.[51] Whether or

not the ability to analyse different grammatical structures or to apply

various grammatical rules is advantageous to reading comprehension is not

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[50] Roy O'Donnell, "Awareness of Grammatical Structure and Reading Comprehension," _High School Journal_, XLV (February, 1962), pp.184-188.

[51] Weaver, _op.cit._

at all clear. The next section will attempt to summarize the findings

regarding those language elements which are present within written

language and which educators have felt influence the difficulty of

language as a comprehension variable.

III. THE LANGUAGE VARIABLE IN WRITTEN MATERIAL

Many writers[52 53 54 55 56 57 58 59] maintain that the degree

to which an individual comprehends a written passage is a function of

the complexity of the language within it. Complexity of language,

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[52]Elsa Beust, "The Publishers Role in Promoting Growth in Interpretation," Supplementary Educational Monographs No.74, November, 1951, W.S. Gray (ed.), pp.240-4.

[53]Emmett A. Betts, "Readability: Its Application in the Elementary Schools," Journal of Educational Research, XLII (February, 1949), pp.438-459.

[54]Gwen Horsman, "Adjusting Guidance in Interpretation to Students Taught," Supplementary Educational Monographs No.74, November, 1951, W.S. Gray (Ed.), pp.39-43.

[55]Helen M. Robinson, "Factors Which Affect Success in Reading," Elementary School Journal, LV (January, 1955), pp.263-269.

[56]Ruth G. Strickland, The Language of Elementary School Children: Its Relationship to the Language of Reading Textbooks and the Quality of Reading of Selected Children (Bloomington: School of Education, Indiana University, 1962), Vol.38, No.4.

[57]Robert B. Ruddell, An Investigation of the Effect of the Similarity of Oral and Written Patterns of Language Structure on Reading Comprehension (unpublished Doctoral dissertation, School of Education, Indiana University, Bloomington, 1963).

[58]Jean Elizabeth Robertson, An Investigation of Pupil Understanding of Connectives in Reading (unpublished Doctoral dissertation, the University of Alberta, Edmonton, 1966).

[59]Charles T. Scott, "The Linguistic Basis for the Development of Reading Skill," The Modern Language Journal, L (December, 1966), pp.535-544.

however, has various meanings for different researchers. The earliest

research in analyzing written language was done in readability studies.

It is generally agreed[60] that the publication of McGuffey's graded

readers sparked interest in the readability of printed materials;

however, it was not until the 1920's that any important work was done

in this field. Reports of eye-movement studies, publication of

vocabulary counts, and increased information on the semantic basis of

readability, and on children's preferences for various types of reading

materials contributed to the upgrowth of interest in readability at this

particular time.

One of the important studies reported in this period was by

Lively and Pressey[61] who concerned themselves with the vocabulary

load of textbooks. Other studies on the vocabulary factor were

reported by Lewerenz[62] and Patty and Painter[63]. The first readability

formula was published by Vogel and Washburn in 1928 and was used with

children's books from grades three to eight inclusive. Besides

counting the number of different words, and number of uncommon words,

they also noted the number of prepositions and number of simple sentences.

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[60]Betts, _op.cit._

[61]Bertha A. Lively, and S.L. Pressey, "A Method for Measuring
the 'Vocabulary Burden' of Textbooks," _Educational Administration and
Supervision_, IX (October, 1923), pp.389-398.

[62]Alfred S. Lewerenz, "Measurement of the Difficulty of Reading
Materials," _Educational Research Bulletin_, VIII (March, 1929), pp.11-16.

[63]W.W. Patty, and W.I. Painter, "A Technique for Measuring
the Vocabulary Burden of Textbooks," _Journal of Educational Research_,
XXIV (September, 1931), pp.127-134.

What Makes A Book Readable was published by Gray and Leary[64] in 1935· and contained a readability formula for predicting the "ease" or "difficulty" of printed materials for adults. The authors began with eighty-two elements which were grouped under three headings: properties of words, properties of sentences, properties of paragraphs or entire selections. Elements were gradually eliminated until five were finally judged useful for predicting reading difficulty. These were (1) number of different hard words, (2) number of first, second and third person pronouns, (3) average length of sentences in words, (4) percentage of different words, (5) number of prepositional phrases.

In 1939, Yoakam[65] reported a technique for grading books. This technique was based on an index figure derived from Thorndike's Teachers Work Book of 20,000 Words. In that year also, Lorge[66] reported the results of a study which he conducted to apply the Gray and Leary formula to children's readings. Lorge[67] began to eliminate certain variables and found that by using only the number of prepositional phrases and average sentence length, the multiple correlation was .6949 - still higher than that reported by Gray and Leary[68].

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[64]William S. Gray, and Bernice E. Leary, What Makes A Book Readable (Chicago: The University of Chicago Press, 1935).

[65]Gerald A. Yoakam, A Technique for Determining the Difficulty of Reading Material (unpublished Material, University of Pittsburg, Pittsburg, 1939).

[66]Irving Lorge, "Predicting Reading Difficulty of Selections for Children," Elementary English Review, XVI (October, 1939), pp.229-33.

[67]Gray, and Leary, op.cit.

[68]Rudolf Flesh, "A New Readability Yardstick," Journal of Applied Psychology, XXXIII (June, 1948), pp.221-33.

In the 1940's Flesch contributed a number of studies on the measurement of readability. A number of formulas resulted for measuring reading ease, human interest, and abstraction of written materials. The original Flesch formula was revised by Dale and Chall[69] in 1948 in an attempt to eliminate the unreliability of the counting of some elements. Their resulting formula included a word factor and a sentence factor -the latter being the average sentence length. The need for a formula useful for primary grade materials was met by Spache[70]. Using sentence length and number of 'hard words' (i.e. those not included in the Dale List of 769 words) he obtained a multiple correlation coefficient of .818. The results of Spache's[71] study also indicated that sentence length is slightly more closely related to reading difficulty than the per cent of hard words.

One of the most recent readability formulas published in the literature was the "Devereux Formula" reported by Smith[72] in 1961. The formula was designed to reduce the element-counting time without undue loss of accuracy. Since the 1950's, however, little advance has been made in the readability formulas. This was due largely to the unavailability of appropriate research techniques. With the development of the "cloze" procedure, advances in readability studies have been made possible. This technique "has solved the problem of reliably

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[69]Edgar Dale, and Jeanne S. Chall, "Predicting Readability," Educational Research Bulletin, XXVII (1948), pp.11-20 and 28.

[70]George Spache, "A New Readability Formula for Primary Grade Reading Materials," Elementary School Journal, LIII (march, 1953), pp.410-13.

[71]Ibid.

[72]Edgar A. Smith, "Devereux Readability Index," Journal of Educational Research, LIV (April, 1961), pp.298-303.

measuring language difficulty."[73] Because of the importance of the "cloze" technique to this study, it will be dealt with separately at a later point.

Though studies on readability have contributed to our knowledge of various language factors which make for reading "ease" and "difficulty", the language factors most popularly accounted for in readability formulas have been vocabulary and sentence length. There are many other factors which may contribute to the difficulty of written language. Syntactic patterns (simple, compound, complex, active, passive, question, negative, and combinations of these types), structural elements within sentences (clauses, verbals, nominalizations), style and organization have not always been accounted for.

In 1933, Holland[74] conducted a study in which he had subjects from grades four, five, six, seven, nine, and college freshmen read before the eye-movement camera, ten geographical selections written in complex and compound sentences and ten selections containing the same content but written in simple sentences. A test of comprehension was given. Holland concluded from the results of this study that the effect of the length and structure of sentences varies with different patterns of sentences, with different individuals, and with groups of subjects.

McClusky[75] wished to determine the characteristics of reading

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[73]John R. Bormuth, "Readability: A New Approach," Reading Research Quarterly, I (Spring, 1966), pp.79-132.

[74]B.F. Holland, "The Effect of Length of Structure of Sentence on the Silent Reading Process," Psychological Bulletin, XXX (November, 1933), pp.668-9.

[75]Howard Y. McClusky, "A Quantitative Analysis of the Difficulty of Reading Materials," Journal of Educational Research, XXVIII (December, 1934), pp.276-282.

materials representing different levels of difficulty. He used six

passages of reading materials - fiction, political science, economics,

sociology, psychology, and physics. Even though he tested comprehension,

only the rate scores were used in determining the level of difficulty

represented by each passage and on the basis of this criterion divided

the six passages into three distinct levels of difficulty: (1) fiction,

(2) sociology, economics, political science, (3) psychology and physics.

McClusky then analyzed each passage for the number of ideas, length

of words, length of sentences, and types of nouns. He concluded that

"easy material is characterized by short, simple sentence structures

and easy familiar vocabulary while the difficult material is

characterized by a technical unfamiliar vocabulary and a complex sentence

structure."[76]

Wilson maintained that "one reason why textbooks are inadequately

understood is that they contain many general and abstract statements

which do not provide sufficient detail for pupils with limited

experiential and linguistic backgrounds."[77] To test this hypothesis,

she devised three articles, each 300 words in length on three aspects

of the topic "paper". Each article was then expanded into two-lengths -

an article of 600 and an article of 1200 words. Grade six and seven

pupils read each article and then took comprehension tests. Wilson

found that differences in comprehension may be attributed to

the meager statements in the short article and the amplification provided

in the long article. She concluded that "amplification of reading

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[76]Ibid, p.282.

[77]Mary Caroline Wilson, "The Effect of Amplifying Material Upon
Comprehension," Journal of Experimental Education, XIII (September, 1948),
p.5.

material is advantageous to comprehension."[78] A similar study was

conducted by Coleman[79] who matched three different passages for

number of words, syllables, prepositions, "direct words", and sentences.

Each passage was then rewritten so that there were three versions of

each passage with average sentence lengths of 15.4, 23.2, and 38.7

words, respectively. The sentence difficulty was measured by the

"cloze" technique. Though results indicated that passages containing

the shorter sentences were more readable than passages containing

longer ones, the author hesitated to generalize this occurrence to all

types of sentences. An analysis of the "cloze" score of each long

sentence when compared to the sum for the two sentences into which it

had been divided led him to propose the following hypotheses.

1. Raising clause fragments to a full sentence will improve
readability.

2. Dividing clauses joined by "but, for, or, etc." will improve
readability.

3. Dividing clauses joined by "and" does not improve comprehension.

4. It may be that the clause and not the sentence is the least
unit to shorten.[80]

According to Burk[81] few studies were done using "style", partly

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[78]Ibid, p.7.

[79]E.B. Coleman, "Improving Comprehensibility by Shortening Sentences," Journal of Applied Psychology, ILVI (1962), pp.131-4.

[80]Ibid.

[81]Cassie Burk, "A Study of the Influence of Some Factors in Style of Composition on the Interests, Comprehension, and Rate of Reading of Fourth Grade Pupils," Journal of Experimental Education, IV (June, 1936), pp.303-352.

due to the difficulty in defining this term. She selected as two

factors of style, the kind of sentence, and the form (narrative, play)

in which the selection was written and sought to determine what

influence, if any, these had on the reading interest, comprehension,

and rate of grade four pupils. Though interest appeared to depend

on the type of sentence in which the story was written, the kind of

sentence "apparently has no influence on the size of the average

comprehension score."[82] Similar, but separate, studies by Robinson[83],

and Klare, Mabry and Gustafson[84] showed that sentence complexity in

written passages militated against comprehension, and retention of

material read. Robinson[85] also found some evidence that subjects of

higher intelligence showed greater facility in reading and understanding

complex passages.

Robertson[86] was concerned with the embeddedness of ideas and its

influence on comprehension. She maintained that ideas may be conjoined

as well as embedded but whether embedded or conjoined the association

of such ideas is partially through the connectives which join them and

thus she sought to determine the understanding in reading which children

in grades four, five, and six have of connectives that occur in basal

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[82]Ibid., p.349.

[83]Francis P. Robinson, "The Effect of Language Style on Reading Performance," Journal of Educational Psychology, XXXVIII (March, 1947).

[84]George R. Klare, James E. Mabry and Levall M. Gustafson, "The Relation of Style Difficulty to Immediate Retention and to Acceptability of Technical Material," Journal of Educational Psychology, XLVI (May, 1955), pp.287-295.

[85]Robinson, op.cit.

[86]Robertson, op.cit.

readers. Robertson used a "modified transformational-generative grammar" in the analysis of sentence structures. Cossitt[87] used a transformational-generative model to identify and describe syntactical elements in six high school social studies textbooks. The results of this analysis showed that the prenominal adjective was the structure that appeared most frequently in all texts. She asserted that this is the most complex grammatically since it is more deeply embedded than the other structures with the exception of the prenominal participle which has the same degree of embedding as the prenominal adjective. Cossitt, however, did not test for difficulty.

Summary

A number of studies have been reviewed which investigated the language factor in written materials. Readability studies were concerned mainly with vocabulary and sentence length. Furthermore, readability studies lacked appropriate techniques for arriving at reliable indexes of language difficulty. Studies which sought to determine the influence of various style elements, particularly sentence complexity, have also been reviewed. Cossitt[88] analysed the language structure of social studies texts at the high school level which she described in terms of Chomsky's theory of transformational-generative grammar. The effect of these structures on comprehension, however, was not determined. Few studies have been found which analysed basal readers to determine the type of language structures to which children are

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[87]Therese G. Cossitt, A Linguistic Analysis of Social Studies Texts (unpublished Master's thesis, the University of Alberta, Edmonton, 1966).

[88]Ibid.

normally exposed. Strickland[89] analysed texts from four basal reader series to determine if they contained language patterns similar to the oral language patterns of children in grades one to six who had been part of a major study on oral language. This, however, was mainly a matching process and did not provide a description of the many structures that may be found in texts but not in children's oral language. Robertson[90] conducted a study in which she analysed the language structures of grade four, five, and six basal readers, but the analysis was made mainly in terms of connectives.

The writer believes that the nature of the written language is an important factor in a pupil's understanding of what he reads. The more that can be learned about the influence of language structures on reading comprehension, the more one can do to help children master the important task of reading. Since basal readers are the main material used in teaching children to read, the writer proposes to analyse prose samples from different basal reader series to try to determine the type of language structures which pupils generally contend with while they are learning to read. Chomsky's theory of transformational-generative grammar appears to be the most viable theory of language so far published. It is therefore the intention of the writer to work within the framework of this model and to analyse written language in terms of number of transformations per sentence and the types of transformations that may occur. The theory of transformational-generative grammar and studies on the psychological reality of grammatical structures will be reviewed in the following chapter.

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[89] Strickland, op.cit.

[90] Robertson, op.cit.

CHAPTER III

REVIEW OF THE LITERATURE:LINGUISTIC THEORY AND PSYCHOLOGICAL REALITY

In this chapter the writer will attempt to provide a rationale

for his selection of the transformational-generative theory of grammar

as the theory under which the language samples of this study will be

analysed and explained. The writer is following the revision of the

transformational-generative theory as suggested in the Aspects of the

Theory of Syntax.[1] However, in order to show the rationale for this

theory, the writer proposes to give a brief account of the basis for

his decision to use a "generative" rather than a "descriptive" grammar.

The inadequacy of "finite state" and "phrase structure" grammars as

grammars of English will also be discussed. This chapter will also

contain a review of research on the psychological reality of sentence

constituents. Very often the terminology of these studies was not

defined and thus it was often difficult to make comparisons among

studies.

Generative versus Descriptive Grammar.

Chomsky defines language as:

> . . . a set (finite or infinite) of sentences, each
> finite in length and constructed out of a set of
> finite elements. All natural languages in their
> spoken or written form are languages in this sense,
> since each natural language has a finite number of
> phonemes (or letters in its alphabet) and each sen-
> tence is representable as a finite sequence of these

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[1]Noam Chomsky, Aspects of the Theory of Syntax (Cambridge: The M.I.T. Press, 1965).

phonemes (or letters) though there are infinitely many sentences.[2]

Throughout the years the elements of the sequences of a language have been categorized in a number of ways. The "traditionalists" categorized linguistic elements when they spoke of nouns, verbs, prepositional phrases etc. More recently the "structuralists" have devised a number of ways for segmenting and classifying such elements. However, according to Chomsky[3] recording the data of usage is of little advantage unless there is some way by which these data may be explained. This, he maintains, is the purpose of a grammar. Which grammar is best for this purpose? There has been a great deal of discussion between the choice of a "generative grammar" and a "descriptive grammar". Chomsky maintains there is really no choice at all because "a descriptive grammar is not a theory of the language. Rather, the latter is an inventory of elements of various kinds that play a role in the language."[4]

Finite State and Phrase Structure Grammars

In _Syntactic Structures_, Chomsky[5] discusses three theoretical models of a grammar. He first considers a finite state model which may be compared to a machine that can be in any one of a number of internal finite states and can switch from one state to another by producing a

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[2]Noam Chomsky, _Syntactic Structures_ (The Hague:Mouton and Company, 1957), p. 13.

[3]Noam Chomsky, "The Current Scene in Linguistics:Present Directions," _College English_, XXVII (May, 1966), pp. 587 - 595.

[4]_Ibid_, p. 593.

[5]Chomsky, _op. cit._, 1957.

certain symbol. If the machine is in the "initial" state and then runs through a sequence of states (producing a word with each transition) and ends in a "final" state, then the string of words produced may be called a sentence. Chomsky argues that English is not a finite state language and demonstrates his point by showing that English contains sentences in which the latter part is in a dependency relationship to the first part. Chomsky concludes that such sentences are generated by a process not possible in the finite state grammar.

Chomsky next considers the "phrase structure" grammar which provides a linguistic description on the syntactic level in terms of constituent analysis (parsing). It proceeds by a set of rewrite rules of the form X ----$\rangle$ Y which means rewrite X as Y. The following rules may be used to produce the sentence "The man hit the ball."

1. Sentence   ----$\rangle$ NP + VP

2. VP   ----$\rangle$ Verb + NP

3. NP   ----$\rangle$ T + N

4. T   ----$\rangle$ the

5. N   ----$\rangle$ man, ball, etc.

6. Verb   ----$\rangle$ hit, took, etc.

Though X may be more than one symbol, only one symbol can be rewritten in forming Y. The step by step derivation of the above sentence would appear as:

Sentence

NP + VP   (1)

NP + Verb + NP   (2)

T + N + Verb + NP   (3)

the + N + Verb + NP   (4)

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the  +  man  +  Verb  +  NP                    (5)

the  +  man  +  hit  +  NP                      (6)

the  +  man  +  hit  +  T  +  N                 (3)

the  +  man  +  hit  +  the  +  N               (4)

the  +  man  +  hit  +  the  +  ball            (5)
```

Such a sentence derivation may also be represented by a tree diagram or phrase marker.
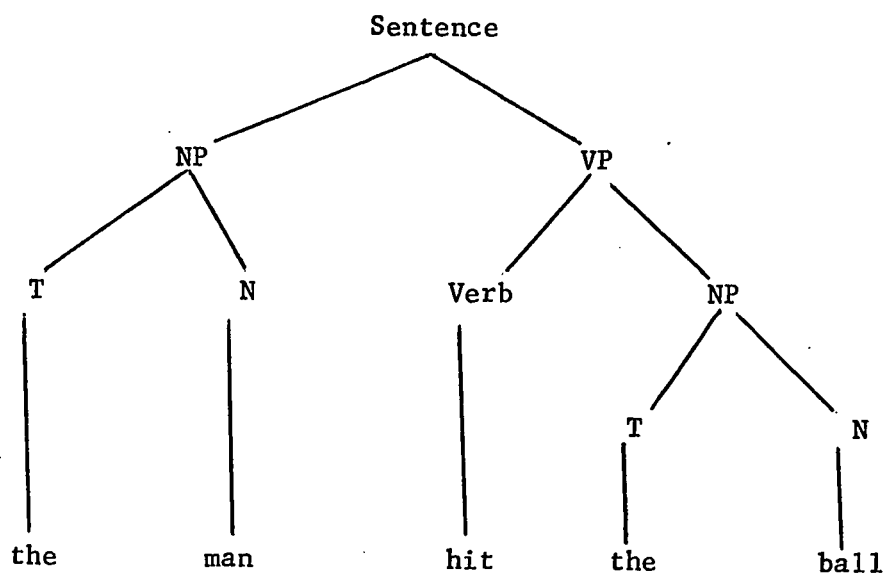
The tree diagram, however, contains less information than the derivation since it does not tell in what order the rules were applied. In the example of the phrase structure grammar listed above, the only member of the set of initial strings was the single symbol "Sentence". However, the initial set could have been easily extended to include, for example, such symbols as "Declarative Sentence" and "Interrogative Sentence". A derivation is said to be terminated in the sense that the final string cannot be rewritten any further by the phrase structure rules. Each terminal string has many different representations. The

sentence given above, "the man hit the ball" is represented by the strings: Sentence, NP + VP, T + N + VP, etc. Thus on the level of phrase structure, each sentence of the language is represented by a set of strings, not by a single string as it is on the level of phonemes, morphemes, or words.[6]

Chomsky does not consider the phrase structure grammar to be an adequate grammar for the construction of English sentences. He states that the strongest claim against the adequacy of a grammar is to show that it does not account for the sentences of a natural language. A less strong argument for the inadequacy of a grammar is to show that it applies to the sentences of a natural language only clumsily, that is, the rules may have to be expressed in a complicated fashion. It is on the second point rather than the first on which Chomsky attacks the adequacy of a phrase structure grammar. As an example, he uses the process of conjunction. He shows how this process may be generalized in a single rule. However, the application of this rule depends on a knowledge of the derivational history of a sentence rather than on its final shape only. Therefore, the grammar must have power to "scan" or look back at previous strings in the derivation. A phrase structure grammar, however, generates sentences not from left to right but from top to bottom. Thus the application of any rule is completely determined by the string it has just produced, that is by the final string in the derivation. Chomsky also shows that processes such as inversion (as in the affix shift rule), and restricting the co-occurrence of certain lexical items cannot be handled by a phrase structure grammar, or else can be handled only rather clumsily.

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[6] Chomsky, _op. cit._, 1957

Since the publication of <u>Syntactic Structures</u>, Postal[7] has provided evidence that phrase structure grammars are also inadequate in the enumeration of the sentences of a natural language. He states that "in view of the fact that transformational-generative grammar is the only theory known which circumvents the limitations of phrase structure, such evidence can be taken as indirect support for the claim that natural languages require transformational generative grammars."[8]

Transformational Generative Grammar

The third model discussed by Chomsky[9] is the transformational generative model. This model, Chomsky claims, can easily incorporate rules to handle the processes referred to above, and thus can simplify the grammar.

The transformational generative model was first visualized as having a tripartite arrangement - a phrase structure, a transformational component, a morphophonemic structure. The phrase structure component would operate in a manner similar to that discussed for a phrase structure grammar and would construct a terminal string with a sequence of morphemes. The transformational component would be responsible for mapping this string into its corresponding surface structure, or as Chomsky states it "a grammatical transformation T operates on a given string, or a set of strings with a given constituent structure and con-

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[7]Paul M Postal, "Limitations of Phrase Structure Grammars," <u>The Structure of Language</u>, Jerry A. Fodor and Jerrold J. Katz (eds.), Englewood Cliffs: Prentice-Hall, Inc., 1964), 137 - 151.

[8]<u>Ibid</u>., p. 146.

[9]Chomsky, <u>op</u>. <u>cit</u>., 1957.

verts it into a new string with a new derived constituent structure."[10]

The result is then a string of words which are subjected to the

morphophonemic rules which convert them into a string of phonemes.

Before a transformation can be applied, the analysis of the strings

to which it is to apply must be described, that is, a structural

description (SD) must be given. The structural change (SC) which the

transformation effects on the string must also be stated, as well as

any conditions upon which the application of the T-rule may be depend-

ent. For example, the active-passive transformation would apply as

follows:

$$
\begin{array}{llllll}
\text{SD:} & NP_1 & T(M) \ (ASP) & V & NP_2 \\
\text{SC:} & 1 & 2 & 3 & 4 & ----\rangle \\
 & 4 & 2 + be + en & 3 & by + 1 \\
\text{COND:} & 1 \neq & 4
\end{array}
$$

Transformations may be "obligatory" or "optional". If a trans-

formation is obligatory, it must apply to every derivation in which the

SD is met or the result will not be a sentence. The affix shift rule is

an obligatory transformation. The passive transformation is an example

of an optional transformation and may or may not be applied. In either

case the result would be a sentence.

The transformations that operate on the deep structure to generate

the surface structure may perform one or more of the following functions.

The examples to illustrate these functions are presented by Goodman.[11]

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[10] _Ibid._, p. 44.

[11] Ralph Goodman, "Transformational Grammar," _An Introductory_
English Grammar (New York: Holt, Rinehart, and Winston, 1965), pp.
348 - 349.

(a) The transform may rearrange elements in a string.

Example: String: NP + V + Adv = The man walked slowly

Transform: NP + Adv + V = The man slowly walked

(<u>Adv</u> and <u>V</u> are rearranged)

(b) It may add elements to a string.

Example: String: NP_1 + V + NP_2 = The man hit the ball

Transform: NP_2 + be + V + by + NP_1 = The ball was hit by the man

(<u>be</u> and <u>by</u> are added; also the NP's are rearranged)

(c) It may delete elements.

Example: String: You + will + V = You will go

Transform: V   = Go

(<u>You</u> and <u>will</u> are deleted)

(d) It may combine two or more strings.

Example: String: 1. NP_1 + VP_1 = John Walks

2. NP_2 + VP_2 = John giggles

Transform: NP_1 + who + VP_2 + VP_1 = John,who giggles, walks

(Strings 1 and 2 are combined; NP of string 2 is deleted; <u>who</u> is added to replace NP of string 2)

Example: String: 1. NP + V = John knows

2. S   = The world is round

Transform: NP + V + that + S = John knows that the world is round

(Strings 1 and 2 are combined; <u>that</u> is added)

Chomsky has continued to reformulate his ideas of a transformational generative grammar. In his book <u>Aspects of the Theory of Syntax</u>, he shows considerable extension of the ideas of this theory of grammar

over his formulation of it as presented in <u>Syntactic Structures</u>.

Chomsky[12] still considers the transformational generative grammar as possessing a tripartite arrangement but he now visualizes the three major components of this grammar as being the <u>syntactic</u>, the <u>phonological</u>, and the <u>semantic</u>. The phonological and the semantic components are purely interpretative in the sense that they provide for a phonetic or a semantic representation of the sentence. Both of these components, however, are dependent on the syntactic component in that they use information provided by the syntactic component concerning formatives, their inherent features, and the interrelationships between parts of a given sentence. For this reason, the syntactic component provides for two structures - a deep and a surface structure. The former provides the input for the semantic component, whereas the latter is the input for the phonological component. The deep and the surface structures of a sentence are related by means of transformations.

It is the base of the syntactic component which initiates the deep structure. Because of the importance of the syntactic component of grammar to this study, it will be discussed below.

The base consists of a categorical subcomponent and a lexicon. Rewriting rules which apply to category symbols are the natural mechanism for generating phrase markers. These may be considered as of the same type as expressed by Chomsky in <u>Syntactic Structures</u>,[13] that is, of the form A $\longrightarrow$ Z, which means that A is rewritten as Z.

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[12]Chomsky, <u>op</u>. <u>cit</u>., 1965.

[13]Chomsky, <u>op</u>. <u>cit</u>., 1957.

The function of the branching or rewrite rules is to define the grammatical relationships which may be used by the semantic component, and to specify an abstract underlying order of elements which may be necessary before the transformational rules apply. In addition to the rules of the above type there are rewriting rules which apply to symbols for lexical categories and which introduce or operate on complex symbols, which may be considered as sets of specified syntactic features. Rules such as:

$$V \longrightarrow CS/ \underline{\qquad} \quad \left\{ \begin{array}{l} NP \\ \# \\ Adj. \\ Pred. \ Nom. \\ etc. \end{array} \right\}$$

which analyse a symbol in terms of its categorical content are termed <u>strict subcategorization rules</u>, whereas rules of the type:

$$[+V] \longrightarrow CS/ \quad \left\{ \begin{array}{l} [+ \ Abstract] \ Aux \underline{\qquad} \\ \underline{\qquad} Det \ [+ \ Animate] \\ etc. \end{array} \right\}$$

which analyse a symbol (generally a complex symbol) in terms of the syntactic features of the frames in which it appears are called <u>selectional rules</u>.

The lexicon no longer consists of rewrite rules. Instead, it is a set of lexical entries, each lexical entry being a pair (D,C), where D is a phonological distinctive feature matrix "spelling" a certain lexical formative and C is a collection of specified syntactic features, that is, a complex symbol. By applying the rewrite rules of the base, a <u>preterminal string</u> will be generated which will consist of grammatical formatives and complex symbols. In order to produce a

terminal string, lexical formatives must be inserted. The insertion of a lexical entry will depend on whether its contextual features match those of the symbol for which it is being substituted. Transformations are now used to convert this abstract deep structure into a surface structure.

It has already been pointed out that the nature of the transformational generative grammar theory is constantly changing in the light of new research and new insights. Chomsky was well aware of the tentativeness of various parts of this theory when he wrote Aspects of the Theory of Syntax, for in the preface of this book he states "the tentative character of any conclusions that can now be advanced concerning linguistic theory, or for that matter, English grammar, should certainly be obvious to anyone working in this area."[14] However, though he admits that many questions as to the proper form of the theory of transformational generative grammar remain to be answered he goes on to say that "the central role of grammatical transformations in any empirically adequate generative grammar seems to me to be established quite firmly . . ."[15]

Psychological Reality of Linguistic Constituents

Chomsky thinks of the transformational generative model of grammar as a model of competence rather than of performance. However, he admits that "one can study models of performance that incorporate generative grammars, and some results have been achieved in some studies."[16]

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[14]Chomsky, op. cit., p. v.

[15]Ibid., p. vi.

[16]Ibid., p. 140.

Miller[17] was one of the first to conduct studies in this area.
It bothered Miller that meaning was so often explained in terms of
referents - which in turn was merely a matter of conditioning. He was
willing to accept the fact that this might explain a small percentage
of the meaning one derives from language but he felt there was another
important factor which was so often overlooked - "something that
linguists usually call 'grammar'."[18] Miller[19] considered the sentence
"Bill hit the ball" and felt that it was intuitively obvious to
speakers of English that within this sequence of words there is a kind
of structure and that some pairs of adjacent words are more closely
related than others. He considered that "the ball" is a more natural
unit than "hit the" in that it is much easier to substitute a single
word for "the ball" than for "hit the" without changing the underlying
structure of the sentence. Thus he posed the question "Is there any
solid empirical evidence for the psychological reality of syntactic
categories?"[20] As evidence he cited studies by Ervin[21] and Glanzer.[22]
These studies were concerned mainly with the influence on memory of the
organization of words into syntactic categories. The Ervin study showed

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[17]George A. Miller, "Some Psychological Studies of Grammar,"
American Psychologist, XVII (1962), pp. 748 - 762.

[18]Ibid., p. 748.

[19]Ibid., p. 750.

[20]Ibid.

[21]S.M.Ervin, "Changes with Age in the Verbal Determinants of
Word-Association," American Journal of Psychology, LXXIV (1961), pp. 361 -
372.

[22]M. Glanzer, "Grammatical Category: A rote learning and Word
Association Analysis," Journal of Verbal Learning and Verbal Behavior.
I (1962), pp. 31 - 41.

that responses from adult subjects on a word association test tend to be members of the same syntactic category as the stimuli which evoke them. Glanzer used paired associates in his study and found that it was easier for his subjects to learn associations between nonsense syllables and content words (nouns, verbs, adjectives, adverbs) than between nonsense syllables and function words (pronouns, prepositions, conjunctions). Thus, expressions like "yig-food" and "mef-think" were more readily learned than "of-tah" and "kex-and." However, function words became easier to learn when they were placed in contexts which were considered more natural for them. Thus triplets like "tah-of-zum" and "kex-and-woj" were learned faster than triplets like "yig-food-seb" and "mef-think-jat".

Miller had participated in an experiment in 1951 with Heise and Lichten.[23] This study had shown that words are perceived more accurately when they are heard in the context of sentences than when they are heard as individual items pronounced separately as a string of words. They concluded that the sentence context serves to narrow down the range of alternative words that a listener expects to hear and thus makes the perceptual task of recognition much easier. However, the question of how the sentence context reduced the number of alternatives still remained. In order to seek an answer to this question, Miller[24] conducted a further study in 1962. In this study he drew up a list of twenty-five monosyllabic English words which he then divided into five sublists of five words each.

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[23]George A. Miller, George A. Heise, and William Lichten, "The Intelligibility of Speech as a Function of the Context of the Test Materials," Journal of Experimental Psychology, XLI (1951), pp. 329 - 335.

[24]Miller, op. cit.

The lists were so divided, that if a word were chosen from each of the five sublists in succession, a grammatical English sentence would be formed. The subjects (who were adults) were drilled on the words until they knew the lists perfectly. The first two testing conditions showed that when a group of five words were drawn randomly from one of the sublists and spoken separately against a background of random masking noise, they were more easily recognized than when a group of five words were drawn from the entire list and tested in a similar manner. In the third and fourth test conditions the subjects worked with strings of words. Words were drawn successively from each of the sublists to produce a grammatical string of words, for example, "Don has no wet things." Such strings were then given in reverse order. When the examiner paused between successive strings of five words and gave the listener a chance to think about what he had just heard, there was no difference in the subjects' comprehension of the sentences and reversed strings. When the presentation was speeded up, thus eliminating the pauses, the reversed strings were about as difficult to learn as the five words randomly drawn from the full list which had been used as the first test condition. Miller concluded that the sentence context did narrow the range of expected words. He also felt that the functional unit of perception in speech was larger than a single morpheme or a word, and more nearly the size and shape of a syntactic constituent. The latter term, however, was not defined.

Sentences are normally constructed according to linguistic rules - phonological, syntactic, and semantic. It should be easier to understand a spoken sentence that conforms to the rules of the grammar than sentences in which such rules are violated. This was the underlying

assumption of a study conducted by Miller and Isard in 1963.[25] Ten sets

of five grammatical sentences (each set employing a different phrase

structure) were used as the basis of this study. The sets were recom-

bined in such a way that there were fifty grammatical sentences, fifty

anomalous sentences, and fifty ungrammatical strings of words. The 150

sentences were randomly mixed and recorded on magnetic tape. The sub-

jects were asked to repeat aloud what they had heard immediately after

a string of words had been played. The subjects' responses were record-

ed and were scored for the number of principal words (five per sentence)

and for the number of complete sentences that were repeated exactly.

The sentence scores were: 88.6 per cent of the grammatical sentences;

79.3 per cent of the anomalous sentences; and 56.1 per cent of the un-

grammatical strings were repeated exactly. Differences were statis-

tically significant. It was concluded from this study that syntactic

rules do affect the ability to hear and repeat sentences. Semantic

rules also play a part since grammatically acceptable but semantically

anomalous sentences were intermediate in difficulty between the normal

sentences and the ungrammatical strings of words.

Marks and Miller[26] conducted a follow-up study in 1964. They

wished to differentiate between the effect of learning of semantic and

syntactic rules and so they constructed their strings of words in such

a way that semantic and syntactic rules could be interfered with

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[25]George A. Miller and Stephen Isard, "Some Perceptual Consequences of Linguistic Rules," Journal of Verbal Learning and Verbal Behavior, II (1963), pp. 217 - 228.

[26]Lawrence E. Marks and George A. Miller, "The Role of Semantic and Syntactic Constraints in the Memorization of English Sentences," Journal of Learning and Verbal Behavior, III (1964), pp. 1 - 5.

independently. They initially constructed five normal sentences of five words each with identical syntactic structures (adjective-plural noun-verb-adjective-plural noun). Five more sentences were constructed from these original ones by taking the first word of number one sentence, the second word of number two sentence and so on. Thus this group of sentences would have the same structure as the first group but would be semantically anomalous. A third set of "anagram" strings was constructed by scrambling the word order of the first set of sentences, while strings of word lists resulted when the words of the anomalous sentences were scrambled. "Clearly learning was more rapid for the normal sentences and most difficult for the word lists."[27] The types of errors were placed in two categories - semantic and syntactic. Misplacing of words from one string to another was considered a semantic error. Such errors occurred most frequently in the anomalous sentences and in the word lists where semantic rules were most interfered with. Bound-morpheme errors and inversions were considered as syntactic errors and these occurred most frequently in the anagram strings and word lists where the syntactic rules were most violated. "Apparently therefore, these errors give support to the contention that syntactic and semantic rules have psychological as well as linguistic reality."[28]

A study by Schlesinger[29] led him to conclude that a sentence is normally decoded in syntactic constituents and that an individual finds

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[27]Ibid., p. 2.

[28]Ibid., p. 4.

[29]I.M. Schleshinger, "The Influence of Sentence Structure on the Reading Process," Technical Report, Number 24, prepared for the United States Office of Naval Research, Information Systems Branch (Jerusalem, Israel, October, 1966).

it easier to store these as memory units. His experiment consisted in having subjects read aloud from a text in which the boundaries of syntactic constituents had been marked for the examiner's use. At different numbers of words from the boundary of a constituent the light was switched off and the subject was told to say as much as he could remember. The results indicated that the last word seen was the end of a constituent more often than not. When a second study was conducted to control for sentence length (word length had been controlled for in the first study), similar results were found. The second study also showed that results were almost equal for slow and fast readers, "which shows that the effect of syntactic structure is not confined to the former."[30]

Another study based on the premise that the particular segment seen at each glance as one reads must perhaps be a syntactic unit was carried out by Graf and Torrey.[31] Two written passages were broken down into constituents according to their phrase structure. These stories were flashed on the Craig Reader (a device which flashes a line at a time) at a speed a little too fast for the subjects' full comprehension of the passage. In one story breaks between lines were made to conform as closely as possible to major boundaries, while in the second story, breaks were made at minor boundaries so that one line contained words from each of two unified phrases. The scores were the number of questions answered correctly. The results showed that scores were

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[30]Schlesinger, op. cit., p. 32.

[31]Richard Graf and Jane W. Torrey, "Perception of Phrase Structure in Written Language," Proceedings of the Seventy-Fourth Annual Convention of the American Psychological Association (Washington:American Psychological Association, Inc., 1966), pp. 83 - 84.

much higher on material which was broken into constituents at major

boundaries. These results were consistent with findings of studies by

Ladefoged and Broadbent[32] and Fodor and Bever[33] which also demonstrated

the perceptual (psychological) reality of linguistic segments.

A series of experiments was reported by Epstein during the years

1961 - 1967. The main purpose of these studies was to consider the role

of syntactical structure in verbal learning. Epstein[34] defined syntax

as "the generalized pattern or schema which is imposed upon the reservoir

of available words and determines the sequences of these words." It was

Epstein's belief that syntactic and semantic constraints could be studied

independently and this he attempted to do by using nonsense words in his

sentence structures. His 1961 study[35] showed that syntax is a facilitat-

ing factor in a learning situation. In seeking an answer to the question

as to why syntax facilitates learning, Epstein became interested in

Miller's "chunking hypothesis" - that is, the immediate memory span is

determined not by the amount of information per unit, but by the number of

units or chunks into which it is possible to divide the material. From the

results of his study Epstein[36] concluded that syntactically unstructured

material is more difficult to learn than structured material because the

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[32]P. Ladefoged and D. E. Broadbent, "Perception of Sequence in Auditory Events," Quarterly Journal of Experimental Psychology, XII (1960), pp. 162 - 170.

[33]J.A.Fodor and T.G.Bever, "The Psychological Reality of Linguistic Segments," Journal of Verbal Learning and Verbal Behavior, IV (1965), pp. 414 - 420.

[34]William Epstein, "The Influential of Syntactical Structure on Learning," American Journal of Psychology, LXXIV (1961), p. 81.

[35]Ibid.

[36]Ibid.

latter is already organized whereas the former can be organized into more efficient chunks only through the intentional efforts of the learner. The 1962 study[37] which was a replication of the 1961 study, with slight modifications, produced similar results. Epstein[38] approached the 1963 study by considering differences between structured and unstructured materials. He investigated the existence of what he called a "temporal schema" which supposedly consisted of the syntactical constraints placed on the temporal ordering of the individual words or items within a structured series. He required his subjects to learn a syntactically structured series of nonsense syllables or real words, or a matched unstructured series composed of the same items. Immediately following the acquisition of the strings in their natural order, the subjects were required to learn the new material in reverse order. Epstein[39] maintained that such a schema exists by showing that the original forward acquisition was more rapid for structured materials whereas the unstructured materials were learned more rapidly in reverse order. A study by Forster[40] was also concerned with the order within structured material. He predicted that if the subjects were not required to recall the items in order, any facilitative effect of the syntactical structures

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[37]William Epstein, "A Further Study of the Influence of Syntactical Structure on Learning," American Journal of Psychology, LXXV (1962), pp. 121 - 6.

[38]William Epstein, "Temporal Schemata in Syntactically Structured Material," Journal of General Psychology, LXVIII (1963), pp. 157 - 164.

[39]Ibid.

[40]Kenneth I. Forster, "The Effect of Syntactic Structure on Nonordered Recall," Journal of Verbal Learning and Verbal Behavior. V (1966), pp. 292 - 297.

should disappear. The results of this study indicated "clearly that syntactic structure facilitates recall, even if subjects are not required to recall items in order."[41]

Among other purposes for conducting his 1967 study, Epstein[42] sought to determine if the findings of his previous studies were applicable when a variety of grammatical structures were used. In the previous studies, Epstein had used the active-verb form only. The learning material of the 1967 study consisted of structured anomalous sentences and their unstructured counterparts. The structured strings were divided into strings with an active form, strings with a passive form, and those involving nominalizations. It was evident from the results of the study that the effect of syntax is not confined only to structures of active-verb form. The presence of syntactic structure equally facilitates the learning of structures with the passive-verb, and nominalization forms. There was also evidence that these three structures were not equivalent in difficulty. The number of words learned was greatest for the active-verb form, intermediate for the passive-verb form, and least for the forms employing nominalizations. This finding marked the distinction between Epstein's 1967 study and all other studies reviewed above. Epstein, however, did not attempt to explain the reason for the difference in difficulty between different sentence structures. Findings of other studies, however, had cast some

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[41]Ibid., p. 295.

[42]William Epstein, "Some Conditions of the Influence of Syntactical Structure on Learning:Grammatical Transformation, Learning Instructions, and 'Chunking'," Journal of Verbal Learning and Verbal Behavior, VI (1967), pp. 415 - 419.

light in this direction. The common factor in these studies to be
reviewed presently is the presence of "sentence transformations."

Transformational Processes and Sentence Difficulty

Transformational processes according to Jacobs and Rosenbaum[43]
provide an important clue to the question of how people in various
cultures learn to speak their native languages. They consider there
are two approaches to this phenomenon.

> The first is a neurological investigation of the
> speech and brain mechanisms - mechanisms common
> to every normal child. The second is a linguistic
> investigation into what all languages have in
> common - linguistic universals. The fact that
> transformations in all languages studied to date
> seem to make use of the same elementary trans-
> formational processes . . . provide a partial
> answer.[44]

They go on to say that

> . . . because he is human, a child comes into the
> world knowing, quite unconsciously what to look
> for in a language. He is equipped to recognize
> which of the elementary transformational proc-
> esses are used in the transformations of his
> language. He uses his innate knowledge to con-
> struct the particular transformations of his
> language, to piece together in a remarkably
> short time the grammar of the language to which
> he is exposed. This explains in part how a
> human child can learn any native language at
> all. Once the child has discovered the particular
> transformations of his language, the transformations
> that convert the deep structures into the surface
> structures of the language, he is able to distinguish,
> with relatively few errors the grammatical utterances
> of his language, to interpret certain grammatical
> structures, even though elements of his inter-
> pretation may not be physically present in the
> utterance, and to perceive ambiguity and synonymy.[45]

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[43]Roderick A. Jacobs and Peter S. Rosenbaum, English Transformational
Grammar (Waltham: Blaisdell Publishing Company, 1968).

[44]Ibid., p. 28.

[45]Ibid.

Other writers have taken the above view a step further and have posited a psychological reality of these transformational processes. Such writers maintain that the complexity of sentence structure is a function of the number of transformations required to derive the structure. In their review of literature in this area, Fodor and Garrett[46] refer to this as the "Derivational Theory of Complexity" (DTC).

> DTC can be made explicit in the following way. Consider a generative grammar G of the Language L and a sentence S in the range of G. It is possible in principle to define a metric which for every pair (G_1, S_1) specifies the number N_1 of rules (or elementary operations or whatever) G_1 requires to generate S_1. DTC in its strongest form is the claim that the size of N_1 is an index of the complexity of S_1. In particular, two sentences assigned the same number are equally complex, and, of two sentences assigned different numbers, the larger number is assigned to the more complex sentence.[47]

Gough's[48] "transformational decoding hypothesis" is essentially the same as Fodor and Garrett's DTC. Gough considers the type of transform as well as the number, for he says "the latency of understanding a sentence should be a function of the number and nature of the transformations separating it from its underlying structure."[49]

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[46]J. A. Fodor and M. Garrett, "Some Syntactic Determinants of Sentenial Complexity," Perception and Psychophysics, II (July, 1967) pp. 289 - 296.

[47]Ibid., p. 289.

[48]Philip B. Gough, "The Verification of Sentences: The Effect of Delay of Evidence and Sentence Length,'Journal of Verbal Learning and Verbal Behavior, V(1966), pp. 492 - 496.

[49]Ibid. p. 492.

There have been various attempts to prove or disprove the above hypothesis.

Miller[50] was one of the first to test this hypothesis. He did this by giving subjects a set of sentences to transform and by determining how many of these sentences they could complete in a fixed interval of time. Kernel, negative, passive, and passive-negative structures were used. The test was constructed by taking any two of these four sets of sentences and by having the subjects pair them. For example, one test form required the subjects to match passives with their corresponding passive-negative forms. Before the test, the subject was given a sample pair of sentences which illustrated the transformation he would be required to make. As a control, other tests were constructed so that no transformations were required. Thus Miller reasoned that from the measurements on the identity pairing, an estimate could be made of the time required for subjects to read down the right hand column, find the sentence they wanted and write in the appropriate number. If this time were subtracted from the total time, then an estimate of the time required to recognize, analyse, and transform sentences would be had. The results showed that the subjects found it more difficult (required more time) to transform sentences which were separated by two transforms (kernel to passive-negative) than sentences which were separated by a single transform (kernel to passive, or kernel to negative).

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[50]Miller, op. cit.

Similar but separate studies were conducted by Mehler[51] and by Salinger and Eckerman.[52] These authors investigated the effect of sentence complexity (number of transformations) on recall. Subjects were required to listen to strings of words and then write down as much as they could remember. Mehler's sentences included seven different transforms - kernel, negative, questions, passive, negative-question, negative-passive, question-passive, and negative-question-passive. According to Mehler, the results of the study suggested that subjects do not recall sentences verbatim. Instead they analyse them syntactically and encode them as kernels with the appropriate transformation tags. He was not prepared to suggest how the kernel sentences might be learned.

Salinger and Eckerman, who controlled for sentence length, word order (sentence order versus random order), stage of learning (first versus second presentation), method of stimulus presentation (entire series at once versus one unit at a time), used only two different structures - the simple-active-declarative and the passive-negative-question. These structures had been found in Miller's[53] study to be most difficult. The authors found that a larger number of errors occurred in the passive-negative-question structure on the first presentation only. They concluded that "the difference in memory

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[51]Jacques Mehler, "Dome Effects of Grammatical Transformations on the Recall of English Sentences," _Journal of Verbal Learning and Verbal Behavior_, II (1963), pp. 346 - 351.

[52]Kurt Salinger and Carol Eckerman, "Grammar and the Recall of Chains of Verbal Responses," _Journal of Verbal Learning and Verbal Behavior_, VI (1967), pp. 232 - 239.

[53]Miller, _op. cit._

due to grammatical structure is at best equivocal."[54] Their results,
however, may have been influenced by their method of scoring. Words
were counted as correct when they were written in correct order and
spelled the same as the stimuli. Since transforms usually differ
by function words or by derivations of content words (addition of
suffixes), a great difference in the spelling errors would not be
expected. Also since only two different structures were used, it
would be expected that there would be a "learning effect."

A study by Coleman[55] also showed that when subjects were re-
quired to learn grammatical structures, those with less transforms
were more easily learned. In a previous study with Blumenfeld,[56]
Coleman had used the "cloze technique" to study the difficulty of
active-verb sentences (John described it) and their corresponding
nominalizations (John's description of it). Five cloze forms in
which every fifth word was deleted were prepared. The results
showed that the number of words filled in correctly per subject was
significantly greater for the active verb sentences than for the
nominalized forms.

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[54]Salinger and Eckerman, op. cit., p. 236.

[55]E. B. Coleman, "Learning of Prose Written in Four Grammatical
Transformations," Journal of American Psychology, XLIX (1965), pp. 332 -
341.

[56]E. B. Coleman and J. P. Blumenfeld, "Cloze Scores of
Nominalizations and their Grammatical Transformations," Psychological
Reports, XIII (1963), pp. 651 - 4.

Similar but separate studies on the DTC were reported by Gough[57]
and Slobin.[58] Both studies had subjects select a picture to verify
a grammatical structure they had just heard. Slobin who used subjects
in kindergarten, grades one, four, six, and adults found the same
order of difficulty at all levels - kernel, passive, negative, passive-
negative. Since the pictures were presented immediately after the
subjects heard the sentences,Gough maintained that verification time
included the time it took the subjects to transform the sentence plus
actual verification time. Thus he reasoned, if a delay were present
after subjects heard the sentence and before the pictures were pre-
sented for verification, subjects would have reduced the complex
sentences to their underlying structure and thus verification time
should be the same for all types of sentences. He used a three
second delay but found that subjects still took longer to verify
the passives or negatives than the actives. Gough maintained that
the findings of this study did not confirm the DTC. They did not
discredit the transformational description of sentence complexity,
however, for verification time was a function of the number of
transforms even after a delay of evidence. Gough concluded that the
differences are in verification not comprehension and one must look
to verification for an explanation.[59]

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[57]Gough, op. cit.

[58]Dan I. Slobin, "Grammatical Transformations and Sentence
Completion in Childhood and Adulthood," Journal of Verbal Learning
and Learning Behaviour, V (1966), pp. 219 - 227.

[59]Gough, op. cit.

Contrary to Gough's assumptions, the writings on the DTC do not indicate that the time required to reduce complex sentences to their underlying structures is integral to the DTC. Gough is also assuming that comprehension takes place immediately after a sentence has been heard but he has no way of checking comprehension except by his verification process. Finally, verification time may have been influenced by each individual's rate of response which may be independent of a particular task.

A couple of studies have been reported which were designed to determine if complex sentences are actually stored in kernels in an individual's memory. This is the process referred to as "recoding" by Miller[60] and as "encoding" by Mehler.[61] Coleman[62] hypothesized that if a subject remembers a group of passives by detransforming them to kernels then he should remember essentially the same words as a matched subject presented with the actives. The results of his study showed that there was a tendency to recode in kernels. Fifty-six passives were retained as actives as compared to thirty-three actives retained as passives. According to Savin and Perchonock[63] if it is assumed that the immediate memory has a small fixed capacity and if the amount of memory space remaining after a sentence structure has been learned can be determined, then hypotheses may be made as to whether or not an

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[60]Miller, op. cit.

[61]Mehler, op. cit.

[62]Coleman, op. cit.

[63]Harris B. Savin and Ellen Perchonock, "Grammatical Structure and the Immediate Recall of English Sentences," Journal of Verbal Learning and Verbal Behavior, IV (1965), pp. 348 - 353.

individual recodes all sentences as kernels. The grammatical features

used in this study were the negative, passive, question, negative-

question, emphatic, and WH transformations. Each subject heard a

sentence followed by a string of eight words. He was instructed to

recall the sentence verbatim and then recall as many as possible of the

words. If two sentences differ by only one transform, then the one

with more transforms should be harder to remember, and therefore fewer

additional words should be recalled after it. Thus the negative should

be more difficult than the kernel; the negative-passive more difficult

than the negative or the passive, and so on. Results were as predicted.

The authors then considered the number of words recalled in an interval

of space between two structures. There were five independent measures

of this space, namely: kernel to passive, emphatic to emphatic-passive,

negative to negative-passive, question to question-passive, and question-

negative to question-negative-passive. As predicted, the five intervals

were equal. The authors concluded "that these transformations are

remembered independently of one another and of the rest of the sent-

ence."[64] Though this study casts some doubt on the "recoding" hypothesis,

the results lend weight to the assumption that sentence complexity is a

function of the number of transformations.

A study by Compton[65] not only considered the number of trans-

formations but also the nature of the transforms - that is, whether they

originated from a single base sentence (singularly transforms) or from a

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[64]Savin and Perchonock, op. cit., p. 352.

[65]Arthur J. Compton, "Aural Perception of Different Syntactic
Structures and Lengths," Language and Speech, X (April - June, 1967)
pp. 81 - 87.

pair of base sentences (generalized transforms). The most intelligible

sentence type was the simple or kernel which was from 3.57 to 16.95

per cent more intelligible than the other types. The passive-negative-

question was most difficult. The difficulty seemed to depend more on

the number of transforms rather than on whether they originated from

one or two base sentences. A second study designed to look at the

derivation of sentences was reported by Mehler and Carey.[66] All of

the studies reviewed so far have focussed on the transformations which

are used to derive a sentence from its deep to its surface structure.

It was the purpose of Mehler and Carey's study to test the

psychological reality of these structural levels. There were forty

sentences of four syntactic types. Sentences of the form "They are

forecasting cyclones", "They are conflicting desires" were used to

assess the importance of surface structure in perception. The other

two sets which were similar in structure at the surface level but

differed at the base level were of the form "They are delightful to

embrace" and "They are hesitant to travel". The subjects were told

that they would hear short, ordinary English sentences mixed with

noise. They were instructed to listen to each sentence carefully and

to write it down in the interval before the next sentence. They were

informed that the first two words in every sentence would be "They

are" and guessing was encouraged. The results showed that a sentence

that differed in surface structure from the structure of the ten pre-

ceding sentences was perceived significantly less accurately than when

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[66]Jacques Mehler and Peter Carey, "Role of Surface and Base
Structure in the Perception of Sentences," Journal of Verbal Learning
and Verbal Behavior, VI (1967), pp. 335 - 338.

it followed other sentences of its own type. These results indicate that in the perception of sentences, surface structure plays an important part. Similar findings resulted in the perception of sentences which differed at the deep structure level. It was also noted that in the perception of the test sentences the subjects were only partially aware of the actual sounds of the recording. When an error did occur, the words chosen were more often compatible with the syntactic set rather than words phonetically close to the stimulus. It is possible that the complexity of a sentence "is a function not (or not only) of the transformational distance from its base structure but also of the degree to which the arrangement of elements in the surface structure provides clues to the relations of elements in the deep structure."[67] This is the assumption on which Fodor and Garrett[68] based their study in which they hypothesized that the presence of the relative pronoun in sentences like "The man whom the dog bit died" should make them perceptually less complex than corresponding sentences of the form "The man the dog bit died". They maintained the ease of perception of the first set of sentences would result from the presence of the relative pronoun which provides a surface structure clue to relationships expressed in the deep structure. The effect on perception was found to be as they predicted. To test the validity of the DTC theory, Fodor and Garrett added adjectives to the first set of structures, thereby increasing the number of transformations. Results, however, still showed that the group of sentences containing relative pronouns and adjectives was better perceived. According to

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[67]Fodor and Garrett, op. cit., p. 290.

[68]Ibid.

Fodor and Garrett this was just the reverse of the DTC prediction.
Fodor and Garrett, however, did not define "transformation".

The present writer would consider the deletion of the relative
pronoun as a transform and thus this set of sentences would be more
complex than the other. The fact that these sentences were more
difficult to perceive would be expected. When an adjective was added
to the first set of structures, then both sets were equal in terms of
the number of transforms. However, the second set was still more
difficult to perceive. Perhaps the factor unexplained was the nature
or type of the transform as has been suggested by Gough.[69]

Summary

It is difficult to draw any clear conclusion from the above
research reviews. This is so for a number of reasons. Authors very
often failed to define their terms. Thus one is not sure of what an
experimenter has in mind when he uses the word "transformation". Such
terms as negative, passive, emphatic, WH-transformations, singularly,
and generalized have been assumed under this term. Fodor and Garrett[70]
apparently did not consider the deletion of the relative pronoun a
transformation. Slobin[71] concluded from his study that the passive
should have been more difficult than the negative because the former
is more "grammatically complex". The latter term, however, was not
defined.

Difficulty of sentence structures was tested in a variety of

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[69]Gough, op. cit.

[70]Fodor and Garrett, op. cit.

[71]Slobin, op. cit.

ways. Most studies tested the difficulty of aural perception. Subjects were required to report or write down what they had heard. In some instances, the number of words correctly reproduced was the criterion of difficulty, whereas in other instances the difficulty was measured by the time it took to complete the task. Coleman and Blumenfeld[72] used written sentences and measured the difficulty of sentence transformations by the "cloze" technique. These sentences were presented in isolation. In all but the Slobin[73] study, the subjects were adults, usually undergraduate psychology students. One can conclude from the above that evidence for or against the DTC theory, is, at the most, conflicting.

The present study is being conducted to determine whether the number and type of transformations influence the difficulty of a printed prose passage which the child is asked to read. A second part of this study consists of stories constructed to control for the number and type of transformations. Subjects are children in grades four, five, and six, between the ages of nine and twelve. The difficulty of the stories read,and of the transformations contained therein,will be measured by means of the "cloze" technique. The following chapter is devoted to a description of this measure.

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[72]Coleman and Blumenfeld, op. cit.

[73]Slobin, op. cit.

CHAPTER IV

A REVIEW OF THE LITERATURE: THE "CLOZE" TECHNIQUE

The "cloze procedure" is used in this study to measure the
degree of understanding pupils have of selected prose passages, of
sentences within these passages, and of transformations within sentences.
Because of the importance of the "procedure" to this study, an
explanation will be given below.

Definition

The term "cloze procedure" first appeared in professional
literature in 1953 when it was used by Taylor[1] as a measure of
readability. The procedure consists of the deletion of words from a
passage by some objectively specifiable process. Words are generally
deleted in either of two ways: either every n^{th} word, or words of a
particular type (lexical, structural) are deleted. The words removed
are replaced by blanks of uniform length and the subjects are asked to
try to complete the blanks by guessing the word which has been deleted.
The forms may be scored by counting as correct only those insertions
which match exactly the words that have been deleted, or by accepting
in addition to exact replacements, synonyms of words deleted.

Cloze as a Readability and Comprehension Measure

The "cloze procedure" as was stated above, was first used as a
readability measure. Though it differed from the formulas which were

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[1]Wilson L. Taylor, "Cloze Procedure: A New Tool for Measuring
Readability," Journalism Quarterly, XXX (Fall, 1953).

commonly used at that time to measure readability of various selections,

Taylor showed that it was reliable as a readability measure. The

"cloze procedure" unlike the formulas, did not involve the counting of

elements. Nevertheless, according to Taylor "It seems to measure

whatever effects elements actually have on readability. And it does

so at the same time that it is also taking account of the influences

of many other factors readability formulas ignore."[2] Taylor considered

the "cloze procedure" as "throwing all potential readability influences

in a pot, letting them interact, them sampling the result."[3]

It was soon realized that the "cloze procedure" could be used

not only to give an indication of the readability of printed or written

materials, but also to determine the comprehension of these materials by

readers. Taylor reasoned that "if the statement that a passage is

'readable' means that it is 'understandable', then the scores that

measure readability should measure comprehension too."[4] Thus he

assumed that r lability and comprehensibility are synonymous terms.

The cloze score of a passage depends on the cloze score of all subjects

who attempt to complete that prose sample. In turn an individual's

cloze performance appears to depend heavily on how well he understands

the meaning of the materials to which he has been exposed - "hence on

factors which affect comprehension, such as general language facility,

specific knowledge and vocabulary relevant to the material at hand,

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[2]Ibid., p.417.

[3]Ibid., p.417.

[4]Wilson L.Taylor, "Recent Developments in the Use of "Cloze
Procedures," Journalism Quarterly, XXXIII (1956), p.44.

native ability to learn, attention, motivation and so on."[5] To test

the reliability of the "cloze procedure" as a measure of comprehension,

Taylor selected an article about 3,000 words in length. This was

mutilated to produce "any", "easy", and "hard" cloze forms. The "any"

form was produced when any and all words were considered equally liable

to deletion; the "easy" and "hard" forms were produced by deleting

certain words which were categorized as "easy" or "hard" on the basis

of the findings of previous studies. Cloze tests and multiple choice

tests of comprehension were administered before and after the reading

of the passages. Correlations were highly significant and positive

between all paired distributions of cloze and comprehension scores.

Cloze scores also correlated significantly with scores on the Armed

Forces Qualification Test. The test-retest reliability coefficients

for the three forms of the "cloze" were "any" - .88, "easy" - .80,

"hard" - .84. Taylor concluded that cloze readability scores are

"valid indices of the comprehensibility of English prose - for the

readers concerned."[6]

The "cloze procedure" as a measure of passage comprehension has

been since used in a number of studies. Jenkinson[7] used it in her

doctoral study to measure comprehension, and among her reasons for

selecting the "cloze" as a comprehension measure are:

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[5]Wilson L. Taylor, "Cloze Readability Scores as Indices of
Individual Differences in Comprehension and Attitude," Journal of
Applied Psychology, XLI (February, 1957), p.19.

[6]Ibid., p.25.

[7]Marion D. Jenkinson, Selected Processes and Difficulties of
Reading Comprehension (unpublished Doctoral Dissertation, the
University of Chicago, 1957).

1. A logical analysis of the processes which are brought into play in the completion of the "cloze" test suggests both selected general and specific factors which would be involved. From the general point of view, it was reasoned that many of the types of thinking involved in reading as suggested by reading specialists, such as evaluating, judging, imagining, reasoning, and problem solving, might be employed in the completion of this type of test. Specifically, context would need to be used, and the meaning of individual words would have to be fused together before the word required for the completion of the idea could be inserted.

2. It appears also that an individual's ability to complete a "cloze" test depends upon the extent to which he understands the meaning of the passage, and thus on the various factors generally included in comprehension, as well as on the knowledge of vocabulary and general language ability.

3. Most reading tests require the subjects to answer questions designed to measure the amount of knowledge obtained from a passage. Such a method depends upon the ability of the subject to understand the question as well as the passage. Furthermore, it seems probable that the understanding which is gained by an individual in the ongoing reading process may differ from the comprehension which ensues when the reader is guided by questions. This criticism would appear to be even more apposite when multiple-choice questions are used.

4. Russell suggests that the process of concept formation "involves inductive thinking, and at least sometimes deductive and creative thinking to clarify and verify the structure of the concept." Analysis of the process of the "cloze" procedure reveals that these types of thinking are brought into play on the verbal level.

5. The "language" factor as it is designated by Burt which relates words to words in context, and Thurstone's word fluency factor appear to involve vital language abilities which are rarely measured in tests of reading comprehension. Both the ability to understand words in context and verbal fluency will obviously be tested by the "cloze" procedure.[8]

Further adaptation of the "cloze" as a comprehension measure has been made within recent years. In 1966, Bormuth indicated "an acute need for readability formulas which measured the readability of individual words and sentences."[9] He maintained that if such a measure

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[8]Ibid., pp.62-64.

[9]John R. Bormuth, "Readability: A New Approach," Reading Research Quarterly, I (Spring, 1966), p.85.

existed, it could be applied to indexes, captions, and test items,
as well as to indicate difficult spots in larger texts. Thus in a
larger study he set as one of his purposes to determine whether it
was possible to obtain useful readability formulas for these smaller
units.[10] Bormuth used the "cloze" procedure as his readability
measure and on the basis of the results concluded it was a useful
measure of comprehension difficulty at the word level of analysis,
the independent clause level of analysis, and the sentence level of
analysis.

> The difficulty of every word, phrase, clause
> or sentence in a passage can also be determined
> by using five forms of a cloze test over the
> passage. To make the first forms, words 1, 6, 11,
> etc., are deleted; words 2, 7, 12, etc., are
> deleted to make the second form. This process
> continues until all five forms have been constructed
> and each word in the passage appears as a cloze
> item in exactly one test form. The proportion of
> subjects writing the correct word in a blank is
> used as a measure of difficulty of the word
> deleted. The difficulties of the words within a
> phrase, sentence, or passage are averaged to
> determine the difficulties of those units.[11]

Validity

The claim has been made that "cloze" tests measure a pupil's
reading comprehension ability. If the "cloze" test is to be used
as such a measure, then evidence is required showing that the "cloze"
makes good this claim. Most of the validity studies that have been

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[10]John R. Bormuth, "Cloze Readability Procedure," CSEIP
Occational Report Number I (University of California, Los Angeles,
October, 1967).

[11]Ibid., p.2.

done in connection with the "cloze" procedure have showed its concurrent validity by correlating "cloze" test scores with scores on other reading tests. Table I which has been reproduced from Bormuth[12] shows the correlations between cloze readability tests and standardized tests of reading achievement.

Two studies which sought to investigate the "factorial validity" and the "construct validity" of the "cloze" procedure have been reported by Weaver and Kingston[13] and by Greene.[14] Weaver and Kingston submitted to factor analysis a battery of tests including eight cloze tests and found three factors to be predominant. These were verbal comprehension, redundancy utilization, and rote memory retrieval. The cloze tests related most closely to "redundancy utilization" and only moderately to "verbal comprehension." The latter was unexpected since most of the literature on the cloze has emphasized a close relationship between cloze tests and tests of verbal abilities. The authors of the above mentioned study pointed out the importance of noting that "there is much specific variance connected with the cloze procedure which is unexplained by this analysis."[15] To study the "construct validity" of the cloze procedure, Greene[16] prepared a test to measure two factors (words and relationships between words) which he assumed accounted for most of the variance in comprehension test results.

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[12]Ibid.

[13]Wendell W. Weaver and Albert J. Kingston, "A Factor Analysis of the Cloze Procedure and Other Measures of Reading and Language Ability," Journal of Communication, XIII (1963), pp.252-261.

[14]F.P. Greene, A Modified Cloze Procedure for Assessing Adult Reading Comprehension (unpublished Doctoral Dissertation, the University of Michigan, 1964).

[15]Weaver and Kingston, op.cit., p.261.

[16]Greene, op.cit.

TABLE I

CORRELATIONS BETWEEN CLOZE READABILITY TESTS AND STANDARDIZED
TESTS OF READING ACHIEVEMENT

Study	Subjects	Tests	Correlations
Jenkinson (1957)	High School	Cooperative Reading C2	
		Vocabulary	.78
		Level of Comprehension	.73
Rankin (1957)	College	Diagnostic Survey	
		Story Comprehension	.29
		Vocabulary	.68
		Paragraph	.60
Fletcher (1959)	College	Cooperative Reading C2	
		Vocabulary	.63
		Level of Comprehension	.55
		Speed of Comprehension	.57
Hafner (1963)	College	Michigan Vocabulary Profile	.56
Ruddell (1963)	Elementary	Stanford Achievement	
		Paragraph Meaning	.61 -.74
Weaver and Kingston (1963, two cloze tests)	College	Davis Reading	.25 -.5
Green (1964)	College	Diagnostic Reading Survey	
		Total Comprehension	.51
Friedman (1964) 20 cloze tests	College (Foreign Students)	Metropolitan Achievement	
		Vocabulary	.63 -.85
		Total Reading	.71 -.87

Significant correlations ranging from .49 to .59 were found between the cloze tests and the criterion tests. However, like Weaver and Kingston,[17] Greene observed that a considerable amount of the variance was not accounted for by the cloze scores and concluded that "the cloze procedure is more complex than was thought."[18]

Cloze Test Reliability

Very few studies showing the reliability of the "cloze" procedure have been found in the literature. In a study using grade four, five, and six pupils, Bormuth[19] computed the reliabilities of the "cloze" procedure by the method known as rational equivalence or internal consistency. Cloze tests were made over nine short passages - three in each of the subject matter areas of literature, social studies, and science. Reliability coefficients when calculated for each of the nine passages ranged from .84 to .87. When scores of the pupils in each grade were grouped for the nine passages the coefficients were .84 for grade six, .91 for grade five, and .94 for grade four. Bormuth concluded that "the cloze tests were valid and highly reliable predictors of the comprehension difficulty of the passage."[20] Taylor[21] using Armed Forces Personnel as subjects and employing the "any", "easy", and "hard" cloze forms found that the test-retest reliability coefficients for these forms were respectively

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[17]Weaver and Kingston, op.cit.

[18]Greene, op.cit., p.139.

[19]John R. Bormuth, "Cloze as a Measure of Readability," IRA Conference Proceedings (New York: Scholastic Magazines, 1963), pp.131-134.

[20]Ibid, p.134.

[21]Taylor, op.cit., 1957.

.88, .80, and .84. A study by Gallant[22] found that the cloze test reliability decreased markedly when such tests were used with first grade children.

Methodological Considerations

In considering test length, such factors as time, fatigue, and the degree of test reliability needed for a particular purpose must be taken into account. According to Taylor[23] a 50 item test provides a sufficient sample for a staple score with chances for easy and hard words to cancel out. However, Bormuth[24] using 50 item tests found significant differences between means for over one half of twenty cloze forms. In a following study, Bormuth[25] found that increasing the number of items in a cloze test reduces the error in estimating the difficulty of the materials more rapidly than adding the same number of pupils.

Deciding how many words of the text should be left between cloze items also posed a problem for cloze test users. Leaving fewer words between test items makes it possible to obtain a larger number of items for a given test length; however, it also introduces the possibility that items will exhibit statistical dependence such that the ability of a subject to respond to one test item will depend upon whether or not he can respond correctly to an adjacent test item.

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[22]R. Gallant, An Investigation of the Use of Cloze Tests as a Measure of Readability of Materials for the Primary Grades (unpublished Doctoral dissertation, Indiana University, 1964).

[23]Taylor, op.cit., 1956.

[24]John R. Bormuth, "Experimental Applications of Cloze Tests," IRA Conference Proceedings (Newark, Delaware: International Reading Association, 1964).

[25]Bormuth, op.cit., 1966.

This problem was studied by MacGinitie[26] who varied the number of words left intact on either side of a cloze item. He could not detect any dependence among items when four or more words of text were left between items.

Studies showing that it makes little difference in results whether students are given cloze tests before or after reading the passage(s) which are being tested by means of the cloze, have been reported by Taylor[27] and Rankin.[28] From a review of these studies, Bormuth concludes "Consequently when greater validity and reliability are desired, it is probably more economical to obtain it by increasing the number of items in the cloze test and by giving the tests to subjects who have not read the passage."[29]

Scoring Procedure

According to Bormuth "a response can differ from the deleted word in semantic meaning, grammatical inflection, and spelling."[30] These factors have been considered by researchers when scoring cloze

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[26]Walter H. MacGinitie, "Contextual Constraint in English Prose Paragraphs," The Journal of Psychology, LI (1961), pp.121-130.

[27]Taylor, op.cit., 1956.

[28]Earl F. Rankin, Jr., "The Cloze Procedure - Its Validity and Utility," National Reading Conference Eighth Yearbook, 1959.

[29]Bormuth, op.cit., 1967, p.15.

[30]Ibid.

tests. Studies by Taylor,[31] Rankin,[32] and Ruddell[33] have found that although slightly higher scores are obtained when synonyms are considered correct, there is no significant differences in test reliability or validity between a scoring system considering scoring synonyms correct and one in which credit is given only if the exact word is replaced in the blank space. Rankin concluded that "for measurement purposes, the more tedious and subjective procedure of giving credit for synonyms is not worthwhile."[34]

Decisions on the "Cloze"

In light of the results of the studies cited above, the writer makes the following decisions with regard to the use of the cloze procedure in this study. Every fifth word will be deleted from the passages to be used, and the five possible cloze forms will be made so that all words will be eventually deleted. Thus the cloze score may be used as a measure of transform type, sentence, and passage difficulty. The cloze test will be taken by pupils who have not read the passages. The "cloze" will be scored by three different methods. The methods and the reasons for using them will be described in Chapter V.

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[31]Taylor, op.cit., 1956.

[32]Rankin, op.cit.

[33]Robert B. Ruddell, An Investigation of the Effect of the Similarity of Oral and Written Patterns of Language on Reading Comprehension (unpublished Doctoral dissertation, Bloomington: School of Education, Indiana University, 1963).

[34]Earl F. Rankin, Jr., "The Cloze Procedure - A Survey of Research," Sixteenth Yearbook of the National Reading Conference (Milwaykee, Wisconsin: The National Reading Conference, Inc., 1967), p.157.

CHAPTER V

THE ANALYSIS OF BASAL READERS AND CONSTRUCTION OF STORIES

A review of the literature has shown the importance of language
as a factor in the comprehension of printed or written materials.
However it is only in recent years that any attention has been paid
to the importance of syntax in comprehension. Although children at
the fourth grade level begin to branch out into sources of reading
other than the basal reader series, the basal reader is popularly
used in the teaching of reading at this level. Furthermore, it is
believed that there is a gap between the type of language used in
grade three and grade four basal readers, that is, the language
of the grade four basal readers tends to rise sharply in complexity.
This has been posited by writers as a reason why many children begin
to show reading difficulties in the elementary grades. Since the
emphasis in reading at the grade four level is still on the teaching
of the "skills" of reading, it was decided to make an analysis of
the language structures (in terms of the number and types of
transformations) of prose passages written by authors of basal readers
at this level.

In this chapter, after a brief description of each of the
basal reader series selected for analysis, the Bateman and Zidonis
grammar - on which the sentence analysis was based - will be described.
This will be followed by an explanation of how each sentence of the
sample was analysed. The final form of the transformation rules and
the construction of the stories used in this study will be described.
The final section will be devoted to the scoring of the "cloze" and

determining the difficulty of sentence transformations.

I. SELECTION OF READER SERIES

The three basal reader series chosen for analysis in this study are 1) the Ginn Basic Readers, 2) the New Basic Readers, and 3) the Young Canada Readers.

The Ginn Basic Series (Canadian Edition) is widely used in Canadian schools. The stories of this series cover a wide range of interest - fairy tales, tall tales, talking animal stories, stories of rural and city life, of child life far away and long ago, of boys and girls and men and women at work and at play.[1]

The New Basic Readers of the Curriculum Foundation Series (Canadian Edition) is also widely used in Canadian schools. Among the aims of the authors of this series is the aim "to develop the fundamental language understandings and the basic interpretative skills common to the reading done in all areas of the curriculum."[2] An analysis of this series for linguistic structures has been made by Robertson[3] who was mainly concerned with the types of connectives that occurred in the basal readers at the grade four, five, and six levels.

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[1]The Ginn Basic Reader Series, Manual to Accompany Roads to Everywhere (Toronto: Ginn and Company, 1964), p.29.

[2]The New Basic Readers, Manual to Accompany the New Times and Places (Toronto: W.J. Gage Limited), p.16.

[3]Jean Elizabeth Robertson, An Investigation of Pupil Understanding of Connectives in Reading (unpublished Doctoral dissertation, The University of Alberta, Edmonton, 1966).

The Young Canada Readers is a relatively new series (1964) compiled by Canadian editors. Material was selected, not only for the development of the various reading skills, but also to provide for the study of literature. "In order to achieve this combined purpose, the words of the author remain unchanged in all but one of the selections; pupils, in the natural reading situation, meet literature in its original form, without its freshness being destroyed by adaptation."[14] The prose selections of this series cover a wide range of topics and reflect a wide range of sources - stories from literary heritage, folk - and fairy - tales, passages from the Bible, narratives of adventure, animal stories, stories of Canada and of the Commonwealth and of other lands and people, biographies, plays, stories related to history and science, narratives with moral and spiritual values, modern fantasy and humorous tales.[5]

Below are the basal reader texts at the grade four level in each of these series and which were the source of the sentence samples investigated in this study.

Series	Date of Latest Printing	Name of Reader
The Ginn Basic Readers (Canadian Edition)	1964	Roads to Everywhere
The New Basic Readers (Canadian Edition)	no date given	The New Times and Places
Young Canada Readers	1964	Young Canada Readers - 4

Throughout the remainder of this study, the Ginn Basic Readers will be designated as Series A, the New Basic Readers as Series B,

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[4]Young Canada Readers, Grade Four Manual (Toronto: Thomas Nelson and Sons (Canada) Limited, 1964), p.7.

[5]Ibid., p.11.

and the Young Canada Readers as Series C.

Sentences selected for analysis were chosen from a total of twenty-one stories – seven from each reader series. The stories were selected by dividing each basal reader into seven sections (approximately. equivalent in the number of pages per section) and then using a table of random numbers, a page was drawn from each section. The total number of pages in a text was counted from the first page of a written passage designed for the pupil's reading to the last page of some such final passage. For example, in the New Times and Places, the first pupil selection begins on page 6, and the last page of the final passage is on page 461 – for a total of 456 pages. The seven sections will end on pages 71, 135, 199, 263, 391, and 456, respectively. A passage of at least 100 words in length was drawn from each page. If a poem occurred on a page that had been randomly selected, then the next nearest page with a prose passage was chosen. Captions and titles were excluded from the analysis.

Table II contains a brief summary of the pertinent data on each

TABLE II

PERTINENT DATA ON LANGUAGE SAMPLES CHOSEN FOR ANALYSIS

| | Basal Reader Series | | | |
	Series A	Series B	Series C	Total
Number of Passages	7.0	7.0	7.0	21.0
Average number of sentences per passage	9.9	11.2	8.3	9.8
Average number of words per sentence	12.6	10.9	16.0	13.2
Total number of words per passage	868.0	863.0	926.0	2657.0
Total number of sentences per passage	69.0	79.0	58.0	206.0

passage chosen for analysis.

II. THE GRAMMAR OF THE BATEMAN-ZIDONIS (1966) STUDY

Dissatisfied with the extant research on the correlation

between the study of grammar and the improvement of pupil writing,

Bateman and Zidonis[6] devised a study to determine what effect, if any,

the teaching of a generative grammar would have upon the writing of

ninth grade and tenth grade pupils. From the writing of Chomsky,[7]

Lees,[8] and Fillmore,[9] the authors developed a grammar that could be

used in the study of sentence formation and in describing the

transformational history of sentences analysed in the writings of the

grade nine and ten pupils. The grammar contained a set of 46 rules,

and according to Bateman and Zidonis "this descriptive tool is an

objective, largely mechanical device for identifying the grammatical

components of each sentence produced."[10] The rules were of four

major types - Embedding, Conjoining, Deletion, and Simple. For

the complete grammar of Bateman and Zidonis, the reader is referred

to Appendix A.

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[6]Donald R. Bateman and Frank J. Zidonis, "The Effect of a Study
of Transformational Grammar on the Writing of Ninth and Tenth Graders,"
NCTE Research Report No,6, The National Council of Teachers of English,
Champaign, Illinois, 1966.

[7]Noam Chomsky, Syntactic Structures (The Hague: Mouton and
Company, 1957).

[8]Robert B. Lees, "The Grammar of English Nominalizations,"
Supplement to the International Journal of American Linguistics,
XXVI (1960).

[9]Charles J. Fillmore, Desentential Complement Verbs in English,
The Ohio State University Research Foundation, GN 174, Report 1,
April 1964.

[10]Bateman and Zidonis, op.cit., p.5.

III. ANALYSIS OF THE SENTENCES

An analysis was made of each sentence by drawing a phrase-marker for it. By comparing the phrase-markers of the deep and surface structures, it could be determined which transformations had been applied. A search was then made of the Bateman and Zidonis rules to determine if they had formulated rules to account for these transformations. If such rules were available, they were accepted as part of the grammar of this study. When a comparison of phrase-markers revealed the presence of transformations which were not accounted for by the Bateman and Zidonis grammatical rules, then transformation rules to take care of these were devised by the writer. After all the sentence types had been examined in the manner stated above, an analysis was made of the Bateman-Zidonis grammar to determine which of their rules had not been utilized. These rules were then deleted or in a few instances conflated. The grammar was then typed in its final form. Ruled sheets were drawn up which contained the transformation rules in the left hand column and which provided separate columns for each sentence of a passage. Each sentence was then taken and if a transformation had applied, a tick (✓) was placed at the appropriate intersection of the columns. This information was later used for summary purposes.

IV. FINALIZATION OF GRAMMATICAL RULES

The transformation rules in their final form as used in this study are listed in Appendix B. The rationale for the manner in which the rules are stated and the choice of rules will be given below.

The language corpus consisted of a random sample of sentences used by authors of prose in selected passages of three grade four basal readers. The two main hypotheses concern the number of transformations per sentence and the types of transformations. Thus it was considered necessary to state only those transformations which were used in the derivation of the sentences of this corpus. However, it is assumed that these transformation rules are part of a complete grammar (see Chapter III). Though phrase markers were drawn for the various sentence types to find the transformations which had been applied, it was decided to state the rules in the manner of Bateman and Zidonis[11] rather than using category symbols or derived phrase-markers. If category rules were used, it would be necessary to state all the base rules. Since the base rules themselves were not under investigation in this study - though it is assumed that they underlie the transformation rules used - a listing of them was not deemed necessary. It was decided that drawing derived phrase-markers for each sentence type would lead to an extremely complicated way of stating the rules, and thus, this method of describing the grammar was discarded.

The four main types of transformations as used by Bateman and Zidonis were retained. These are the Embedding, Conjoining, Deletion, and Simple.

The source for Embedding transformations is accounted for by recursiveness in the base. That is, the embedding transformation acts on structures which have been embedded in the base. Recursiveness in

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[11]Ibid.

the base gives more power to a grammar in that it makes the underlying

structures of the sentences of a language unique, that is, each

sentence has a unique underlying structure. The recursive property of

the base also allows for singulary transformations in the derivation

of sentences.

The Bateman and Zidonis grammar lists "Relative Clause (Be)",

"Relative Clause (Have)", and "Relative Clause (Vb)" as separate

transformations. An analysis of the sentence structures indicated

these transformations involved the same type and number of processes

and the results of the pilot study showed that the pupils did not

seem to distinguish these in regard to difficulty as measured by the

"cloze" procedure." Consequently it was decided to conflate these

as one rule "Relative Clause". A similar finding led to the decision

to conflate rules 34 - "Adverbial Replacement in Loc., Tm., Mot., or

Man. : You may go whenever you wish" and 35 - "Adverbial Replacement

He is happy because she smiled at him" into one rule which was listed

as "Adverbial Replacement".

The Bateman-Zidonis grammar made no provision for quotations.

It is possible, of course, that instances of direct speech did not

occur in the samples of writing which they analysed. Nevertheless,

such structures did appear in the corpus of this study. It was

decided to handle these as special instances of "That + S". This decision

was based on the writings of Chomsky.[12] At one point in the Aspects of

the Theory of Syntax where Chomsky discusses the strict subcategorization

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[12]Chomsky, op.cit., 1965.

of nouns, he lists _____ S' as one of the contexts in which nouns appear. Farther in the text when he discusses this context for nouns in relation to the other contexts in which nouns may appear, he says "The category _____ S' is not realized in so obvious a way as the others. Perhaps one should utilize this category to account for 'quotes contexts' . . ."[13]

"Gerundive Nominals" and "Gerundive Nominals of Purpose" of the Bateman-Zidonis grammar were reclassified as "Ing-Nominalization" and "Ing-Nominalization of Purpose", respectively. This change was made in accord with Lees'[14] writings on nominalizations. Lees also discussed "action nominals" and since these have an "ing" form, it was decided to use the "Ing-Nominalization" nomenclature which would account for these as well as for the "Gerundive Nominals". The "It-That Inversion" transformation was not found in the corpus of this study. However, it was used in the construction of stories in Part III of this study and was designated as 8a. This transformation was listed by Bateman and Zidonis as a Simple Transformation. However, the writer attributes the generation of this type of structure to processes similar to these underlying the generation of "That + S" structures and has therefore placed it in the Embedding category.

A number of surface structure features which were unaccounted for in the Bateman-Zidonis grammar were assigned to the category of Simple transformations. Examples of such transformations are "Aspect", "Comparative", "Reflexive-Intensive", "Vocative". The

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[13]Ibid., p.200.

[14]Lees, op.cit.

decision to assign these to the Simple transformation category was

based on the assumption that these are "simplex" in nature as opposed

to the "complex (embedding)" rules.

In the transformation generative model as outlined in the

Aspects of the Theory of Syntax, there is an assumed linear ordering

of elements in the base. That is, an NP normally precedes a VP (in

linear position), the subject of a sentence precedes the verb, and

prepositional phrases and adverbials are usually dominated by nodes

at the right hand side of the phrase marker. Since it is assumed

that the above and other elements appear in the deep structure in a

particular linear order, then it would follow that any departure

from this ordering in the surface structure is brought about by

means of transformations. Four types of sentences were found in the

corpus which suggested transformations of this nature. These were

classified as a sub-group under the heading "Position-Shift".

V. CONSTRUCTION OF THE STORIES

There was no control over the number of transformations, the

types, or the number of any one type of transformation in the passages

analysed from the basal readers and tested by the "cloze" procedure.

It was possible that a large number of one type of transformation

might be predominant in a passage and the difficulty of the passage

might be influenced, not so much by the type of transformation per se,

but by the numbers of a particular type. In view of this it was

decided to construct two sets of stories in which there would be some

control over these variables. In the remainder of this study, the

twenty-one stories drawn from the basal readers will be referred to as

Part I of the study. The following sets of stories to be described
will be designated as Stories - Part II, and Stories - Part III,
respectively.

Stories - Part II. From each of the three basal reader series, one
passage of prose was randomly drawn. A page used in the stories of
Part I of the study, could not, of course, be used again, and if
such a passage were drawn, the next page following was chosen. From
each page, a portion of about one hundred words was selected. Using
the transformation rules as a guide, each story was then rewritten
in four different ways. Each of the four forms of a story contained
twenty transformations. The twenty transformations could be divided
into two groups of twelve and eight. That is, twelve of the
transformations were of one of the four major types - Embedding,
Conjoining, Deletion, and Simple, whereas the remaining eight were
made up of transformations from the other three categories. There
were two exceptions to this procedure. After the stories had been
constructed, a change was made in the grammar of the study. At the
time of construction, the "It-That Inversion" transformation was
classified as a Simple transformation (as in the Bateman and Zidonis
classification) and this transformation was incorporated in two of
the stories under this classification. On the basis of further
research studies reviewed it was decided that the "It-That Inversion"
would be more appropriately classed as an Embedding transformation.
Thus after this change, two forms of the stories each contained
eleven transformations of the Simple type and nine transformations of
the other three classifications.

Vocabulary Control. The vocabulary of the stories was controlled by using the words of the original stories as far as it was possible. However, in order to get the proper proportion of transformations, ten words other than those in the text were used. With one exception these words occurred within the first 4000 words of the Lorge and Thorndike[15] list of 30,000 words placing them at a grade four level of difficulty. "Hopeful" was the word used which was not within the first 4000 words of the above list.

Stories - Part III. From each of the basal readers, two more pages were randomly drawn. The conditions were that the page must be in prose and that it must not have been previously selected from Part I or Part II of the study. A passage of about one hundred words was drawn from each page. Five versions of each passage were constructed. The first version consisted of the passage exactly as it had been printed in the text. This was considered the basic passage. To this passage, a sentence containing a transformation of the four major types was added separately. That is, the five versions of a passage would consist of the Basic passage, Basic plus an Embedding transformation, Basic plus a Conjoining transformation and so on. The six basic stories were randomized into three lots of two. To one lot, the transformations were added in the initial position, to the second lot in the medial position and to the third lot in the final position. The stories of Part III may be found in Appendix E.

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[15]Edward L. Thorndike and Irving Lorge, The Teacher's Word Book of 30,000 Words (New York: Bureau of Publications, Columbia University, 1944).

VI. THE PILOT STUDY

A pilot study to determine the feasibility of the stories (especially those of Part II and Part III), the adequacy of the directions, the time needed by the pupils to complete the stories, and the most suitable method of scoring the "cloze" was carried out in an Edmonton Separate School in December 1968. Twenty-eight pupils from grade four and thirty-two pupils from grade six completed the stories. Each pupil was given four stories - one from Part I, one from Part II and two from Part III. The sample was subdivided so that one story from Set I, three stories from Set II, and six stories from Part III were used. Stories and pupils were randomized for the administration. To determine the adequacy of the directions for the teacher as well as for the pupils, the examiner had the teacher of one group administer the tests, while the examiner himself administered the tests to the other grade.

Though the results of the study showed that the grade six pupils completed the stories with greater ease than the grade four pupils, the stories did not appear too difficult for the pupils of the latter grade. However, the grade four pupils took much longer than expected to complete the stories. Consequently it was decided to divide the twenty-one stories into two lots of ten and eleven stories and to double in number the proposed grade four sample. The sample and stories would be randomized in such a way that one hundred grade four pupils would complete each of the twenty one stories. The three stories of Part II and the six stories of Part III were administered to all pupils in the final test sample. The procedures for administering the "cloze" tests are given in Table III.

TABLE III

ADMINISTRATION OF THE CLOZE TESTS

	No. of stories	No.of transf. versions	No. of cloze forms	No.of sub-gps. required	N of total sample
Part I					
Grade 5 and 6	21	-	5	5	129 109
Grade 4	10	.	5	5	100
	11	-	5	5	102
Part II					
Grs.4-5-6	3	4	5	20	440
Part III	6	5	5	25	440

Twenty sub-groups were required for the administration of the "cloze" forms of Part II. This was necessary since there were four transformation versions or forms (Embedding, Conjoining, Deletion, Simple) of each story, employing basically the same vocabulary. Consequently no two forms could be administered to the same student. This really meant that there were four different sets of stories and with five "cloze" forms constructed on each set, twenty sub-groups were necessary for their administration. A similar rationale held for the twenty-five sub-groups of Part III.

Directions for both pupils and teachers were readily understood and were used in the main study without change.

VII. SCORING THE EXPERIMENTAL TESTS

On the basis of the results of the pilot study, it was decided to score each item inserted for one of six features. The six scores

were : identical (I), grammatical-semantic (GS), grammatical only (G),

semantic only (S), grammatically dissimilar but semantic (-GS),

grammatically dissimilar but not semantic (-G), and incorrect.

Identity of words is self-explanatory. A word was classed as

grammatical if it was dominated by the same type of node as dominated

the item of the original passage. If it could not be traced back to

the same node in the derived phrase marker, then the item was considered

grammatically dissimilar. An item was classified as semantically

correct if it were a synonym for the word deleted or if it did not

change the meaning of the passage. It was necessary to consider both

the single item replaced and the item in context. The latter was

necessary since transformations cross sentence boundaries. The results

of the pilot study had shown that pupils inserted words which were

grammatically dissimilar to the words deleted but were grammatically

acceptable within the context of the passage.

Proper names were scored as grammatical-semantic (GS) if the

word inserted was a reasonable substitution. Any boy's name would

have been accepted in place of a boy's name, or the name of any city

in place of the name of a city as long as the substitution did not

contradict the presence of this name at some other point in the passage.

Punctuation was observed in the scoring. In the sentence

"Trees were cut down, land had to be cleared, cattle had to be

herded, and many other hard jobs had to be done" the word "the" was

often inserted in place of the word "down" and was marked as incorrect.

To simplify decision making in scoring, a features table was

constructed. The format of this table is illustrated in Figure I.

WORD	G_1	G_2	S_1	S_2
smooth	+	+	-	-
and	-	+	-	-

Fig.1 FEATURE MATRIX FOR SCORING THE CLOZE

The features G_1 (grammatical in terms of the item deleted), G_2 (grammatical in terms of context), S_1 (semantic in terms of the item deleted, that is a synonym substitution), and S_2 (semantic in terms of the context) formed the horizontal dimension of the table. The words to be scored formed the vertical dimension. Each word of the "cloze" was placed within the table and the scorer determined if the features designated were positive or negative. Suppose the word "smooth" were substituted for the word "high" in the sentence "When the water of the lake is high, as it often is, the gull shape cannot be seen" then it would appear in the matrix as shown. It was then necessary to transfer the markings of the features table into the five sets of "cloze" markings. The manner in which this was done is shown in Table IV.

TABLE IV

CORRESPONDENCES BETWEEN FEATURES TABLE MARKINGS AND CLOZE SCORES

Feature Possibilities	Cloze Scores
If G_1 and G_2 and S_1 and S_2 are marked positively	GS
If G_1 and G_2 are marked positively	G
If S_2 is marked positively	S
If G_2 not G_1 and S_2 are marked positively	-GS
If G_2 not G_1 is marked positively	-G
All features marked negatively	incorrect

Since the word "smooth" is marked positively for G_1 and G_2, it would be designated by the symbol G. If the word "and" were substituted for "of" in the sentence "It is on the grey rock of this mineral island that the gulls build their nests", it would be designated by the "cloze" score -G because of its features as presented in the features table.

Though twenty-four possibilities or scoring categories may be derived from the features table, there are a number of redundancies which reduce the total somewhat. For example, $+G_1$ implies $+G_2$, $+S_1$ implies $+S_2$, $+S_1$ implies $+G_1$ etc. Thus it was decided to limit the number of categories to those listed above.*

VIII. TRANSFORMATION DIFFICULTY

The rules of grammar as listed in Appendix B were used in determining the number of transformations per sentence. The rules also indicate the names given to the various transformation types. For measuring the difficulty of particular types of transformations, the words which have been brought into the surface structure as a result of the application of a particular transformation were measured rather than the transformation itself, since the latter is an abstract process. From the results of marking the "cloze", a score was obtained for each word in the passages tested. This was done by transferring the individual scores for each word to a column under that word which enabled one to get the average difficulty for that word. Supposing forty-eight subjects gave acceptable responses for the word "high" in the sentence beginning "When the water of the lake is high . . ." then the average difficulty of the

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*See Appendix G for examples illustrating the various scoring categories.

word is .8 since 60 subjects completed a "cloze" form in which this word was deleted. To get a difficulty index for the phrase "of the lake", the scores for each word in this phrase would be combined and averaged. An analysis of sentence types showed that transformation types could not always be measured independently of one another. Thus it was necessary to add a category termed "multi-transforms". This was actually a combination of two or more of the transformation rules of the grammar.

IX. RELIABILITY OF SENTENCE ANALYSIS AND SCORING PROCEDURE

In order to determine whether the method of analysing sentences using the grammar of this study was reliable, a passage was chosen randomly from the twenty-one passages of the texts and xeroxed copies submitted to two doctoral students with a copy of the grammatical rules. They were asked to determine which and how many of these rules were used in the construction of the sentences of the passages. There was perfect agreement between the analysis of both individuals and the analysis of the passage by the examiner.

Interscorer Reliability

Two passages were drawn randomly from those completed by the test sample. Two xeroxed copies were made of each story and were given to an undergraduate and a graduate student with instructions for scoring. The original copy was scored by the examiner. An examination of the results showed complete agreement among all three individuals on the scores for the deleted items. On this basis it was decided that the scoring method was reliable. All items of the completed stories were scored by the examiner.

Reliability of "Cloze" Scoring Methods

In all of the studies reviewed on the "cloze" procedure, the authors considered either the replacement of the word deleted or its synonym in their scoring. The investigator departed from that procedure by considering three scoring methods for the "cloze". The first consisted of scoring for those words which were identical to or synonymous with the words deleted. Number two Method consisted of the same procedures as in the first Method plus accepting those words which were grammatically similar to the words deleted. The scores from this Method were used to derive difficulty indexes for the transforms. It was felt that this type of method was necessary for this purpose since transforms are syntactical units. Thus a child who substitutes an adjective for an adjective (even though the substitution is not a semantic synonym) would be considered to have control of this particular transform. The results of the pilot study indicated that a number of pupils substituted a word which was not grammatically similar to the word deleted but was grammatically acceptable within the context of the sentence or passage. Thus the addition of this type of words to the procedures of the second scoring Method constituted Method Number Three. The first method was used to get reliability scores for the other two methods. Correlations were calculated between the three scoring methods and the results are shown in Table V.

The correlation coefficients of Table V indicate the high degree of reliability between the three methods of scoring the "cloze".

TABLE V

CORRELATIONS BETWEEN THE DIFFERENT 'CLOZE' SCORING METHODS

	Methods 1 and 2	Methods 1 and 3	Methods 2 and 3
Grade 4	0.938	0.936	0.935
Grade 5	0.907	0.904	0.900
Grade 6	0.955	0.945	0.950
Total	0.938	0.937	0.933

CHAPTER VI

THE EXPERIMENTAL DESIGN

This chapter contains a description of the design of the study,
the pupils who participated in the experiment, the data relevant to the
study, the collection of the data, and the statistical treatment.

I. THE DESIGN OF THE STUDY

The main purpose of this study was to investigate the relation-
ship between the reading difficulty of selected prose passages and the
number of transformations per sentence and the type of transformation.
The design used is the treatment by subjects plan. The treatment is
the "cloze" tests which were constructed on selected prose passages
from grade four basal readers, and on stories devised by the examiner.
The construction of these stories is described in Chapter V. The
"cloze" tests were constructed so as to allow for the collection of
data on passage, sentence, and transformation difficulty, and were com-
pleted by pupils in grades four to six in Newfoundland schools.

The variables under consideration in the study were: grade,
chronological age, sex, reading achievement, mental ability and socio-
economic status.

Computation of correlations and analysis of variance were the
main statistical techniques used to analyse the data.

II. SAMPLE

This section will contain an overview of the population from which the sample was drawn. The age, grade, sex, and socio-economic levels of the pupils who participated in the study will be described.

Sample Selection

The test population for this study consisted of those students who were studying in grades four, five, and six in the schools of St. John's, Newfoundland. According to the Department of Education Report for 1968, the number of pupils in those grades for the year 1967-68 was 7108. This pupil population was studying in forty-two different elementary schools. Because the administration of the tests for this study would take from eight to ten days, it was decided to select whole classes rather than randomize by student. Permission was obtained from the Roman Catholic and United Church School Boards. Three schools were selected from the former system and were chosen as they appeared on a list provided. One school was chosen from the United Church School system and was selected because of ease of access. These schools may be considered fairly representative of the St. John's school population for the following reasons. They contained a total of 2915 pupils with 1053 of these pupils enrolled in grades four, five, and six. The schools were located within each of four different provincial districts. Finally a school often serviced pupils from beyond its immediate vicinity. In one of these schools, at least sixty per cent of the pupils came from beyond the boundaries normally serviced by this school.

The total number of pupils in the classes selected was 567.

Grade of the Test Sample

It was the purpose of this study to determine the relationship between the complexity of language (as measured by the number and type of transformations) and the comprehension of selected prose passages from grade four basal readers. It was felt that the language of the grade four readers was sufficiently complex for this purpose. Considerable time is still devoted to the teaching of reading skills in grades four, five, and six. Most basal readers extend to the grade six level. Thus pupils from these three grades were chosen as the subjects for the investigation.

Age of the Sample

In order to choose, as far as it was possible, those pupils who were progressing through school at a normal rate, it was decided to limit the age range of the sample to the years between nine and twelve inclusive. The ages were taken from the school registers.

Sex of the Sample

Since the report from the Department of Education for the year 1967-68 showed that about equal numbers of boys and girls were studying in grades four, five, and six, in St. John's schools, it was decided to choose equal numbers of both sexes.

Socio-economic Status of the Sample

A review of the literature shows that there is a close relationship between language and socio-economic status. Bernstein stated "that certain linguistic forms involve for the speaker a loss or an acquisition of skills - both cognitive and social - which are strategic for educational and occupational success, and these forms of language

use are culturally, not individually determined."[1] Thus it was

considered necessary to treat socio-economic status as a variable in

the analysis of the data. Socio-economic status was rated by the

Blishen Occupational Class Scale.[2]

The data used to construct this scale were taken from the

decennial census of 1951 which classifies occupations according to a

variety of characteristics including income and years of schooling.

These two characteristics were used to arrange the occupations

hierarchically. The average income and the average number of years

of schooling were then determined and standard scores were computed,

which when combined were used to rank the occupations on a scale.

The resulting scale contained 343 occupations which were divided into

seven categories.

Only one other study[3] regarding Canadian occupations and their

associated prestige had been undertaken at that date. When the

occupations of that scale were compared with similar categories on

the Blishen Scale the rank correlation was .91. Blishen stated that

"the use of data referring to a particular year implies certain

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[1]Basil Bernstein, "Social Class and Linguistic Development:A
Theory of Social Learning, "Education, Economy, and Society, eds. A. H.
Halsey, Jean Floud, and C. Arnold Anderson, (New York:Macmillan Company,
1961), pp. 288 - 9.

[2]Bernard Blishen et al., Canadian Society;Sociological Perspectives
(Toronto:The Macmillan Company of Canada, Ltd., 1961).

[3]Jacob Tuckman, "Social Status of Occupations in Canada,"
Canadian Journal of Psychology, Vol. 1 - 2, 1947 - 48, pp. 71 - 74.

restrictions on the generalizations that can be derived from them."[4]

There has been no revision of the scale, however, even though another

census has since been taken and the results published.

The figures in Table VI indicate the number of pupils falling

in each of the seven categories of the Blishen Scale.

TABLE VI

SOCIO-ECONOMIC STATUS OF THE TEST SAMPLE (N = 440)

SCALE	Grade 4	Grade 5	Grade 6	Total
1	4	8	1	13
2	35	26	24	85
3	5	5	7	17
4	8	9	6	23
5	109	60	45	214
6	20	3	6	29
7	21	18	20	59
Total	202	129	109	440

Final Test Sample

Any student who failed to complete all of the tests was dropped

from the sample. Also excluded were those students who had reached

their thirteenth birthday at the time of testing. After the necessary

deletions had been made, 440 pupils remained. Table VII gives a

breakdown of this sample according to age, grade, and sex.

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[4]Blishen, op. cit., p. 449.

TABLE VII

TEST SAMPLE BY AGE, GRADE, AND SEX (N = 440)

Grade	Boys	Girls	Total
4	100	102	202
5	66	63	129
6	54	55	109
	220	220	440

The N of grade four was much larger than that of the other grades since the number of stories in Part I had been divided into two sections for administration to the grade four pupils. One hundred grade four students still completed each story.

III. DATA PERTINENT TO THE STUDY

The "Cloze" Tests

The main testing instrument of this study was the "cloze" test which was constructed on the passages drawn randomly from grade four basal readers, and on stories designed especially for this study. The construction of these stories is described in Chapter V. The "cloze" tests were used to assess the difficulty of sentences which varied according to the number of transformation rules applied in their derivation, the difficulty of types of transformations and the reading comprehension of the different prose passages.

Mental Ability

Mental ability has often been considered a factor in language comprehension. Brighter children often seem to be more skilled in manipulating language components - both usage and understanding. Chomsky

maintains that "the language-acquisition device is only one component of the total system of intellectual structures that can be applied to problem solving and concept formation; in other words, the faculté de langage is only one of the faculties of the mind."[5]

The mental ability of the pupils of this study was assessed by the <u>Cooperative School and College Ability Test (SCAT)</u>, Level 5, Form 5A. This test helps to estimate the capacity of a student to undertake the academic work at the next higher level of schooling.. There are four subtests which are designed to measure two kinds of school related abilities - verbal and quantitative. Sections I and III which involve sentence understanding and word meaning, respectively, provide a verbal score, while Sections II and IV which include numerical computations and numerical problems provide a quantitative score. The combination of the numerical and quantitative scores give a total score. In his summary of the review of this test in the <u>Fifth Mental Measurements Yearbook</u>, Fowler stated that "undoubtedly, <u>SCAT</u> is a superior test series. It clearly shows the result of careful planning, an excellent experimental program, and the use of sound, up-to-date statistical procedures."[6]

Reading Achievement

To assess the reading achievement of the students of the test sample, the Reading Test, Level 4, Form 5A of the <u>Sequential Tests of</u>

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[5]Noam Chomsky, <u>Aspects of the Theory of Syntax</u> (Cambridge:The M.I.T. Press, 1965), p. 56.

[6]Hanford M. Fowler in <u>The Fifth Mental Measurements Yearbook</u> ed. O. K. Buros (Highland Park, New Jersey:The Gryphon Press), pp. 453 - 5.

Educational Progress (STEP) battery was administered. According to the

STEP manual the STEP battery of tests "provides for continuous measure-

ment of skills over nearly all of the years of general education, so

that the cumulative effect of instruction can be ascertained."[7]

Hobson states that "the STEP reading tests are a broadly conceived,

expertly planned, scientifically executed, efficiently packaged series

whose innate validity will be demonstrated in the crucible of use."[8]

He goes on to say that this test "may well prove to be the most useful

and authoritative scholastic measuring instrument to be developed in

many years."[9]

The STEP Reading Test is primarily a reading comprehension test

and attempts to assess an individual's facility in using five major

comprehension skills. These are (1) ability to reproduce ideas, which

among other sub-skills consists of comprehending subject-predicate,

pronoun-antecedent, modifier-thing modified, and dependent-independent

clause relationship, (2) ability to analyse motivation, (3) ability to

translate ideas and make inferences, (4) ability to analyse presentation,

(5) ability to criticize. The materials by which these functions are

tested is well varied, including extracts from poems, plays, letters,

children's stories, and newspapers. This material is divided into two

subsections. There is a total score only. The STEP test has been

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[7]STEP Manual for Interpreting Scores, Cooperative Test Division,
Educational Testing Service, Princeton, N. J., 1957.

[8]James R. Hobson in The Fifth Mental Measurements Yearbook, ed.
O.K. Buros (Highland Park, New Jersey:The Gryphon Press), p. 653.

[9]Ibid.

validated largely by the method of item selection and analysis.
Reliability coefficients as calculated on the Kuder-Richardson
formula 20 range from 0.91 to 0.95.[10]

The STEP tests are a companion series to the SCAT tests in that
both were normed on the same population, and hence direct comparisons
between students' standings on the STEP and SCAT are possible.

IV. COLLECTION OF THE DATA

The data were collected from a sample of grades four, five, and
six students attending four schools in St. John's, Newfoundland. All
data were collected in the first two weeks of January, 1969.

Collection of the data could be divided into four separate parts:
the administration of the STEP and SCAT tests, the administration of
the "cloze" on the twenty-one stories selected from basal readers, the
"cloze" tests on three stories with equal numbers of transformations
and written especially for the study, and the "cloze" tests on six
stories to which transformations of different types had been added. On
the basis of the results of the pilot study it was decided to divide
the twenty-one stories into four groups with five stories in each of
three lots and six stories in the remaining division. Five "cloze"
forms were made on the stories in each lot in order that all words
would be deleted. This necessitated dividing the sample into five
subgroups which was done with the aid of a table of random numbers.
Randomized also was the order of stories in each group, and the word
to be deleted. Part II of the study contained three stories. There

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[10]STEP Manual for Interpreting Scores, op. cit.

were four versions of each story and five "cloze" forms of each version

which necessitated twenty subgroups in order to avoid having a child

receive two forms and/or two versions of the same story. Part III of

the study contained six stories, each of which had five versions and

five "cloze" forms which required twenty-five subgroups for adminis-

tration. As in Part I and Part II, the order of stories, the word to

be deleted,and the assignment of pupils to the subgroups was randomized.

Thus there were six lots of "cloze" tests. The order in which these

tests were administred was also randomized.

The examiner met with the teachers concerned and explained the

directions for the administration of the standardized and "cloze" tests.

These directions may be found in Appendix F of this study. In most

cases the tests were administered by the principal or by the teachers.

In a few instances the STEP or SCAT tests were administered by the

investigator. The investigator, however, was usually present in the

school while the tests were being administered.

V. TREATMENT OF THE DATA

Pupils' answers to the STEP and SCAT tests were scored on the IBM

Optical Mark Reader at the Division of Educational Research Services at

the University of Alberta. Statistical procedures were programmed for

use on the IBM 7040.

Cloze Scores Three methods of scoring the "cloze" were employed in

this study. The first method was used mainly for determining the

reliability of Methods 2 and 3. Method 2 was used to derive difficulty

indexes of transformations, sentences and passages while the results of

the third method were used in analysing various language patterns the

pupils had changed grammatically. For the stories of Part I there were three different difficulty indexes - one for each story, one for each sentence, and one for each transformation. There was also a pupil's "cloze" score for each story in Parts I, II, and III.

Order of Difficulty of Transforms The transforms were arranged according to their difficulty indexes so that the top and bottom thirds could be selected and comparisons made across grades.

Computation of Correlations

Correlations Between Three Cloze Scoring Methods Methods 2 and 3 of scoring the "cloze" were used particularly for the purposes of this study. To determine the reliabilities of these scoring procedures, correlations were calculated between each of these and Scoring Method 1.

Correlations of the Presence of Transformations with Sentence and Passage Difficulty In order to determine the relationship, if any, that existed between transformations and sentence and passage difficulty, the presence of a transformation was coded as 1 and its absence as 0, and correlations were calculated between these figures and sentence and passage difficulty. This was done for the total test group (N=440) and for students at each grade level.

Correlations of the Difficulty of Transformations with Sentence and Passage Difficulty For the total group and for each grade singly, correlations were calculated between the difficulty indexes of transformations and the indexes of sentences and passages.

Correlations of Cloze Scores with Selected Variables Correlations were determined between the "cloze" scores for pupils in each group (total, grades four, five, and six) and the following variables: grade, chronological age, mental ability, reading achievement, and socio-

economic status.

<u>Rank Order Correlations</u> To determine the degree of similarity between the rankings of the difficulties of transformations over grades, a rank order correlation was computed between the difficulty indexes of transforms at each grade level.

<u>Multiple Regression Analysis</u> This type of analysis was carried out to determine the extent to which the number of transformations per sentence would predict the difficulty of a sentence when the number of words per sentence was controlled. This procedure was also used to determine if the number of words per sentence would predict sentence difficulty when the number of transformations per sentence was controlled.

<u>One Way Analysis of Variance</u> To test the significance of variation in the difficulty indexes when pupils were divided into various groups, a one way analysis of variance was carried out. The groups set up for this purpose were by sex, grade, mental ability, and reading achievement. This statistical procedure was also used to test the significance of variation in reading and mental ability scores between boys and girls. A third use of this procedure was to determine the significance of differences between pupils' scores by grade on sentences when sentences were divided into twelve different groups on the basis of the number of transformations per sentence.

<u>Analysis of Variance with Repeated Measures</u> Each pupil completed the "cloze" on each story in Part III of the study. The transforms under consideration in these stories were added in the initial, medial, and final positions. To determine whether there was a significant difference in the variation of pupils' performance on stories when they were grouped by the position of the transformation an analysis of variance with

repeated measures was carried out.

The Analysis of Covariance To determine whether the number of trans-
formations per sentence affected the difficulty of sentences over grade
levels an analysis of covariance was completed.

Summary

The "cloze" tests were used as the treatments in this study.
Difficulty indexes on transformations, sentences, and passages were
derived from the results of these tests which were completed by 440
students in grades four, five, and six in Newfoundland schools.

In addition to the "cloze" scores of these pupils, six other
variables were investigated. These were sex, grade, chronological age,
mental ability, reading achievement, and socio-economic status.

To determine the relationship between the presence and difficulty
of transformations and sentence and passage difficulty, correlations
were computed. Correlations were also employed in testing the relation-
ship between different scoring methods and "cloze" test scores and
selected variables. Analysis of variance was the statistical procedure
used to test the significance in variations of the difficulty indexes
of the transforms for students when the latter were grouped by grade,
sex, mental ability, and reading achievement.

CHAPTER VII

FINDINGS: ANALYSIS OF SENTENCE SAMPLES EXTRACTED FROM BASAL READERS

This chapter contains the findings of the analysis of sentences selected from the basal reader series in terms of the number and the types of transformations which these sentences contain.

The grammar of the study contains forty-three transformation rules which are grouped under five different categories - Embedding, Conjoining, Deletion, Simple, and Position Shift.* A sentence may vary in the number of transformations it contains. According to the DTC theory (see Chapter III) the complexity of a sentence may be determined by the number of transformations it contains. However some authors have expressed the idea that the occurrence of types of transformations may also be important in determining the difficulty of sentence structures. The analysis of the data from the three basal readers investigated in this study will show the total number of transformations, and the percentage of the different types of transformations that were found to occur. Information will also be presented on the percentage of sentences that were found to contain different numbers of transformations and different types of transformations. The tables and figures included in this chapter are arranged so as to present information about each text separately and to show comparisons between the different series examined.

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*See Appendix B

I. DATA ON THE OCCURRENCE OF THE NUMBER OF SENTENCES AND TRANSFORMATIONS
ANALYSED

Seven passages were drawn from the basal readers by a stratified random procedure. That is, each text was divided into seven approximately equal sections and one page was drawn randomly from each section. Table VIII contains the number of sentences that were contained in the passages selected, the number of sentences that contained transformations, the total number of transformations and the average number of transformations per sentence.

TABLE VIII

SUMMARY OF NUMBERS OF SENTENCES ANALYSED AND NUMBERS OF
SENTENCES CONTAINING TRANSFORMATIONS

	Series A	Series B	Series C	Total
Number of sentences	69	79	58	206
Number of sentences containing transformations	65	76	57	198
Percentage of sentences containing transformations	94.2	96.2	98.3	96.3
Number of transformations	324	342	369	1035
Average number of transformations per sentence	5.0	4.5	6.5	5.3

The total number of sentences selected from the texts ranged from fifty-eight to seventy-nine. The number of sentences was not dependent on the number of words. Series B which contained the greatest number of sentences contained the least number of words and Series C which

contained the least number of sentences contained the greatest number of words. This information is presented in Table II in Chapter V, page 83. Thus the number of words per sentence varied greatly, with the average number of words per sentence for the three series A, B, and C being 12.6, 10.9, and 16.0, respectively. Almost all of the sentences sampled contained transformations as defined by the grammar of this study. The number of transformations also varied widely between series. It seems as if there may be some relationship between the number of words per sentence and the number of transformations per sentence by series. The number of transformations per sentence for each Series A, B, and C was 5.0, 4.5, and 6.5, respectively. Thus, if the complexity of a sentence is actually dependent on the numbers of transformations it contains, one would expect to find the sentences of Series C the most difficult and those of Series B, the easiest. However, the presence of various types of transformations should not be overlooked. Information of this nature will be presented later on in this chapter.

Percentage of Sentences Containing Different Numbers of Transformations

Figures 2, 3, and 4 provide a breakdown of the information on the percentage of sentences containing different numbers of transformations. According to Figure 2 the range of the number of transformations per sentence in Series A is from one to thirteen. The graph of this figure is bimodal, that is, there are two areas of concentration for the occurrence of different numbers of transformations. About 36.5 per cent of the sentences contained three or four transformations, while another 27.5 per cent contained either six or seven, or eight transformations. The graph of Figure 3 which shows the number of
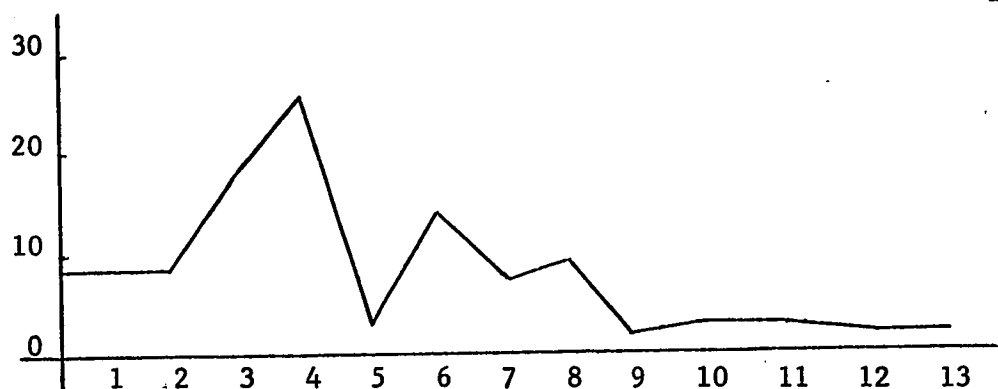
Fig. 2   Number of Transformations(Series A)
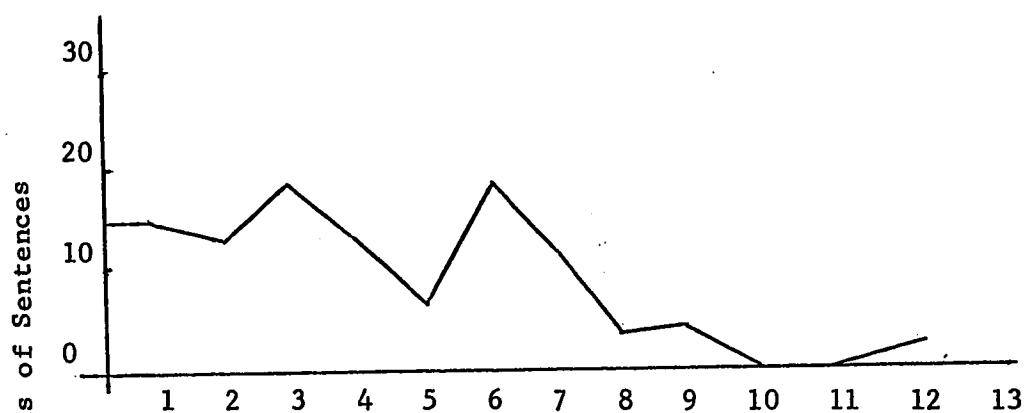
Fig. 3   Number of Transformations(Series B)
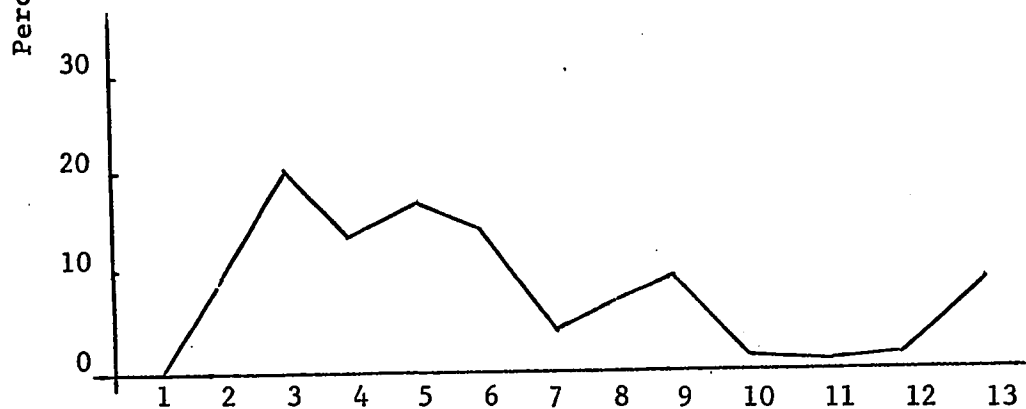
Fig. 4   Number of Transformations(Series C)

Figs. 2-4   PERCENTAGE OF SENTENCES IN EACH BASAL READER SERIES
CONTAINING DIFFERENT NUMBERS OF TRANSFORMATIONS

sentences containing various numbers of transformations in Series B is

also bimodal in form. The modes, however, are somewhat lower than those

of the graph of Figure 2. In Series B, the majority of sentences con-

tained either between two and four or between six and seven transfor-

mations. A small percentage of sentences contained a number of trans-

formations greater than seven. The graph of Figure 4 is skewed some-

what to the left. Sixty-seven per cent of the sentences contained

between two and six transformations. There was another peak at nine

transformations per sentence. The range of the number of transfor-

mations per sentence was fairly great in this series. Almost nine

per cent of the sentences contained more than thirteen transformations

per sentence. The greatest number of transformations per sentence was

twenty-seven.

Percentage of Occurrence of Selected Transformations in Series A

The data presented in Figures 5, 6, and 7 show the percentage

of the different types of transformations that occurred in the different

reader series. According to the data of Figure 5, the greatest number

of transformations occurring in the sentences of Series A were of the

Embedding type. The next greatest number to occur were the Simple

transformations. Of all transformations found in the sentences of

this series, Conjoining transformations occurred least frequently. Within

the Embedding group, the "adjective" occurred most frequently. This

linguistic structure was also found by Cossitt[1] to occur most frequently

in social studies texts at the high school level. However, the "rela-

tive clause" which was the next most frequent structure to occur in

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[1]Therese G. Cossitt, A Linguistic Analysis of Social Studies Texts
(unpublished Master's thesis, The University of Alberta, Edmonton, 1966).
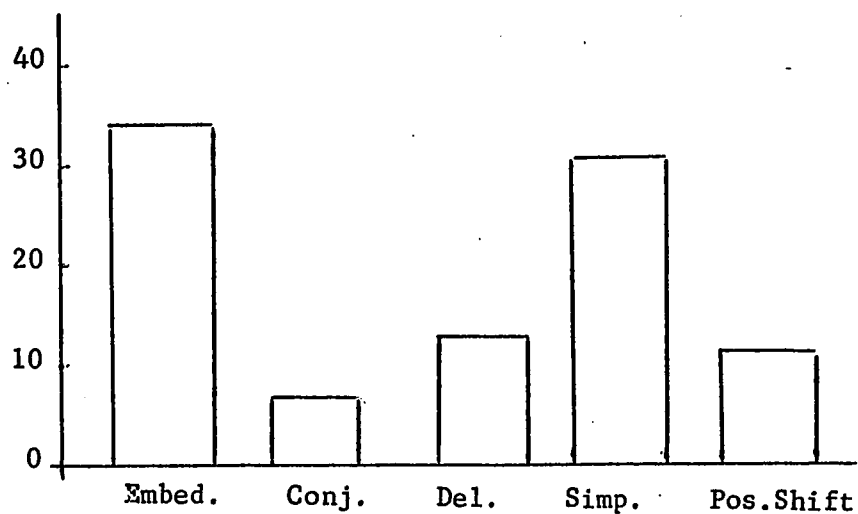
Fig.5 Series A
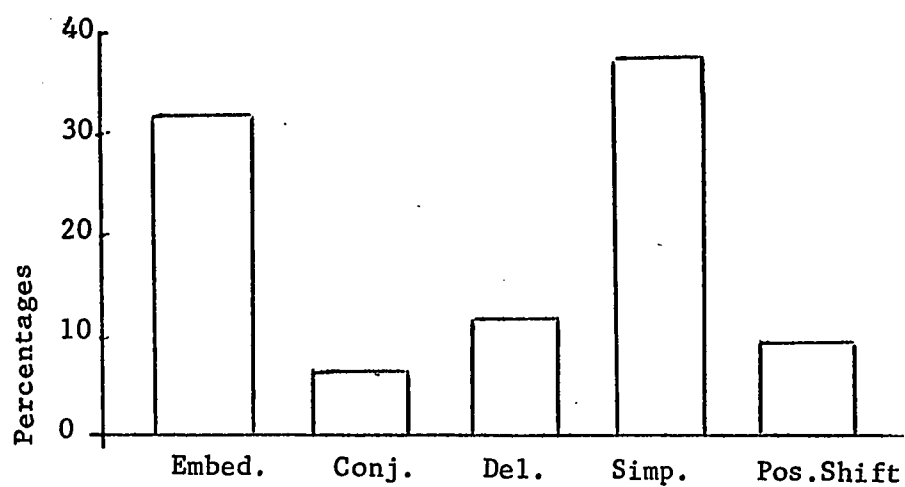
Fig. 6 Series B
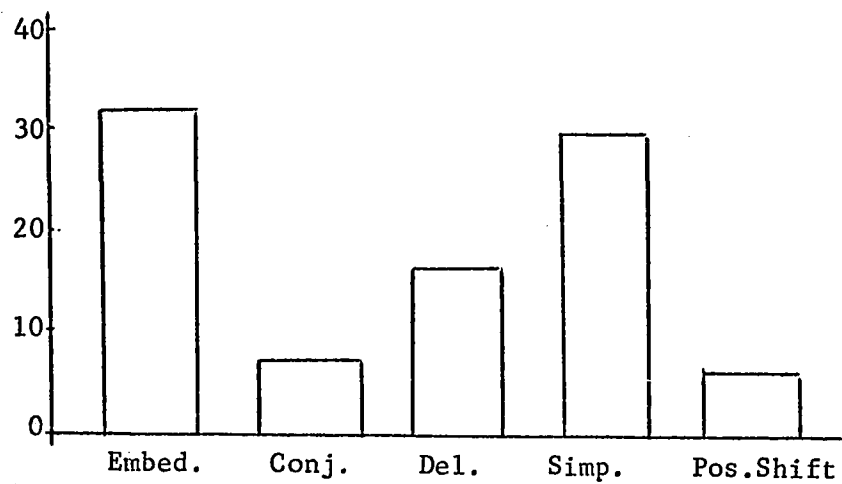
Fig. 7 Series C

Figs. 5-7 PERCENTAGE OF OCCURRENCE OF SELECTED TRANSFORMATIONS
IN EACH BASAL READER SERIES

Cossitt's study would be placed in seventh position on the basis of its

occurrence in the basal reader of Series A. The "adverb replacement"

occurred second in order of frequency and was followed by "compounds",

"pronouns (genitive)", "genitives", and "Ing-nominalization". Of the

Deletion type transformations, the most frequent to occur was the

"common elements deletion". This was present almost as often as the

Conjoining transformation from which it differs by one transformation.

The "WH-BE deletion" was the next most frequent transformational

structure to occur. The "adverb position shift" was the most numerous

structure of the category which involved a front shifting of various

structural elements. The "adverb replacement shift" was next in order

of occurrence in this category. Of all transformations in this series,

the "NP - V Inversion" constituted only 0.6 per cent. That is, there

were very few sentences of the samples analysed in which the subject

was placed before the verb. The most frequent transformation in the

Simple category was, by far, the "pronoun (simple)" which comprised

19.8 per cent of all transformations as compared with the next most

popular transformation which was "aspect" and which made up four per

cent of the transformation total. "Negation" was present 3.4 per cent

of the time.

Percentage of Occurrence of Selected Transformations in Series B

The greatest number of transformations to be found in this series

were of the Simple type. Embedding transformations ranked second in

appearance, and were followed in order by Deletion, Position Shift,

and Conjoining. Of the Embedding transformations, the "adjective"

was most frequently present. This was followed in order of frequency

by the "pronoun (genitive)", "compounds", "adverb replacement", and

"genitives". The next in order of occurrence were the "relative clause",
and the "infinitive of purpose" - each of which constituted only 1.5
per cent of all transformations analysed in this series. The "common
elements deletion" occurred most frequently in the Deletion category.
The number of times it occurred, however, made up only 3.8 per cent
of the total. Of the transformations involving a shift in linguistic
elements, the "adverb" was the structure most frequently shifted. This
was followed in frequency of occurrence by the "NP - V Inversion", and
"(That) + S Object Quotation Shift", each of which occurred two
per cent of the time. "Pronouns" were the most commonly occurring
transformations of the Simple category. "Aspect", and "negative"
ranked second and third in frequency of occurrence. The number of times
the other transformations of this category were present was minimal.

Occurrence of Selected Transformations in Series C

Transformations of the Embedding type were the most frequent
transformations to occur in Series C and made up 34.3 per cent of all
transformations found in the sentences analysed. Simple transformations
constituted 30.3 per cent of the total. Deletion, Conjoining, and
Position Shift ranked in that order of occurrence.

The "adjective" occurred most frequently within the Embedding
category. This was followed in order of occurrence by the "pronoun
(genitive)", "adverb replacement", "relative clause", "genitives",
and "compounds". Within the Deletion transformation category, the
"common elements deletion" appeared most often. Instances of the
occurrence of the "WH-BE deletion" would put it in second place. The
"adverb" was front-shifted most frequently in the Position Shift group
and was followed by the "adverb replacement shift". Of the

transformations which make up the Simple category, the "pronoun (simple)"
occurred most frequently, and made up thirteen per cent of the total
number of transformations sampled in Series C. "Aspect", "passive",
"negative", and "there (here) inversion" ranked next in that order of
occurrence.

Summary

There are a number of similarities between the types of trans-
formations that were found in each of the three basal reader series
(grade four level) analysed. The order of frequency by transformation
type was Embedding, Simple, Deletion, Position Shift, and Conjoining.
The only two exceptions were in Series B where Embedding and Simple
were reversed and in Series C where Conjoining and Position Shift were
reversed. When the types of transformation were sub-classified the
most frequent transformations in each category were the same for all
three series.

It is difficult to compare the occurrence of the various trans-
formation types to the oral and written language development of child-
ren since the only studies found on language development of children
age eight to ten years (about grade four level) used a different
nomenclature for their linguistic elements than was used in this study.
Subordination (presence of clauses usually) is very frequently dis-
cussed in such studies. Adjective clauses were rarely found in the
oral or written language of children until they were at least eleven
years old.[2] The relative clause (adjective) ranked in seventh place

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[2] Jean Elizabeth Robertson, *An Investigation of Pupil Understanding
of Connectives in Reading* (unpublished Doctoral dissertation, The
University of Alberta, Edmonton, 1966).

among the Embedded transformations of Series A, sixth place in Series B, and fourth place in Series C. Adverb clauses which are more common in children's oral language than adjective or noun clauses occurred in second place position among the Embedded transformations of Series A, fourth place in Series B, and third place in Series C. Adverb clauses were more commonly found at the beginning of the sentence in which they occurred both in oral and written language.[3] In the analysis of the texts in this study, the percentage of times when the adverb clause occurred in initial position in the sentences of each of the three basal series was 3.4, 1.5, and 2.2, respectively.

II. COMPARISON OF BASAL READER SERIES

Transformations occurred in almost all sentences of the passages analysed from each of the basal reader series. However, the number of transformations per sentence, and the type of transformations to occur often differed from one series to another. The graphs in the remainder of this chapter present data for comparison purposes of the three basal readers on the number and types of transformations found.

The average number of transformations per sentence for the three series combined is 5.3. Thus the examiner divided the sentences into two groups - those which contained five or less transformations, and those which contained more than five. The data on this analysis are presented in Figure 8. About the same percentage of sentences in Series A and Series B contain five or less, or more than five transformations. The graph of the data of Series C differs. In Series C,

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[3]Ibid.
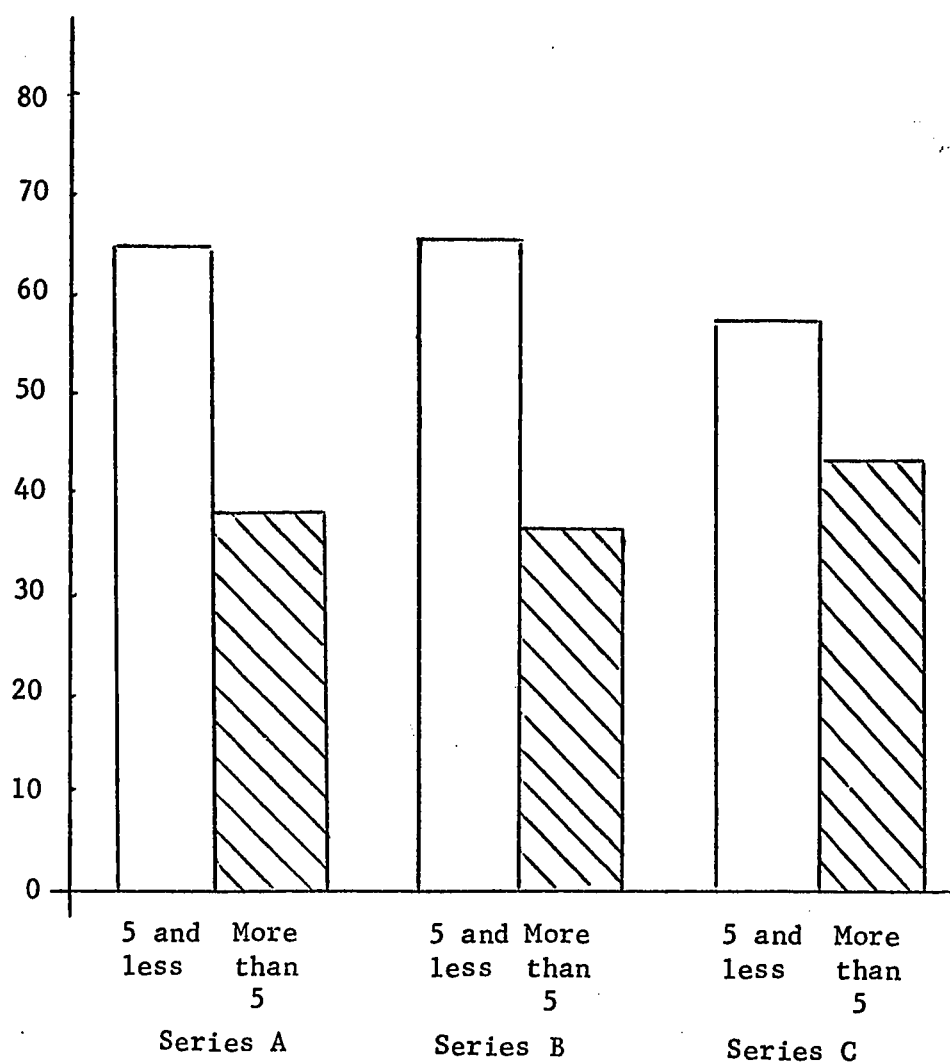
Fig. 8 COMPARISON OF THE NUMBER OF SENTENCES PER SERIES
CONTAINING FIVE AND LESS OR MORE THAN
FIVE TRANSFORMATIONS

a greater percentage of the sentences contains more than five trans-

formations than in either of the other two series.

Comparison of the Occurrence of Selected Transformations

The graphs of Figure 9 contain data on the occurrence of trans-

formations in each of the five major transformation categories investi-

gated. The graphs have been arranged so that a comparison of the

occurrence of transformations within each category in each text can be

easily compared with the occurrence of transformations in the same

category in the other two series. The frequency of occurrence of

various transformations is stated in percentages, that is, the per

cent of the total number of transformations in the samples analysed

which they constitute. Tables LVII - LX in Appendix J provide a

breakdown of the occurrence of transformations within each of the

categories being compared. Data from these tables will be used in

this section.

Comparison of the Occurrence of Embedding Transformations

There is little variation in the occurrence of transformations

of the Embedding type in each of the three series. Of the total number

of transformations analysed from Series A, B, and C, transformations

of the Embedding type formed 35.5, 32.8, and 34.3 per cent respectively.

These data are shown in Figure 9. The "adjective" was the most frequent

transformation within the Embedding group to occur in the sentences of

each of the three series. The "pronoun (genitive)" ranked second in

frequency in Series B, and C, but third in Series A. In the latter

series, the "adverb replacement" held second place. The "adverb replace-

ment" was the third most frequent of the Embedding transformations to be

found in Series C, and the fourth most popular in Series B. The
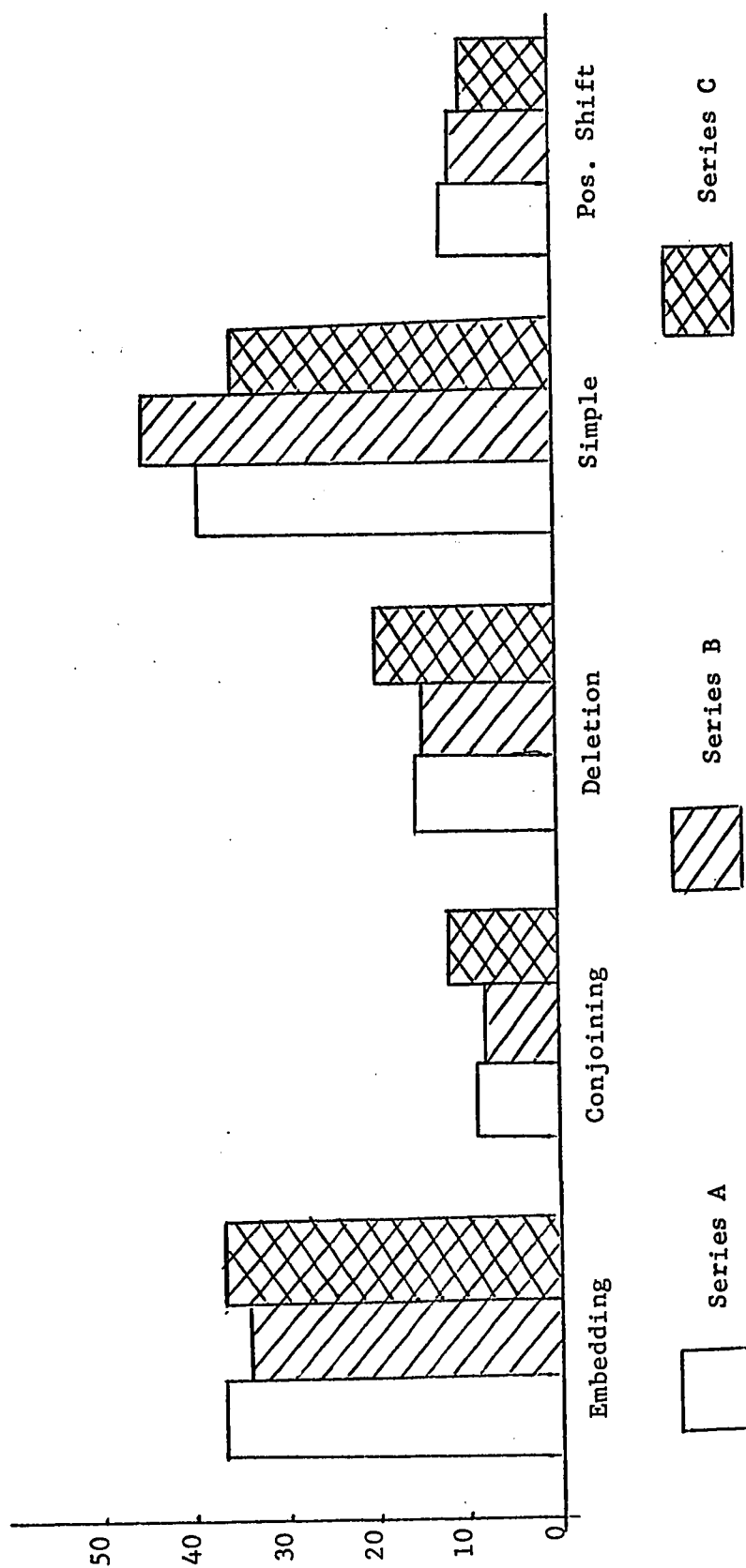
Fig. 9   PERCENTAGE OF OCCURRENCE OF TRANSFORMATION TYPES WITHIN THE THREE BASAL READER SERIES

"relative clause" which ranked in fourth place in Series C, held sixth,
and seventh place positions in frequency of occurrence in Series B, and
C, respectively.

Comparison of Occurrence of Conjoining Transformations

According to the percentages of Figure 9 the Conjoining trans-
formation constituted a larger part of the total number of transfor-
mations in Series C than it did in either Series A or Series B. It
made up 9.6 per cent of the transformations of Series C, as compared
with 7.1 per cent of the transformations in Series A and 6.1 per cent
of those in Series B.

Comparison of the Occurrence of Deletion Transformations

The presence of the Deletion transformation varied within each
of the three basal reader series. The graph of Figure 9 shows that the
Deletion transformation is found more often in Series C than in Series
A, or B. Its appearance in Series C constitutes 18.3 per cent of the
transformations of that series, as compared with its occurrence in
Series A, and B where it made up 13.3, and 12.9 per cent of the trans-
formations of these texts, respectively. The "common elements deletion",
"WH-BE deletion", and "(that) + S Object-Quotation" ranked in that
order of occurrence in each of the three basal reader series. The
percentage of occurrence of each of these transformations, however,
varied within and between texts. The percentage of occurrence for each
of the three transformations mentioned above, in each of the three texts
are as follows: Series A - 6.1, 3.7. 1.9; Series B - 3.8, 3.5, 3.2;
Series C - 8.1, 5.4, and 2.2.

Comparison of Occurrence of Simple Transformations

Instances of transformations of the Simple category showed

greater variation between texts than any of the other transformation types. Simple transformations formed a larger percentage of the total number of transformations in Series B than in either of the other two series. They occurred least frequently in Series C. The percentages of the Simple transformations for each of the three series are 33.7, 38.9, and 30.3 respectively. The "pronoun (simple)" occurred most frequently in each of the three series investigated. Instances of its occurrence, however, varied between texts - 19.8, 18.7, and 13.0, for Series A, B, and C respectively. Other transformations of this category which occurred to any great degree were the "aspect", and "negative" which ranked second and third in frequency of occurrence in Series A and B. "Negatives" ranked fourth on a frequency scale in Series C. In the latter series, "passives" occupied third position. "Passives" were fifth in order of occurrence in Series A, but tenth in Series B.

Comparison of Transformations Involving Position Shift

Transformations which involved a shift in the positioning of certain linguistic elements made up about equal per cents of the total transformations in each basal reader series. The rank order for the occurrence of transformations of this type was also similar in each of the three series. "Adverbs" were front-shifted most frequently, followed by the "adverb replacement".

Comparison of Percentage of Sentences Containing Selected Transformations

The graph of Figure 10 shows the per cent of sentences of each series in which the various transformation types occurred. Although the contours of the graphs are similar for each of the three series, the graphs representing the sentences of Series A and B indicate greater similarity between the sentences of those two series. The graph differs
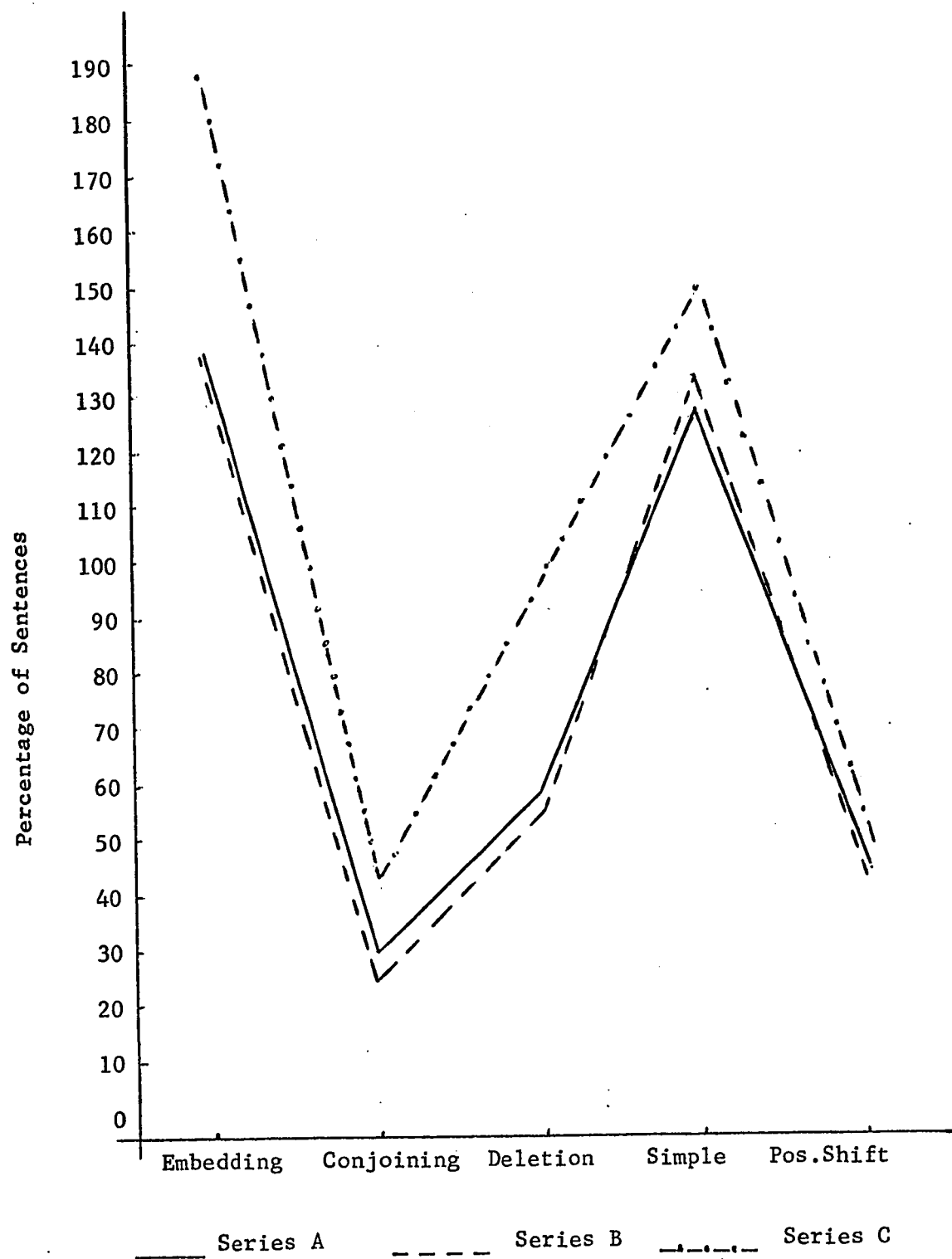
Fig. 10 COMPARISON OF THE PERCENTAGE OF SENTENCES IN EACH BASAL
READER CONTAINING SELECTED TRANSFORMATIONS

considerably for Series C. An Embedding transformation occurred on an average of one per sentence in the passages of Series A and a second Embedding transformation occurred in another twenty-six per cent of the sentences. That is, the number of Embedding transformations in Series A occurred on an average of 1.26 per sentence. The average occurrence per sentence in Series B was a little greater. In Series C, the occurrence of Embedding transformations was on an average of almost two per sentence. The number of sentences containing Conjoining transformations varied from twenty-three per cent of the sentences in Series B to forty-four per cent of the sentences in Series C. There is wide discrepancy in the per cent of sentences that contained transformations of the Deletion type in each of the three series. Transformations of this type occurred in about one-half of the sentences in the passages of Series A, and B. They occurred on an average of almost one per sentence in Series C. In each series a transformation of the Simple type occurred on an average of at least one per sentence and a second transformation of this type was found in another twenty-three to forty-seven per cent of the sentences depending on the series. Transformations involving a shift in the ordering of linguistic elements were found in almost one-half of the sentences in each series. Tables LXI and LXII in Appendix J give a breakdown of the percentage of sentences containing transformations within each of the five major categories.

<u>Summary</u>

Transformations as defined by the grammar of this study, occurred in almost all of the sentences selected for examination. The percentages of sentences per text which contained transformations were 94.2, 96.2, and 98.3 for Series A, B, and C, respectively. Sentences varied

as to the number of transformations they contained. When sentences
were divided into two groups - those that contained five or less, and
those that contained more than five, it was found that a greater per-
centage of the sentences of Series C contained more than five trans-
formations as compared with the other two series. If numbers of trans-
formations per sentence is a measure of sentence complexity, then the
sentences in the passages selected from Series C should be more complex
than the sentences of the other two series.

The type of transformation that occurs may also be an important
factor to consider in sentence complexity. There was a high degree of
similarity between the occurrence of the different types of transfor-
mations in each of the three series. Embedding and Simple transfor-
mations occurred frequently in all texts and in that order in Series A,
and C. There were more Simple than Embedding transformations in Series
B. Conjoining and Deletion transformations were present in greater
numbers in Series C than in the other two series. A breakdown of the
transformations in each of the above categories shows more similarities
than differences between the different reader series. The most frequent
occurring transformation in each category was the same for all series.
However, there was some variation as to the percentage of the total
number of transformations in each text which it represented.

On the basis of the analysis of percentages of sentences contain-
ing transformations, one would expect to encounter more sentences in
Series C containing transformations than in Series A or B. At least
every sentence in each series would be likely to contain an Embedding
transformation and a Simple transformation, and almost every sentence
in Series C would be likely to contain a transformation of the Deletion

type as well. About one-half of the sentences in all three series were found to contain a transformation involving a shift in the positioning of either the "adverb", "adverb replacement", "NP - V Inversion", or "(That) + S Object-Quotation" structures.

An analysis of the sentences selected from the basal readers has shown the number and type of transformations that tend to be found within basal readers at the grade four level. Although there are some differences among series there are many similarities. Thus children at the grade four level would tend to have similar experiences with different written language structures in their basal readers regardless of which of these three texts was chosen. The degree of exposure, however, would differ.

CHAPTER VIII

FINDINGS:RELATIONSHIPS BETWEEN TRANSFORMATIONS, SENTENCE AND
PASSAGE DIFFICULTY

Language structure may affect the difficulty of a written passage
in a number of ways. One way is by the very presence of the various
structures. That is, a particular structure may cause a reader to lose
his train of thought or cause him difficulty in following through on a
particular idea. A second way by which language structure may affect
passage difficulty is that the linguistic structure itself may be
difficult for the reader. That is, the structure by its very nature may
be difficult for the reader to understand. It must be realized, however,
that a structure may be difficult but its difficulty may not necessarily
relate to the difficulty of the sentence or passage in which it occurs.

This chapter will contain an analysis of the findings of the
relationship of the presence of transformations to sentence and passage
difficulty, the difficulty indexes of the various transformations in-
vestigated and the degree to which this difficulty relates to the
difficulty of the sentence and passage.

I. THE RELATIONSHIP OF THE PRESENCE OF THE VARIOUS TRANSFORMATIONS
TO SENTENCE AND PASSAGE DIFFICULTY

Within the pages of the three basal readers analysed, the writer
found a total of 1035 transformations which were grouped into four major
categories - Embedding, Conjoining, Deletion, and Simple. A category,
Position Shift was also added. These categories can be subdivided into
forty-three specific transformations. A forty-fourth unit (multi-
transforms) was necessary to provide for instances where the words in

the surface structure of the sentence resulting from different trans-
formations overlapped and could not be measured independently. What may
be termed the "linguistic residue" of the passage was also considered.
This usually, though not always, consisted of the "kernel" or basic
parts of the sentence, that is, those elements which received the least
changes while they were being brought from deep to surface structure.
Such words as "perhaps", "but", "anyway" used to initiate sentences were
also included in this "residue". These linguistic data were termed
"non-transformationsl units" to distinguish them from the transformations
under investigation.

All transformations did not occur in all sentences. Thus the
writer attempted to determine whether there was any relationship between
a transformation and sentence and passage difficulty, given the presence
of that transformation. This was done by coding the presence of a
transformation as 1 and its absence as 0, and calculating correlations
between these digits and the digits representing sentence and passage
difficulty. Because of the presence of only one's and zero's in the
dependent variables, low correlations were expected. However, because
of the large N, many of these correlations were significant.

A negative correlation would indicate that the greater the number
of a transformation that was present, the more difficult the sentence
or passage would be (a number of lower magnitude represented a more
difficult sentence or passage) while a positive correlation meant that
as the number of the occurrence of a particular transformation increased
so did the size of the digit(s) representing the difficulty of the
sentence or passage. That is, the sentence or passage became easier.
The tables of this chapter have been arranged to provide information on

the number of particular transformations which correlated with sentence
or passage difficulty while the figures were designed to provide infor-
mation for purposes of comparing the number of transformations which
correlated with sentence difficulty as opposed to passage difficulty,
and the number which correlated with each of these difficulties at the
grade four level as opposed to the grade five and six levels.

Embedding Transformations

Of the eighteen transformations within the Embedding category
there was a significant correlation between the presence of eleven of
these and sentence difficulty and between ten and passage difficulty at
the grade four level(Table IX). There was not a one to one correspondence
however, between those transformations which influenced both sentence
and passage difficulty. Eight transformations were similarly related
to both difficulties. "Appositives", "pronoun (genitive)", and "verb
+ C" seem to be more influential in predicting the difficulty of the
sentence in which they were found, while the "WH + S obj.", and "adverb
expansion + S" appear to be more crucial in determining the difficulty
of the passage by their presence.

One may speculate as to why the presence of a particular
linguistic unit would relate to the difficulty of a sentence or passage.
One suggestion is that the presence of a linguistic unit creates a
sentence pattern unfamiliar to the child. It may also be that the trans-
formational unit deleted may be easily replaced by a unit of a different
grammatical form. In either case it seems that both situations relate
mainly to the syntax of the sentence. In the case of the "pronoun (geni-
.tive)" many of the pupils did substitute other grammatical forms, parti-
cularly the articles "a", and "the". The presence of the "pronoun

TABLE IX

CORRELATIONS OF THE PRESENCE OF EMBEDDING TRANSFORMATIONS WITH SENTENCE AND PASSAGE DIFFICULTY

Transform	Grade Four		Grade Five		Grade Six		Total	
	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.
Relative Clause	-0.099*	-0.075*	-0.089*	-0.067*	-0.080*	-0.024	-0.090*	-0.051*
With Phrase	0.025	0.033	-0.069*	-0.163*	-0.050	0.027	-0.017	-0.015
Adjective	0.026	0.035	0.076*	0.026	0.005	-0.006	0.029	0.008
Appositive	-0.103*	-0.030	-0.083*	-0.001	-0.104*	-0.029	-0.100*	-0.031*
Gerundive	0.013	0.016	-0.005	0.013	-0.037	-0.015	-0.010	0.000
Compounds	-0.186*	-0.097*	-0.123*	-0.017	-0.147*	-0.060*	-0.151*	-0.061*
Genitive	-0.068*	-0.050*	0.007	0.016	-0.011	0.011	-0.024	-0.005
That + S Object	-0.004	0.018	-0.113*	-0.059*	-0.004	0.090*	-0.037*	0.025
VP Comp	-0.126*	-0.090*	-0.091*	-0.144*	-0.141*	-0.070*	-0.095*	-0.068*
WH + S as Object	0.023	0.043*	0.020	-0.019	-0.032	0.097*	0.008	0.039*
Infinitive as Obj.	0.032	0.003	0.071*	0.050	0.015	0.003	0.039*	0.019
Infin. of Purpose	-0.042*	-0.050*	-0.125*	-0.161*	-0.041*	-0.035	-0.054*	-0.043*
Ing-Nominalization	-0.146*	-0.056*	-0.084*	-0.004	-0.109*	-0.050*	-0.112*	-0.038*
Ing-Nom. of Purpose	-0.121*	-0.072*	-0.095*	-0.032	-0.033	-0.026	-0.092*	-0.056*
Pronoun(genitive)	-0.108*	0.001	-0.026	0.061*	-0.036	-0.016	-0.065*	-0.007
Verb + C	-0.043*	0.021	-0.004	0.030	-0.026	0.028	-0.029	0.020
Adverb Replace.	-0.106*	-0.084*	-0.044*	-0.092*	-0.079*	-0.091*	-0.077*	-0.081*
Adv. Expans + S	-0.039	-0.049*	-0.030	0.052*	-0.034	0.050*	-0.035*	0.039*

* significant at the .01 level

(genitive)" often causes ambiguity. The sentence "Bob was annoyed because Bill lost his ball" provides an example. Such a sentence would have two underlying phrase markers. Is it possible that the child avoids ambiguity by using an unambiguous grammatical form? The "appositive" and "verb + C" appear to be more sentence centered than passage centered and this could explain why their presence related to sentence difficulty only. In the linguistic segments "The bear, a creature of the wilds . . . " and "After a crash they always make pilots fly again . . . " the "appositive: and the "verb + C" may prove difficult to the child in reconstructing the meaning of the sentence but may not be crucial to the passage meaning because the information given in such units is often redundant within the passage. Punctuation may also be a significant factor as well. Punctuation is a surface structure feature to aid in comprehending written language. Pupils frequently ignored punctuation marks to the point of erasing them or changing words to conform to some other syntactical structure. For example, commas are often a very good indicator of the presence of an "appositive". Ignoring these commas may lead to difficulty with this transformation.

Almost all of the correlations were negative in direction which means that as the number of a specific transform increased there was a corresponding increase in the difficulty of the sentence or passage. The two exceptions were the "WH + S obj." and the "adverb Expansion + S", both of which were in a positive relationship to the difficulty of the passage. The correlations of the presence of these two transformations with sentence difficulty however, was not significant.

Data for grade five pupils show that twelve transformations correlated significantly with sentence difficulty and nine with passage

difficulty with seven transformations in common. As in grade four, the majority of the correlations were in a negative direction. The "adjective" was positively correlated with sentence difficulty, the "adverb expansion + S" with passage difficulty and the "infinitive as object" with both sentence and passage difficulty. When an "adjective" was deleted in the "cloze" there were usually a number of cues to aid in its insertion. There is also a considerable amount of redundancy in connection with the "infinitive as object" transformation, particularly when its difficulty is measured by the "cloze". In the sentence "John asked <u>to see the dog</u>", the insertion of a word in either of the slots formed by deleting either of the four words in the "infinitive as object" is aided by a number of linguistic cues.

The number of transformations whose presence correlated significantly with sentence and passage difficulty decreased at the grade six level (Table IX and Figure 11). The number of transforms significantly correlated with sentence and passage difficulty was eight and seven respectively with only four in common. The direction of the correlations was similar to that described for the grade four pupils. All but two of the transforms (WH + S obj. and adverb expansion + S) were negatively correlated and these two were correlated with passage difficulty only. As in grade four and five, the presence of the "appositive" was significantly related to sentence difficulty only. For grade six students, the "relative clause", "with phrase", and "infinitive of purpose" were also significantly related to sentence difficulty.

When the data on the correlations of the presence of Embedding transformations with sentence and passage difficulty for the three grades were considered, the findings were similar to those described for grade

Number of transforms
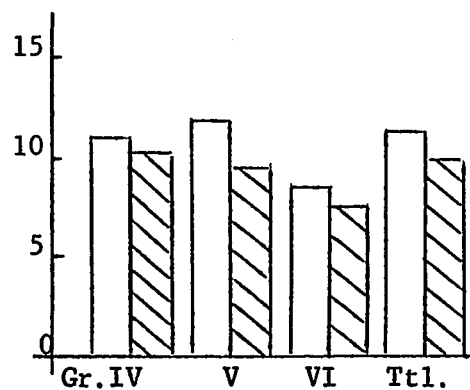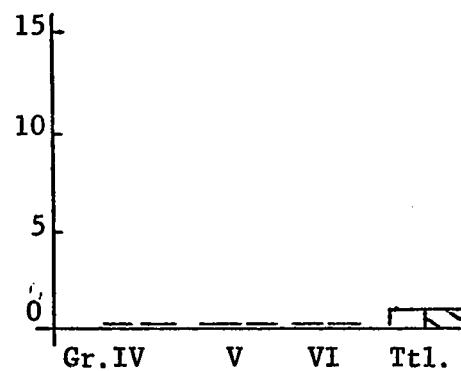
Fig. 11.   Embedding
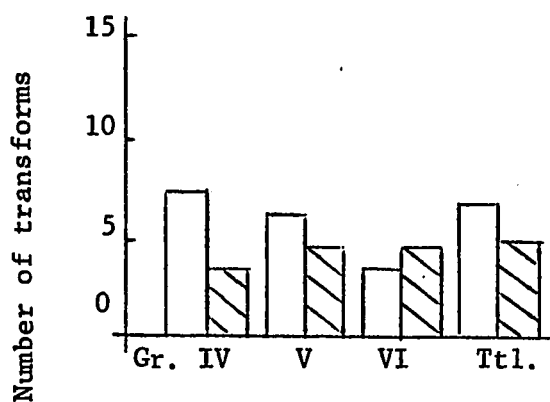
Fig. 12.   Deletion
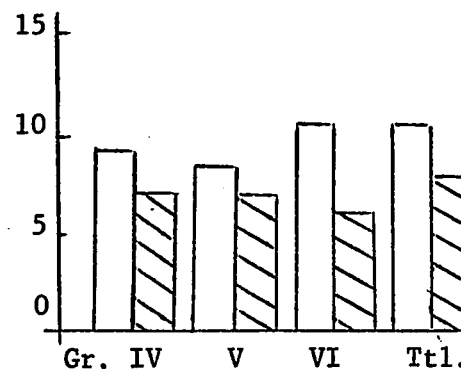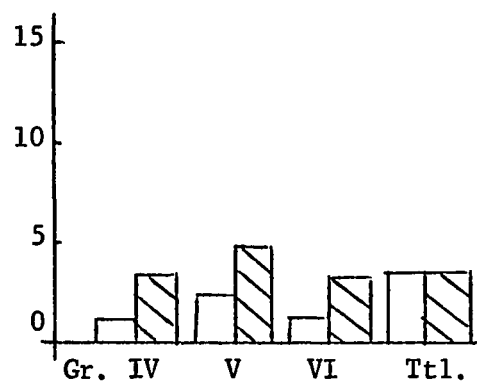
Fig. 13.   Position Shift

Fig. 14.   Conjoining

Fig. 15.   Simple
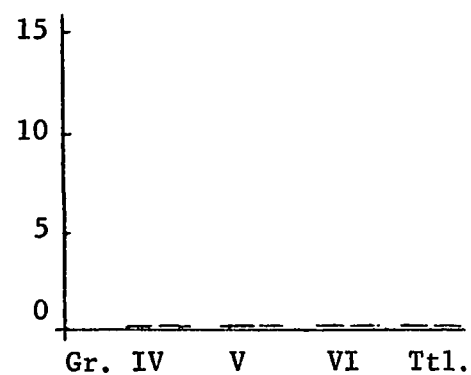
Fig. 16.   Multi-transforms

☐ Sentence difficulty   ◩ Passage difficulty

Fig. 11 - 16   A COMPARISON BY GRADE OF THE NUMBER OF TRANSFORMS
WHOSE PRESENCE CORRELATES SIGNIFICANTLY WITH
SENTENCE AND PASSAGE DIFFICULTY

five students, that is, the presence of twelve transformations correlated significantly with sentence difficulty and ten with passage difficulty. There were nine transformations which correlated significantly with both difficulties. Those transformations which correlated with either sentence or passage difficulty were the "that + S", the "pronoun (genitive)", and "infinitive as object" (correlating with sentence difficulty only) and the "WH + S object" (correlating with passage difficulty only). For grades four, five, and six combined, the "adverb expansion + S" was significantly correlated with both sentence and passage difficulty. However, the presence of this transformation correlated negatively with the former but positively with the latter. The small N of this particular transformation, however, casts some doubt on the reliability of the correlation.

It may be concluded from the data of Table IX and Figure 11 and from the description of these data that the greater number of Embedding transformations within a sentence and/or passage, the more difficult that sentence and/or passage is likely to be. There are a few exceptions - the "adjective", the "infinitive as object", the "WH + S object", and the "adverb expansion + S". The difficulty of the sentence is more likely to be predicted from the presence of Embedding transformations than is the passage difficulty. This finding lends some weight to the views that the comprehension of a passage is not the sum of the comprehension of its individual sentences.

Conjoining and Deletion Transformations

The degree to which the presence of Conjoining and Deletion transformations correlated significantly with sentence and passage difficulty is shown in Table X and Figures 12 and 14. The presence of

TABLE X

CORRELATIONS OF THE PRESENCE OF CONJOINING AND DELETION TRANSFORMATIONS WITH SENTENCE AND PASSAGE DIFFICULTY

Transform	Grade Four		Grade Five		Grade Six		Total	
	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.
Conjoining	-0.030	-0.023	-0.039	-0.034	-0.006	-0.024	-0.046*	-0.031*
Common Elements Deletion	-0.136*	-0.082*	-0.109*	-0.052*	-0.046*	-0.069*	-0.096*	-0.067*
WH Deletion	-0.133*	-0.119*	-0.157*	-0.079*	-0.129*	-0.145*	-0.134*	-0.072*
WH BE Deletion	-0.139*	-0.156*	-0.105*	-0.075*	-0.099*	-0.089*	-0.113*	-0.098*
(That) + S Obj.	0.062*	-0.017	-0.020	-0.009	0.021	0.003	0.030	-0.014
(That) + S Obj. Quotation	0.067*	-0.008	0.109*	0.044*	0.027	-0.026	0.060*	-0.004
Compar. Deletion	-0.090*	-0.035	-0.047*	-0.006	-0.025	-0.051*	-0.033*	-0.037*
Adv. Replacement Deletion	-0.094*	-0.009	-0.074*	0.027	0.021	0.035	-0.036*	0.017

* significant at the .01 level

the Conjoining transformation was not a good predictor of sentence or of passage difficulty. All of the Deletion transforms correlated significantly with sentence difficulty and three of these showed a significant relationship to passage difficulty. Two of the transformations which related to sentence difficulty only were positively correlated. These were the "(that) + S object", and the "(that) + S object quote". For grade five pupils, Conjoining transformations were not significantly correlated with sentence and passage difficulty. Of the Deletion transforms, six were good indicators of sentence difficulty while four of these correlated with passage difficulty. As in grade four, the "(that) + S object quote" was positively correlated with sentence difficulty. The "(that) + S object" transformation which was positively correlated with sentence difficulty at the grade four level, was not significant at the grade five level.

When the grade six pupils read the passages and the sentences contained therein, the transformations which exerted an influence on these linguistic segments varied. Sentence and passage difficulty was influenced by the presence of three and four of the Deletion transformations, respectively. All correlations were in a negative direction indicating that these transforms increased the difficulty of the sentence or passage. Those transforms which were positively correlated with sentence and/or passage difficulty at the grades four and five levels were not significant for this grade level. When the findings for the three grades combined were considered, there was a low but significant correlation between the presence of Conjoining transformations and sentence and passage difficulty. All of the Deletion transforms correlated significantly with sentence difficulty and four of them

correlated with passage difficulty. The correlation of the "(that) + S object" and the "(that) + S object quote" were positive in direction. The "adverb replacement deletion" correlated negatively with sentence difficulty. This finding also occurred for grades four and five.

A redundancy factor may provide an explanation - a redundancy of meaning contained within the linear concatenation of words. When a child reads "The bear overturned Betsy's sewing basket" the only added information which the "adverb replacement deletion" in the following sentence "After that he walked around the room" gives is sequence in time and in many stories of the basal readers, sequence in time is usually correlated with the linear position of sentences. Thus a child could omit the words "after that" and not be penalized in deriving meaning from the context of the passage, but could find difficulty in interpreting the meaning of the sentence only. In many instances when the word "that" was omitted in the "cloze" tests, a pupil pencilled in the blank and drew an arrow from the word "after" to the word "he", or inserted the word "he" in the blank and crossed out the "he" which was already printed in the original. When the word "he" was deleted, pupils often inserted a noun (apparently thinking of "that" as a demonstrative). These pupils subsequently had difficulty with other words of the sentence which were deleted.

Deletion transformations like Embedding transformations tended to increase the difficulty of a sentence or passage in which they occurred. Conjoining transformations did not relate significantly either to sentence or passage difficulty except when the data on the total group were considered.

Simple Transformations

The correlations of the presence of the Simple transformations with sentence and passage difficulty are shown in Table XI and Figure 15. The numbers of the correlations are given in Figure 15. Nine of these transformations correlated significantly with sentence difficulty and seven with passage difficulty with five of the transformations in a common relationship. The majority of correlations between Simple transformations and sentence and passage difficulty were positive. Three exceptions were the "there inversion" and the "negative" which correlated negatively with both sentence and passage difficulty, and the "comparative" which related negatively to the difficulty of the sentence. An analysis of the "cloze" tests completed by the students of the sample revealed a possible reason for the negative correlation between the latter two transformations and the difficulty of the written language in which these occurred. When a "comparative" was deleted, the pupils very often substituted an adjective of positive degree and as a result often became confused with the insertion of some subsequent item which was either then omitted or inserted incorrectly. The presence of the "negative" tended to give trouble for a similar reason, particularly when the negative consisted of the word "no" and began a sentence as "No people were present when the incident occcurred."

Findings for grade five pupils on the relationship of the presence of the various Simple transformations to passage difficulty showed that the same number of transformations correlated with passage difficulty as at the grade four level. Eight transformations tended to influence sentence difficulty by their presence - four negatively and four positively. In addition to the "negative" and the "comparative" which were negatively

TABLE XI

CORRELATIONS OF THE PRESENCE OF SIMPLE TRANSFORMATIONS WITH SENTENCE AND PASSAGE DIFFICULTY

Transform	Grade Four		Grade Five		Grade Six		Total	
	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.
Passive	-0.039	0.001	-0.003	-0.030	-0.045*	0.012	-0.034	-0.017
There Invers.	-0.050*	-0.076*	-0.008	-0.133*	-0.043*	0.001	-0.037*	-0.053*
Question	0.114*	0.003	0.139*	0.027	0.076*	-0.043*	0.098*	-0.015
Negative	-0.141*	-0.065*	-0.074*	0.008	-0.122*	-0.010	-0.116*	-0.029
Aspect	-0.037	0.003	-0.048*	-0.036	-0.028	0.019	-0.039*	-0.020
Imperative	0.045*	0.031	0.133*	0.145*	0.047*	0.025	0.068*	0.049*
Contraction	0.027	0.115*	-0.008	0.054*	-0.039	0.026	-0.009	0.049*
Comparative	-0.076*	0.001	-0.126*	-0.097*	-0.047*	-0.033	-0.077*	-0.032*
Pron(Simple)	0.044*	-0.105*	0.128*	0.002	0.075*	-0.092*	0.062*	-0.083*
Indirect Obj.	0.043*	0.021	-0.017	-0.100*	0.051*	0.098*	0.029	0.020
Reflex-Intens.	-0.020	0.061*	-0.116*	0.003	-0.067*	0.074*	-0.062*	0.044*
Vocative	0.104*	0.066*	0.103*	0.089*	0.096*	0.050*	0.094*	0.052*
Expletive	0.138*	0.126*	-0.005	0.051*	0.076*	0.135*	0.068*	0.076*

* significant at the .01 level

related to sentence difficulty at the grade four level, the "aspect"

and "reflexive-intensive" transformations may also be included in this

category at the grade five level. The "there inversion" transformation

which was related to sentence difficulty only, at the grade four level

correlated with passage difficulty at the grade five level. There was

also a negative correlation between the "indirect object" and passage

difficulty. Analysis of the "cloze" tests for words inserted into the

slots formed by the deletion of this transformation gives some explan-

ation as to how the presence of this transformation may affect the

difficulty of a passage. In many cases where an "indirect object" had

been deleted, the pupils tried to insert a "direct object". On

realizing that the word inserted did not make sense, they either left

the word there but crossed it out, or pencilled it out completely, thus

leaving the slot blank. When the "indirect object" was not deleted in

the "cloze" forms but the "direct object" following it was deleted,

pupils had difficulty in inserting the latter. This situation occurred

more often when the "indirect object" was a noun than when it was a

pronoun.

According to the data of Table XI, eleven of the Simple trans-

formations related significantly to sentence difficulty (seven positively)

and six to passage difficulty (four positively) at the grade six level.

There were no transformations from this category which related to passage

difficulty only. Among those transformations which correlated negatively

with sentence difficulty was the "passive". This transformation did not

correlate significantly with the difficulty of either the sentence or

passage at the other grade levels

When one considers the data on Simple transformations for all

three grades combined, it appears that the presence of more of this type

of transformation related to the ease of the sentence or passage read.

Correlations of the "passive", the "there inversion", the "negative",

the "aspect", the "comparative" and the "reflexive-intensive" were

negative. The negative correlation of the "pronoun (simple)" with

passage difficulty which occurred for grades four and six pupils was

also present when the data for all three grades were combined. The

"expletive", the "imperative", the "vocative" and the "question" trans-

formations which are usually associated with direct speech were all

positively correlated with the difficulty of the sentence and/or

passage of which they formed a part. Ruddell's study[1] has already shown

that the more similar written language structures are to the oral

language structures of grade four pupils, the easier these written

structures are likely to be for pupils to understand.

Transformations with Position Shift

Information on the relationship of transformations which involves

a shift in the position of various linguistic elements, "multi-

transforms", and "non-transformational units" to sentence and passage

difficulty for grades four, five, and six, and for these grades is given

in Table XII and Figure 13. There appears to be little consistency in

regard to the type of Position Shift transformation which related to

sentence and passage difficulty for each grade singly and for the total

[1] Robert Byron Ruddell, An Investigation of the Effect of the
Similarity of Oral and Written Patterns of Language on Reading Comprehension
(unpublished Doctoral dissertation, Bloomington:School of Education, Indiana
University, 1963.

TABLE XII

CORRELATIONS OF THE PRESENCE OF POSITION SHIFT TRANSFORMATIONS, MULTI-TRANSFORMATION UNITS, AND NON-TRANSFORMATION UNITS WITH SENTENCE AND PASSAGE DIFFICULTY

Transform	Grade Four		Grade Five		Grade Six		Total	
	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.
NP- V Inversion	0.028	0.087*	0.002	-0.071*	0.003	0.064*	0.011	0.031*
Adv. Position Shift	-0.038	0.064*	0.023	0.011*	-0.059*	0.029	-0.030*	-0.047*
Adv. Replace. Shift	-0.063*	-0.060*	-0.042*	-0.116*	-0.001	-0.057*	-0.038*	-0.066*
(That) + S Object Quotation Shift	-0.000	-0.023	0.115*	0.053*	0.029	0.045*	0.046*	-0.004
Multi-Transforms	0.002	0.012	-0.023	0.009	-0.039	0.004	-0.019	-0.029
Non-Trans. Units	-0.017	-0.027	0.045*	0.169*	-0.001	-0.004	-0.008	0.004

* significant at the .01 level

group. It is interesting to note, however, that the number of Position

Shift transformations which related to passage difficulty was always

greater than the number which related to sentence difficulty. When it

is considered that Position Shift transformations usually serve an

introductory purpose or serve as links between sentence or a passage,

the above finding is all the more plausible.

The "adverb replacement shift" correlated significantly and

negatively with passage difficulty for all grades. At all but the grade

six level it bore a significant and negative correlation to sentence

difficulty as well. The "adverb replacement shift" is really a double

transformation in that the "adverb replacement" was first embedded and

then the transform was front-shifted. At the grade six level and for

the total group, the "adverb position shift" tended to increase the

difficulty of the sentence. At the grade four and five levels its

presence did not relate to sentence difficulty but its correlation with

the difficulty of the passage at these grade levels was both significant

and negative. When the correlations of the presence of the "(that) + S

object quote shift" and the "NP - V inversion" transformations were

significant, they were also positive except for the latter at the grade

five level. The former transformation is part of direct speech while in

the sentences of the texts examined, the latter also occurred most

frequently in connection with direct speech, as for example, "Where are

you going?" said the boy." It has already been pointed out that trans-

formations within the context of direct speech tended to relate to the

ease of the written passage in which they occurred. The presence of

"multi-transformation" units were not significantly related to passage

or sentence difficulty. Non-transformation units were positively

correlated with the difficulty of both sentence and passage at the grade
five level and with passage difficulty for the total group.

<u>Summary</u>

Written language was generally more difficult for pupils to
understand when Embedding and Deletion transformations were present.
Sentences were more difficult than were the passages which contained
these transformations. Correlations between the presence of the Con-
joining transformations and sentence and passage difficulty were signi-
ficant for the total group but not for either of the grades separately.
An analysis of the correlations between the various Simple transfor-
mations and sentence and passage difficulty for each grade singly and
for the three grades combined showed that the majority of the signi-
ficant correlations were positive. This means that the presence of
these transformations usually indicated an easier sentence or passage
for the pupils of this sample. It was also noted that many of the
Simple transformations which were positively correlated with sentence
and passage difficulty are usually found in direct speech. The "there
inversion", "negative" and "comparative" were generally negatively cor-
related.

The "adverb replacement shift" (Position Shift category) was
generally negatively correlated with sentence and passage difficulty.
It was pointed out that this was really a two-fold transformation since
the adverb clause was first embedded and then front-shifted. The "that
+ S object quote shift" and the "NP - V inversion" were generally posi-
tively correlated with both sentence and passage difficulty. These two
transformations are frequently found in connection with direct speech.
The correlations of multi-transformation units were not significant

whereas non-transformation units were significantly correlated with sentence and passage difficulty at the grade five level and with passage difficulty for the total group. In each case the correlations were positive indicating that the presence of non-transformation structures tended to contribute to the ease of the passage.

II. THE RELATIONSHIP OF THE DIFFICULTY OF VARIOUS TRANSFORMATIONS TO SENTENCE AND PASSAGE DIFFICULTY

In the previous section it has been shown that the presence of specific transformations was related to the difficulty of the sentence or passage in which they occurred. The difficulty of each transformation and the correlation of this difficulty to sentence and passage difficulty was also considered in this study for it may be that the presence of a transformation may influence the difficulty of a sentence but the transformation itself is not difficult or its difficulty does not bear any relationship to sentence or passage difficulty. Difficulty of transformations was measured by the "cloze" technique.

Tables XIII to XVI have been arranged similar in format to Tables IX to XII but indicate the correlations of the difficulty of transformations rather than the correlations of the presence of transformations. Figures 17 - 22 are patterned after the format of Figures 11 - 16 and provide a comparison by grade of the number of transformations whose difficulty correlated significantly with sentence and passage difficulty.

Embedding Transformations

According to the data of Table XIII the difficulty of ten of the eighteen Embedding transformations was significantly correlated with sentence difficulty and nine with passage difficulty at the grade four

TABLE XIII

CORRELATIONS OF THE DIFFICULTY OF EMBEDDING TRANSFORMATIONS WITH SENTENCE AND PASSAGE DIFFICULTY

Transform	Grade Four		Grade Five		Grade Six		Total	
	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.
Relative Clause	0.591*	0.643*	0.592*	0.405*	0.759*	0.647*	0.669*	0.608*
With Phrase	-0.414	0.163	0.651	0.677	0.491	0.368	0.059	0.422
Adjective	0.474*	0.266*	0.645*	0.184	0.464*	0.378*	0.527*	0.314*
Appositive	0.961	0.945	0.000	0.000	1.000*	1.000*	0.698*	0.772**
Gerundive	0.067	0.372	-0.024	0.152	0.620	0.753**	0.297	0.525*
Compounds	0.489*	0.454*	0.482*	0.390*	0.635*	0.560*	0.587*	0.531*
Genitive	0.260	-0.038	0.499*	0.215	0.337*	0.159	0.417*	0.209*
That + S Object	0.623	0.768	0.657	0.594	0.848***	0.101	0.790*	0.487**
VP - Comp.	-0.275	-0.843	0.498	-0.785	0.873	0.676	0.662*	0.142
WH + S Object	1.000*	1.000*	1.000*	1.000*	1.000*	1.000*	0.800*	0.840**
Infin. as Obj.	0.689*	0.553***	0.503*	0.299	0.453	0.290	0.439*	0.265
Infin. of Purpose	0.642*	0.634*	0.350**	0.440*	0.544*	0.436*	0.517*	0.477*
Ing-Nominalization	0.750*	0.559*	0.410**	0.345	0.606*	0.672*	0.623*	0.543*
Ing-Nom. of Purpose	0.220	0.495	0.802	0.924	0.807	0.900	0.580***	0.758*
Pronoun(genitive)	0.483*	0.197	0.390*	0.228*	0.462*	0.286*	0.452*	0.258*
Verb + C.	0.663*	0.498*	0.769*	0.204	0.731*	0.317	0.727*	0.418*
Adv. Replacement	0.817*	0.496*	0.684*	0.366*	0.800*	0.581*	0.795*	0.548*
Adv. Expans. + S	0.443	0.574	0.694	0.567	0.422	0.065	0.429**	0.418

* significant at the .01 level
** significant at the .05 level

level. The "relative clause", the "adjective", "compounds", the "WH +
S object", the "infinitive as object", the "infinitive of purpose", the
"ing-nominalization", the "verb + complement" and the "adverb replacement"
were good predictors of both sentence and passage difficulty. The
difficulty of the "pronoun (genitive)" tended to correlate with the
difficulty of the sentence rather than with the difficulty of the pas-
sage. All the above correlations were positive indicating that as the
ease or difficulty of the transform increased so did the ease or
difficulty of the sentence and/or passage.

At the grade five level eleven transformations correlated signi-
ficantly with sentence difficulty and six with passage difficulty. As
in grade four the "relative clause", "compounds, "WH + S object",
"infinitive of purpose", and "adverb replacement" were related to the
difficulty of both sentence and passage. The "adjective", the "genitive",
the "that + S object", the "infinitive object", and the "VP complement"
tended to be better predictors of sentence difficulty at the grade five
level. The "pronoun (genitive)" which correlated significantly with
sentence difficulty at the grade four level correlated with passage
difficulty at the .05 level of significance at the grade five level.
The correlation coefficients of twelve of the Embedding transformations
indicated a significant relationship with sentence difficulty at the
grade six level while ten of these transformations bore such a relation-
ship to passage difficulty. As in grade four and five, the direction
of all correlations was positive. The five transformations common to
grade four and five pupils which related significantly to sentence and
passage difficulty still showed the same relationship at the grade six
level. There appeared to be more similarities between grade four and

grade six as to which transformations tended to influence sentence or passage difficulty.

When the data for all three grades were combined, fifteen of the eighteen Embedding transformations related significantly to sentence and fourteen to passage difficulty. The "gerundive", and the "appositive", (the latter at the .05 level of significance) correlated with passage difficulty while a correlation significant at the .01 level between sentence and transformation difficulty was found for the "VP complement" and the "infinitive as object". The only transformation which did not correlate significantly with either sentence or passage difficulty when the data for the three grades were combined was the "with phrase".

Conjoining and Deletion Transformations

Correlations of the Conjoining and Deletion transformations with sentence and passage difficulty are indicated in Table XIV and Figure 20. The difficulty of the Conjoining transformation appeared to be a good predictor of both sentence and passage difficulty at the grade four level. It appears that it is not the presence of this transform which was crucial to the difficulty of written language but the degree to which this structure was difficult for the reader to understand. Only the "common elements deletion" from among the seven Deletion transformations related significantly to the difficulty of both the sentence and the passage at this grade level. The "common elements deletion" involves the same transformation steps as the Conjoining plus one more - the deletion of the conjunction. Of the other Deletion transformations, the difficulty of the "WH BE Deletion", the "(that) + S object", the "(that) + S object quote" and the "adverb replacement deletion" tended to be indicators of sentence difficulty only. According to the data of

TABLE XIV

CORRELATIONS OF THE DIFFICULTY OF CONJOINING AND DELETION TRANSFORMATIONS WITH SENTENCE AND PASSAGE DIFFICULTY

Transform	Grade Four		Grade Five		Grade Six		Total	
	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.
Conjoining	0.699*	0.421*	0.662*	0.485*	0.775*	0.637*	0.740*	0.573*
Common Elements Deletion	0.617*	0.370*	0.590*	0.482*	0.640*	0.448*	0.624*	0.435*
WH Deletion	0.347	0.253	0.637**	0.490	0.668*	0.437	0.533*	0.421*
WH BE Deletion	0.323*	0.173	0.118	0.050	0.454*	0.369*	0.371*	0.290*
(That) + S Object	0.811*	0.222	0.493	0.275	0.936*	0.463	0.786*	0.402**
(That) + S Object Quotation	0.811*	0.245	0.725*	0.308**	0.801*	0.510*	0.797*	0.468*
Compar. Deletion	0.493	-0.061	0.629**	-0.013	0.617	0.351	0.634*	0.278
Adverb Replace. Deletion	1.000*	0.629	0.824	-0.293	0.907	0.893	0.667**	.757*

* significant at the .01 level
** significant at the .05 level
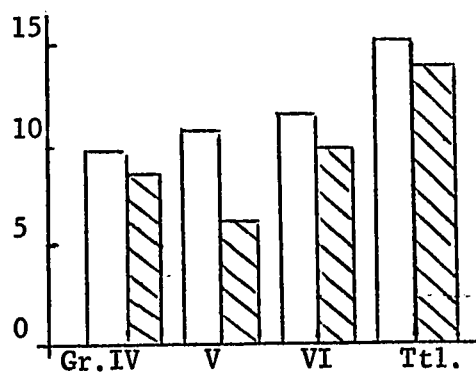
Fig. 17. Embedding
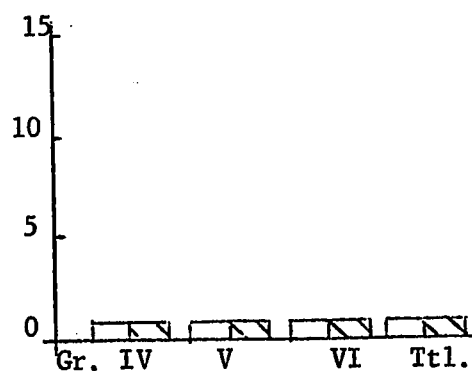
Fig. 20. Conjoining
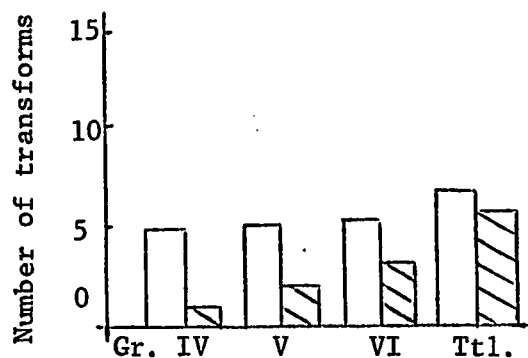
Fig. 18. Deletion
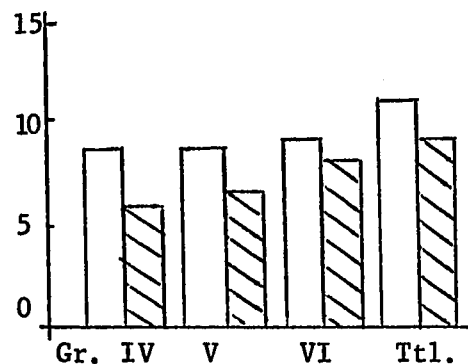
Fig. 21. Simple
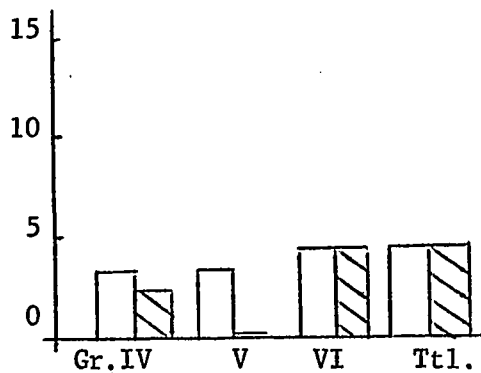
Fig. 19. Position Shift
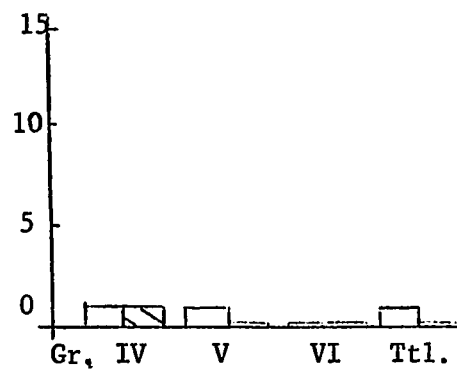
Fig. 22. Multi-transforms

☐ Sentence difficulty   ▨ Passage difficulty

Fig. 17 - 22   A COMPARISON BY GRADE OF THE NUMBER OF TRANSFORMS
WHOSE DIFFICULTY CORRELATES SIGNIFICANTLY WITH
SENTENCE AND PASSAGE DIFFICULTY

Table XIV the correlations of the difficulty of transformations at the grade five level are similar to the correlations at the grade four level with some exceptions. The "WH BE deletion", the "(that) + S object" and the "adverb replacement deletion" were not significantly correlated with sentence or passage difficulty at this level. The correlations of the difficulty of the "WH deletion" and the "comparative deletion" with sentence difficulty were significant at the .05 level of confidence while a similar relationship held between the correlation of the "(that) + S object quote" and passage difficulty.

For grade six pupils the Conjoining transformation and the "common elements deletion", the "WH BE deletion" and the "(that) + S object quote" transformations were good predictors of both sentence and passage difficulty. The "WH deletion" and the "(that) + S object" transformations correlated with sentence difficulty only. Findings for grades four, five, and six combined indicated that all transformations of the Conjoining and Deletion categories except the "comparative deletion" correlated significantly with both sentence and passage difficulty. Correlations of the "(that) + S object" with passage difficulty and of the "adverb replacement deletion" with sentence difficulty were significant at the .05 level of confidence.

Simple Transformations

Data on the correlations of the difficulty of Simple transformations are given in Table XV. At the grade four and five levels, the difficulty of nine of the Simple transformations correlated significantly with sentence difficulty while the number of Simple transformations whose difficulty correlated significantly with passage difficulty for these grades was six and seven respectively. At the grade six level the

TABLE XV

CORRELATIONS OF THE DIFFICULTY OF SIMPLE TRANSFORMATIONS WITH SENTENCE AND PASSAGE DIFFICULTY

Transform	Grade Four		Grade Five		Grade Six		Total	
	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.
Passive	0.640*	0.326*	0.741*	0.328*	0.778*	0.459**	0.725*	0.437*
There-Invers.	0.840*	0.613*	0.755*	0.698*	0.817*	0.822*	0.816*	0.721*
Question	0.647*	0.432	0.811*	0.499**	0.962*	0.535**	0.771*	0.544*
Negative	0.487*	0.356*	0.484*	0.288**	0.622*	0.620*	0.530*	0.430*
Aspect	0.646*	0.318*	0.659*	0.367*	0.729*	0.479*	0.705*	0.459*
Imperative	0.434	0.293	0.408	0.419	0.431	0.425	0.530*	0.496*
Contraction	0.549*	0.380	0.075	0.379	0.628*	0.717*	0.483*	0.553*
Comparative	0.677	-0.111	0.698**	-0.283	0.807**	0.498	0.725*	0.159
Pronoun(Simple)	0.426*	0.434*	0.425*	0.275*	0.561*	0.447*	0.502*	0.435*
Indirect Obj.	0.605**	0.697*	0.827*	0.866*	0.262	0.193	0.602*	0.563*
Reflex-Intens.	0.638	-0.289	-0.578	-0.878	0.039	0.378	0.188	0.249
Vocative	0.444	0.452	0.426	0.506	0.666*	0.663*	0.547*	0.554*
Expletive	0.648*	0.607*	0.574**	0.504**	0.969*	0.787*	0.761*	0.651*

* significant at the .01 level
** significant at the .05 level

difficulty of a greater number of transformations was related to the difficulty of the sentence and passage than for the previous two grades. The difficulty of the "reflexive-intensive" and of the "imperative" transformations did not relate significantly to either sentence or passage difficulty at either of the three grade levels. However, when the data for all three grades were combined, the correlation between the "imperative" and both sentence and passage difficulty was significant at the .01 level. The difficulty of the "vocative" correlated significantly with both sentence and passage difficulty for grade six pupils and for the total group. A correlation at the .05 level of significance was found between the difficulty of the "comparative" and sentence difficulty at the grade four and five levels. For the three grades combined this correlation was significant at the .01 level.

Transformations With Position Shift

Data on the correlations of the difficulty of transformations which underwent some change in the position of the formatives are shown in Table XVI. At the grade four level the difficulty of the "adverb position shift" and "adverb replacement shift" was significantly correlated with both sentence and passage difficulty. The difficulty of the "(that) + S object quote shift" may be considered a good predictor of sentence difficulty only. The latter statement is also true for findings on the grade five sample. At this grade level the difficulty of the "adverb position shift" and of the "adverb replacement shift" correlated significantly with sentence difficulty only. Data for grade six pupils and for the total group show that all transformations of the Position Shift group were correlated with both sentence and passage difficulty.

TABLE XVI

CORRELATIONS OF THE DIFFICULTY OF POSITION SHIFT TRANSFORMATIONS, MULTI-TRANSFORMATION UNITS, AND NON-TRANSFORMATION UNITS WITH SENTENCE AND PASSAGE DIFFICULTY

Transform	Grade Four		Grade Five		Grade Six		Total	
	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.	Sent.	Pass.
NP - V Inversion	0.222	0.005	0.006	-0.015	0.673*	0.785*	0.429*	0.357*
Adverb Pos. Shift	0.346*	0.322*	0.253**	0.003	0.408*	0.344*	0.382*	0.320*
Adv.Replace. Shift	0.652*	0.446*	0.653*	0.129	0.780*	0.627*	0.718*	0.480*
(That) + S Object Quotation Shift	0.724*	0.200	0.629*	0.240	0.868*	0.467*	0.798*	0.464*
Multi-Transforms	0.589**	0.574**	0.777*	0.466	-0.057	0.033	0.330**	0.133
Non-Trans. Units	0.705*	0.359*	0.685*	0.378*	0.764*	0.613*	0.741*	0.516*

* significant at the .01 level
** significant at the .05 level

The difficulty of "multi-transformation" units predicted sentence difficulty for the total group and for grades four and five. For the former two groups the correlation was significant at the .05 level. A correlation at the .05 level of significance also occurred for "multi-transformation" units and passage difficulty at the grade four level. The difficulty of the non-transformation units (sentence kernels) correlated significantly with sentence and passage difficulty at all grade levels and for the total group. Thus the difficulty of those units not containing transformations was a good indicator of the difficulty of both sentence and passage.

Summary

The difficulty of the majority of the transformations in each category correlated significantly with the difficulty of the sentence or passage in which they were found. The only exception was the Deletion category in which less than one-half of the transformations of this group correlated with passage difficulty at the grade four, five, and six levels. That is, the difficulty of the passage did not appear to depend upon the difficulty of the Deletion transformations present. For each group investigated (grade four, five, and six and the total group) the difficulty of the "relative clause", "compounds", "WH + S object", "infinitive of purpose", and the "adverb replacement" transformations from the Embedding group correlated significantly with sentence and passage difficulty. A similar relationship occurred for the Conjoining transformations and for the "common elements deletion". (The latter differs from the former by the addition of one transformation). The difficulty of the "passive", "there-inversion", "negative", "aspect", "pronoun (simple)", "expletive" from the Simple category also correlated

significantly with both sentences and passage difficulty for all grade
levels and for the total group. Whereas the difficulty of a sentence
and passage also appeared to be dependent upon the difficulty of "non-
transformational units", the difficulty of "multi-transforms" was not
significant.

Similar to the findings on the correlations of the presence of
the various transformations with sentence and passage difficulty, the
difficulty of the transforms appeared to be more crucial to the
difficulty of the sentence than of the passage. Redundancy of the
language was suggested as a possible reason for this. Whereas the
number of transformations whose presence correlated significantly with
the difficulty of a passage tended to decrease from grade four to grade
six, the opposite was generally true when the difficulty of the trans-
formations was considered. That is, grade six students were generally
less affected in their comprehension of written language by the presence
or difficulty of specific transformations than were the grade four
students. In the case of the presence of transformations where the
number of transformations which affected sentence or passage difficulty
decreased, the meaning of the above statement is self-evident. In re-
gard to the difficulty of transformations it has been stated that the
number of transformations whose difficulty correlated with sentence and
passage difficulty increased from grade four to grade six. However,
since the difficulty indexes of transformations were generally easier
for grade six students (next section), correlations between the diffi-
culty indexes of transformations and the difficulty of sentence and
passages meant that the latter were easier for pupils at this grade level.

III. DIFFICULTY OF TRANSFORMATIONS

The preceding section has dealt with the correlation of the difficulty of the various transformations investigated to the difficulty of the sentences and passages chosen for analysis. The difficulty of a number of transformations correlated significantly with both sentence and passage difficulty. This, however, merely indicates that an easy transform would tend to occur in an easy passage or sentence while a difficult transformation would be more likely to occur in conjunction with a difficult sentence or passage. The correlations give no indication as to which transforms actually were easy and which were difficult. In this section, the writer has set up tables to show the fifteen (top third) easiest and fifteen (bottom third) most difficult transformations as measured by the "cloze" technique. It must be borne in mind that "ease" or "difficulty" is relative and transforms which rank in the top third may still be difficult for students.

According to Table XVII which shows the relevant data on the easiest and most difficult transforms for the grade four pupils, it can be seen that of the fifteen most difficult transformations, six are of the Simple transformation category, four are Embedding transformations, three involve a deletion of specific linguistic elements and one is of the Position Shift type. Multi-transformation units also fell within the most difficult fifteen for grade four students. As shown in Tables XVIII and XIX the proportions changed slightly for grade five and six pupils. For grade fives, the number of Embedding transformations within the bottom third is still four. The number of Simple transformations has decreased by one from six to five. One more transformation of the Deletion type occurred within the most difficult

TABLE XVII

FIFTEEN EASIEST AND FIFTEEN MOST DIFFICULT TRANSFORMATIONS AT THE GRADE FOUR LEVEL

Easiest				Most Difficult		
Transform	Mean	S.D.		Transform	Mean	S.D.
Infinitive as Object	79.50	12.74		Reflexive-Intens.	15.50	16.13
WH + S Object	72.50	7.50		Ing-Nom. of Purpose	30.71	18.45
NP - V Inversion	71.47	22.17		Adverb Replace. Del.	33.33	13.12
Pronoun(Simple)	71.08	21.20		Contraction	34.33	20.49
(That) + S Object	67.55	11.58		WH Deletion	41.00	26.23
Adjective	66.28	25.15		Comparative Del.	43.43	20.18
Gerundive	65.50	21.20		With Phrase	44.14	28.03
Indirect Object	64.61	27.18		Vocative	45.00	29.82
Infinitive of Purpose	62.00	18.79		Multi-Transforms.	45.39	25.75
Appositive	62.00	17.28		Adverb Pos. Shift	45.42	24.77
Verb + C	60.60	22.20		Negative	45.49	34.09
(That) + S Object Quot.	60.26	16.62		Adv. Expans + S	46.28	28.11
Conjoining	58.53	18.75		Imperative	46.50	20.31
Question	58.33	24.80		Genitive	46.61	24.06
There Inversion	58.18	23.51		Comparative	46.85	29.84

TABLE XVIII

FIFTEEN EASIEST AND FIFTEEN MOST DIFFICULT TRANSFORMATIONS AT THE GRADE FIVE LEVEL

Easiest			Most Difficult		
Transform	Mean	S.D.	Transform	Mean	S.D.
NP - V Inversion	81.52	14.13	Reflexive-Intens.	22.50	18.25
Apositive	81.50	1.50	Multi-Transforms.	35.21	15.67
With Phrase	79.00	8.86	Adv. Replace. Del.	40.66	13.07
Pronoun(Simple)	78.63	17.04	Contraction	41.72	22.22
Infinitive as Obj.	77.85	13.15	WH BE Deletion	48.49	16.04
WH + S Object	75.50	3.50	Expletive	49.86	23.21
Indirect Object	73.69	20.38	Negative	50.06	30.73
(That) + S Object	72.71	7.45	Pronoun(Genitive)	53.33	27.49
Adv. Expans + S	72.33	5.37	That + S Object	53.66	8.64
Question	71.16	13.30	Ing-Nom. of Purpose	54.00	11.57
Adjective (That) + S Obj.	71.00	24.16	Adverb Pos. Shift	54.04	20.70
Quotation Shift	70.93	15.24	Vocative	54.33	33.27
(That) + S Obj.Quot.	68.93	13.37	Genitive	55.79	25.50
Verb + C	68.59	15.39	Comparative Del.	56.79	18.41
Gerundive	68.14	11.05	Common Elem. Del.	57.09	19.84

fifteen at the grade five level than at the grade four level. One transformation of the Position Shift type, and "multi-transformation" units were among the most difficult for grade five pupils. At the grade six level (Table XIX) the number of transforms in the Deletion and Position Shift categories that were most difficult for students of this grade was the same as in grade four. The number of Simple and Embedding transformations within the most difficult fifteen has reversed from the situation at the grade four level. For the latter group there were six transformations of the Simple type and four of the Embedding type included in the most difficult category while at the grade six level the number of transforms in these respective groups was four and six. For all grades combined, the number of transformations in these respective groups was six and three. For all grades combined, the number of difficult transformations from the Simple, Embedding, Deletion and Position Shift categories was six, three, four, and one respectively. "Multi-transformation" units were among the most difficult fifteen for all grades singly and combined.

More Embedding than Simple transformations fell among the fifteen easiest transforms for grade four and five pupils. At the grade six level the number for both categories was equal. There were two transforms of the Deletion type among the top fifteen for each of the three grades and for the total group. One transformation from the Position Shift group was included among the easiest fifteen for grade four, while there were two from this group at the grade five and grade six levels. The Conjoining transformation tended to be among the fifteen easiest for grade six and for the three grades combined. An inspection of the tables showing the fifteen easiest transforms and the

TABLE XIX

FIFTEEN EASIEST AND FIFTEEN MOST DIFFICULT TRANSFORMATIONS AT THE GRADE SIX LEVEL

Easiest				Most Difficult		
Transform	Mean	S.D.		Transform	Mean	S.D.
WH + S Object	84.50	9.50		Multi-Transforms.	20.33	12.88
Pronoun(Simple)	79.60	19.59		Reflexive-Intens.	33.75	27.08
NP - V Inversion	78.85	19.19		Contraction	42.40	24.54
Gerundive	77.75	26.61		Ing-Nom. of Purp.	48.75	30.26
Infinitive as Obj.	76.93	28.73		WH Deletion	51.15	26.06
Question	76.62	16.29		Negative	54.65	29.87
Indirect Obj.	76.61	21.00		Pronoun(Genitive)	54.72	30.81
Adjective	74.50	25.72		Adv. Position Shift	56.24	22.80
(That) + S Obj. Quot.	73.85	16.36		Adv. Replace. Del.	58.25	17.38
(That) + S Object	73.42	14.51		With Phrase	58.50	38.32
(That) + S Object						
Quotation Shift	73.18	17.90		Vocative	60.33	29.15
There Inversion	72.06	19.20		VP Comp.	61.25	19.94
Verb + C	71.27	21.54		Genitive	61.36	26.61
Conjoining	70.06	18.32		Appositive	62.00	18.00
Passive	68.85	20.12		Common Elem. Del.	62.31	20.83

TABLE XX

FIFTEEN EASIEST AND FIFTEEN MOST DIFFICULT TRANSFORMATIONS FOR THE TOTAL GROUP

	Easiest			Most Difficult	
Transform	Mean	S.D.	Transform	Mean	S.D.
Infinitive as Object	78.04	20.06	Reflexive-Intens.	23.91	22.33
WH + S Object	77.50	8.88	Multi-Transformations	33.61	21.66
NP - V Inversion	77.14	19.40	Contraction	39.42	22.83
Pronoun(Simple)	76.37	19.77	Ing-Nom. of Purpose	40.85	23.80
Indirect Object	71.66	20.06	Adv. Replace. Del.	45.50	18.44
(That) + S Object	70.91	11.87	Negative	50.07	31.90
Adjective	70.61	25.24	WH Deletion	51.28	25.29
Gerundive	70.56	19.07	Pronoun(Genitive)	51.91	29.64
Question	68.40	20.36	Adv. Position Shift	51.92	23.28
(That) + S Obj. Quot.	67.71	16.44	Vocative	53.12	31.27
Appositive	67.57	17.28	WH BE Deletion	54.03	22.74
(That) + S Object					
Quotation Shift	66.77	19.35	Genitive	55.09	26.17
Verb + C.	66.73	20.49	Comparative Del.	55.14	20.43
Conjoining	65.32	18.79	Expletive	55.68	27.07
There Inversion	65.10	20.40	Imperative	57.20	18.41

fifteen most difficult ones indicates a number of similarities across grades. Five of the transforms generally found among the fifteen easiest are one word transforms (appositive, Pronoun (simple), adjective, indirect object, and gerundive). But eight of those transforms commonly found among the most difficult fifteen also consist of one word (reflexive-intensive, contraction, negative, vocative, expletive, pronoun (genitive), aspect, and genitive). Thus the number of words in the surface structure of a sentence as a result of various transformations does not appear to be a criterion of transform difficulty. Three transformations which occurred among the top third are usually part of direct speech - "(that) + S object quote", "(that) + S object quote shift", and "questions". Two transformations generally associated with direct speech occurred within the most difficult group. These are the "vocative" and the "expletive". It is interesting that these two transformations occurred most often in a split quotation such as, "Bob," said John, "what would happen if we should run into rough weather?" or "Oh!" said the boy, "I didn't know I was late". Is it possible that children are more familiar with the form of direct speech where the entire quote either precedes or follows the words indicating the speaker? On several papers where the word "John" had been deleted in the sentence mentioned above, the students seemed to ignore punctuation marks and pencilled in the blank where the word "John" was to be inserted. Some students drew an arrow from the word "said" to the word "what".

The graph of Figure 23 shows the comparative difficulty of the various transformations by grade and for the total group. A progression of the ease with which pupils responded to these linguistic segments is obvious over the grades. The one exception is the "multi-transformation"
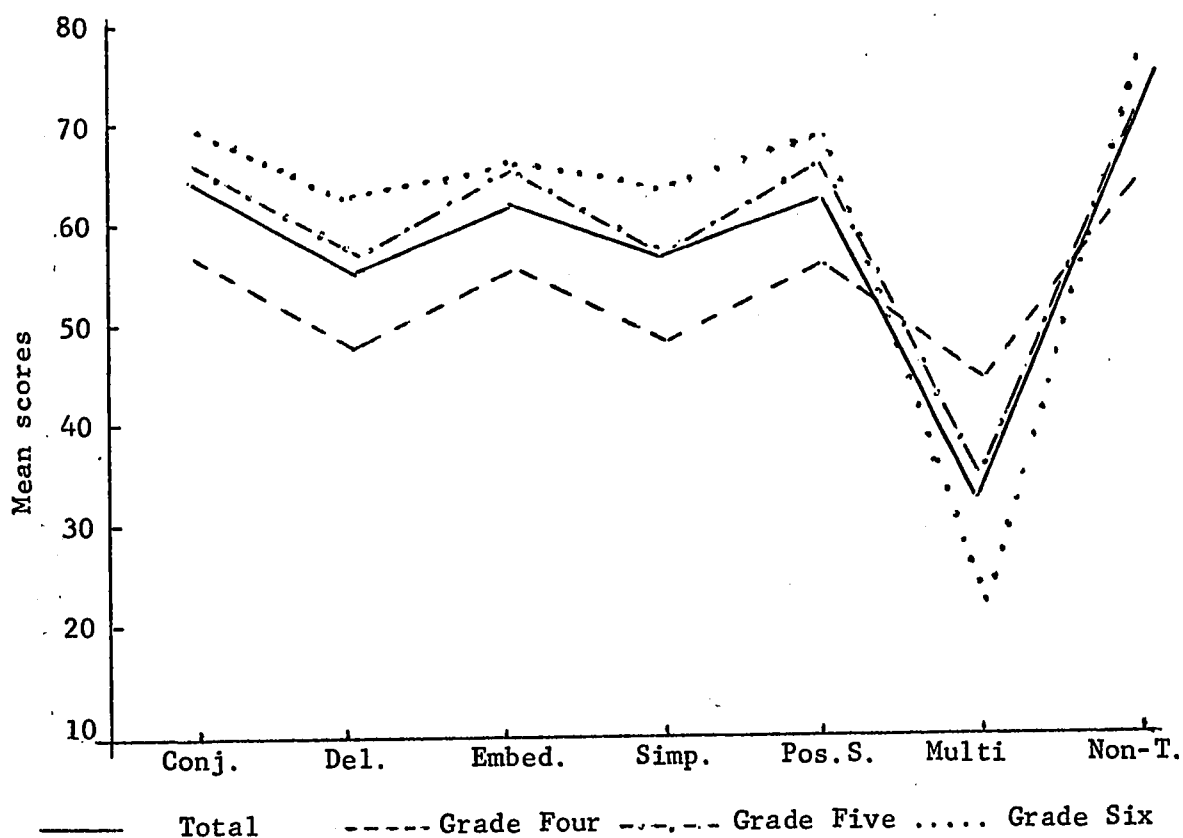
Fig. 23. DIFFICULTIES OF THE DIFFERENT TYPES OF TRANSFORMS BY GRADE

unit which became progressively harder from grade four to grade six. The lines of the graph parallel each other for the various transformation difficulties indicating that the relative ease or difficulty of the various transformation types are similar over grades. Although students tended to do better on their responses to transformations from grade four to grade six (with the exception of multi-transformations) the relutive ease or difficulty did not change over grades. It thus appears that the same type of transforms are causing greater difficulties at each grade level. When one considers the mean of the different transformation difficulties, with the exception of the mean for "multi-transformation" units, the grade four pupils were farther below the group mean than the

grade six pupils were above it. This is indicative of the difficulties grade four students normally have with language structure in their basal readers as has been mentioned in the literature. This graph also emphasizes the fact that the transformation units within a passage tended to relate to the difficulty of that passage. The scores for the non-transformation units for each grade were, on the average, the lowest for the linguistic elements to which the pupils responded.

In order to compare statistically the ordering of the difficulties of the various transformations, a rank order correlation was computed. In order to overcome the difficulty of unequal N's and large variances, the difficulties were grouped into five categories and ranked in this manner. There were nine groups of five. The correlation coefficients of this ranking are given in Table XXI and attest to the similarity

TABLE XXI

RANK ORDER CORRELATIONS BETWEEN THE DIFFICULTIES OF TRANSFORMS
FOR GRADES FOUR, FIVE, AND SIX

Grades	Grades		
	4	5	6
4	1.000	0.7805	0.8615
5	0.7805	1.0000	0.7798
6	0.8615	0.7798	1.0000

of the responses which grades four, five, and six pupils made to the different transformations inherent in the passages read.

Summary

More Simple than Embedding transformations generally fell within the most difficult group of fifteen for the pupils of the sample. However, a much larger group of Embedding transformations than Simple transformations were unaccounted for either in the bottom or top third. That is, these transformations were generally of medium difficulty according to the measure used. A greater percentage of the Deletion transforms than of any other group fell within the fifteen most difficult transformations for all grade groups. The two Deletion transformations which were consistently easy for all grades were the "(that) + S object", and the "(that) + S object quote". It has already been pointed out that these transformations are generally found in direct speech. The Position Shift transformations that were among the easiest also commonly occur in direct quotations. These were the "(that) + S object quote shift", and the "NP - V inversion". The Conjoining transformations were generally found among the easiest fifteen while "multi-transforms" were consistently difficult.

In addition to the above descriptive data, a rank order correlation was carried out which showed the similarity of the ease and difficulty of transformations over grade levels.

IV. A COMPARISON OF THE EASE AND DIFFICULTY OF TRANSFORMATIONS AND THE CORRELATIONS OF THEIR PRESENCE AND DIFFICULTY TO SENTENCE AND AND PASSAGE DIFFICULTY

The correlations of the presence of transformations with sentence and passage difficulty, the correlation of the difficulty of transforms with the difficulty of the sentence or passage, and the least and most difficult of the transformations have been described in the three

preceding sections of this chapter. Were those transformations which related by their presence to the difficulty of written language also the more difficult in terms of the "cloze" technique? Was it the difficulty of those transformations which correlated significantly with sentence and passage difficulty? Or did the transforms which fell into these three categories vary in kind? The writer will attempt to answer these questions in this section of the chapter. Tables XII to XV have been designed to show similarities between those transformations whose presence correlated significantly with sentence and passage difficulty, those transforms whose difficulty correlated significantly with sentence and passage difficulty, and the fifteen easiest and the fifteen most difficult transforms.

Data on the Embedding transformations for grades four, five, and six and for the total group are given in Table XXII. In general, both the presence and difficulty of the "relative clause", "compounds", the "infinitive of purpose", the "ing-nominalization", and the "adverb replacement" transforms were significantly correlated with sentence or passage difficulty at all grade levels and for the total group. However, except for the "infinitive of purpose" (which was one of the easiest transformations at the grade four level), the difficulty of these trans-formations was included neither among the fifteen easiest nor the fif-teen most difficult. Thus, although the presence of these transforms would tend to produce a difficult passage, their difficulty indexes in the passages tested were not among the most difficult for the sample investigated.

When one considers those Embedding transformations which fell among the most difficult fifteen, it can be seen from the data of

TABLE XXII

A SCATTERGRAM OF SIGNIFICANT CORRELATIONS OF THE PRESENCE AND DIFFICULTY OF TRANSFORMATIONS AND THE FIFTEEN EASIEST AND FIFTEEN MOST DIFFICULT TRANSFORMATIONS

Embedding Transforms	Grade Four Pres. S P*	Diff. Eas. S P	Most Diff.	Grade Five Pres. S P	Diff. Eas. S P	Most Diff.	Grade Six Pres. S P	Diff. Eas. S P	Most Diff.	Total Pres. S P	Diff. Eas. S P	Most Diff.
Rel. Clause	-x-x	x x		-x-x	x x		-x	x x		-x-x	x x	
With Phrase	-x-x	x x	x	-x-x	x		-x	x x	x		x x	x
Adjective		x x		x	x			x x	x	x x	x x	x
Appositive	-x	x x		-x	x		-x	x x	x	-x-x	x x	x
Gerundive		x			x			x			x x	x
Compounds	-x-x	x x		-x	x x		-x-x	x x		-x-x	x x	
Genitive	-x-x	x x			x		-x	x		-x	x x	
That + S		x		-x-x	x	x	x	x	x		x	
VP Comp.	-x-x	x x		-x-x	x x	x	-x-x			-x-x	x x	
WH + S Obj.	x	x x	x		x x	x	x	x x	x	x	x x	x x
Infin. Obj.		x x	x		x x	x		x x	x		x x	x
Infin. Purp.	-x-x	x x	x	-x-x	x x		-x	x x		-x-x	x x	
Ing-Nom.	-x-x	x x		-x	x		-x-x	x x		-x-x	x x	
Ing-Nom Purp.	-x-x	x x	x	-x	x x			x x	x	-x-x	x x	x
Pron(Gen)	-x	x		x	x	x		x x	x	-x	x x	x
Verb + C	-x	x x	x	-x-x	x x	x	-x-x	x x	x	-x-x	x x	
Adv. Replace.	-x-x	x x		x	x x	x	x	x x		-x-x	x x	
Adv. Expans + S	x	x	x		x			x		-x-x	x	

x indicates the presence of the transform within the particular column
- the correlation is negative
*S sentence difficulty   P passage difficulty

Table XXII that the correlations of their difficulties was not significant at the grade four level. That is, their difficulty did not relate to the difficulty of the sentence or passage in which they were found. At the grade five and six levels, the difficulty of the "genitive" correlated significantly with sentence difficulty while the difficulty of the "pronoun (genitive)" was significantly related to sentence and passage difficulty. These two transformations were also among the most difficult fifteen for students at these grade levels. At the grade six level, the "appositive" was most difficult for students and its difficulty correlated significantly with both sentence and passage difficulty. Furthermore, the presence of this transform tended to increase the difficulty of the sentence in which it occurred. When the data for all three grades were combined, the findings were similar to those for grade six pupils with the exception that the presence of the "ing-nominalization of purpose" correlated highly with both sentence and passage difficulty. Thus for the pupils of these three grades, it would appear that this transform would be the best predictor among Embedding transforms of a difficult passage.

The "adjective", "gerundive", "WH + S object", and the "verb + C" tended to fall amongst the fifteen easiest transformations for grade four, five, and six pupils, and for the total group. The difficulty of these transforms also correlated significantly with sentence and passage difficulty for each group singly. Though the "appositive" tended to occur amongst the easiest transformations, its presence correlated significantly and negatively at all grade levels with sentence difficulty and with both sentence and passage difficulty for the total group. It has already been mentioned that the presence of a transform appears to

affect the grammatical structure of a sentence more than it affects the semantic content. When students were required to complete the "cloze" where the "appositive" had been deleted, they were usually successful. This is understandable when one considers how this process worked. In the sentence "Bob, the football coach, was our guest last Sunday" if either word of the "appositive" is deleted, there are enough syntactic cues remaining for the insertion of that item. In view of the fact that an item which was grammatically similar to the item deleted was considered correct, this statement seems all the more reasonable. In place of "coach" pupils inserted "fan", "hero", "player" etc. After the insertion of an item in an "appositive", the pupils seemed to score low on some subsequent item which normally received high scores. It could be that completion of the "appositive" interrupted the flow of the language or that the insertion of a word other than the one which had appeared in the original text caused some semantic confusion further on, or that both factors contributed to the situation.

Table XXIII contains data on the Conjoining and Deletion transformations for all grades combined and singly. The correlation of the presence and difficulty of these transformations and their difficulty indexes tended to vary considerably by grade and for the total group. When the data for the total group were examined, it appeared that the "WH deletion", the "WH BE deletion", the "comparative deletion" and the "adverb replacement deletion" would more likely be found in a difficult passage than any of the other Deletion transforms since these were among the most difficult fifteen, and their presence and difficulty correlated significantly with sentence and/or passage difficulty. An analysis by grade showed that the "common elements deletion" transform tended to be

TABLE XXIII

A SCATTERGRAM OF SIGNIFICANT CORRELATIONS OF THE PRESENCE AND DIFFICULTY OF TRANSFORMATIONS AND THE FIFTEEN EASIEST AND FIFTEEN MOST DIFFICULT TRANSFORMATIONS

Conjoin. and Deletion Transforms	Grade Four						Grade Five						Grade Six						Total					
	Pres.		Diff.		Eas.	Most Diff.	Pres.		Diff.		Eas.	Most Diff.	Pres.		Diff.		Eas.	Most Diff.	Pres.		Diff.		Eas.	Most Diff.
	S	P*	S	P			S	P	S	P			S	P	S	P			S	P	S	P		
Conjoining			x	x					x	x					x	x	x		-x	-x	x	x	x	
Com.Elem.Del.	-x	-x	x	x			-x	-x	x	x		x	-x	-x	x	x	x		-x	-x	x	x	x	
WH Deletion	-x	-x				x	-x	-x	x				-x	-x	x			x	-x	-x	x	x		x
WH BE Del.	-x	-x	x				-x	-x			x	x	-x	-x	x	x			-x	-x	x	x	x	
(That) + S Obj.	x		x		x				x	x	x				x		x		x		x	x		
(That) + S Obj. Quotation	x		x				x	x	x	x	x		-x		x	x	x				x	x		
Compar. Del.	-x		x			x	-x		x			x							x		x	x	x	
Adv. Replace. Deletion	-x		x			x	-x					x	-x		x			x	-x		x	x		x

x indicates the presence of the transform within the particular column

− the correlation is negative

*S sentence difficulty   P passage difficulty

a good predictor of passage difficulty for grade five and six pupils since it was one of the most difficult transforms for these grades and its presence and difficulty correlated significantly with sentence and passage difficulty. The "(that) + S object" and the "(that) + S object quote" transformations differed from all the other transformations in this group in that their presence most likely meant an easy passage. Furthermore, their difficulty correlated with sentence and passage difficulty for each grade and for the total group and their difficulty indexes were among the fifteen easier transforms. It has already been mentioned that the latter of these transformations is part of direct speech and which pupils of this study seemed to find easier. The "(that) + S object" also appears to occur more in oral language than its counterpart "that + S object".

With some exceptions, the "question" and the "indirect object", and "pronoun (simple)" appeared to be the best predictors among Simple transformations for an easy passage (Table XXIV). The presence of the "pronoun (simple)" transformation, however, was negatively correlated with passage difficulty at the grade four and grade six levels and for the total group. The "negative" appears to be consistently the most difficult transformation of this group. Its presence and difficulty correlated significantly with sentence and/or passage difficulty and it occurred among the most difficult fifteen for each grade singly and for the total group.

Data for transformations of the Position Shift type are shown in Table XXV. The "adverb position shift" appeared to be the best predictor of a difficult passage for all groups. Though the presence and the difficulty of the "adverb replacement shift" transformation correlated

TABLE XXIV

A SCATTERGRAM OF SIGNIFICANT CORRELATIONS OF THE PRESENCE AND DIFFICULTY OF TRANSFORMATIONS
AND FIFTEEN EASIEST AND FIFTEEN MOST DIFFICULT TRANSFORMATIONS

Simple Transforms	Grade Four Pres. (S P*)	Grade Four Diff.Eas. (S P)	Grade Four Most Diff	Grade Five Pres. (S P)	Grade Five Diff.Eas. (S P)	Grade Five Most Diff	Grade Six Pres. (S P)	Grade Six Diff.Eas. (S P)	Grade Six Most Diff	Total Pres. (S P)	Total Diff.Eas. (S P)	Total Most Diff
Passive	-x-x	x x			x x		-x	x x	x		x x	
There Invers.	x	x x	x x	-x	x x		-x	x x	x	-x-x	x x	x x
Question	x	x x	x x	x	x x	x	x x	x x	x	x	x x	x x
Negative	-x-x	x x	x	-x	x x		-x	x x		-x	x x	
Aspect		x x		-x	x x			x x		-x	x x	
Imperative	x			x x		x	x			x x	x x	x
Contraction	x	x	x	x				x x	x	x	x x	x
Comparative	-x	x x	x	-x-x	x		x	x		-x-x	x x	
Pron(Simple)	x-x	x x	x x	x	x x	x x	x-x	x x	x	x-x	x x	
Indirect Obj.	x	x x	x	-x	x x	x	x x	x			x x	
Reflex-Intens.	x			-x			-x-x		x	-x	x x	x x
Vocative	x x	x x	x	x x	x x	x	x x	x x		x x	x x	x x
Expletive	x x	x x	x	x	x x	x	x x	x x		x x	x x	x

x   indicates the presence of the transform within the particular column
-    the correlation is negative
*S   sentence difficulty   P   passage difficulty

TABLE XXV

A SCATTERGRAM OF SIGNIFICANT CORRELATIONS OF THE PRESENCE AND DIFFICULTY OF TRANSFORMATIONS
AND THE FIFTEEN EASIEST AND FIFTEEN MOST DIFFICULT TRANSFORMATIONS

Pos.Shift, Multi-trans., Non-T Units	Grade Four					Grade Five					Grade Six					Total				
	Pres.		Diff.Eas.		Most Diff	Pres.		Diff.Eas.		Most Diff	Pres.		Diff.Eas.		Most Diff	Pres.		Diff.Eas.		Most Diff
	S	P*	S	P		S	P	S	P		S	P	S	P		S	P	S	P	
Adv. Pos.Shift	x		x	x	x	x		x		x	-x		x	x	x	-x	x	x	x	x
Adv.Replace.Shift	-x	-x	x	x		-x	-x	x			-x		x	x		-x	-x	x	x	
(That) Quot. Shift			x		x	x	x	x		x	x		x	x	x	x		x	x	x
NP - V Invers.	x					-x				x	x		x	x	x	x		x	x	x
Multi-Transforms.			x	x	x			x					x	x	x			x		x
Non-T Units			x	x		x	x	x	x									x	x	

x indicates the presence of the transform within the particular column

- the correlation is negative

*S sentence difficulty   P passage difficulty

significantly with sentence and passage difficulty, its difficulty index was not included among the most difficult or the easiest transformation groups. The "(that) + S object quote shift" was relatively easy for all groups. Its presence and difficulty were also positively correlated with the difficulty of the sentence and passage. Multi-transformation units were among the most difficult for pupils of this study and the difficulty of these elements correlated significantly with sentence and passage difficulty. The presence of these units, however, was not related to the difficulty of the sentence or passage. Thus the difficulty of the sentence or passage appeared to depend on the difficulty of these units than on their actual presence. The difficulty of the non-transformation units fell into the medium range of transformation difficulties for all grades and since the difficulty of these units correlated significantly with both sentence and passage difficulty, such units would likely predict passages of medium difficulty.

Summary

Comparisons were made among the presence of each transformation investigated, the difficulty of each transformation and the correlation of transform difficulty with sentence and passage difficulty. A consideration of these three factors showed that very few transforms were consistent in their relation to sentence and passage difficulty.

The "WH + S object" appeared to be relatively easy. Its presence correlated positively with passage difficulty at the grade four and grade six levels and for the total group; its difficulty correlated significantly with sentence and passage difficulty for each grade singly and for the total group, and it was among the easiest fifteen transforms for all groups. The "appositive" was generally difficult for grade six students.

Its presence correlated significantly with sentence difficulty; it was one of the most difficult fifteen transformations and its difficulty correlated significantly with sentence and passage difficulty at this grade level. The "ing-nominalization" and the "pronoun (genitive)" appeared to be most difficult for the total group. Both were among the fifteen most difficult transformations and their difficulty correlated significantly with sentence and passage difficulty. Whereas the presence of the latter correlated significantly with sentence difficulty, the presence of the former was significantly related to both sentence and passage difficulty.

When the presence, the difficulty and the correlation of the difficulty of Conjoining transformations were considered, no consistency was found between the relationship of these factors and sentence and passage difficulty at the different grade levels.

The "common elements deletion" was one of the most difficult transforms for grade four and grade five pupils on all three counts. The "WH deletion" was difficult for grade six pupils, while this transformation and the "WH BE deletion", the "comparative deletion", and the "adverb replacement deletion" were difficult for the total group. The "that + S object" and the "(that) + S object quote" were generally consistently easy for the total group. The latter transformation also contributed to the ease of understanding of written language for students at the grade five level.

Of the Simple transformations, the "negative" was the most difficult for the students at each grade level. The "question" and the "pronoun (simple)" were generally consistently easy for each grade group and for the total group. While the "(that) + S object quote"

and the "NP - V inversion" were generally easy for the total group, there was little consistency in the ease or difficulty of Position Shift transforms for each grade individually. There was also no consistency in the ease or difficulty of "multi-transforms" or "non- transformation units" when their presence, their difficulty, and the correlation of their difficulty with sentence and passage difficulty was considered.

It is difficult to generalize about the findings of this study on the relationship of transformations to sentence and passage difficulty. Some transformations related more to the difficulty of written language by their presence, while others related more by their difficulty. Those transformations whose difficulty correlated with sentence and passage difficulty may have high or low difficulty indexes. Thus generalizations are best made about a transform on either of these factors separately and for each grade group tested.

V. THE DIFFICULTY OF THE PASSAGES OF THE THREE BASAL READER SERIES

In order to determine whether there was any difference in the difficulty of the stories from each of the three basal reader series, a one way analysis of variance was carried out. The results for the total test group are summarized in Table XXVI. According to the data of this table the differences between the stories of the basal readers (grouped by series) are significant at the .05 level of confidence.

An analysis of the means of each of the three series shows that the stories of Series B were least difficult for the pupils of this study (Table XXVII). Since the means of the other two series did not differ significantly statistically, it is not possible to say that either was more difficult than the other. The analysis of the sentences

TABLE XXVI

SUMMARY OF ANALYSIS OF VARIANCE FOR DIFFERENCES IN STORIES BY SERIES

Source of Variance and Sums of Squares		Mean Squares		df		
Among Means of Series	Between Means	Among Means of Series	Between Means	Among Means of Series	Between Means	F*
973.1850	15332.50	486.59	124.65	2	123	3.90

* for this F, the p < .05

TABLE XXVII

MEAN CLOZE SCORES OF EACH OF THE THREE BASAL READER SERIES

Series	Mean	S. D.
A	63.0714	9.6333
B	69.0714	11.0485
C	63.2857	12.6131
Total	65.1421	11.3759

of the three basal reader series (described in Chapter VII) showed that though there were more transformations in Series B than in Series A, there were fewer transformations per sentence in the former than in the latter series. The number of transformations per sentence for Series A and B were 5.0 and 4.5 respectively. However, if the number of transformations per sentence tended to make written language more difficult then one would expect the stories of Series C to be significantly different from the stories of Series A and B since the number of transformations per sentence in Series C is 6.2.

A better explanation as to the differences in difficulty of the stories of Series A, B, and C may lie in the type of transformations. Of the total number of transformations in either series those of the Embedding type formed the largest single group in Series A and C. In Series B, Simple transformations constituted the largest single group - the percentage of such transforms being 38.9 as compared to 33.7 for Series A and 30.3 for Series C. It has already been shown that the presence of Embedding transformations within written language is likely to increase the difficulty of sentences.

The presence of Deletion transformations also correlated highly with sentence and passage difficulty. Of the three series, Series B contained the least number of this type of transformation. An analysis of the transformations within the various transformation categories also gives some interesting facts. The presence of the "adverb replacement" and the "relative clause" were both significantly correlated with sentence and passage difficulty. The "adverb replacement" was the second most frequent transformation in Series A, the third most frequent in Serie C and the fourth most frequent in Series B. Similarly, the "relative"

clause" which ranked fourth place in Series A, held sixth and seventh

place in frequency of occurrence in Series B and C. An analysis of the

Deletion type transformations showed that although the "common elements

deletion", the "WH BE deletion", and the "(that) + S object quote" ranked

in that order of occurrence in each of the three basal reader series, the

percentage of occurrence of each of these transformations, however, varied

within and between texts. The "common elements deletion" whose presence

correlated significantly with sentence and passage difficulty at all

grade levels and whose difficulty index was among the bottom fifteen at

the grade five and grade six levels, constitued 6.1 per cent of all trans-

formations in Series A, 8.1 per cent of all transformations in Series C

but only 3.8 per cent of all transforms in Series B. Furthermore, the

findings indicated that both the presence and the difficulty of the

"(that) + S object quote" correlated significantly with sentence and

passage difficulty. It was one of the easiest fifteen transformations

for each of grades four, five, and six and for these grades combined.

This transformation made up only 1.9 per cent of all transformations in

Series A, 2.2 per cent of those in Series C but 3.2 per cent of the

transformations in Series B.

It appears from the above that the type of transform may be more

crucial to the difficulty of a sentence or passage than the number of

transformations. When type of transformation is considered, it is

necessary to take into account both its presence and its difficulty.

Summary

Linguistic elements within written language can affect the diffi-

culty of the total language unit (sentence or passage) both by their

presence and by their difficulty. Information of this nature on forty-

three specific sentence transformations which may be grouped into five

categories has been reviewed in this Chapter.

A greater number of transformations tended to affect the difficulty

of a sentence than of a passage. Some explanation for this may lie in

the redundancy of language - particularly the redundancy of language

structure. Information which an individual may miss within the boundaries

of a particular sentence may be acquired within some other sentences of

the passage. The transformation containing this information would thus

be more crucial to the sentence than to an understanding of the passage.

The "negative" and the "adverb replacement deletion" may be used to

illustrate. Supposing the sentence "The boy wasn't allowed to go swim-

ming" were part of a story. If a child should miss the "negative"

within the sentence, the information he derives from the sentence is

certain to be incorrect. Farther on in the passage there may be some

statement telling what the boy did after his friends had gone swimming

and thus the item of information missed in the "negative" is regained.

Redundancy of the "adverb replacement deletion" is due mainly to the

linear ordering of words, which in the stories of most basal reader

series tends to correlate highly with sequence in time. In the sentence

"The boy was first sent to the nurse's office. After that he was sent

home to go to bed" the information which the "adverb replacement deletion"

provides is also provided by the linear ordering of words and by the

word "first" in the former sentence.

Though there are exceptions within categories, it appears from the

findings that the presence of the Embedding and Deletion transformations

were better predictors of a difficult sentence or passage than were trans-

formations of the other three types. The presence of the Conjoining

transformation was not a good indicator of sentence or passage difficulty for the grade levels investigated. Simple transformations tended to increase the ease of a passage although some like the "negative" had the opposite effect. The only transformation from among the Position Shift group whose presence correlated significantly with sentence and passage difficulty was the "adverb replacement shift". This transformation is actually an Embedding transformation which has been front-shifted.

When the correlation of the difficulty of transformations with sentence and passage difficulty was considered, transformations of the Embedding and Simple types were the best indicators of sentence and passage difficulty. The difficulty of the Conjoining transformation also correlated significantly with the difficulty of the sentence and passage in which it occurred. Similar findings resulted for non-linguistic units. Though the difficulty of the Embedding transformations correlated significantly with sentence and passage difficulty, transformations of this type were not always the most difficult for students.

The most difficult transformations as measured by the "cloze" technique tended to be Simple or Deletion transformations. Multi-transformations units were also included in this category. The difficulty of a transformation did not appear to depend on the number of words in the surface structure of a sentence due to the application of a particular transformation rule. There was a high correlation between the difficulties of transformations at each grade level investigated. Pupils at each grade level also scored progressively higher except on "multi-transformation units" which seemed to become more difficult from grade four to five to six.

When a comparison was made of those transformations whose presence

and difficulty correlated significantly with sentence and passage diffi-
culty and those transformations which were easiest or most difficult
for the pupils at the grade levels tested, it appeared that transfor-
mations of the Deletion type would present most difficulty in written
language. Transformations of this category which correlated most highly
with sentence and passage difficulty were the "WH deletion", the "WH BE
deletion", the "adverb replacement deletion", and the "comparative
deletion". The "ing-nominalization", the "ing-nominalization of pur-
pose", the "appositive" (Embedding transformations) and the "negative"
(Simple transformation) also tended to be consistent in their relation-
ship to the difficulty of the sentence and/or passage in which they
occurred. Transformations which are generally associated with direct
speech regardless of the type of transformation under which they may be
classified, correlated with sentences or passages which students tended
to find easy.

When the difficulties of the passages of the three basal reader
series were compared, it was found that the passages of Series B were
easier than those of Series A or C. An explanation for this seemed to
lie in the type of transforms rather than in the number of transforms
present in the passages.

A greater number of transformations tended to relate more to the
difficulty of a sentence than to the difficulty of a passage which seems
to indicate that the difficulty of a passage and the difficulty of a
sentence are not dependent on the same factors.

CHAPTER IX

FINDINGS: THE NUMBER OF TRANSFORMATIONS AND SENTENCE AND
PASSAGE DIFFICULTY

An analysis of the findings of this study has shown that of the

forty-four transformations(including multi-transformation units)

investigated, the presence and difficulty of a number of these correl-

ated significantly with sentence and passage difficulty. It is possible

that the presence or difficulty of these transformations may be influ-

ential in determining the difficulty of a sentence or passage because of

the number of that particular type which is present in the sentence or

passage.

In order to gather further data on this problem, the writer

constructed four forms of three stories (one story from each basal

reader series). Each form contained twenty transformations and of these

twenty transformations, twelve were of one of the four major categories

investigated - Conjoining, Deletion, Embedding, and Simple. This

constituted Part II of the study. In Part III, there were six stories-

two from each basal reader series. Each story had five forms - one basic

and one which corresponded to each of the four major types of transfor-

mations. The four forms of each story were constructed by taking the

basic form (as extracted from the basal reader) and adding a sentence

or sentences containing a transform of each of the four major types. In

order to determine whether the number of transforms was influential in

determining the difficulty of the sentence in which they were contained,

correlations were calculated on the number of transformations per sent-

ence and sentence difficulty. An analysis was also made to determine

whether the number of transformations was a predictor of sentence difficulty when the number of words per sentence was controlled. Results of the findings pertinent to the above will be summarized in this chapter.

Stories With Equal Numbers of Transforms

Figures indicating differences in the "cloze" mean scores of forms over each of the three stories are given in Table XXVIII. Forms differed significantly over each of the three stories. A Newman-Keuls comparison of ordered means(Table XXIX and Appendix L) indicated that for Story 1 the order of means from most difficult to easiest was Deletion, Simple, Embedding, and Conjoining. According to the data of Table XXIX, however, only Deletion and Conjoining, and Deletion and Embedding differed from each other. The degree of difference was at the .05 level of significance. For Story 2, the order of means was Deletion, Simple, Embedding, and Conjoining while the order of difficulty for the forms of the third story was Embedding, Deletion, Simple, and Conjoining. A Newman-Keuls comparison of the ordered means of the forms of Story 2 indicated that the passage with the greater number of Deletion transforms differed at the .01 level of significance from the Conjoining and Embedding forms, and at the .05 level from the Simple form(Table XXIX). The form containing a higher proportion of Embedding transforms differed at the .01 level from the Conjoining and the Simple forms for the third Story. The story form containing a majority of Deletion transforms appears to be the most difficult. It has already been shown that the presence of Deletion transformations tended to increase the difficulty of a passage, and with the exception of Simple transformations at the grade four level, there was a greater proportion of Deletion transforms included among the most

TABLE XXVIII

SUMMARY OF ANALYSIS OF VARIANCE OF EACH OF THE THREE STORIES BY FORM

Stories	Source of Variance and Sums of Squares		Mean Squares		df		F
	Among means of Story forms	Within forms	Among means of Story forms	Within forms	Among means of Story forms	Within forms	
First	2383.62	73313.87	794.54	168.93	3	434	4.70*
Second	8447.00	127256.00	2815.67	295.26	3	431	9.54*
Third	5412.00	124954.00	1804.00	287.25	3	435	6.28*

* significant at the .01 level

TABLE XXIX

A NEWMAN-KEULS COMPARISON OF ORDERED MEANS OF THE FORMS OF EACH STORY

Stories	Forms					
	1-2	1-3	1-4	2-3	2-4	3-4
First	.05			.05		
Second	.01	.01		.01	.05	
Third						.01

_____ not significantly different at the .05 level

.05   significantly different at the .05 level

.01   significantly different at the .01 level

Forms   Conjoining(1), Deletion(2), Embedding(3), Simple(4)

difficult transformations at the different grade levels.

In view of the findings(Chapter VIII) that the difficulty of a passage may be dependent on the type of transformations, an analysis was made of the remaining eight transforms in the four forms of each story. This analysis is summarized in Table XXX. The Conjoining forms ranked easiest for all stories on the basis of mean scores. According to Table XXX the remaining eight transforms in each of the Conjoining forms consisted largely of Simple transformations like the "pronoun (simple)", or Embedding transforms like the "pronoun(genitive)". Neither the presence nor difficulty of these transforms was found to influence passage difficulty to any extent. The Story forms containing a greater number of Simple transforms ranked as the second most difficult for Stories 1 and 2 and the third most difficult for Story 3.

This finding is not surprising when one considers the data of Table XXX which shows that the remaining eight transformations in each Simple form consisted mostly of Deletion or Embedding transformations. The "relative clause" and the "adverb replacement" - the presence of which transformations was found to be a significant factor in passage difficulty - were the most common Embedding transforms to be found. Also in two of the Stories the Simple forms contained eleven transforms of that category rather than twelve since the "It inversion" transformation had originally been classified as a Simple transformation(from the Bateman and Zidonis study) but was later placed in the Embedding category.

Table XXXI contains data on differences between the forms of each story for each grade level. It is obvious from an analysis of the

TABLE XXX

AN ANALYSIS OF THE STORIES OF PART II BY NUMBERS OF THE DIFFERENT TYPES
OF TRANSFORMATIONS

	Transform Type			
	Conjoining	Deletion	Embedding	Simple
(First Story)				
Conjoining	12		3	5
Deletion	1	12	5	2
Embedding	2	2	12	4
Simple	1	3	4	12
(Second Story)				
Conjoining	12	1	3	4
Deletion		12	6	2
Embedding	1	1	12	6
Simple	1	3	5	11
(Third Story)				
Conjoining	12		3	5
Deletion		12	5	3
Embedding	1		12	7
Simple	3	1	5	11

TABLE XXXI

SUMMARY OF ANALYSIS OF VARIANCE OF THE DIFFICULTY OF FOUR FORMS OF A STORY BY GRADE

Story and Grade	Source of Variance and Sums of Squares		Mean Squares		df		F	P
	Among means of forms	Within forms	Among means of forms	Within forms	Among means of forms	Within forms		
Story 1-Gr.4	887.93	33066.31	295.98	168.71	3	196	1.75	ns
Story 1-Gr.5	320.03	18402.12	106.79	147.22	3	125	0.73	ns
Story 1-Gr.6	1694.56	16772.25	546.85	159.74	3	105	3.54	.01
Story 2-Gr.4	2128.43	61058.37	709.48	313.12	3	195	2.27	ns
Story 2-Gr.5	4607.00	26497.06	1535.67	215.42	3	123	7.13	.01
Story 2-Gr.6	1939.56	32782.18	642.52	315.21	3	104	2.05	ns
Story 3-Gr.4	3938.43	66313.31	1312.81	336.62	3	197	3.90	.01
Story 3-Gr.5	816.68	28219.50	272.23	225.76	3	125	1.21	ns
Story 3-Gr.6	1430.43	21190.37	476.81	201.81	3	105	2.36	.05

figures of this table that differences between forms of a story varied from grade to grade. The responses of grade five pupils on the forms of Story 2 differed significantly while similar results occurred for the grade four students on the forms of Story 3. Grade six students tended to be most discriminative in their responses on the "cloze" tests constructed on the various forms of each story. Differences for pupils of this grade were significant over the forms of Story 1 and Story 3. The level of significance, however, was .05.

A final analysis of differences in forms over the three Stories was made to determine if scores of pupils in grades four, five, and six differed significantly from each other. Data from this analysis are summarized in Table XXXII. According to the data of this table, students in grades four, five, and six differed significantly in their responses to nine of the twelve forms over the three Stories. The Embedding form appears to be the most discriminative over grades and stories since each of the three forms of this type was different from one grade to the next at the .01 level of significance. Forms employing a greater proportion of Simple transformations were least discriminative over grades and stories. Forms of this type differed at the .05 level for the test sample on Story 3 only.

Summary

Deletion transforms appear to be consistently difficult for students at grade four, five, and six levels. This finding occurred when the difficulty of each transformation was investigated separately (Chapter VIII) and again when the difficulties of passages containing equal numbers of transformations were analysed. The mean scores of the

TABLE XXXII

ANALYSIS OF VARIANCE: DIFFERENCES IN GRADES OVER STORY FORMS

Story	Form	Source of Variance and Sums of Squares		Mean Squares		df		F	P
		Among means of grades	Within grades	Among means of grades	Within grades	Among means of grades	Within grades		
1	Conjoin.	1720.18	14988.81	860.09	152.95	2	98	5.62	.01
1	Deletion	805.68	17060.31	402.84	157.97	2	108	2.55	ns
1	Embedding	1696.87	21556.31	848.44	190.76	2	113	4.45	.01
1	Simple	1056.00	14429.68	528.00	134.86	2	107	3.92	.05
2	Conjoin.	2343.56	29249.50	1171.78	275.94	2	106	4.25	.01
2	Deletion	1989.18	33288.62	994.59	314.04	2	106	3.17	.05
2	Embedding	3351.81	33826.68	1675.91	307.52	2	110	5.45	.01
2	Simple	645.62	23886.56	322.81	236.50	2	101	1.36	ns
3	Conjoin.	1557.50	25667.68	778.75	249.20	2	103	3.12	.05
3	Deletion	3115.43	28336.25	1557.72	262.65	2	108	5.93	.01
3	Embedding	3156.37	20995.31	1578.19	198.07	2	106	7.97	.01
3	Simple	1401.25	40693.93	700.63	369.94	2	110	1.89	ns

stories of Part II indicated that those passages containing a greater number of Conjoining transformations were the easiest for students at the intermediate grade levels.

An analysis of the remaining eight transformations within each passage gave some clues as to why a passage may have been easy or difficult. The findings summarized in Chapter VIII already showed that the presence of certain transformations more than others were crucial in determining the difficulty of a passage. Some of these transforms whose presence correlated significantly with passage difficulty were found in the Deletion and Simple passages(which tended to be most difficult). The remaining eight transformations of the passages with a greater number of Conjoining transformations were usually the "pronoun(genitive)", or the "passive" which did not relate significantly to passage difficulty.

When an analysis was made on the differences in means of each form of each story over grades, it was found that grades differed most on stories employing more Embedding transformations. It thus appears that students at the intermediate grade level tend to make greater progress in their ability to manipulate these types of written language structures. An analysis of the Newman-Keuls comparison of ordered means(Appendix L), however, showed that the statistical differences were accounted for by the differences between the means of the forms for grade four and grade five pupils. Grade six pupils did not differ statistically from grade five pupils on the means of the Embedding forms of each of the three stories. On the basis of this analysis it appears that students make considerable progress from grade

four to grade five but tend to level off when they reach grade six.

The finding that least differences between grades occurred on stories with more Simple transformations may indicate that pupils tend to mature earlier in their facility with this type of language structure. An analysis of the graphs in Figure 23, page 169, indicates that this is not so since the means of Simple transformations fall below those of Embedding and Conjoining transforms. Thus another explanation might be that students from grades four, five, and six progress in their ability to manipulate this type of language structure. The amount of progress, however, is not great enough to be statistically significant($p < .05$).

Stories With Transformations Added

An analysis of variance was carried out on the five forms of each story for the total group. Figures from this analysis are shown in Table XXXIII. None of the forms differed significantly on either of the six stories, though for stories 2 and 3, the $p < .07$. It appears that the addition of one or two sentences does not increase the difficulty of the story significantly ($p < .05$). Since findings of this study have shown that the type of transformation correlated significantly with the difficulty of a sentence or passage, an analysis was made of the type of transformation that was added to each of the six stories. The results of this analysis are summarized in Table XXXIV. Many of the transforms added did not correlate significantly with sentence or passage difficulty according to the findings discussed in Chapter VIII. It is interesting that in the two stories where differences in forms approached the level of significance, the transform of the Embedding type that was added was the "relative clause". The presence of this transform correlated significantly with sentence and passage difficulty.

TABLE XXXIII

SUMMARY OF ANALYSIS OF VARIANCE: DIFFERENCES IN FIVE FORMS OVER SIX STORIES

Story	Source of Variance and Sums of Squares		Mean Squares		df		F	P
	Among means of forms	Within forms	Among means of forms	Within forms	Among means of forms	Within forms		
1	646.26	95460.81	161.56	224.09	4	426	0.72	ns
2	2740.00	135566.00	685.00	319.73	4	424	2.14	ns
3	2744.00	138824.00	686.00	322.10	4	431	2.13	ns
4	89.93	136432.63	22.48	313.64	4	435	0.07	ns
5	2475.00	17117.10	618.75	401.74	4	426	1.44	ns
6	1809.06	139078.06	452.27	319.72	4	435	1.41	ns

TABLE XXXIV

ANALYSIS OF SIX STORIES(PART II) BY TYPE OF TRANSFORM ADDED

Story	Form			
	Conjoining	Deletion	Embedding	Simple
1	Conjoining	Com.Elem.Del.	Adv.Expans + S	Passive
2	Conjoining	Com.Elem.Del.	Relative Clause	There Invers.
3	Conjoining	Com.Elem.Del.	Relative Clause	Question
4	Conjoining	Com.Elem.Del.	That + S Object	Passive
5	Conjoining	Com.Elem.Del.	Infin. as Object	Question
6	Conjoining	Com.Elem.Del.	Relative Clause	There Invers.

The sentences containing transforms added to the six stories of Part III were inserted at the beginning, the middle, and the end of the stories(two stories to each position). The stories were grouped into three categories according to where the transformations were added and an analysis of variance with repeated measures was carried out. The results which are summarized in Table XXXV indicate a significant difference in the difficulty of the three groups of stories. The means for stories with transformations added in initial, medial, and final positions were 106.965, 91.729, and 98.729, respectively. Although a number of factors other than the position of transformations may have caused these differences, this finding does suggest the possibility that, in addition to the presence and difficulty of transformations in a passage, the placement of these transforms may also be important in determining the difficulty of the passage.

Test of Partial Correlations

The findings reviewed above have shown that the type rather than the number of transformations per passage appeared to be more important in determining the difficulty of passages. Previous findings(Chapter VIII) showed that the presence of transformations correlated more frequently with the difficulty of sentences than with the difficulty of passages. Consequently it was decided to determine to what extent the number of transformations per sentence would predict sentence difficulty. Studies have frequently shown that the number of words per sentence is a crucial factor in the difficulty of a sentence. It was therefore decided to control for sentence length in words. The data from this analysis are summarized in Table XXXVI. According to the figures of this table the numbers of transformations per sentence were not good

TABLE XXXV

SUMMARY OF ANALYSIS OF VARIANCE WITH REPEATED MEASURES OF SIX STORIES GROUPED BY POSITION
OF ADDED TRANSFORMATIONS

Source of Variance	Sums of Squares	Mean Squares	df	F
Between groups	119143.90	2713.98	439	
Within groups	30859.40	350.67	880	
Treatments	54666.00	27333.00	2	94.50*
Residual	25392.80	289.21	878	
Total	1500033.00		1319	

* for this F, the p < .001

TABLE XXXVI

SUMMARY OF TEST OF PARTIAL CORRELATIONS OF NUMBER OF TRANSFORMS PER SENTENCE WITH
SENTENCE DIFFICULTY CONTROLLING FOR NUMBER OF WORDS

Group	Non-Restricted Multiple Correlation Coeff.* R^2_1	Restricted Multiple Correl. Coeff.** R^2_2	df Num.	df Den.	F	P
Total Group	0.01530863	0.01479474	1	1084	0.5657	ns
Grade 4-Boys	0.02039057	0.00863989	1	179	2.1472	ns
Grade 4-Girls	0.03843769	0.02330575	1	179	2.8169	ns
Grade 5-Boys	0.06405854	0.05345971	1	179	2.0270	ns
Grade 5-Girls	0.06659919	0.05166406	1	179	0.0688	ns
Grade 6-Boys	0.00608500	0.00570295	1	179	0.0688	ns
Grade 6-Girls	0.01775775	0.01169709	1	179	1.1045	ns

* In the non-restricted model, the predictors are the number of
  transforms and the number of words.
** In the restricted model, the predictor is the number of transforms.

predictors of sentence difficulty - either for the total group or for any of the sub-groups. This finding would tend to refute the opinion that there is a psychological reality corresponding to the number of transforms per sentence and sentence difficulty when sentence difficulty is measured by the "cloze" procedure.

On the basis of the above findings and in view of the literature which reported a relationship between the number of words per sentence and sentence difficulty, it was decided to interchange the criterion and predictor variables of the program for partial correlations. Figures from this analysis are given in Table XXXVII. The number of words per sentence was significant as a predictor of sentence difficulty for the total group and for both boys and girls at the grade five level.

The majority of findings on differences in the difficulty of linguistic units(passages, sentences, transformations) has shown that the most significant differences over grades occurred between grade four and grade five levels. It seems that students at the grade five level are fairly facile in their use of language structures but experience difficulty with sentences(and the transformations they contain) when the number of words per sentence increases. Since grade four pupils and grade six pupils had considerable difficulty with transformation units relatively, the number of words per sentence may not be such a crucial factor to sentence difficulty at these levels. Another possible explanation for word length being important at the grade five level may be that the sentences with the greater number of words contained those types of transforms which by their presence or difficulty influenced the difficulty of sentences for grade five students.

TABLE XXXVII

SUMMARY OF TEST OF PARTIAL CORRELATIONS OF NUMBER OF WORDS PER SENTENCE WITH SENTENCE
DIFFICULTY CONTROLLING FOR NUMBER OF TRANSFORMS

Group	Non-Restricted Multiple Correlation Coeff.* R^2_1	Restricted Multiple Correl.Coeff.** R^2_2	df Num.	df Den.	F	P
Total Group	0.015308630	0.00765869	1	1084	8.4125	.001
Grade 4-Boys	0.02039057	0.02034792	1	179	0.0078	ns
Grade 4-Girls	0.03843769	0.03780682	1	179	0.1174	ns
Grade 5-Boys	0.06405854	0.00317317	1	179	11.6444	.001
Grade 5-Girls	0.06659919	0.00148788	1	179	12.4865	.001
Grade 6-Boys	0.00608500	0.00245857	1	179	0.0653	ns
Grade 6-Girls	0.01775775	0.01620842	1	179	0.2823	ns

 * In the non-restricted model, the predictors are the number of
   transforms and the number of words.
** In the restricted model, the predictor is the number of words.

Correlations Between the Number of Transforms per Sentence and Sentence
and Passage Difficulty

When correlations were calculated between the number of trans-
formations per sentence and sentence and passage difficulty the results
showed that the number of transformations per sentence significantly
correlated with sentence difficulty at the grade four level only
(Table XXXVIII). The correlation was negative indicating that the more
transforms occurring in a sentence, the more difficult one would expect
the sentence to be.

TABLE XXXVIII

CORRELATIONS BETWEEN THE NUMBER OF TRANSFORMS PER SENTENCE WITH PASSAGE
DIFFICULTY AND SENTENCE DIFFICULTY

Grade	Sentence	Passage
4	-0.128*	-0.062
5	-0.043	-0.028
6	-0.074	-0.026
Total	-0.083	-0.038

* significant at the .01 level

Since the number of words per sentence was not controlled in this
program it seems that the number of words interacted with the number of
transforms to produce difficulty for pupils at the grade four level in
their understanding of sentences and passages as measured by the "cloze".
Thus both the number of transforms per sentence and sentence length in
words may be considered important factors in language complexity for

students at this grade level.

Since it has already been shown that the type of transform does influence both sentence and passage difficulty, the investigator decided to provide a breakdown of those transforms whose difficulty correlated significantly with the number of transforms per sentence. The results are shown in Table XXXIX. Those transforms which increased in difficulty when the number of transforms increased were generally those transformations whose presence or difficulty had correlated significantly with sentence or passage difficulty. Those transforms which tended to become easier ("that + S object quote", "that + S object quote shift", "passive") when the number of transforms in a sentence increased either did not correlate significantly with sentence or passage difficulty according to the findings of Chapter VIII or else the correlations with these variables were positive.

Another interesting finding of this analysis (Table XXXIX) was that at the grade four level, the number of transformations per sentence tended to increase the difficulty of those linguistic elements which did not contain transformations. This may provide some explanation for the finding that the number of transformations per sentence correlated significantly with sentence difficulty at the grade four level. Pupils beyond this level appear to have attained a higher level of maturity with the kernel elements of sentences and can use these elements as a sort of base line with which to acquire facility in dealing with more complex structures. Findings, however, indicate that grade four pupils are not able to analyse sentence structures for comprehension purposes as well as students of higher grades. The degree of control appears to be influenced by the number of transformations present.

TABLE XXXIX

SIGNIFICANT CORRELATIONS BETWEEN THE NUMBER OF TRANSFORMS PER
SENTENCE AND THE DIFFICULTY OF SELECTED TRANSFORMS BY GRADE

Type of Transform	Grades			
	4	5	6	Total
Relative Clause			-0.426*	-0.248*
Compounds			-0.294*	-0.217*
Genitive		-0.270*		
VP Comp		-0.979**		
Infin.of Purpose	-0.360**			-0.231**
Pron(Genitive)				-0.169*
Verb + Comp			-0.415**	
Adv. Replacement			-0.932*	
Conjoining	-0.214**	-0.236*	-0.277*	-0.236*
Com.Elem.Deletion		-0.246**	-0.323*	-0.220*
WH Deletion				-0.382*
(That) +S Obj.Quot.			0.348**	0.245*
Passive	0.523*			
There Invers.				-0.308**
Contraction		0.586*		-0.309*
Comparative		-0.705**		-0.498**
Pron(Simple)		-0.165*	0.141**	-0.114*
Vocative		-0.713**		-0.402**
NP - V Invers.		-0.469**		
Adv. Pos. Shift		0.265**		
(That) + S Quot.Shift		0.374**	0.339**	0.267*
Non-Trans.Units	-0.154*			-0.094*

* significant at the .01 level
** significant at the .05 level

Summary

Those story forms with a greater number of transformations of the Deletion type appeared to be most difficult while forms with a greater number of Simple transformations tended to rank second in difficulty. An analysis of the stories indicated that in addition to the twelve transforms of a particular type exerting an influence on the difficulty of the passage, the type of the remaining eight transformations may also be crucial in this regard.

The Embedding and Conjoining forms of all three stories differed significantly over grades while similar grade differences were evident on two of the Deletion forms and one Simple form. Most differences, however, were accounted for by the differences in performance of grade four and grade five, and grade four and grade six pupils.

When six stories were taken from the basal readers and a single transform of each of the four major types added, the means of the various forms did not differ significantly. Differences between the means of the forms of two of these stories, however, tended in the direction of significance (p < .07). The addition of a single transform did not appear to make a difference in the difficulty of a passage. It may also be that those transforms which were added did not vary considerably in difficulty. Although forms did not differ due to the addition of transforms of different types, there was some evidence that the position of transforms within a passage may be important in determining passage difficulty.

The number of transforms per sentence did not appear to be a factor in the difficulty of a sentence or of a passage except at the grade four level. The number of words per sentence at the grade five

level and for the total group was a better predictor of sentence difficulty than the number of transforms per sentence. The findings of this chapter favor the conclusion that the type of transformation rather than the number of transforms per sentence is the most important factor in determining the difficulty of written language structures.

CHAPTER X

FINDINGS: THE RELATIONSHIP OF THE DIFFICULTY OF TRANSFORMATIONS
TO SELECTED VARIABLES

In this chapter the writer will summarize the data on the

relationship of the difficulty of the passages and the transformations

occurring within these passages to selected variables. The variables

chosen for investigation are grade, chronological age, sex, mental

ability, reading achievement, and socio-economic status.

I. ANALYSIS OF VARIANCE OVER PASSAGE DIFFICULTY BY GRADE AND SEX

Differences by Grade

According to the data of Table XL it is apparent that grades

four, five, and six pupils as a group differed significantly in their

responses to the stories of the three basal reader series. In order to

determine the degree to which each of the grades differed from one

another, a Newman-Keuls comparison of ordered means was employed. The

results are summarized in Table XLI and the data on which this table

is based are given in Appendix L.

Grade four students found the stories most difficult to complete,

followed by grade five and six students, respectively. The performance

of grade four pupils differed from grade five and from grade six pupils

at the .01 level of significance. The performance of grade six pupils

was not significantly different from that of grade five pupils, however.

Difficulties among the three grades are relative. It is not

possible to determine from this study how acceptable each grade score

TABLE XL

SUMMARY OF ANALYSIS OF VARIANCE: DIFFERENCES BY GRADE OVER STORIES OF SERIES A, B, AND C

Series	Source of Variance and Sums of Squares		Mean Squares		df		F	P
	Among means of stories	Within stories	Among means of stories	Within stories	Among means of stories	Within stories		
A	348.43	3456.37	174.22	88.63	2	39	1.97	ns
B	1733.12	327.71	866.56	83.89	2	39	10.33	.001
C	1659.00	4863.62	829.50	124.71	2	39	6.65	.001
A,B,C	3353.62	12951.81	1675.81	105.30	2	123	15.95	.001

TABLE XLI

A NEWMAN-KEULS COMPARISON OF ORDERED MEANS OF TWENTY-ONE PASSAGES
FROM THREE GRADE FOUR BASAL READER SERIES

	Grade four	Grade five	Grade six
Passages from grade four basal reader series			

"____" the two means connected by a line are not significantly
different at the .05 level of significance.

All the groups with no markings between means differ
from each other at the .001 level of significance.

is for each of the grade groups. Bormuth[1] considered the advantage of

establishing a criterion score by which the difficulty of "cloze" tests

might be evaluated. He adopted as his criterion score the seventy-five

per cent level which he stated has long been accepted as a criterion

score. "According to this criterion, a passage is said to be suitable

for use in a pupil's instruction if he responds correctly to seventy-

five per cent or more of the questions asked him about the passage."[2]

Bormuth conducted two studies. In one he had the pupils read the

passages silently and then answer multiple choice questions. In the

second study, using different materials and subjects, he had the pupils

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[1]John Robert Bormuth, "Cloze Readability Procedure," CSEIP
Occasional Report, No. 1, University of California, Los Angeles, 1967.

[2]Ibid., p. 18.

read the passages and respond to the questions orally. In both studies he estimated that a "cloze" score of about forty-four per cent was found to be comparable to the seventy-five per cent criterion. Bormuth's study employed the exact word method of scoring and he warned against inferring the results of his study to "cloze" tests scored by other methods. In the present study, one method of scoring the "cloze" was by exact word and synonym. On this basis the per cents correct on the "cloze" for grades four, five, and six were fifty-seven, sixty-seven, and sixty-nine, respectively. These scores illustrate a point that has been made earlier that the greatest differences on linguistic units appear to occur between grades four and five rather than between grades five and six. The differences between grades five and six were slight. The caveat of Bormuth's study[3], however, must be kept in mind. Nevertheless there is a need for setting up criterion scores for other "cloze" scoring methods so that the difficulty of the "cloze" for different groups may be evaluated.

It has already been shown that the stories of each series differed significantly at the .05 level of confidence. In order to determine whether there were differences within grades at this level of significance on the stories of each series, an analysis of variance on each series by grade was carried out. The results are summarized in Table XLII. According to the data of this table, the three grades differed significantly at the .01 level on the stories of Series B and C but not on the stories of Series A. An analysis of the means of the

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[3]Ibid.

three series showed that whereas the pupils of all three grades were consistent in finding the stories of Series B the least difficult, there was not complete agreement on the difficulty by grade of the other two series (Table XLII).

TABLE XLII

A COMPARISON OF THE MEANS BY GRADE FOR STORIES OF THREE
BASAL READER SERIES

Series	Grade 4		Grade 5		Grade 6	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
A	59.00	8.152	62.21	8.74	65.00	13.37
B	60.07	6.612	72.50	5.31	74.64	7.34
C	54.78	12.477	65.28	12.11	69.28	11.89
Total	63.07	9.517	69.07	10.91	63.28	12.46

Grade four pupils scored considerably lower on the stories of Series C than of Series A whereas the opposite was true for grade six pupils. It appears that the same linguistic transformations did not pose similar difficulty for pupils of different grade levels. It has been shown in the findings of Chapter VIII that although there were similarities between grades, there were also differences between those transforms which by their presence or difficulty correlated significantly with sentence or passage difficulty at each grade level. Another explanation for the low scores of pupils at the grade four level on the stories of Series C may be the number of transforms per sentence. Results of correlations between the number of transformations per sentence and sentence difficulty summarized in Chapter IX have shown that the number of transformations per sentence correlated significantly

with sentence difficulty at the grade four level. The sentences of

Series C contained more transforms per sentence than either of the

other two series. The number of transforms per sentence for each

series respectively was 5.0, 4.5, and 6.5.

Differences by Sex

Girls achieved higher than the boys and differed from them at

the .01 level of significance on their responses to the "cloze" tests

constructed on the passages of the three basal reader series(Table

XLIII). It is possible that girls tend to be more mature in their use

of language structures or in their knowledge of vocabulary as found

in these texts. This maturity with written language structure may

result from the fact that girls at the intermediate grade levels tend

to read more than boys and consequently would be more exposed to the

structures of written language.

Summary

An analysis of the data showed that the students of grades four,

five and six differed significantly on their responses in completing

the cloze tests on the twenty-one stories of the three series. Most

of the differences, however, were accounted for by the variance between

grade four and five, and grade four and six. The performance of grade

five and grade six pupils did not differ significantly.

When the stories were grouped by series, students differed

significantly by grade on the cloze tests of Series B and C. Students,

differed by sex on the difficulty of the passages of all three series.

II. SENTENCE DIFFICULTY BY GRADE LEVEL

To determine whether there was an increase in the difficulty of

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TABLE XLIII

SUMMARY OF ANALYSIS OF VARIANCE: DIFFERENCES BY SEX OVER STORIES OF SERIES A, B, AND C

Series	Source of Variance and Sums of Squares		Mean Squares		df		F	P
	Among means of stories	Within stories	Among means of stories	Within stories	Among means of stories	Within stories		
A	1141.87	2662.93	1141.87	66.57	1	40	17.15	.001
B	1270.43	3734.37	1270.44	93.96	1	40	13.61	.001
C	2377.56	4145.06	2377.56	103.63	1	40	22.94	.001
A,B,C	4656.75	1164.86	4656.75	93.94	1	124	49.57	.001

sentences from grades four to five to six, an analysis of variance and analysis of covariance were carried out. The covariate was the number of transforms per sentence since it was possible that students at the three grade levels might differ in their responses to sentences which contained a specific number of transformations. The figures of Table XLIV which contains a summary of the variance and covariance analysis shows that pupils in grades four, five, and six differed significantly in their responses to sentences(as measured by the "cloze") regardless of the number of transforms per sentence. The question of sentence difficulty over grades was further investigated by grouping the sentences with various numbers of transformations into eleven categories. Those sentences with no transforms constituted the first group while those with one to nine transforms made up the next nine groups. Since the number of sentences which contained ten or more transforms when the numbers were taken separately was small, it was decided to put those sentences which contained ten or more transformations into the eleventh group. An analysis of variance allowed the investigator to determine whether students differed significantly on sentence difficulty when the number of transforms per sentence ranged from zero to ten or more. Data from this analysis are given in Table XLV and indicate that for all sentences except those with no transforms and those with one transform, differences between grades were significant. It appears that sentences with one transform are not significantly more difficult than sentences with no transforms and do not discriminate among the responses of pupils at the grade four, five, and six levels.

Summary

There was a significant decrease in the difficulty of sentences

TABLE XLIV

SUMMARY OF ANALYSIS OF VARIANCE ON SENTENCE DIFFICULTY AND NUMBER OF WORDS PER SENTENCE AND ANALYSIS OF COVARIANCE ON SENTENCE DIFFICULTY CONTROLLING FOR NUMBER OF TRANSFORMS PER SENTENCE

	Source of Variance and Sums of Squares		Mean Squares		df		F	P
	Among means of grades	Within grades	Among means of grades	Within grades	Among means	Within means		
(Predictor) No. of transforms per sentence	6.73	16682.90	3.37	15.40	2	1083	0.21	ns
(Criterion) Sent.difficulty	21326.00	216057.00	10662.00	199.49	2	1083	53.44	.001
(Adjusted Analysis of Variance with number of transforms per sentence predictor partialled out)			10617.68	198.44	2	1082	53.50	.001

TABLE XLV

SUMMARY OF ANALYSIS OF VARIANCE OF SENTENCE DIFFICULTY BY NUMBER OF TRANSFORMATIONS PER SENTENCE OVER GRADE LEVELS

Number of trans. per sent.	Source of Variance and Sums of Squares		Mean Squares		df		F	P
	Among means of grades	Within grades	Among means of grades	Within grades	Among means	Within means		
0	1188.37	10219.12	594.19	237.65	2	43	2.50	ns
1	1475.93	31160.06	737.97	338.70	2	92	2.92	ns
2	2082.75	24666.68	1041.37	202.19	2	122	2.22	.01
3	1803.66	26998.18	901.81	144.38	2	187	6.25	.01
4	3318.68	30063.75	1659.34	190.28	2	158	8.72	.01
5	2181.43	18296.62	1090.72	179.38	2	102	6.08	.01
6	5056.06	24137.00	5258.03	187.05	2	130	13.51	.01
7	1522.62	10448.75	761.31	155.95	2	67	4.88	.01
8	1734.93	8709.26	867.47	152.79	2	57	5.68	.01
9	662.68	2410.56	331.34	92.71	2	26	3.57	.05
10 +	1780.25	13839.31	890.33	200.57	2	69	4.44	.01

from grade four to grade six when the number of transformations per

sentence was held constant. When sentences were grouped by the number

of transforms, a decrease in the difficulty of sentences was found for

sentences containing from two to ten transforms. The difficulty of

sentences with no transforms(as defined by the grammar of this study)

and with one transform did not differ significantly by grade.

III. CORRELATIONS OF SCORES ON 'CLOZE' TESTS(TWENTY-ONE STORIES) WITH SELECTED VARIABLES

Tables XLVI to XLIX summarize the findings of the computation

of correlations between the scores on the "cloze" tests of twenty-one

stories and eight selected variables for the three grades combined and

for each grade separately. It has already been mentioned in Chapter VI

that the "cloze" tests over the twenty-one stories were scored in three

different ways. According to the figures of Table XLVI which summarize

the data over the three grades, these three scores correlated signif-

cantly with all variables except chronological age. Cloze(Six Stories)

and Cloze(Three Stories) refer to the stories which were especially

constructed for Parts II and III of this study and which were discussed

in the previous chapter.

The correlation coefficients for the SCAT quantitative were

lower than those for the verbal section of this test but nevertheless

significant at the .01 level of significance. One reason for the lower

correlation coefficients here may be that the quantitative section of

the SCAT test is based on the "old mathematics". Some of the students

included in the sample of this study had never been exposed to the

"old math" and were unfamiliar with various signs and symbols. The

TABLE XLVI

CORRELATIONS BETWEEN TOTAL SCORES ON 'CLOZE' TESTS OF 21 STORIES AND
EIGHT SELECTED VARIABLES FOR THE TOTAL GROUP

Correlation of student scores with: on:	Total scores of 21 stories as measured by:		
	Cloze 1	Cloze 2	Cloze 3
Chronological Age	.061	.081	.077
Cloze(Six Stories)	.845*	.840*	.849*
Cloze(Three Stories)	.747*	.759*	.769*
SCAT(Verbal)	.781*	.779*	.776*
SCAT(Quantitative)	.616*	.620*	.617*
SCAT(Total)	.757*	.759*	.758*
STEP	.758*	.750*	.751*
SES	-0.039*	-0.264*	-0.274*
Cloze 1		.938*	.937*
Cloze 2	.938*		.933*
Cloze 3	.937*	.933*	

* significant at the .01 level

TABLE XLVII

CORRELATIONS BETWEEN TOTAL SCORES ON 'CLOZE' TESTS OF 21 STORIES AND
EIGHT SELECTED VARIABLES FOR GRADE FOUR

Correlations of student scores with: on:	Total scores of 21 stories as measured by:		
	Cloze 1	Cloze 2	Cloze 3
Chronological Age	-0.331*	-0.372*	-0.364*
Cloze(Six Stories)	.861*	.866*	.864*
Cloze(Three Stories)	.716*	.747*	.755*
SCAT(Verbal)	.782*	.779*	.780*
SCAT(Quantitative)	.607*	.581*	.583*
SCAT(Total)	.785*	.772*	.775*
STEP	.711*	.692*	.715*
SES	-0.332*	-0.297*	-0.310*
Cloze 1		.938*	.936*
Cloze 2	.938*		.935*
Cloze 3	.936*	.935*	

* significant at the .01 level

appropriateness of the quantitative section of this test for testing

or research purposes is questioned. Low, though significant correlations

occurred between the three measures of the "cloze" and socio-economic

status. The coefficients are negative in sign due to the fact that

the higher scores on the "cloze" tests are represented by higher numbers

whereas on the Blishen scale (used to classify the sample by socio-

economic status) the higher socio-economic classes are designated by a

lower number. Extremely high correlation coefficients were found

between the three measures of the "cloze" indicating the reliability of

each scoring procedure.

All correlations were significant at the .01 level for grade

four students (Table XLVII). A similar observation on the lower correl-

ation coefficient for the quantitative section of the SCAT was made here.

At this level, chronological age appeared to be a factor in the scores

on the "cloze". The negative correlation indicates that at this level

nine year old pupils tended to do better than the ten year olds. The

findings of the grade five students differed from those of the grade

four and grade six students in that chronological age was not signif-

icantly correlated with the "cloze" scores and the correlations between

socio-economic status and scores 2 and 3 of the "cloze" were significant

at the .05 level. The finding that socio-economic status did not

correlate as highly with "cloze 2" and "cloze 3" as with "cloze 1" is

interesting in that the former two scores are based on the grammaticality

of the items as well as on the semantic correspondence. That is, an item

on these measures was considered correct if it were grammatically

acceptable although not semantically so. Is it possible that students

from lower socio-economic classes tend to utilize the same syntactical

TABLE XLVIII

CORRELATIONS BETWEEN TOTAL SCORES ON 'CLOZE' TESTS OF 21 STORIES AND
EIGHT SELECTED VARIABLES FOR GRADE FIVE

Correlations of student scores with: on:	Total scores of 21 stories as measured by:		
	Cloze 1	Cloze 2	Cloze 3
Chronological Age	-0.135	-0.167	-0.159
Cloze(Six Stories)	.754*	.692*	.690*
Cloze(Three Stories)	.731*	.678*	.675*
SCAT(Verbal)	.757*	.701*	.694*
SCAT(Quantitative)	.605*	.554*	.552*
SCAT(Total)	.782*	.720*	.714*
STEP	.768*	.750*	.747*
SES	-0.243*	-0.178**	-0.179**
Cloze 1		.907*	.904*
Cloze 2	.907*		.900*
Cloze 3	.904*	.900*	

* significant at the .01 level
** significant at the .05 level

TABLE XLIX

CORRELATIONS BETWEEN TOTAL SCORES ON 'CLOZE' TESTS OF 21 STORIES AND
EIGHT SELECTED VARIABLES FOR GRADE SIX

Correlation of student scores with: on:	Total scores of 21 stories as measured by:		
	Cloze 1	Cloze 2	Cloze 3
Chronological Age	-0.322*	-0.361*	-0.345*
Cloze(Six Stories)	.872*	.865*	.858*
Cloze(Three Stories)	.746*	.761*	.768*
SCAT(Verbal)	.769*	.748*	.721*
SCAT(Quantitative)	.600*	.621*	.588*
SCAT(Total)	.755*	.752*	.731*
STEP	.756*	.768*	.748*
SES	-0.357*	-0.308*	-0.321*
Cloze 1		.955*	.945*
Cloze 2	.955*		.950*
Cloze 3	.945*	.950*	

* significant at the .01 level

patterns as their counterparts in the higher socio-economic classes but due to vocabulary difficulty or the task of comprehending sentences within context do not score so highly?

According to the data for grade six students on the variables indicated, all were significant at the .01 level of confidence. Thus younger students did better than older students, students of higher mental ability, those with higher reading achievement scores and who were higher on the socio-economic scale did better than their counterparts who were lower on these scales.

Correlations between the various measures of the "cloze" and reading achievement as measured by the STEP Reading Test were consistently high for the total group and for individual grades. The size of the coefficients ranged from .74 to .78. Table I in Chapter IV contains a summary of correlations between scores on "cloze" tests and scores on standardized tests of reading achievement. The only correlations from this table which are equivalent to or higher than those reported in this study were found by Jenkinson between the "cloze" and the Vocabulary section of the The Cooperative Reading Test C2, and by Friedman who used the Vocabulary and Total reading scores of the Metropolitan Reading Achievement Tests. These researchers used as their subjects high school and college students.

Summary

Correlations between the scores of each of the three cloze scoring methods and reading achievement, mental ability, chronological age, socio-economic status, and the cloze scores of Part II and Part III were significant at all grade levels. The only exception was the correlation between the cloze scores and chronological age at the grade five

level.

IV. ANALYSIS OF VARIANCE BY GRADE, SEX, MENTAL ABILITY, AND READING ACHIEVEMENT OVER DIFFICULTY OF TRANSFORMATIONS

In order to test the hypothesis that there is a significant difference in the difficulty of the transforms between grades, sex, mental ability, and reading achievement groups, an analysis of variance was carried out on the difficulty of each transform for each group. The findings are summarized in Tables L to LII and the data on which these tables are based are listed in Appendix P.

Differences by Grade

Of the forty-four transformations (including multi-transformation units) there was a significant difference on seventeen of these between grades four, five, and six. According to the data of Table L which contains information on Embedding transformations, five of the transformations of this category differed significantly in difficulty over grade levels. These were the "relative clause", the "adjective", "compounds", the "genitive" and the "adverb replacement" transformations. Previous findings(Chapter VII) have shown that with the exception of the "adjective" the presence of these transformations within written language correlated with the difficulty of the sentence or passage in which they occurred. All correlations were negative indicating that the more of this type of transformations the more difficult the passage would tend to be. The "adjective" was found to have the opposite effect. Its difficulty rather than its presence (except at the grade five level) correlated significantly with the difficulty of the sentence or passage and at each grade level it occurred among the fifteen easiest transformations as measured by the "cloze".

TABLE L

TRANSFORMS WHICH DIFFER SIGNIFICANTLY OVER GRADES, SEX, READING
ACHIEVEMENT, AND MENTAL ABILITY GROUPS

Transform	Grade	Sex	R.Ach.	M.A.
Relative Clause	**	*	*	
With Phrase				
Adjective	**	*	*	
Gerundive				
Appositive		**	*	*
Compounds	*	*	*	*
Genitive	*	*	*	
That + S Object		**	*	
VP Comp.				
WH + S Object				
Infin. as Object				**
Infin. of Purpose		*	*	
Ing-Nominalization		*	**	
Ing-Nominalization of Purpose		*		**
Pronoun(Genitive)		**	**	
Verb + C		*		
Adverb Replacement	*	*	*	**
Adverb Expans + S		**	**	

* significant at the .01 level
** significant at the .05 level

The difficulty of Conjoining transformations also differed significantly over grades(Table LI). Two of the Deletion transforms differed significantly by grade. These were the "WH BE Deletion" and the "(that) + S object quote". Whereas the latter was consistently easy at all grade levels, the difficulty of the former varied by grade. The "pronoun(simple)", "question", "aspect", and the "imperative" were the Simple transforms to differ by grade(Table LII). All transformations of the Position Shift category except the "NP - V inversion" were significantly different as were the responses to words which made up the linguistic unit - multi-transformations.

A Newman-Keuls comparison of ordered means was employed to find out which of the three means of the above seventeen transformations were different from the other at each of the grade levels. A summary of the results of this comparison is given in Table LIII and the data from which this table was compiled are in Appendix L. From the data in Appendix L it can be seen that with the exception of the "WH BE Deletion" and "multi-transformation units" the size of the means was consistently larger from grade four to grade six. For "multi-transforms" the reverse was true while for the "WH BE Deletion" transform the order of increasing difficulty was from grade six to four to five. According to the data of Table LIII very few of the transforms differed in difficulty between grade four and five, and fewer still differed significantly between grades five and six. It appears that pupils of the intermediate grades are experiencing similar difficulties with transformations in written language.

Differences by Sex

Whereas the difference on the difficulty of seventeen transfor-

TABLE LI

TRANSFORMS WHICH DIFFER SIGNIFICANTLY OVER GRADES, SEX, READING
ACHIEVEMENT, AND MENTAL ABILITY GROUPS

Transform	Grade	Sex	R.Ach.	M.A.
Conjoining	*	*	*	*
Common Elements Del.	**	*	*	*
WH Deletion		*	**	**
WH BE Deletion	*	*	**	**
(That) + S Object		**		
(That) + S Object Quotation	*	*	**	
Comparative				
Adverb Replace. Del.				
Adv.Position Shift	*	*	*	*
Adv. Replace. Shift	*	*	*	
(That) + S Object Quotation Shift	*	*		
NP - V Inversion		**	*	
Multi-Transformations	*	**	*	
Non-trans. Units				

* significant at the .01 level
** significant at the .05 level

TABLE LII

TRANSFORMS WHICH DIFFER SIGNIFICANLTY OVER GRADES, SEX, READING
ACHIEVEMENT, AND MENTAL ABILITY GROUPS

Transform	Grade	Sex	R.Ach.	M.A.
Passive		**	**	
There Inversion		*		**
Question	**	**	*	**
Negative		**	**	
Aspect	*	*	*	
Imperative	**	**		
Contraction				
Comparative			**	
Pronoun(Simple)	*	*	*	*
Indirect Object				*
Reflexive-Intensive				
Vocative				
Expletive		*	**	

* significant at the .01 level
** significant at the .05 level

TABLE LIII

A NEWMAN-KEULS COMPARISON OF ORDERED MEANS OF TRANSFORMS WHICH DIFFER SIGNIFICANTLY OVER GRADES

Transform	Grades			
	4	5	6	4
Relative Clause				.05
Adjective				.05
Compounds				.01
Genitive				.01
Adv. Replacement	.01			.01
Conjoining	.01			.01
Common Elements Del.				.05
WH BE Deletion		.01		.01
(That) + S Obj. Quot.	.05			.01
Question				.05
Aspect				.01
Imperative				
Pronoun(Simple)	.01			.01
Adv. Position Shift				.05
Adv. Replacement Shift				.01
(That) + S Quot. Shift	.01			.01
Multi-Transformation Units				.01

"_____" the two means connected by a line are not significantly different at the .05 level

mations was significant between grades, the difficulty of thirty-two

of such transformations differed significantly for boys and girls. A

breakdown of the number by type is as follows: Embedding - thirteen,

Conjoining and Deletion - six, Simple - eight, and Position Shift and

multi-transformations - five. All transformations which had differed

significantly over grades were significantly different for boys and

girls as well. One explanation why there were so many differences

between boys and girls over the difficulty of transformations is that

boys and girls also differed significantly in reading ability with

girls being the better readers. This information is shown in Table LIV

which contains data from an analysis of variance on the scores of the

STEP Reading and the SCAT Verbal, Quantitative, and Total for boys and

girls.

Differences by Reading Achievement

Boys and girls differed significantly on the scores of the

STEP Reading Test. Because of this it was decided to include in the

high reading achievement group the upper quartiles of both boys and girls

according to their scores on the STEP Reading Test. The low reading

achievement group would then include those boys and girls who scored

in the lowest quartile of the scores on the STEP Reading Test. An

analysis of variance was carried out to determine if high and low reading

achievers differed on their scores on the various transforms.

The results showed that there was a significant difference on

twenty-seven of the forty-four transformations for the high and low

reading achievement groups. Eleven of the Embedding transformations

differed significantly. These eleven were among those transforms which

differed significantly by sex. Responses to Conjoining and Deletion

TABLE LIV

SUMMARY OF ANALYSIS OF VARIANCE OF STEP AND SCAT SCORES BY SEX

Source of Variance and	Sums of Squares		Mean Squares		df		F
	Among means of groups	Within groups	Among means of groups	Within groups	Among means	Within means	
STEP	5147.81	56219.81	5147.81	128.36	1	438	40.11*
SCAT(Verbal)	1780.06	34506.62	1780.06	78.78	1	438	22.59*
SCAT(Quantitative)	410.37	35508.62	410.38	81.07	1	438	5.06**
SCAT(Total)	3960.00	117516.00	3960.00	268.30	1	438	14.76*

* significant at the .01 level
** significant at the .05 level

transformations were significant on five items. With the exception of the "(that) + S object" these were identical to those transforms on which boys and girls significantly differed. Responses to seven of the Simple transforms differed significantly. The difficulty of the "comparative" differed at the .05 level for high and low reading achievers. The difficulty of this transform did not differ for boys and girls. Differences on transformations of the Position Shift group were similar to differences on these transforms that existed for boys and girls except for "(that) + S object quote shift" which differed at the .01 level for boys and girls but did not differ significantly for high and low reading achievement groups.

Differences by Mental Ability

Two groups of pupils with different mental abilities were set up on the basis of the top and bottom quartile scores of boys and girls on the SCAT Test and the differences in their scores on the various transforms were compared. It was found that significant differences occurred on fourteen of the forty-four variables. Five of these transformations were of the Embedding type, four were Simple transformations, four were either Conjoining or Deletion and one was from the Position Shift group. Seven of these transforms were also significantly different for students when grouped by grade, sex, and reading achievement. These transforms were "compounds", the "adverb replacement", the "common elements deletion", "WH BE deletion", "adverb position shift", "question", and "pronoun(simple)". Two transforms which differed significantly for mental ability groups were not different for any of the other groups. These were the "infinitive as object" and the "indirect object".

Summary

When an analysis was made of the differences between the difficulty of each of the transformations by grade, sex, reading achievement, and mental ability, it was found that more significant differences occurred when students were grouped by sex than by either of the other factors. The order of the other factors according to the greater number of differences on the difficulty of transforms was reading achievement, grade, and mental ability. Transformation difficulty tended to decrease from grade four to grade six. Most differences between grades, however, were accounted for by the variation between the performance of grade four and grade five, and grade four and grade six pupils.

Changes in Grammatical Structure

Words that were grammatically acceptable in the sentence or passage although of a different grammatical form than the original word (that is, it could not be traced to the same node in the phrase marker) were considered in the third method of scoring the "cloze". The writer investigated these words further at the grade four and grade six levels. An analysis of the scoring sheets showed the number of such items for boys and girls in each of these grades. These figures are given in Table LV.

According to the data of Table LV pupils in grade six were more inclined to insert a grammatically dissimilar word than were grade four pupils, and girls were more apt to do this than were the boys. Although there was a progression in the number of such items from grade four to grade six, there was an overlap between the boys of grade six and the girls of grade four. The latter inserted a higher number of grammat-

ically dissimilar words than did the former.

TABLE LV

WORDS GRAMMATICALLY DISSIMILAR BUT ACCEPTABLE IN THE THIRD
'CLOZE' SCORING METHOD

	Boys	Girls	Total
Grade 4	476	696	1172
Grade 5	640	968	1608
Grade 6	1116	1664	2780

If the assumption is made that the insertion of such words is indicative of an individual's flexibility with language structure, then pupils in grade six were more flexible than were those in grade four in their use of language and girls were more flexible than boys. Since pupils from grade six scored consistently higher than pupils from grade four, and girls scored consistently higher than boys at all levels, it may be that flexibility in language use may be related to an individual's ability to analyse language and understand the information contained therein.

When an analysis was made of the type of grammatical form that had been inserted, a variety of forms were found for the four groups. There were, however, a number of similarities between groups. The most common changes to occur were as follows: the conjoining transform was substituted for a variety of grammatical forms, negatives were substituted for positives or vice versa, articles or adjectives were substituted for the "pronoun(genitive)" or the "genitive" or vice versa, adverbs were substituted for verbs, "aspect" for the second word of a

proper noun, and articles for the first word of proper noun. Grade four

pupils substituted more of the Conjoining type than did grade sixes.

The latter grade tended to have a higher proportion of article and

adjective substitution for the "pronoun(genitive)" or the "gentive".

There were more similarities than dissimilarities among grade four boys

and girls and grade six boys. Grade six girls tended to have a wider

range of substitutions for a number of parts of speech, and negative

substitutions for positives. The latter substitution was most often

reversed for the other three groups. Examples of grammatically dissimilar

substitutions are given in Appendix H.

<u>Punctuation</u>

In each of the three methods of scoring the "cloze", punctuation

was taken into account. Pupils at all grade levels and both sexes

ignored punctuation marks at times when they were completing the "cloze".

Examples are: the substitution of "plains" for "too" in the sentence

"Food is sometimes scarce on the desert, too"; "please" for "must" in

"Next time though, David must take a long nap before we come"; "come"

for "honey" in"'Come whenever you want to, honey,' Mrs. Wheelwright

said"; and "the" for "down" in the sentence "Trees had to be cut down,

land had to be cleared . . .". Punctuation changes were sometimes made

by the student in order to make the structure more acceptable to him.

In the sentence " 'What fox?' David mumbled sleepily", when the word

"fox" was deleted, pupils often inserted "said" and changed the "ed" of

"mumbled" to "ing". When the word "they" was deleted from the sentence

"So most of the stories they told were about men . . .", pupils pencilled

in the blank and inserted a comma after "told".

Punctuation is an important surface structure feature to aid in the comprehension of written language. It is designed to represent as far as possible those idiosyncrasies of oral language which are usually expressed by intonation, stress, and juncture. If pupils are not aware of the function of punctuation marks, then a less than complete understanding of the printed page is likely.

The Derivational Theory of Complexity (DTC)

According to the DTC theory as explained in Chapter III, the greater the number of rules used to generate a sentence from its underlying structure to its surface structure, the more complex the sentence is and the more difficult one would expect it to be for the processes of perception and comprehension.

Findings of this study have shown that the number of transformation rules applied in the derivation of the surface structure of a sentence is not a good indicator of the complexity of that sentence and its resulting difficulty as measured by the "cloze". Many of the studies conducted to investigate this problem and reviewed in Chapter III have analysed the number of rules within a transform rather than the number of transforms within a sentence. Of the forty-three transforms investigated in this study, thirteen could be grouped into five categories so that within each group the transforms differed by one rule. The categories were made up as follows: 1) "relative clause", "WH deletion", "WH BE deletion", and "adjective", 2) "that + S object" and "(that) + S object", 3) "(that) + S object quote" and "(that) + S object quote shift", 4) Conjoining, and "common elements deletion", 5) "adverb replacement", "adverb replacement shift", and "adverb replacement deletion". The means for the transforms in each of these groupings for each grade

and for the total group are given in Table LVI.

Pupils were generally consistent in their responses to the words of these transforms. Exceptions were the responses of the grade five students to the transforms of groups one and four. For groups two, three, and five, it appears that those transforms which differ by the addition of an extra rule were most difficult for the students of all grades. The "(that) + S object" was consistently easier than the "that" + S object". It has already been hypothesized that the former tended to occur more often in direct speech which pupils of this study tended to find easier. An analysis of the transforms of group one shows that the "adjective" which differed by the addition of most rules was consistently easier for all groups. The "relative clause" was the second most difficult. The "WH deletion" was generally more difficult than the "WH BE deletion" though the latter differed from the former by an additional rule. One should be hesitant,however, in making inferences from the data above since this study was not designed to investigate transformations differing by rules and the N's of the transforms mentioned above varied considerably. Fodor and Garrett's [4] suggestion that the complexity of a sentence is " a function not (or not only) of the transformational distance from its base structure but also of the degree to which the arrangement of elements in the surface structure provides clues to the relations of elements in the deep structure"[5] merits further investigation.

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[4] J. A. Fodor and M. Garrett, "Some Syntactic Determinants of Sentential Complexity," <u>Perception and Psychophysics</u>, II(July, 1967).

[5] <u>Ibid</u>., p. 295.

TABLE LVI

MEANS OF SELECTED TRANSFORMATIONS WHICH DIFFER BY A SINGLE RULE

Transform	Grade 4	Grade 5	Grade 6	Total
(Group 1)				
Relative Clause	54.88	61.37	66.66	60.82
WH Deletion	41.00	62.58	51.18	51.28
WH BE Deletion	50.12	48.49	63.29	54.03
Adjective	66.28	71.00	74.60	70.61
(Group 2)				
That + S Obj.	55.83	62.00	66.83	61.52
(That) + S Object	67.55	72.71	73.42	70.91
(Group 3)				
(That) + S Obj.Quot.	60.26	68.93	73.85	67.71
(That) + S Obj.Quot.Shift	54.70	70.93	73.18	67.77
(Group 4)				
Conjoining	58.01	67.87	62.31	65.32
Common Elem. Del.	54.00	57.09	51.15	57.79
(Group 5)				
Adv. Replacement	54.72	66.00	68.89	64.13
Adv.Replace. Shift	54.71	62.68	68.84	62.77
Adv. Replace. Deletion	33.33	40.66	58.25	45.50

Summary

The relationship of chronological age, sex, mental ability, and reading achievement to scores on passages, sentences, and transformations has been summarized in this chapter. Pupils in grades four, five, and six differed significantly in their responses to the twenty-one passages which had been selected from the three basal reader series. That is, grade four pupils differed significantly from grade five and six pupils. Grade five and six pupils were not significantly different in their responses to the "cloze" tests on these stories. When differences by difficulty were analysed by story, it was found that the stories of Series B were consistently easier for pupils of all three grades. Difficulties of the other two series by grade varied. Boys and girls were significantly different on their "cloze" scores of the twenty-one stories when these stories were considered in total and by series with girls attaining higher scores.

When the scores on the twenty-one passages of the three basal reader series were correlated with the variables - chronological age, socio-economic status, mental ability, reading achievement, and "cloze" scores on stories of Part II and Part III of this study - it was found that for the total group and for grade four and grade six the correlations were significant at the .01 level. Correlations between chronological age and the "cloze" scores were not significant at the grade five level. For grade five pupils also, the correlation between socio-economic status and "cloze" 2 and 3 scores of the twenty-one stories was significant at the .05 level. Reading achievement as measured by scores on the STEP Reading Test correlated significantly with the three "cloze" scores thus indicating a significant relationship between scores on these variables.

Sentence difficulty differed significantly over grades. However, when sentences were grouped according to the number of transforms per sentence, differences occurred for all groups except for sentences which contained no transforms or one transform. The difficulty of such sentences did not discriminate between grade levels.

An analysis of variance was carried out on transformation difficulty for each of the four groups - grade, sex, mental ability, and reading achievement. Most differences on transformation difficulty occurred for boys and girls with differences between high and low reading achievers ranking second. Least differences occurred for groups divided on the basis of mental ability indicating that this variable does not discriminate as well as grade, sex, and reading achievement between pupils' responses to various linguistic units. Differences between seven transforms were common to all groups. Most transformations which differed in difficulty over grade, sex, mental ability, and reading achievement were those which by their presence or difficulty correlated significantly with sentence and passage difficulty.

Grade six pupils rather than grade four pupils and girls more than boys were more flexible in their use of sentence structures if one accepts the assumption that such flexibility is reflected in a pupil's ability to substitute grammatically acceptable but dissimilar forms for words deleted in a "cloze" test. The type of grammatical form substituted was similar for boys and girls at the grade four level and for grade six boys. Girls of the latter grade seemed to substitute a wider range of forms, and substituted a greater proportion of negatives for positives, and adverbs for various parts of speech. The most common substitution consisted of Conjoining transformations, positives for

negatives, articles and adjectives for the "pronoun(genitive)" and the "genitive".

Punctuation was commonly ignored by the pupils of this study and consequently caused difficulty in their insertion of words in the blanks of the "cloze".

When the number of rules within a transform was investigated, there was some evidence that transformations with fewer rules were less difficult than transforms that differed by the addition of a rule. However for the "relative clause-WH-deletion-WH BE deletion-adjective" and the "that + S object-(that) + S object" groups, the reverse was generally true. Because this study was not designed to investigate this problem it is not feasible to generalize from these findings.

CHAPTER XI

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Although pupils may be fluent in their use of oral language, it does not follow that they will be equally fluent with written language since the structure of both is different. That is, there is not a reciprocal relationship between the structures of oral and written language. Although all oral language patterns or structures may appear in print, it is unlikely that all written language structures will be heard orally. Rarely, if ever, will one hear a child speak the sentences and phrases so commonly found in the reading material for primary grades, and more rarely still will one hear an individual speak the language of a Shakespearian play or sonnet except in theatrical performances.

If a child is to become a good reader he must be able to analyse the various syntactical structures of written language in order to comprehend fully the information conveyed in print. It is, perhaps, a wise recommendation that pupils be taught how various language structures relate to one another and how these structures vary in the manner in which they convey information. In order to do this, however, teachers must first be aware of those language structures which are crucial to a child's understanding of what he reads. It was the general purpose of this study to try and identify some of these structures which influence the difficulty of a sentence or passage in which they occur.

This chapter will be divided into four sections. The first two sections will contain a summary of the study and the findings and con-conclusions. Certain limitations of the study, suggestions for further research, and educational implications arising from the study will be

contained in the remaining sections.

I. SUMMARY OF THE STUDY

It was the purpose of this study to investigate the number and types of transformations (under the framework of transformational-generative grammar) which were found in the written language of three basal reader series at the grade four level, and to determine by means of the "cloze" technique, the difficulty which these structures presented for pupils aged nine to twelve in grades four, five, and six. To try and accomplish this purpose it was first necessary to make an analysis of the language structures of basal readers so that a grammar could be formulated and suitable test materials devised. The administration of the materials was divided into three parts. Part I contained twenty-one stories which had been randomly selected from three basal readers at the grade four level. An analysis was made of the language structures of these written passages according to transformation rules of the Chomskian transformational-generative grammar theory. A total of 206 sentences were analysed which contained 1035 transforms as defined by the grammar of this study. These transforms had resulted from the application of forty-three types of transformational rules in the derivation of the surface structures of the sentences analysed. These forty-three rules were further divided into five categories on the basis of certain commonalities. The five categories were Embedding, Conjoining, Deletion, Simple, and Position Shift. Two other language units were also investigated. These were "multi-transformation units" which were necessitated due to the fact that words resulting from the application of transformational rules

could not always be measured independently by the "cloze" technique - the main measuring instrument of this study. The remaining category was termed "non-transformational units" and included all those linguistic elements remaining after the transformations had been removed. The twenty-one passages containing these forty-three transformations were tested by means of the "cloze" technique.

Part II of the study contained three stories (one selected randomly from each basal reader) which were modified for the purposes of this study. Each story was rewritten in four different forms. Each form contained twenty transforms, twelve of which were of the type which the form specified (Embedding, Conjoining, Deletion, Simple) and the remaining eight transforms were of the other three types. This section was designed to control the number of transforms per passage - a control that was not possible in the passages of Part I. Part III was designed for the purposes similar to those of Part II. In this section, six stories which had been selected randomly from the three basal readers (two from each series) were changed by adding a sentence or sentences containing a transform of one of the four major types. The passage as selected from the text was termed the "basic" passage or form. Stories of Part II and Part III were also tested by means of the "cloze" technique.

After modifications had been made in the test directions and instruments on the basis of the results of a pilot study, the cloze tests were administered to 440 students who were studying grades four, five, and six in Newfoundland schools. The cloze tests were scored in three different ways. Method 1 was a "conventional" method of scoring the "cloze" and was used mainly to determine the reliability of methods

2 and 3. The second method took into account those words inserted which were grammatically similar to the forms which had been deleted though not semantically synonymous. This method was used to derive difficulty indexes for passages, sentences, and transforms. In the third scoring method the writer considered items which were grammatically acceptable within the sentence or passage but dissimilar grammatically to the form which had been deleted. The results of this scoring method were used to investigate various structures which were changed by students as they completed the "cloze".

The data collected were processed by a number of statistical techniques including rank order, and Pearson product moment correlations, one way analysis of variance, analysis of variance with repeated measures, and analysis of covariance. These statistical measures were applied to determine the degree of relationship of sentence and passage difficulty to the presence of transformations within the sentences or passage and to the difficulty of the transformation. It was felt that both the presence and the difficulty of a transformation could have differing effects on written language and thus it was decided to investigate both aspects. The relative difficulty of the transformations (that is, the fifteen easiest and the fifteen most difficult) was also investigated. In addition to the scores on the cloze tests, a number of other variables were investigated. These were chronological age, grade, sex, mental age as represented by student achievement on the SCAT tests, reading achievement which was determined by scores on the STEP Reading Test, and socio-economic status which was rated by the Blishen Occupational Class Scale. The findings of these analyses are contained in the next section.

II. FINDINGS AND CONCLUSIONS

The null hypotheses stated in Chapter I are restated below and data for and against the statement of each hypothesis explained.

Null Hypotheses

Null Hypothesis 1

> There is no significant relationship between the presence of various transforms and the difficulty of a sentence or written prose passage when difficulty is measured by the "cloze" technique.

Forty-three different transforms were investigated in this study. These were grouped into five different categories and correlations were calculated between the presence of these transforms and sentence and passage difficulty.

The presence of Embedding transformations tended to be the best predictor of sentence and passage difficulty. Of the eighteen transformations within this category, there was a significant relation between sentence difficulty and eleven, twelve, and eight of these for grades four, five, and six, respectively. When data for the total group were considered it was found that twelve of the Embedding transformations correlated significantly with sentence difficulty.

Transformations of this type were not as good predictors of passage difficulty as they were of sentence difficulty. The number of Embedding transformations for each of the three grades which correlated significantly with passage difficulty was ten, nine, and seven, respectively. The number for the total group was ten. The difficulty of a passage does not appear to be dependent entirely upon the difficulty of the sentences which make up that passage.

One reason why fewer Embedding transforms were related to passage

difficulty than to sentence difficulty may lie in the redundancy of language. Within the space of a passage (about one hundred words) there is more room for redundancy than within a single sentence and information which a pupil may miss within a sentence may be retrieved at. some other point within the passage.

Transformations of the Embedding type which correlated significantly with sentence difficulty at all grade levels and for the total group were the "relative clause", the "appositive", "compounds", the "VP - complement", "the infinitive of purpose", the "ing-nominalization", and the "adverb replacement". All correlations were negative indicating that the presence of such transforms would tend to increase the difficulty of the sentence in which they occurred. Embedding transformations which related significantly to passage difficulty at all grade levels and for the total group were the "VP - complement", the "adverb replacement", and the "adverb expansion + S". All correlations were negative.

Data on Conjoining transformations show that the presence of these transforms is not a good indicator of sentence or passage difficulty since correlations between their presence and the difficulty indexes of sentences and passages were not significant. This was true of all grades when the data for each grade were considered separately. When the data for all three grades were combined correlations were significant between the presence of Conjoining transformations and sentence and passage difficulty.

Deletion transforms, like Embedding transforms were fairly good predictors of both sentence and passage difficulty. There were seven Deletion type transformations and of this number, seven, six, and three

for grades four, five, and six respectively correlated significantly
with sentence difficulty. The number for the total group was seven.
The number of these transformations correlating with passage difficulty
for each of the respective grades and for the total group was three,
three, four, and four. Again it is obvious that sentence difficulty
was more dependent upon the presence of those transformations than was
passage difficulty. The most difficult transformations of this category
in terms of the influence of their presence on sentence difficulty were
the "common elements deletion", the "WH deletion", the "WH BE' deletion",
and the "comparative deletion". Correlations between these and sentence
difficulty were significant at all grade levels and for the total group.
The "common elements deletion", and the WH BE deletion" exerted a
similar influence on passage difficulty as on sentence difficulty.

There were thirteen transformational rules within the Simple
category. Of this number, nine, eight, eleven, and eleven correlated
significantly with sentence difficulty at each grade level and for the
total group, respectively. The numbers for each respective group which
correlated with passage difficulty were seven, seven, six, and eight.
The correlations of this group of transformations differed from those
of the preceding groups in that a number of positive correlations
occurred indicating that the presence of various transforms of this
type contributed to the ease of the sentence or passage. The "negative"
and the "contraction" correlated negatively with sentence difficulty
at all grade levels and for the total group thus indicating that the
higher the number of these transforms within a sentence the more
difficult the sentence was likely to be. None of the Simple trans-
formations correlated negatively with passage difficulty for all grades,

either singly or combined. Those transformations exhibiting a positive
relationship with sentence difficulty for all grades consistently and
for the total group were the "question", the "imperative", the
"pronoun (simple)", and the "vocative". The "vocative" and the
"expletive" were consistently correlated with passage difficulty for
all groups investigated. It is interesting that all of those Simple
transformations which correlated significantly and positively with
sentence and/or passage difficulty are commonly, if not always,found
in direct speech. It would appear that pupils were better able to
analyse written language patterns which correspond, as far as
possible, to oral language structures.

No transformations of the Position Shift group consistently
correlated with sentence difficulty over grade levels. The correlations
between the "adverb replacement shift", and the "NP - V inversion" and
passage difficulty were significant for all groups. The correlation
of the former transformation was negative. The correlation of the
latter was positive for grade four, and grade six, and for the total
group,but negative for grade five pupils.

On the basis of these data the null hypothesis may be rejected.
The presence of various transformations does relate significantly to
sentence and passage difficulty.

Null Hypothesis 2

> There is no significant relationship between the
> difficulty of various transformations and the
> difficulty of a sentence or written prose passage
> when difficulty is measured by the "cloze" technique.

The number of transforms within the Embedding group whose
difficulty correlated significantly with sentence difficulty was ten,

eleven, twelve, and fifteen for grades four, five, six, and the total

group respectively. There was a slight progression from grade four to

five to six in the number of transforms of this type whose difficulty

related to the difficulty of the sentence in which they occurred. The

numbers of Embedding transformations which correlated significantly

with passage difficulty for each group were nine, seven, ten and four-

teen. Transforms of the Embedding type whose difficulty correlated

significantly with sentence difficulty were the "relative clause", the

"adjective", "compounds", and "WH + S object", the "infinitive of

purpose", the "ing-nominalization", the "pronoun (genitive)", the

"verb + Complement". and the "adverb replacement". All but the "ing-

nominalization", and the "infinitive of purpose" (both at the grade five

level) were significant at the .01 level. The correlations of these

transformations were significant at the .05 level for the grade five

pupils. The difficulty of fewer transformations significantly cor-

related with passage difficulty for all groups. Those transformations

which were consistently correlated with passage difficulty over grade

levels and for the total group were the "relative clause" (.05 level

of significance for grade five pupils), "compounds", the "WH + S object",

the "infinitive of purpose", the "pronoun (genitive)", and the adverb

replacement".

Data on the Conjoining transformations show that the difficulty

of this type of transformation correlated significantly with sentence

and passage difficulty at all grade levels and for the total group.

The difficulty of Conjoining transformations, therefore, can be con-

sidered a good predictor of sentence and passage difficulty.

The correlations between sentence and transformation difficulty

were significant for five, four, four, and seven transformations of the
Deletion type for grades four, five, and six, and for the total group,
respectively. The number of such transforms that correlated signifi-
cantly with passage difficulty was much smaller. For each group in
order, the numbers were one, two, three, and six. The difficulty of a
sentence is much more dependent on the difficulty of the transformations
of the Deletion type than is the difficulty of the passage. Only two
of the Deletion transforms were consistently correlated with sentence
difficulty for all groups. These were the "common elements deletion"
and the "(that) + S object quote". The former transformation also
consistently correlated with passage difficulty for all groups.

The number of Simple transformations which related to sentence
difficulty for grades four, five, and six and for the total group was
nine, nine, ten, and twelve, respectively. The number for each group
that related to passage difficulty was six, seven, nine, and eleven.
Simple transformations which consistently correlated with passage
difficulty at all grade levels also correlated with sentence difficulty
at all grade levels. These transformations were the "there inversion",
the "question", the "negative", the "aspect", the "pronoun (simple)",
and the "expletive". The "passive" also correlated significantly with
sentence difficulty but not with passage difficulty.

Correlations of the Position Shift transformations varied con-
siderably by grade. For the grade six pupils and for the total group
all of the transformations of this type (N = 4) correlated significantly
with both sentence and passage difficulty. Three transformations of
this group were significantly correlated with sentence difficulty at
the grade four and five levels. For these grades the number of Position

Shift transformations which correlated significantly with passage difficulty was two and zero respectively. The "adverb position shift", the "adverb replacement shift", and the "(that) + S object quote shift" consistently correlated with sentence difficulty at all grade levels.

Null hypothesis 2 may be considered rejected since there is a significant relationship between the difficulty of various transformations and sentence and passage difficulty.

Null Hypothesis 3

> There is no significant relationship between the difficulty of a sentence or of a written prose passage and the number of transformations within that sentence or passage.

A test of partial correlations was used to determine whether the number of transforms per sentence would predict the difficulty of a sentence when the number of words per sentence was controlled. The correlation was not significant at the .05 level. When correlations between the number of transforms per sentence and sentence and passage difficulty were calculated, it was found that all correlations were below the significance level except the correlation between the number of transforms per sentence and sentence difficulty at the grade four level. Findings also showed that when an analysis was made of those transformations whose difficulty correlated significantly with the number of transformations per sentence, the number of transformations per sentence tended to increase the difficulty of non-transformation units - the kernel or basic sentence parts - at the grade four level. Pupils at this level appear not to have attained the same degree of maturity in their facility with written language structures as have students of grade five and six.

An analysis of the scores of the four forms of each of the three stories in Part II of the study showed that there were significant differences between forms even though each form contained equal numbers of transformations.

It appears that it is not the number but rather the type which is the crucial characteristic of transformations in determining the difficulty of various written language structures. On the basis of these findings, null hypothesis 3 cannot be rejected.

Null Hypothesis 4

> There is no significant difference in the pupils'
> understanding of sentences with different numbers
> of transformations from grade four to five to six.

An analysis of covariance in which the criterion was the difficulty of the sentence and the covariate was the number of transforms per sentence was carried out to determine if pupils in grades four, five, and six differed significantly in sentence difficulty when the number of transforms per sentence was controlled. The differences by grades were significant at the .01 level.

When sentences were divided into eleven groups on the basis of the number of transforms per sentence, and an analysis of variance carried out to see if grades differed significantly on the scores of each group, it was found that for all sentence groups except when sentences contained no transformations or one transformation, differences were significant.

Except for the findings on these two sentence groups, the null hypothesis may be rejected.

Null Hypothesis 5

> There is no significant relationship between the

pupil's understanding of a passage as measured by
the "cloze" technique and his reading comprehension
as measured by a standardized reading test.

The "cloze" tests on the twenty-one stories in Part I of this
study were scored by three different methods. Correlations between
each of these sets of scores and pupils' scores on the STEP Reading
Test were significant at the .01 level for each grade separately and
for the total group. Coefficients were fairly high ranging from .73
to .78. Correlations between the "cloze" scores of the stories of
Part II and Part III also correlated significantly with STEP scores
for each grade singly and combined. Null hypothesis 5 is rejected.

Null Hypothesis 6

There is no significant difference in the difficulty
of different transforms over grade, sex, mental ability,
and reading achievement.

When an analysis of variance was carried out on the difficulty of
each of the forty-three transformations for students' groups according
to grade, sex, mental ability, and reading achievement, various results
occurred.

Most differences between the difficulty of the various trans-
formations were found for students of this sample when they were grouped
by sex. There was a significant difference on thirty-two of the forty-
three transformations investigated. The next highest number of sig-
nificant differences on transform difficulty occurred for students'
groups by reading achievement. It appears that the higher reading
achievers have an advantage over lower reading achievers in their
comprehension of transformations within written language. Differences
between high and low readers on transform difficulty may also be re-
flected in the scores of boys and girls since there were significant

differences between sexes on the scores on the STEP Reading Test - girls

being better readers than boys. To overcome any sex bias in setting up

the reading groups, however, the top and bottom quartiles of the STEP

scores of each sex were taken to form the high and low reading achieve-

ment groups.

Pupils at different grade levels differed significantly on only

seventeen of the transformations while the number for mental ability

groups was fourteen. On the basis of the above data, it is not possible

to reject the null hypothesis completely. It can only be stated that a

greater number of differences on the difficulty of transformations

occurred when pupils were grouped by sex, and reading achievement while

least number of differences occurred when students were grouped by

mental ability.

Null Hypothesis 7

There is no significant relationship between pupils'
"cloze" scores on passages containing various trans-
formations and:
   a) chronological age
   b) reading achievement
   c) mental ability
   d) socio-economic status

a) When pupils' "cloze" scores on the twenty-one stories were

correlated with chronological age, the resulting coefficients were

significant at the .01 level for grade four, grade six, and for the

total group. Coefficients were negative indicating that younger

children in these grades tend to score higher on the "cloze" tests.

Chronological age was not significantly related to pupils' "cloze"

scores at the grade five level. Thus the a) statement of the null

hypothesis cannot be rejected completely.

b) and c) Reading achievement and mental ability correlated

significantly with "cloze" scores for all grade levels and for the total group. Scores on the verbal and quantitative sections of the <u>SCAT</u> test as well as total scores were all significantly related to the "cloze" scores. Accordingly the null hypothesis cannot be upheld.

d) A low but significant relationship was observed between socio-economic status and "cloze" scores for each grade singly and for the three grades combined. Correlations between socio-economic status and the "cloze" as scored by methods 2 and 3 were significant at the .05 level for grade five students. However, since the .05 level was accepted as the level of significance in this study, the null hypothesis was rejected.

General Findings and Conclusions

A number of findings other than those pertinent to the stated hypotheses arose from this study. These will be summarized briefly under the headings of language structure of basal reader series, difficulty of transforms, difficulty of the passages, changes in language structure, the ignoring of punctuation, and the DTC theory.

Language Structure of Basal Reader Series

A total of 2657 words which were contained in 206 sentences of twenty-one passages were randomly drawn from three basal reader series at the grade four level. The sentences were found to contain 1035 transformations as defined by the grammar of this study. Reader series differed according to the number of words per sentence. The number of words per sentence in the text of Series A was 12.6 compared to 10.9 words per sentence for Series B, and 16.0 words per sentence for Series C. The number of transformations per sentence also varied by series. The numbers for each of series A, B, and C, respectively were 5.0, 4.5,

and 6.2. More sentences containing ten or more transforms were found in the passages of the latter series than in the passages of series A and B. The percentage of sentences not containing transformations for each of the three series were 5.8, 3.8, and 1.7, respectively.

When the types of transformations that occurred were analysed a number of similarities were evident among series. Of the five major types of transforms - Embedding, Conjoining, Deletion, Simple, and Position Shift, the Embedding transformations constituted the largest proportion of the transforms in Series A and C. Simple transforms were the larger group in Series B and made up 38.9 per cent of the total as compared to 33.7 per cent for Series A and 30.3 per cent for Series C. There were more Conjoining and Deletion transforms in Series C than in Series A or B.

The "adjective" was the most frequent Embedding transformation to be found within all three series. Other transforms of this type which commonly occurred were the "pronoun (genitive)", the "adverb replacement", and the "relative clause" though the order in which they appeared varied by series.

The three most commonly occurring transforms of the Deletion type were similarly ranked in terms of frequency for all series. These were the "common elements deletion", the "WH BE deletion", and the "(that) + S object quote". The percentage of the total number of transforms which they constituted in each text varied, however. The "pronoun (simple)" was by far the most frequent Simple transformation to occur in all three series and for Series A, B, and C, respectively constituted 19.8, 18.7, and 13.0 per cent of the total number of transformations. Other transforms of this type which frequently occurred were the "aspect",

the "negative" and the "passive". Adverbs were most frequently front shifted in each of the three series. This was followed by the front shifting of the "adverb replacement" transformation.

Difficulty of Transforms

An analysis was made of the means of the transforms at each grade level. The fifteen most difficult and fifteen easiest transforms were listed. It was obvious from the findings that those transforms whose difficulty correlated significantly with sentence and passage difficulty were not always the most difficult transforms for the students. Multi-transformations were consistently difficult for students at each grade level. Various Simple and Deletion transforms also tended to occur frequently amongst the most difficult groups of transformations. Conjoining transforms were consistently easy for pupils at all grade levels. With the exception of "multi-transformation units", all transforms were progressively easier from grade four to five to six.

Difficulty of the Twenty-One Passages

An analysis of variance on the means of the passages of each series was carried out to determine if the passages differed significantly by series. The differences were significant at the .05 level. An inspection of the means showed that passages of Series B were least difficult as measured by the "cloze" technique. Though the means of Series C ranked lower (more difficult) than those of Series B, they were not significantly different. It was hypothesized that the ease of the passages of Series B reflected the types of transformation found within that series - transformations which according to the findings stated in Chapter VIII did not tend to increase passage difficulty

by either presence or difficulty.

Changes in Language Structure and Misuse of Punctuation

Pupils frequently inserted a word in the "cloze" which was grammatically dissimilar to the form which had been deleted and which resulted in a different transform than had been present in the original passage. A more detailed analysis of such changes was made for boys and girls at the grade four and the grade six levels. Although grade six students as a group inserted more grammatically dissimilar words than did grade four pupils, the boys of the former grade made less changes than did the girls of the latter grade. At both grade levels, girls made more changes in language structure than did boys.

The type of changes made were similar for grade four boys and girls and for grade six boys. Grade six girls seemed to substitute a wider variety of grammatically dissimilar forms and substituted a greater proportion of negatives for positives, and adverbs for a wide variety of grammatical forms. The most common grammatical elements substituted were Conjoining transformations for a variety of forms, positives for negatives (except for girls at the grade six level), articles and adjectives for the "pronoun (genitive)" and "genitives" or vice versa. The insertion of words of this type (grammatically dissimilar to the word deleted but grammatically acceptable in context) may mean two things - a restriction or a flexibility in language use. Those students who tended to substitute Conjoining transformations mainly (particularly grade four boys) may have a limited repertoire of structures. It has already been shown (findings of Chapter VIII) that the Conjoining transform was one of the easiest transforms for children of this grade. Thus it seems reasonable to assume that this

linguistic structure is within their control, that is, they can under-
stand it in oral and written language. It must be kept in mind, however,
that the substitution of this transformation so that it will still be
grammatically acceptable in context indicates an ability to manipulate
linguistic structures. What may be termed a flexibility of language
use was more common among the grade six girls. These pupils inserted
a wide variety of grammatical forms in place of the form in the original.
Examples are given in Appendix H. Jenkinson[1] hypothesized in her study
that the "language factor" as it was designated by Burt which relates to
words in context and the word fluency factor of Thurstone which appears
to involve a fluency in dealing with words would be tested by the
"cloze" procedure. She maintained that these factors were rarely
measured in tests of reading comprehension. When she classified the
responses which her sample of high school pupils made to "cloze" tests
on passages read orally, she identified three aspects of the pattern by
which the "cloze" slots were completed. One aspect identified was
Structure which was considered to have two subdivisions - syntactical
and awareness of language. The former was assumed to include responses
based on a knowledge of grammar, while an awareness of language included
responses indicative of linguistic knowledge which went beyond the mere
cognizance of syntax or accidence. It appears that this awareness of
language structure may be an important factor in reading comprehension
in view of the literature that the "perceptual", "conceptual", and
"memory unit" is usually bigger than a word. This awareness of
language structure takes on more meaning when it is placed within the

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[1]Marion Dixon Jenkinson, Selected Processes and Difficulties of
Reading Comprehension (unpublished Doctoral dissertation, The University
of Chicago, Chicago, 1957).

framework of transformational-generative grammar. It is not clear as to how much of this depends on innate ability and how much is learned. Jacobs and Rosenbaum[2] maintain that a child comes into the world knowing, quite unconsciously, what to look for in a language. They maintain that "he uses his innate knowledge to construct the particular transformations of his language, to piece together in a remarkably short time the grammar of the language to which he is exposed."[3] They go on to say that once a child has discovered the particular transformations of his language, he is able to distinguish the grammatical utterances of his language, to interpret utterances and to recognize ambiguity and synonomy. Thus this language flexibility may be partly innate and partly acquired. Whether the innate potential may be related to intellectual factors as Chomsky[4] maintains, is still questionable. The findings of this study have shown that the girls were significantly above the boys in mental ability, as measured by scores on the SCAT test. It is also possible that the nature of the girls' surroundings led them to acquire a greater variety of transformations by which the deep structures could be converted into surface structures. The fact that the girls were higher reading achievers in this study may also be a factor in explaining their "syntactical competence."

Pupils also frequently ignored punctuation marks as they inserted

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[2]Roderick A. Jacobs and Peter S. Rosenbaum, English Transformational Grammar (Waltham, Massachussetts:Blaisdell Publishing Company, 1968).

[3]Ibid., p. 28.

[4]Noam Chomsky, Aspects of the Theory of Syntax (Cambridge: The M.I.T. Press, 1965).

words in the "cloze". In some instances punctuation marks were erased

so that the words inserted would conform to a particular language

structure. It may be that when a child encounters a language pattern

which may be easily changed to conform to another pattern (possibly an

oral language pattern of his repertoire) he imposes his own structure.

It would seem that this could occur more easily during oral reading

when a child is not faced with the task of physically changing the

punctuation. He may simply ignore it as often occurred in the tests

of this study. It appears that this situation may be an exemplification

of what Goodman[5] calls "miscues" and Weaver[6] designates as "variant

readings" or "misreadings"

The DTC Theory

If by the DTC theory is meant that the number of transformation

rules which have been applied in the derivation of a sentence is a

measure of sentence complexity and the greater number of transforms,

the more complex and supposedly the more difficult (perceptually or

conceptually) the sentence is, then this study has provided evidence to

refute such a theory. If, however, the DTC theory relates to the number

of rules or steps within a transform rather than the number of trans-

forms within a sentence, then further research is needed before one can

accept or refute the theory. Although this study was not designed to

investigate the latter, the means of a number of transforms which

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[5]Kenneth S. Goodman, "Linguistic Study of Cues and Miscues in Reading," Elementary English, XLIII (October, 1965).

[6]Wendell W. Weaver, "On the Psychology of Reading", College-Adult Reading Thirteenth Yearbook of the National Reading Conference (Milwaukee, Wisconsin:The National Reading Conference, Ind., 1964.

differed by the addition of a step or rule were analysed. The results, however, indicated a certain amount of inconsistency. That is, in some instances those transforms with an additional rule were more difficult but in two instances the opposite was true. Thus the results are, at most, controversial.

Summary

Each of the seven null hypotheses was rejected either wholly or partially with the exception of hypothesis 3. This hypothesis which stated there was no relationship between the number of transforms per sentence and sentence and passage difficulty could not be rejected on the basis of the findings of this study.

The presence of Embedding and Deletion transformations tended to influence the difficulty of a sentence or passage more than the other transformations. The difficulty of Conjoining transformations rather than their presence correlated significantly with sentence and passage difficulty. The difficulty of about equal proportions of transformations from the other four categories also correlated significantly with sentence and passage difficulty. Transforms commonly found in direct speech tended to be easier. Findings also indicated that pupils changed language structures, and ignored punctuation marks in their completion of the cloze tests.

III. LIMITATIONS OF THE APPLICABILITY OF THE FINDINGS

In addition to the limitations stated in Chapter I three other limitations became apparent which may restrict the applicability of the findings.

The sample was selected from city schools and therefore

generalizations to populations in rural areas may be untenable.

Although the sample was selected randomly by schools, girls were found to be higher reading achievers and higher in mental ability than the boys. This may restrict the applicability of the findings somewhat. This factor was minimized however, by selecting the higher reading and mental ability groups from both sexes when differences between these groups on their responses to the "cloze" tests were being investigated.

An analysis of the sentences of the basal readers revealed the presence of forty-three different transformation rules. The number of steps or sub-rules within each transform was not considered in this study. It is also possible that transformation rules other than the forty-three analysed may be present within sentence structures of the basal readers and may be significantly related to the difficulty of sentences and passages. This should be kept in mind when generalizing about the language complexity of basal readers from the findings of this study.

IV. SUGGESTIONS FOR FURTHER RESEARCH

Research findings frequently pose more problems than they answer. A number of areas requiring further investigation were apparent from the findings of this study.

An analysis of basal readers at other grade levels should be undertaken. Little is known about the language structures of the texts by which children are normally taught to read. Such an analysis of texts would provide information on the similarity of language structures within texts at various grade levels. Some information on transformations which grade five and six pupils find difficult has resulted from

this study. Are these structures found within the basal readers of these grades?

An analysis of texts other than basal readers would indicate whether those structures which occur within basal readers also occur in social studies, and science texts etc. Dissimilar structures in different subject areas may militate against transfer of reading skills across subject areas and may necessitate teaching pupils how to analyse sentence structures within subject areas as an aid to comprehension.

There was no control over the type of transformations which occurred in the twenty-one passages of the basal readers. "Basic" passages to which transforms (which according to the findings of this study were most difficult either by their presence or difficulty) were added could be used to determine more precisely the effect of the inter-action of certain transforms. Results of such an experiment might give more information on whether an "easy" transform tends to modify the difficulty of a "difficult" transform or whether the presence or difficulty of transformations is more crucial in determining the difficulty of the sentence or passage.

On the basis of the findings of this study there is some suspicion that the position (initial, medial, final) may be influential in determining transform difficulty. This problem could be investigated further.

This study has shown the feasibility and reliability of two other methods of scoring the "cloze". "Cloze" scores, however, are relative. More research is needed to establish criterion scores by which the difficulty of passages as measured by the "cloze" may be evaluated for pupils of various grade levels.

Further information on the DTC theory is needed. An investigation of the difficulties of transforms when the number of sub-rules or steps necessary to complete the transformation process is noted, would be of value.

More information is needed on the degree to which students make use of punctuation marks when they read and on the importance of such features for comprehension purposes. Comparative studies between a pupil's use of pitch, stress, and juncture would provide valuable information.

Readability formulae have been used for several decades to assess the difficulty of written passages for pupils at various grade levels. Such formulae, however, have been concerned largely with the counting of various linguistic elements. On the basis of the findings of this study, one may question the feasibility of relying mainly on quantity in assessing the difficulty of written language. Construction of formulae utilizing various transformation types and the testing of such formulae would constitute a beneficial project.

Would students be better able to comprehend written language if they were taught how to analyse structures which tend to make written language difficult? This area is in need of further investigation.

The difficulty of a passage is not the sum of the difficulties of the sentences. It was suggested that this was due to the redundancies of language. What are these redundancies and how can pupils make best use of them in comprehending what they read? Both questions are in need of further research.

The findings of this study have shown that language structures did not have the same effect on the comprehension of a prose passage for all

students. More information is needed on the characteristics of students who react differently to the same language structures. It is erroneous to assume that all students will find the same language structures equally difficult. It may be a matter of equating student with language in terms of certain characteristics - in which case research is needed to determine what these characteristics are.

More information is needed on what has been termed a linguistic flexibility factor in this study. What is the nature of this facility with language? Girls in this study tended to exemplify this facility more than did the boys. The girls were also higher in mental ability and reading achievement. Research should be undertaken to try and narrow down as much as possible those characteristics of individuals who tend to possess this ability to manipulate linguistic structures.

V. IMPLICATIONS OF THE STUDY

The findings of this study suggest a number of implications for the reading program and for those who are concerned with the teaching of reading. Some of these implications are stated below.

General Implications for the Reading Program

Results of this study have shown that pupils at the grades four, five, and six levels do not comprehend fully the various written language structures. Teachers may incorporate into their teaching of comprehension skills in the developmental reading program a section on the forms of language structure. In view of the findings of this study, it appears that the teaching of language structure as an aid to comprehension would be most effective when taught from a transformational point of view. The base structure of a sentence may be taken as an

illustration and with the aid of tree markers, the teacher could demonstrate how various syntactic patterns of the language (adjective, relative clauses etc.) are produced according to this theory. Pupils too may engage in this activity.

Since boys tended to be less facile than girls in their use of language structure, more emphasis may need to be placed on the examination of structure for boys. Discussions by boys on topics of interest to them with an occasional opportunity for them to write on the topic discussed may help in this regard.

Students of higher mental ability achieved higher than those of lower mental ability. It may be necessary to give emphasis to the development of language with the latter group. More work of an oral nature (discussion, story telling, describing, etc.) would be helpful.

Students who are higher reading achievers also scored higher on their understanding of transforms as measured by "cloze" tests. Furthermore boys tended to be lower achievers. More emphasis should be placed on encouraging students to build good reading habits and an enjoyment of various literary works.

Cloze tests may be used to get an indication of a child's facility with written language structures. Cloze procedures may also be used to help students note clues indicating the presence of particular language elements, for example, the past tense of a verb (redundancy), and the appropriateness of a variety of linguistic structures in expressing an idea in written language.

Methods for Teaching Reading

The first three implications in this section are based on

suggestions in an article by McGuire.[7]

Students may be assigned a topic and asked to discuss this as fully as possible in one sentence. In order to do this students must explore the resources of the language. Students may first search for words that will help them portray their side of the argument on the topic chosen. The teacher may act the role of a consultant and suggest other words or sources of other words. When pupils begin to structure their ideas into a single sentence the teacher may also give advice on an appropriate connective or introductory phrase for those who may be having difficulty.

Well constructed sentences may be taken from literature and divided by the teacher into a number of brief kernel sentences. Students may then practice combining these in a number of ways. At the end of the exercise the original sentence is presented and discussed. It is not the aim that students produce sentences on a par with great writers but that they recognize the number of ways in which an idea may be expressed structurally.

An exercise opposite to the above may also be a profitable experience. Students may search the writings of great authors for sentences which they consider to be well constructed. These sentences may be broken down into kernels by the students in order to see what the base structure is and what transformations were used in the derivation

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[7]Ellen J. McGuire, "Sentence Building and Transformational Grammar," English Journal, LVI (May, 1967), pp. 747 - 750.

of the sentence.

Examples of good as well as deviant sentence structures may be taken from the students' own written assignments and the merits of the well structured sentences and the improvement of the poorly structured ones discussed. Pupils should understand why the latter were not considered well structured sentences.

It has been a common practice among teachers when they give a written assignment, to discuss and list appropriate words that may be used in the elucidation of the topic. It might also be a profitable experience for pupils to suggest and discuss appropriate linguistic structures (introductory phrases, subject-verb inversion, appositives and participles as opposed to clauses etc.) which may be used.

There has been some evidence in the findings of this study to show that the position of certain structures may be important for comprehension purposes. In view of this there may be some discussion on the importance of the topic sentence, its position in the paragraph where students think it would be most effective, and the appropriateness of certain linguistic patterns for conveying the idea it contains.

Pupils may be given a recipe of sentence structures for a written assignment on a particular topic. For example, they may be asked to write on "My First Experience on the Moon" using one simple sentence, two participles, one negative, four adjectives etc.

Pupils who have written on a particular topic may be asked to 1) tell about it, 2) read it. These situations may be taped. With the teacher's aid students may discuss the differences in these two forms of language and compare them with the written language of the paragraph.

Structures unique to a dialect or a geographical area may be

discussed. Slang expressions are particularly appropriate for such an exercise. These expressions usually contain a number of deletions. Structural changes where linguistic forms have taken on other grammatical functions may be discussed such as the verb "researched" from the noun "research", or "wreckwood" from the wood of wrecks being sold as souvenirs in Eastern Canada.

Pupils should be made aware of the redundancy of language structure. Pupils may be given practice in eliminating all information in a passage except the "core". They may be asked to decide what information may be omitted entirely without destroying the context of the passage. Students may also be asked to list all the clues concerning a particular linguistic element named by the teacher. For example, the teacher may ask for all clues to the plurality of "huskies" in the sentence "The two huskies were the best friends Old Ootik every had."

Redundancy in sequence may be noted by having students list all words in a passage which denote sequence. A passage may be divided into sentences - one version with the sentences intact and the other will all words denoting sequence omitted. The sentences may be scrambled and students may be assigned the task of putting the sentences in the best possible order.

Pupils who are having difficulty in interpreting what they read may be given a story which has been written in short simple sentences. Various linguistic structures may be added or combined and a discussion may follow on the clues which indicate the presence of this structure for example, determiner _____ noun usually indicates the presence of an adjective, whereas the presence of such words as "who, which etc."

usually signify a clause is to follow unless the sentence is a question

which is then denoted by the interrogative symbol.

The importance of punctuation as an aid to comprehension may be

discussed. A passage without punctuation will let pupils readily see

the importance of this structural aid. Pupils may be given practice

in writing passages including proper punctuation which are dictated by

the teacher or pupils.

Teacher Education

The implications of the preceding section assume that teachers

are qualified to implement the suggestions given. This is not always

so.

Methods courses on the teaching of reading should put greater

emphasis on the place of written language in comprehension. Practice

with some of the exercises for the teaching of structure as suggested

in the preceding implications would be valuable in such courses.

The field of linguistics is constantly providing new ideas in

the field of language. New theories on the structure of language are

being constructed and old theories modified. In order that teachers

keep up-to-date on new ideas in the field of language they should be

encouraged to take linguistic courses as part of their teacher education

program.

Though much has been written on the interrelation of the language

arts, teachers are often unaware of ways in which the various "language

arts" may be interrelated for teaching purposes. A topic ordinarily

taught in intermediate school grades (conservation, transportation etc.)

may be taken and a unit developed on this utilizing the five main

language arts - reading, writing, listening, speaking, and spelling.

The feasibility of selecting sentence patterns from social studies for examination purposes, or assigning topics from social studies for written assignments in English class may also be discussed.

Reading consultants and supervisors may profit from more discussion of, and participation in,the setting up of reading programs to meet the needs of students in different socio-economic areas. Experience with appropriate tests (including cloze tests) for assessing the language potential of the students concerned may be profitable.

Though handbooks to the basal readers are valuable aids particularly to beginning teachers, teachers should be aware that the methods, content, and suggestions contained in these are aimed at the "average" child. Teachers should be given more training in assessing the weaknesses of their students and in modifying the reading program to meet the students' needs.

VI. CONCLUDING STATEMENT

This study has identified a number of language structures which influence the difficulty of written language either by their presence and/or their difficulty. Although students are quite facile in their use orally of a number of language structures when they enter school, many fail to acquire equal facility with the structures of written language.

The findings of this study also indicate that there is a gradual increase from grade four to six in pupils' ability to understand the various langauge structures.

In view of these findings, provision should be made for instruction in these language structures so that pupils may be better able to analyse the various linguistic patterns and may better comprehend the ideas

and information conveyed in print. Such instruction may be incorporated into a systematic and thorough program for the teaching of comprehension skills.

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APPENDIX

APPENDIX A

BATEMAN AND ZIDONIS TRANSFORMATIONAL RULES

EMBEDDING TRANSFORMATIONS

NOUN EXPANSION

1. Relative Clause (Be):
   I admire my English teacher, *who is a scholar.*
2. Adjective (by deletion and obligatory placement):
   A *handsome* lad.
3. Relative Clause (Have):
   The book, *which had no index,* proved useless.

4. With-phrase (by simple transformation of ET-3):
   A book *with an index* is needed.
5. Relative Clause (V_b):
   The boy *who scored the touchdown* was cheered.
6. Gerundive Adjective (by deletion and optional placement):
   A *smiling* girl.
7. Compounds: He stepped into the *bull ring.*
8. Genitives: The *horse's* mouth/ The mouth *of the horse.*

NOUN REPLACEMENT

9. That + S as subject:
   That I am failing the course disturbs me.
10a. (That) S as object:
   I know *he is a diligent student.*
10b. That + S as object:
   I believe *that he has made the team.*
11. WH + S as subject:
   What he has already learned astonishes me.
12. WH + S as object:
   I know *what annoys him.*
13. WH + Inf as subject:
   What to visit at the Fair is a problem.
14. WH + Inf as object:
   My cousin knows *what to visit.*
15. Nominal Inf of Obligation:
   Here is a book *for you to know.*
16. Inf as subject:
   To appear on television is an exciting experience.
17. Inf as object:
   I tried *to answer the question correctly.*
18. Inf of purpose:
   The exercises are designed *to help you.*
19. Gerundive Nominal:
   Tom's hot-rodding disturbed his mother./ She objected to
   his continuous complaining.
20. Gerundive Nominal of Purpose:
   I have a knack for *getting into trouble.*
21. Abstractive Nominal.
   His eagerness to depart surprised me./ I admired *the girl's
   reluctance to go.*

ADJECTIVE EXPANSION

22. Adjective + Inf: You are *free to get an education.*
23. Adjective + That-clause: I am *happy that you have enrolled.*
24. Adjective + Gerundive: Lures are *excellent for catching fish.*

VERB EXPANSION

25. V_{Ta}: I *caught him stealing the money.*
26. V_{Tb}: I *prevented him from stealing the money.*
27. V_{Tc}: I *advised him to return the money.*
28. V_{Td}: I *considered him to be the thief.*
29. V_{Te}: I *let him return the money.*
30. V_{Tf}: I *called him a fool.*
31. V_{Tg}: I *made him angry.*
32. V_{Th}: I *put the car in the garage.*
33. V_{In} + C: I *kept on talking.*

ADVERBIAL REPLACEMENT

34. Adverbial Replacement in Loc, Tm, Mot, or Man:
    You may go *wherever you wish.*
35. Adverbial Replacement (ϕ):
    He is happy *because she smiled at him.*

ADVERBIAL EXPANSION

36. Adverbial Expansion of *Man* + C:
    The lawyer spoke *so* rapidly *that he confused the jury.*

CONJOINING TRANSFORMATIONS

37. Conjoining: The boat sank *but* nobody drowned.

DELETING TRANSFORMATIONS

38. Common elements deletion:
    His lonely hotel room seemed cold and *his lonely hotel room seemed* damp.
39. WH + BE deletion: The boy *who is* starting at quarterback is in my class.
40. Adverbial embedment deletion:
    As if *he had been* asked, he sat down to dinner with us.

SIMPLE TRANSFORMATIONS

41. Passive:
    The boy hit the ball—*The ball was hit (by the boy).*
42. It-Inversion: *It is surprising that we won the game.*
43. There-Inversion: *There is a thief among us.*
44. Question: *Are you going to the game tomorrow?*
45. Negation: He *did not see* the mirage in the desert.
46. Negation-shift:
    I advised him not to enroll—I *didn't (did not) advise* him to enroll.

APPENDIX B

TRANSFORMATIONAL RULES OF THE STUDY

The following transformation rules based on studies by

Chomsky[1], Lees[2], Klima[3], Thomas[4], Chomsky[5], and Bateman and Zidonis[6]

have been found adequate for assigning a structural description to

the sentences taken from passages of grade four basal readers. It is

assumed that transformations for marking agreement - such as those

which add singular and plural morphemes or which create the proper

WH-form (who, whom, whose) are generally found throughout all

sentences of the language and are not considered in this set of rules.

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[5]Noam Chomsky, Aspects of the Theory of Syntax(Cambridge: The M.I.T. Press, 1957).

[6]Donald R. Bateman and Frank J. Zidonis, "The Effect of A Study of Transformational Grammar on the Writing of Ninth and Tenth Graders," NCTE Research Report No. 6, The National Council of Teachers of English, Champaign, Illonois, 1966.

EMBEDDING TRANSFORMATIONS

Noun Expansion

1. Relative Clause: Example: I admire my English teacher <u>who is a</u>

<u>scholar</u>.

2. With Phrase: Example: A book <u>with an index</u> is needed.

3. Adjective: Example: A <u>handsome</u> lad

4. Appositive: Example: Bob Jones, <u>a sailor</u>, is home on leave.

5. Gerundive: Example: A <u>smiling</u> girl

6. Compounds: Example: He stepped into the <u>bull ring</u>.

7. Genitives: Example: The <u>horse's</u> mouth/ The mouth <u>of the horse</u>

Noun Replacement

8. That + S as Object: Example: I believe <u>that he has made the team</u>.

8a. It Inversion: Example: <u>It is surprising that we won the game</u>.

9. VP Complement: Example: It appeared <u>that she would make it</u>.

10. WH + S as Object: Example: I know <u>what annoys him</u>.

11. Infinitive as Object: Example: I tried <u>to answer the question</u>

<u>correctly</u>.

12. Infinitive of Purpose: Example: The exercises are designed <u>to help</u>

<u>you</u>.

13. Ing-Nominalization: Example: <u>Tom's hot rodding</u> disturbed his mother.

She objected to <u>his continuous complaining</u>.

14. Ing-Nominalization of Purpose: Example:

I have a knack for <u>getting into trouble</u>.

15. Pronominalization(Genitive): He broke <u>his</u> arm.

Verb Expansion

16. Verb + C: Example: After a crash they always <u>make</u> <u>pilots</u> <u>fly</u> <u>again</u>.

I <u>am</u> <u>going</u> <u>to</u> <u>learn</u>.

Adverbial Replacement

17. Adverbial Replacement in Loc., Tm., Man., Cause: Example:

You may go <u>whenever</u> <u>you</u> <u>wish</u>.

Adverbial Expansion

18. Adverbial Expansion of Man + S: Example:

The lawyer spoke <u>so</u> rapidly <u>that</u> <u>he</u> <u>confused</u>

<u>the</u> <u>jury</u>.

CONJOINING TRANSFORMATIONS

19. Conjoining: Example: The boat sank <u>but</u> <u>nobody</u> <u>drowned</u>.

The car stopped <u>and</u> <u>the</u> <u>policeman</u> <u>got</u> <u>out</u>.

DELETION TRANSFORMATIONS

20. Common Elements Deletion(from conjoining): Example:

His lonely room seemed lonely and <u>damp</u>.

21. WH Deletion: Example: He has a book <u>he</u> <u>wants</u> <u>to</u> <u>show</u> <u>you</u>.

22. WH + BE Deletion: Example: The boy <u>starting</u> <u>at</u> <u>quarterback</u> is in my

class.

23. (That) + S as Object: Example: I know <u>he</u> <u>is</u> <u>a</u> <u>diligent</u> <u>student</u>.

24. (That) + S as Object(quotation): Example: She told Rush and Mona,

"<u>Your</u> <u>little</u> <u>sister</u> <u>got</u> <u>a</u> <u>bad</u> <u>cut</u>."

25. Comparative Deletion: Example: The island is shaped very much <u>like</u>

<u>a</u> <u>gull</u>.

This book is more interesting <u>than</u> <u>that</u> <u>one</u>.

26. Adverbial Replacement Deletion: Example: <u>After that</u> he walked around

the room and poked his nose into everything.

SIMPLE TRANSFORMATIONS

27. Passive: Example: The boy hit the ball - <u>The ball was hit by the boy.</u>

28. There(Here) Inversion: Example: <u>There is a thief among us.</u>

<u>Here is your book.</u>

29. Question: Example: <u>Are you going to town tomorrow?</u>

<u>Where are you going so early?</u>

30. Negation: Example: He did <u>not</u> see the mirage on the desert.

31. Aspect: Example: He <u>has eaten.</u>   He <u>is eating.</u>

32. Imperative: Example: <u>Come here.</u>   <u>You do as you are told.</u>

33. Contraction: Example: He said <u>he'd</u> come early.

34. Comparative: Example: The speck grew <u>larger.</u>

35. Pronominalization(Simple): Example: John arrived late. <u>He</u> missed

the bus.

36. Indirect Object: Example: Give <u>me</u> the book.

She handed <u>the trader</u> a jar of wild honey.

37. Reflexive-Intensive: Example: Randy felt pleased with <u>herself.</u>

38. Vocative: Example: "<u>Harry</u>," she shouted.

39. Expletive: Example: "<u>Oh</u>," said the boy.

Position Shift

40. NP - V Inversion: Example: "That's right," <u>said Randy.</u>

41. Adverbial Position Shift: Example: <u>After a crash</u> they always make

pilots fly again.

42. Adverbial Replacement Shift: Example: <u>When</u> <u>you</u> <u>leave</u>, please close the door.

43. (That) + S Object(quotation) Shift: Example:

"<u>That's</u> <u>right</u>," said Randy.

44. Multi-transformation units: Example:

He had decided <u>that</u> when he grew up

<u>he</u> <u>was</u> <u>going</u> <u>to</u> <u>earn</u> <u>his</u> <u>living</u> by

training them.

APPENDIX C

PAGES OF THE BASAL READER TEXTS FROM WHICH THE PASSAGES

OF PART I WERE SELECTED

Ginn Basic Series	The New Basic Readers	Young Canada Series
Page 43	30	46
104	98	97
151	163	185
213	235	222
276	279	273
349	382	331
417	431	396

APPENDIX D

STORIES OF PART II

Story 1-Daedalus

Conjoining - Number of words - 107

Daedalus lived on an island many years ago. Daedalus was clever but he was discontented and he angered the king of the island and the king gave orders to his men and the men locked Daedalus in a tower and the tower was high.

Daedalus was clever and he escaped from the high tower but Daedalus could not escape from the island. The king gave an order and the men watched every ship that put out to sea for other lands but Daedalus was still hopeful. The king ruled the land and the king ruled the sea but the air was free and Daedalus escaped that way.

Deletion - Number of words - 102

Daedalus, a clever man lived on an island many years ago. Daedalus was discontented on the island ruled by a king and angered him. The king's men obeyed the orders the king gave and locked Daedalus in a tower. The tower was high.

Daedalus was clever and escaped from the tower which was very high but still could not escape from the island. The king gave orders. The men followed the orders the king gave and watched every ship putting out to sea for other lands. Daedalus, still hopeful, decided to escape by air since the king ruled the land and sea.

Embedding - Number of words - 102

A very clever man lived on an island many years ago. The man, who was called Daedalus, was discontented. Daedalus angered the king of the island where he lived. The king's men were given orders and Daedalus was locked in a tower which was very high.

Because he was so clever, Daedalus escaped from the tower. Daedalus could not escape from the island. The king ordered the men to watch every ship that put out to sea for other lands. Daedalus who was still hopeful decided to escape by air since the king ruled the land. The king also ruled the sea.

Simple - Number of words - 109

There lived a clever man on an island many years ago. The man was Daedalus. Daedalus was discontented and he angered the king one day. The king gave orders and Daedalus was locked in a tower which was very high.

Daedalus was clever and escaped from the high tower. It is surprising that Daedalus did not escape from the island. An order was given by the king. Every ship that put out to sea for other lands was watched. There was hope still. The land was ruled by the king and the sea was ruled by the king. The king didn't rule the air, however. Daedalus escaped that way.

Story 2-Preparing for Winter

Conjoining - Number of words - 110

Winter was near and a flock of geese left their home and then they flew southward. Their home was in the wilderness and the wilderness was in the North. The geese were big and the geese were beautiful.

A gander led the geese and the gander was old and the gander was wise. He led the geese over mountains and then he flew over a river and he came straight to a lake and the lake was surrounded by forests and the forests were thick. The lake was always secure for the geese and the geese rested there for a day or so and the geese then continued their journey.

Deletion - Number of words - 104

Winter was near and a flock of geese which were big and beautiful left their home in the wilderness. The wilderness was in the North. The geese were flying southward for the winter.

A gander, very old and wise, led the geese. The geese flew over mountains and a river and came straight to a lake surrounded by forests. The forests were thick. The lake, always secure for the geese, was a place where the geese might rest and get food. The geese rested there for a day or so and then continued on their journey to the feeding grounds in the south.

Embedding - Number of words - 107

A flock of geese saw that winter was near. The geese which were big and which were beautiful left the wilderness which was in the North. The geese flew southward.

The geese were led by an old gander that was very wise. The geese flew over mountains and over rivers and the geese did not stop until they came to a lake which was surrounded by forests. The forests were thick and the lake was secure so the geese stopped there for a day or so. The geese needed rest. Then the geese continued the journey which was to the feeding grounds which were in the south.

Simple - Number of words - 105

A flock of geese were preparing for winter. The geese which were big and beautiful left the wilderness in the North. The geese flew southward.

The geese were led by a gander. The gander was old. The gander was wise. There were mountains and there were rivers below the geese as the geese flew. Until the geese came straight to a lake they didn't stop. Forests surrounded the lake. The forests were thick. Why did the geese stop there? Food was needed. Rest was needed. Here was a secure spot. The geese stopped for a day or so. The geese then continued the journey southward.

Story 3-Kobi

Conjoining - Number of words - 151

Kobi milked the cows and he carried the milk into the hut and he poured the milk into bowls. The bowls were in the milkroom and it was cool there. Kobi ate supper. Kobi drank milk and he ate bread usually. The bread was heavy and it was in hunks. The boy went outside the cabin after supper. Kobi sat on a bench. Kobi watched the shadows.

It was summer and the evening was warm and the evening was clear and Kobi could see some cows grazing on Schwarz Alp. Schwarz Alp lay across the valley. A dog barked and Kobi recognized the bark. Sepp owned a dog. Sepp was a friend.

Shadows drowned each Alp in grey and as night crept up along the valley, the peaks shone with the last rays of the sun but the shadows covered the peaks soon and the shadows cast the world into darkness.

Deletion - Number of words - 142

Kobi milked the cows, carried the milk into the hut and poured it into bowls in the milkroom. The milkroom was cool. Kobi ate supper, milk usually, and bread. The bread was heavy and in hunks. The boy did not work after supper. Kobi sat on a bench outside the cabin when supper was over and watched the shadows.

It was summer. The evening was warm and clear. Kobi could see some cows grazing on Schwarz Alp across the valley. A dog barked. Kobi recognized the bark. Sepp owned a dog. Sepp was a friend.

Shadows drowned each Alp in grey. Night crept up along the sides of the valley. Only the peaks were still visible in the distance. The peaks shone with the last rays of the sun. The shadows covered the peaks soon and cast the world into darkness.

Simple - Number of words - 147

The cows were milked and the milk was carried into the hut. The milk was poured into bowls. Kobi put the bowls in the milkroom which was cool. Then Kobi ate supper. There was milk as usual. There was bread also. The bread was heavy and in hunks. The boy didn't work after supper but went outside and sat on a bench. It was a joy to watch the shadows.

It was summer. The evening was clear. Kobi could see some cows which were grazing on Schwarz Alp. Schwarz Alp lay across the valley. What was that noise? A dog barked. Sepp owned a dog. Sepp was a friend.

Shadows drowned each Alp in grey. Night crept up along the valley. The last rays of the sun could be seen on the peaks. The peaks were covered by shadows soon. The shadows cast the world into darkness.

Embedding - Number of words - 146

When the cows were milked, Kobi carried the milk into the hut. Kobi poured the milk into bowls which Kobi put in the milkroom which was cool. Then Kobi ate supper. Kobi drank milk usually. Kobi ate bread which was heavy and in hunks. Kobi went outside when supper was over so that he could watch the shadows. Kobi sat on a bench. The bench was old.

It was summer. The evening was warm and the evening was clear. Kobi could see some cows which were grazing on Schwarz Alp which lay across the valley. A dog barked. Sepp owned a dog. Sepp was a friend.

Shadows drowned each Alp in grey as night crept up along the valley. The last rays of the sun could be seen on the peaks. The peaks were covered by the shadows soon as the shadows cast the world into darkness.

APPENDIX E

STORIES OF PART III

Story 1

* The girls started at the very back of the orchard, deciding that it would be more fun to work toward the house than away from it.

"We can play we're going to find the Promised Land," said Sarah. "The house and the barn will be the Promised Land."

"And the prune picking will be the troubles we go through," agreed Linda from the next row. Her face was quite red, but she was bravely keeping up with Sarah. Both girls were making the leaves fly as they shook each tree for whatever fruit might still be hanging to its branches.

(Ginn Basic Readers - p. 193)

Simple - Number of words - 17

Both girls were eager. Both girls were excited. A row of trees was taken by each girl.

Conjoining - Number of words - 16

Both girls were and both girls were excited. Each girl took a row of trees.

Deletion - Number of words - 14

Both girls were eager and excited. Each girl took a row of trees.

Embedding - Number of words - 18

Both girls were so eager that each girl took a row of trees. Each girl was excited too.

* insert each sentence here

Story 2

* When the miller died he left all that he had to be divided amongst his three sons. It was only fair that the eldest son should have the mill, and of course the second son claimed the donkey and cart; so all that was left for the youngest was the miller's black cat.

"Dear me!" said the boy as he took the cat in his arms and stroked her gently. "I am very fond of you, Pussy, dear, but I can't see how I am to make a living out of you."

"Just leave that to me, dear Master," said the cat, rubbing her head against the boy's shoulder. "If you can manage to get me a large bag and a pair of top-boots you will see how I can serve you."

(Young Canada Readers - p. 172)

Simple - Number of words - 12

There lived a miller many years ago. The miller had three sons.

Conjoining - Number of words - 12

A miller lived many years ago, and the miller had three sons.

Deletion - Number of words - 10

A miller lived many years ago and had three sons.

Embedding - Number of words - 10

A miller who lived many years ago had three sons.

* insert each sentence here.

Story 3

By the end of October, the bird was more lively, though his wing was not strong enough yet for him to fly very far.

"You had better keep him in the cage," Mr. Johnson advised. "Chirp would have a hard time in the ice and snow this winter."

*

Chirp probably was comfortable but he did not look happy. For hours at a time he huddled in one corner.

"You want to go south, don't you Chirp?" Pat asked. "I wish I could help you."

Then all of a sudden Pat thought of a way he could help. When he told June his plan, she was as excited as her brother.

(The New Basic Readers - p. 143)

Simple - Number of words - 10

Chirp was warm. Would Chirp be comfortable in the cage?

Conjoining - Number of words - 12

Chirp will be comfortable and Chirp will be warm in the cage.

Deletion - Number of words - 9

Chirp will be comfortable and warm in the cage.

Embedding - Number of words - 10

Chirp will be comfortable in the cage which is warm.

* insert each sentence here

Story 4

The tailor traveled on until he came to the gates of the king's palace. There he lay down on the grass and went to sleep. People passing by him could see the words, <u>Seven</u> <u>at</u> <u>one</u> <u>stroke</u>, on his belt. They thought he must be a great soldier and told the king.

*

The tailor was given a fine apartment in the king's palace, but the other servants were afraid of him. They wished him a thousand miles away.

"What might become of us if he were angry with us?" they asked in great excitement. "He can kill seven at one stroke."

(Ginn Basic Readers - p. 80)

<u>Simple - Number of words - 16</u>

The tailor was sent for by the king. The king asked the tailor into the palace.

<u>Conjoining - Number of words - 15</u>

The king sent for the tailor and the king asked the tailor into the palace.

<u>Deletion - Number of words - 13</u>

The king sent for the tailor and asked the tailor into the palace.

<u>Embedding - Number of words - 16</u>

The king sent for the tailor. The king asked that the tailor come into the palace.

* insert each sentence here

Story 5

A huge grizzly bear sat perfectly still in a shallow stream. His eyes were fixed on the water swirling about his forepaws.

The bear ate many kinds of food, but he chose only what he considered the tastiest. Of all the foods that he ate, the bear liked fish the best. Because he had roamed the wilderness for so long, he knew when the trout chose to swim upriver to another pool. He knew also that they passed through the stream right where he was sitting. It was their highway between two pools.

A large trout swam toward him. *

(The New Basic Readers - p. 294)

Simple - Number of words - 19

What did the bear do? The bear raised his head. The bear watched the trout. The trout swam upstream.

Conjoining - Number of words - 15

The bear raised his head and the bear watched the trout. The trout swam upstream.

Deletion - Number of words - 13

The bear raised his and watched the trout. The trout swam upstream.

Embedding - Number of words - 13

The bear raised his to watch the trout. The trout swam upstream.

* insert each sentence here

Story 6

In one corner was the bed; in another a big kettle hung over the hearth; there was also a table and a chair. In the wall was a big door, which the grandfather opened. While he held the door open, Heidi stepped up with her bundle which she stuffed in behind her grandfather's things, as far out of sight as possible. After this she looked carefully about the room, saying, "But where shall I sleep, Grandfather?"

"Wherever you like," was the answer.

This pleased the little girl. She ran about the room, searching every corner, to find the place that would best suit her. Opposite her grandfather's bed was a ladder,which led into the hayloft. Up this ran Heidi and found it strewn with fresh, sweet-smelling hay.*

(Young Canada Readers - p.240-41)

Simple - Number of words - 15

There was a hole in the rafters. One could see far away into the valley.

Conjoining - Number of words - 15

A hole was in the rafters and one could see far away into the valley.

Deletion - Number of words - 14

One could see far away into the valley through a hole in the rafters.

Embedding - Number of words - 16

One could see far away into the valley through a hole which was in the rafters.

* insert each sentence here

APPENDIX F

CLOZE

1. Directions to the Teacher

2. Directions to the Student

3. An Example of a Cloze Test

TO THE TEACHER

1. Each envelope contains enough copies of the tests to supply your class plus one extra copy.

2. When you are ready to begin testing

  a. Be sure that there are at least 60 minutes remaining before the children are scheduled to have recess or some other activity.

  b. Be sure all children have pencils.

3. Pass out the tests.

4. Read the instructions aloud to the children while they read them silently.

5. If the pupils ask questions about the instructions, re-read the appropriate part of the instructions slowly.

6. If they ask if this will count on their grades, tell them "No, this is a new kind of test which is being tried out to see how well it works with children."

7. When you are giving the cloze tests, you may tell a child how to spell a word. Have him whisper it to you first. Then write that word on a piece of paper for him. Do this even if you are sure it is the wrong word.

8. The stories are not in the same order on all test booklets but this does not matter.

9. Let each child work until he is finished or until he has done all that he can possibly do. If, for some reason, a child must be stopped before he has finished all that he can do, write the word "TIME" on the front of the booklet.

10. As the cloze tests get harder, a few children may become discouraged. However, encourage them to do as much as they can.

11. As pupils finish, they should be asked to do some of their regular school work so they won't distract those who are still working.

12. Circulate among the children while they are taking the tests.

13. Have children give you their booklets as they finish. Be sure each child has his name and grade on it.

14. Check each booklet immediately to see that pages have not been skipped.

15. Replace all booklets in the correct envelope when you collect them.

Cloze Test Instructions

Name _____ Grade _____ Age _____

Write your full name, grade, and age in the space above.

This test consists of a number of stories from which words have

been omitted. The test was made by taking every fifth word out of the

stories and putting in blanks. You are to guess what word has been left

out. Write this word in the blank. Here is an example:

Ducks quack, but dogs _____.

You might guess that the word "bark" has been taken out. You

would write the word in the blank like this:

Ducks quack, but dogs _*bark*_.

The word left out might be a contraction like wouldn't___. It

might be an abbreviated word like ____Mrs.____ . It might be a

hyphenated word like __self-made__ . It might be a number like ___1967___.

It might be part of a person's full name like ____Smith____ from the

name "John Smith". But most of the time it will be just an ordinary

word. All the blanks are exactly the same length, but the words that

go in them may be long or short. Be sure to write only one word in

each blank.

Try to fill in every blank, but you may go on if you cannot get

the word. Don't be afraid to guess. You are to write in a word that

you think might fit the blank. When you finish the test go back and

fill in any blanks you may have skipped.

If you don't know how to spell a word, hold up your hand. I will

come to your desk where you will tell me quietly what word you want to

spell and I will write it for you.

Keep working until you have finished the whole booklet.

Example of a Cloze Test

One October morning _____ Manly burst eagerly into

_____ schoolroom.

"Oh, Miss Brand!" _____ called. "Here's a new .

_____. She is nine years _____ and she can't speak

_____ English at all."

At _____ words the teacher looked _____ from her

desk. Jean _____ leading forward a brown-eyed _____

with long black hair.

"_____ morning," said Miss Brand _____ a

friendly smile at _____ shy new girl. "Can _____

tell us your name?"

_____ girl did not answer _____ looked from

Jean to _____ teacher with questioning eyes.

"_____ doesn't know what you're _____,"

explained Jack Mains who _____ come into the room

_____ the two girls. "She _____ just moved to this

_____. Her name is Rosa. _____ lives two doors

from _____."

APPENDIX G

EXAMPLES TO ILLUSTRATE THE CLOZE SCORING CATEGORIES

GS

Jim <u>laughed</u> (chuckled).*

. . . was a servant in the sheriff's <u>house</u> (home).

. . . explained Jack Mains who had <u>come</u> (wandered) into the room behind

the two girls.

. . . and all his men at the <u>great</u> (big) shooting match.

"Heed my <u>command</u> (order)," said the king.

G

Coiling his rope as he <u>went</u> (laughed), he walked toward the <u>alligator's</u>

(pig's) head.

However, when the water of the lake is <u>high</u> (smooth) as it often is . . .

. . . there was a <u>brave</u> (certain) young man . . .

explained Jack Mains who had come into the room <u>behind</u> (with) the two

girls.

-GS

<u>Oh</u>, she's always <u>doing</u> (into) something . . .

May I come <u>and</u> (to) see you sometime?

<u>When</u> (Then) she looked at the house that faced both ways <u>she</u> (and)

knew what she wanted to write.

-G
                                                                    G
Madeleine watched with pride while her mother <u>defended</u> (left) her

father's fort and <u>farm</u> (went) on the St.Lawrence River against a

band of Iroquois Indians.

* the word underlined is part of the original text;the word in

parenthesis is the substitution.

. . . waited patiently outside the houses trying to swish the flies off her back <u>with</u> (and) her short tail.

. . . defended her father's fort and farm on the St. Lawrence River <u>against</u> (which) a band of Iroquois <u>Indians</u> (attacked).

<u>S</u>

. . . cattle had to be herded and many other hard <u>jobs</u> (work) had to be done.

Punctuation

Food is sometimes scarce on the desert, <u>too</u>. (sand)

Trees had to be cut <u>down</u>, land had to be cleared . . .(the)

<u>GS was the accepted marking for the substitution of all proper names except in an instance such as the following. Here the substitution would be designated by G.</u>

One October morning Jean Manly burst eagerly into the schoolroom.

"Oh, Miss Brand!" she called. "Here's a new pupil. She is nine years old, and she can't speak any English at all."

At Jean's words the teacher looked up from her desk. Jean was leading forward a brown-eyed girl with long black hair.

"Good morning," said Miss <u>Brand</u> (King) with a friendly smile at the shy new girl. "Can you tell us your name?"

APPENDIX H

EXAMPLES OF GRAMMATICALLY DISSIMILAR SUBSTITUTIONS

IN THE CLOZE TESTS

Conjoining Substitutions

There was deep pride in her voice <u>as</u> (and) she said . . .

The chief's house should face the Indian way <u>toward</u>(and) the landing where our guests arrive and depart.

. . . a few women <u>with</u> (and) small children.

Rock Island is a small island <u>which</u> (and) has been made in an interesting way.

They dragged him to the king <u>dressed</u> (and) just as he was in a ragged old cloak.

As far as they could see through the moonlight <u>of</u> (and) the arctic day

Trees were cut down, <u>land</u> (and) had to be cleared . . .

When the water of the lake is high <u>as</u> (and) it often is . . .

. . . sat in the buggy holding the reins <u>while</u> (and) his father visited his sick patients.

They wanted to see the parrots <u>who</u> (and) walked round the shop . . .

They asked to see it <u>as</u> (and) they asked to see other places of interest.

You had to pick this minute <u>to</u> (and) roll off and scare the fox.

. . . has piled up <u>until</u>(and) it has made an island.

It is on the grey rock <u>of</u> (and) this mineral island that the gulls have their nests.

I am half English and half Mohawk <u>so</u> (and) I suppose I face both ways too.

It was not long before the dry season came again <u>bringing</u> (and) with it the tourists.

A wolf pack was moving toward the reindeer herd <u>behind</u> (and) them.

. . . he rubbed his hand <u>over</u> (and) the tough leathery head.

Positive for Negative Substitution

The Merry Widow was <u>not</u> (still) a lady . . .

. . . for which she gave <u>no</u> (an) explanation.

Is there <u>no</u> (some, any) one else in all my kingdom . . .

Father Turi made <u>no</u> (an) answer.

It was <u>not</u> (very) long before the dry season came again . . .

. . . with two fronts and <u>no</u> (a) back.

. . . but could see them <u>nowhere</u> (everywhere).

Camels <u>couldn't</u> (sometimes) live on the wet plants that a hippo likes.

. . . alligator's tail could <u>not</u> (just) reach him.

He is <u>not</u> (now) going to tell . . .

<u>No</u> (the) animal that heard David yell . . .

In other ways he <u>wasn't</u> (was) lucky.

Negative for Positive Substitution

After a crash they <u>always</u> (never) make pilots fly again . . .

Certainly it <u>was</u> (wasn't) a workshop . . .

The camel is <u>well</u> (not) fitted to get along without it.

. . . but there was <u>deep</u> (no) pride in her voice . . .

. . . if the engine is still working - and the weather <u>should</u> (doesn't) get rough . . .

Adverb Substitution

They were <u>flying</u> (now) over the city . . .

Jean <u>Manly</u> (just) burst into the room . . .

. . . and soon she <u>had</u> (just) disappeared . . .

The island is <u>shaped</u> (still) very much like a gull . . .

In spite of the mischief that he was <u>doing</u> (into) . . .

Cinder <u>Lad</u> (meekly) came to the foot of the throne.

The river is the Indian's highway he <u>had</u> (often) said.

The Iroquois are <u>coming</u> (here)

You have been <u>sleeping</u> (there) on that log for an hour . . .

Chief Johnson <u>had</u> (always) said . . .

Aspect Substitution

Chief <u>Johnson</u> (had) loved the river.

Father <u>Turi</u> (had) made no answer.

Jean <u>Manly</u> (had) burst eagerly into the schoolroom . . .

. . . and had a sister who <u>still</u> (had) lived in Nottingham . . .

Father <u>Turi</u>(had) set out with Lars and Tomas.

Genitive Substitution

Have you seen <u>the</u> (my) golden apples?

The <u>two</u> (king's) brothers ran home to fetch Cinder Lad.

Article Substitution

. . . run into <u>rough</u> (the) weather.

. . . visit <u>his</u> (the) sick patients.

. . . earn <u>his</u> (a) living by training them.

<u>Johnson</u> (The) Hall in the Mohawk Valley was built that way . . .

Miscellaneous

. . . <u>left</u> (all) alone

. . . who could do more work <u>than</u> (for) his neighbours . . .

. . . but I think that a certain young person who is <u>watching</u> (on) this

program will guess.

APPENDIX I

DIRECTIONS FOR SCORING THE <u>STEP</u> AND <u>SCAT</u> TESTS*

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*By permission of the Cooperative Test Division, Educational
Testing Service, Berkeley 4, California.

SEQUENTIAL TESTS OF EDUCATIONAL PROGRESS • STEP

DIRECTIONS FOR ADMINISTERING

Note: Instructions which are to be read aloud to students are printed in **bold type.** Instructions printed in regular type are intended *only* for the examiner.

In these Directions and in the test booklets the students are instructed to make their marks heavy and black. This is desirable for IBM 805 answer sheets or for hand-scoring. It may not be advisable, however, with other types of scoring machine. It is suggested, therefore, that you consult the person responsible for scoring (or the manufacturer of your machine), and modify this instruction if necessary.

When the students are assembled in the examination room and seated, say:

The testing period has begun. There should be no talking among you until after you have been dismissed.

We shall now pass out test materials. Do not open your booklet or turn it over until you are told to do so.

Distribute booklets, scratch paper (if Mathematics is being administered), answer sheets, and pencils (if they are to be supplied).

Have students fill in the necessary identification information on their answer sheets: name, form of test, date, school, etc. If you are using a two-sided answer sheet check that each student is working on the correct side.

Then say:

Open your test booklet to the GENERAL DIRECTIONS, on the inside of the front cover. Read these directions silently while I read them aloud.

GENERAL DIRECTIONS

This is a test of some of the understandings, skills, and abilities you have been developing ever since you first entered school. You should take the test in the same way that you would work on any new and interesting assignment. Here are a few suggestions which will help you to earn your best score:

1. Make sure you understand the test directions before you begin working. You may ask questions about any part of the directions you do not understand.

2. You will make your best score by answering every question because your score is the number of correct answers you mark. Therefore, you should work carefully but not spend too much time on any one question. If a question seems to be too difficult, make the most careful guess you can, rather than waste time puzzling over it.

3. If you finish before time is called, go back and spend more time on those questions about which you were most doubtful.

Are there any questions?

Answer any legitimate questions. Stay within the meaning and, as far as possible, use the vocabulary of the printed directions.

On p. 1 you will find DIRECTIONS FOR PART ONE of the test. Look at page 1 and read these directions silently while I read them aloud.

DIRECTIONS FOR PART ONE

Each of the questions or incomplete statements in this test is followed by four suggested answers. You are to decide which one of these answers you should choose. You must mark all of your answers on the separate answer sheet you

have been given; this test booklet should not be marked in any way. You must mark your answer sheet by blackening the space having the same letter as the answer you have chosen.

For example:

O Which one of the following is an animal?

A Bed   B Dog   C Chair   D Box

Since a dog is an animal, you should choose the answer lettered B. On your answer sheet, you would first find the row of spaces numbered the same as the question—in the example above, it is O. Then you would blacken the space in this row which has the same letter as the answer you have chosen. See how the example has been marked on your answer sheet.

Make your answer marks heavy and black. Mark only one answer for each question. If you change your mind about an answer, be sure to erase the first mark completely.

The example on p. 1 has been given to you so that you will know how to mark your answer sheets. The questions on the inside of the test are not just like the example; but each one does present four choices, and you must choose your answer from among them.

Are there any questions?

Answer any legitimate questions. Stay within the meaning and, as far as possible, use the vocabulary of the printed directions.

When I say "Begin," turn to Part One on p. 2 and start working. Ready? Begin!.

Examiner and proctors (if any) should move quietly about the room to see that each student is working on the proper pages of his test booklet and that he is marking his answers correctly in the proper section of the answer sheet. Make certain that students do not go on to Part Two of the test.

At the end of *exactly* 35 min., say:

STOP! Even if you have not finished Part One you must stop and lay down your pencil.

If both parts of the test are being given in one session, allow a short break at this time.

If the test is being administered in two sessions, collect answer sheets, test booklets, and other test materials and then dismiss the students.

When the students are ready to begin Part Two, say:

Turn to Part Two of your test booklet. Part Two contains the same kind of material as Part One. Mark your answers in the same way. If you finish before time is called, you may check your work on Part Two. Do not go back to Part One.

If there has been a considerable time lapse between administration of Parts One and Two, review the General Directions and the Directions for Part One before giving the instructions above.

When I say "Begin," start working on Part Two. Ready? Begin!

Again the examiner and proctors should move quietly about the room to make sure that every student is working in the proper part of both test booklet and answer sheet.

At the end of *exactly* 35 min., say:

STOP! Even if you have not finished Part Two you must stop and lay down your pencil.

Collect answer sheets, test booklets, and other test materials.

At this time you should write down for the record a description of any unexpected variation from the normal testing procedure that may have occurred. Such incidents need to be in the record and considered when scores are interpreted.

SCHOOL AND COLLEGE ABILITY TEST • SCAT

DIRECTIONS FOR ADMINISTERING

Note: Instructions which are to be read aloud to students are printed in bold type. Instructions printed in regular type are intended *only* for the examiner.

In these Directions and in the test booklets the students are instructed to make their marks heavy and black. This is desirable for IBM 805 answer sheets or for hand-scoring. It may not be advisable, however, with other types of scoring machine. It is suggested, therefore, that you consult the person responsible for scoring (or the manufacturer of your machine), and modify this instruction if necessary.

When the students are assembled in the examination room and seated, say:

The testing period has begun. There should be no talking among you until after you have been dismissed.

We shall now pass out test materials. Do not open your booklet or turn it over until you are told to do so.

Distribute booklets, scratch paper, answer sheets, and pencils (if they are to be supplied).

Have students fill in the necessary identification information on their answer sheets: name, form of test, date, school, etc. If you are using a two-sided answer sheet check that each student is working on the correct side.

Then say:

Open your test booklet to the GENERAL DIRECTIONS, on the inside of the front cover. Read these directions silently while I read them aloud.

GENERAL DIRECTIONS

This is a test of some of the skills you have been learning ever since you first entered school. You should take it in the same way that you would work on any other new and interesting assignment.

The test is divided into four parts, which you will take one at a time. Give each one your close attention and do your best on every question. You probably will find some of the questions quite easy and others more difficult. You are *not* expected to answer every question correctly.

There are a few general rules for taking this test that will help you to earn your best score:

• Work carefully, but do not spend too much time on any one question. It usually is better to answer

first all of the questions in the part that you know well and can answer quickly. Then go back to the questions that you want to think about.

• If you work at average speed you will have plenty of time to read and answer all of the questions. By leaving until last the questions that are most difficult, you will make best use of your time.

• You may answer questions even when you are not perfectly sure that your answers are correct. Your score will be the number of correct answers you mark.

• Put *all* of your answers on the answer sheet. This test booklet should not be marked in any way. Your examiner will give you an extra sheet of scratch paper to use when you do the number problems.

• Fill in all the information called for on the answer sheet and PRINT your name so that it can be read.

• Make sure that you understand instructions *before* you start work on any part. Ask the examiner to repeat the instructions if you do not understand exactly what you are to do.

• Make your answer marks on the answer sheet heavy and black. If you change your mind about an answer, be sure to erase your first mark completely.

If you give this test your best effort, your score will provide a good estimate of your ability in these important skills.

Are there any questions?

Answer any legitimate questions. Stay within the meaning and, as far as possible, use the vocabulary of the printed directions.

On p. 1, you will find the Directions for Part I of the test. Look at p. 1 and read those directions silently while I read them aloud.

DIRECTIONS FOR PART I

Each question in Part I consists of a sentence in which one word is missing; a blank indicates where the word has been removed from the sentence. Beneath each sentence are five words, one of which is the missing word. You are to select the missing word by deciding which one of the five words best fits in with the meaning of the sentence.

Sample Question

We had worked hard all day so that by evening we were quite (   ).

A small   B tired   C old

D untrained   E intelligent

If you understand the sample sentence you will realize that "tired" is the missing word because none of the other words fits in with the meaning of the sentence. Next, on the answer sheet, you find the line numbered the same as the question and blacken the space which has the same letter as the missing word. Because "tired" is the correct word to use in the sample sentence, and its letter is **B**, the space marked **B** on the answer sheet is blackened. See how it has been marked on the answer sheet. Do *not* make any marks in your test booklet.

Do not turn the page until you are told to do so.

Are there any questions about what you are to do in Part I of the test?

Pause momentarily to allow questions to be asked. Then say:

You have 15 min. in which to answer the questions in Part I. When I say "Begin," turn your test booklet to p. 2 and start to work.

| If 5A or 5B is being admin-istered | If Form 5A or Form 5B is being administered, say: You will find more answer spaces than questions in Part I. Just leave the extra answer spaces blank. |

Ready? Begin!

Examiner and proctors (if any) should move quietly about the room to see that each student is working on the proper part of both test booklet and answer sheet. Make certain that students do not go on to other parts of the test.

At the end of *exactly* 15 min., say:

STOP! Even if you have not finished Part I you must stop.

Look at the Directions for Part II of the test.

Read these directions silently while I read them aloud.

DIRECTIONS FOR PART II

There are 25 problems in Part II of the test. Following each problem there are five suggested answers. Work each problem in your head or on a piece of scratch paper. Then look at the five suggested answers and decide which one is correct. Blacken the space under its letter on the answer sheet.

Sample Problem

| 5413 | F 586 | G 596 | H 696 |
| −4827 | J 1586 | K None of these |

Because the correct answer to the sample problem is 586, which is lettered **F**, the space marked **F** on the answer sheet is blackened. See how it has been marked on the answer sheet. Do *not* make any marks in your test booklet.

Do not turn the page until you are told to do so.

Are there any questions about what you should do in Part II?

Pause momentarily to allow questions. Then say:

There are 25 problems in Part II and you have 20 min. in which to work them. When I say "Begin," turn to the next page and start to work.

Ready? Begin!

Again the examiner and proctors should move quietly around the room to make sure that every student is working in the proper part of both test booklet and answer sheet.

At the end of *exactly* 20 min., say:

STOP! Even if you have not finished Part II you must stop and lay down your pencil.

If all four parts of the test are being given in one session allow a short break at this time.

If the test is being administered in two sessions, collect answer sheets, test booklets, and other test materials. Then dismiss the students.

When the students are ready to begin Part III, say:

Open your test booklet to the Directions for Part III of the test. Read these directions silently while I read them aloud.

If there is a considerable time lapse between the two testing sessions, review the General Directions before giving the instruction above.

DIRECTIONS FOR PART III

Each of the questions in Part III consists of one word in large letters followed by five words or phrases in small letters. Read the word in large letters. Then pick, from the words or phrases following it, the one whose meaning is closest to the word in large letters. For example:

Sample Question

chilly

A tired   B nice   C dry

D cold   E sunny

In order to find the correct answer you look at the word chilly and then look for a word or phrase below it that has the same or almost the same meaning. When you do this you see that "cold" is the answer because "cold" is closest in meaning to the word "chilly." Next, on the answer sheet you find the line numbered the same as the question and blacken the space which has the same letter as the word you have selected as the correct one. Because "cold" is the correct answer to the sample question, the space marked D on the answer sheet is blackened. See how it has been marked on the answer sheet. Do *not* make any mark in your test booklet.

Do not turn the page until you are told to do so.

Are there any questions about what you should do in Part III?

Pause momentarily for questions.

You have 10 min. in which to answer the questions in Part III. When I say "Begin," turn to the next page and start to work.

If 5A or 5B is being administered	If Form 5A or Form 5B is being administered, say: You will find more answer spaces than questions in Part III. Just leave the extra answer spaces blank.

Ready? Begin!

Examiner and proctors should move quietly around the room to make sure that every student is working on the proper part of both test booklet and answer sheet.

At the end of *exactly* 10 min., say:

STOP! Even if you have not finished Part III you must stop.

Look at the Directions for Part IV of the test.

Read these directions silently while I read them aloud.

DIRECTIONS FOR PART IV

There are 25 problems in Part IV of the test. Following each problem there are five suggested answers. Work each problem in your head or on your piece of scratch paper. Then look at the five suggested answers and decide which one is correct. Blacken the space under its letter on the answer sheet.

Sample Problem

Four $10-bills are equal to how many $5-bills?

F 20   G 10   H 8

J 40   K 2

Because the correct answer to the sample problem is 8, which is lettered H, the space marked H on the answer sheet is blackened. See how it has been marked on the answer sheet. Do *not* make any marks in your test booklet.

Do not turn the page of the test booklet until I tell you to do so.

Are there any questions about what you should do in Part IV?

Pause momentarily to allow questions, then say:

There are 25 problems in Part IV and you have 25 min. in which to answer them. When I say "Begin," turn to the next page and start to work.

Ready? Begin!

Again the examiner and proctors should move quietly around the room to make sure that every student is working in the proper part of both test booklet and answer sheet.

At the end of *exactly* 25 min., say:

STOP! Even if you have not finished Part IV you must stop and lay down your pencil.

Collect answer sheets, test booklets, and other test materials.

At this time, you should write down for the record a description of any unexpected variation from the normal testing procedure that may have occurred during the testing sessions. Such incidents need to be in the record and considered when scores are interpreted.

APPENDIX J

DATA FROM THE ANALYSIS OF BASAL READER PASSAGES

1. The Number of Transformations by Type

2. Percentage of Transforms of Each Type

3. Percentage of Sentences Containing

   Each Type of Transform

TABLE LVII

THE NUMBER OF TRANSFORMATIONS BY TYPE IN EACH BASAL READER SERIES

	Series A	Series B	Series C	Total
Relative Clause	6	6	14	26
With Phrase	-	2	2	4
Adjective	25	29	31	85
Appositive	1	-	1	2
Gerundive	1	3	-	4
Compounds	15	13	11	39
Genitive	8	11	12	31
That + S	2	2	-	4
VP Comp	1	2	1	4
WH + S Object	-	2	2	4
Infin. as Obj.	2	1	5	8
Infin. of Purp.	6	5	8	19
Ing-Nom.	7	4	4	15
Ing-Nom. of Purp	1	1	2	4
Pronoun(gen)	13	17	19	49
Verb + C	6	3	4	13
Adv.Replace.	20	12	15	47
Adv.Expans.	1	2	1	4
Conjoining	23	21	36	80
Com.Elem.Del.	20	13	30	63
WH Deletion	1	2	3	6
WH BE Deletion	12	12	19	43
(That) + S Obj.	2	4	2	8
(That) + S Obj.Quot.	6	11	8	25
Comparative Del.	2	-	4	6
Adv. Replace. Del.	-	2	1	3
Passive	5	3	13	21
There Inversion	-	3	7	10
Question	2	5	5	12
Negation	11	15	11	37
Aspect	13	17	16	46
Imperative	1	5	5	11
Contraction	8	5	-	13.
Comparative	1	-	5	6
Pron(Simple)	64	64	46	174
Indirect Obj.	-	5	1	6
Reflexive-Intens.	1	2	1	4
Vocative	2	4	2	8
Expletive	1	6	2	8
NP - V Inversion	2	8	3	13
Adv.Position Shift	16	12	13	41
Adv.Replace. Shift	11	5	8	24
(That) + S Obj.Quot.Shift	5	8	4	17

TABLE LVIII

PERCENTAGE OF OCCURRENCE OF EMBEDDING TRANSFORMATIONS IN EACH
BASAL READER SERIES

	Series A	Series B	Series C
Relative Clause	1.9	1.5	3.8
With Phrase	-	0.6	0.5
Adjective	7.7	8.5	8.3
Appositive	0.3	-	0.2
Gerundive Adj.	0.3	0.9	-
Compounds	4.6	3.8	2.7
Genitives	2.5	3.5	3.0
That + S Object	0.6	0.6	0.5
VP Comp.	0.3	-	-
WH + S Object	-	0.6	0.2
Infinitive as Obj.	0.6	0.3	1.4
Infinitive of Purp.	1.9	1.5	1.9
Ing-Nominalization	2.2	1.2	0.8
Ing-Nom. of Purpose	0.3	-	0.2
Pronoun(gen)	4.0	5.0	5.4
Verb + C	1.9	0.9	0.8
Adv. Replacement	6.1	3.5	4.1
Adverb Expansion	0.3	0.6	0.2

TABLE LIX

PERCENTAGE OF OCCURRENCE OF SIMPLE TRANSFORMATIONS IN EACH BASAL
READER·SERIES

	Series A	Series B	Series C
Passive	1.5	0.9	3.4
There Inversion	-	0.9	2.0
Question	0.6	1.5	1.4
Negation	3.4	4.4	3.0
Aspect	4.0	5.0	4.5
Imperative	0.3	1.5	1.4
Contraction	2.5	1.5	-
Comparative	0.3	-	1.4
Pronoun(Simple)	19.8	18.7	13.0
Indirect Object	-	1.5	0.3
Reflexive-Intensive	0.3	0.3	0.3
Vocative	0.6	1.2	0.6
Expletive	0.3	1.5	0.6

TABLE LX

PERCENTAGE OF OCCURRENCE OF CONJOINING,DELETION,AND POSITION SHIFT
TRANSFORMATIONS IN EACH BASAL READER SERIES

	Series A	Series B	Series C
Conjoining	7.1	6.1	9.6
Deletion	6.1	3.8	8.1
WH Deletion	0.3	0.6	0.8
WH BE Deletion	3.7	3.5	5.4
(That) + S Object	0.6	1.2	0.5
(That) + S Obj.Quot.	1.9	3.2	2.2
Comparative Del.	0.5	-	1.1
Adv.Replace. Del.	-	0.3	0.2
(Position Shift)			
NP - V Inversion	0.6	2.0	0.8
Adv. Position Shift	4.9	3.5	3.7
Adv.Replace.Shift	3.4	1.5	2.2
(That) + S Obj.Quot. Shift	1.5	2.0	1.1

TABLE LXI

PERCENTAGE OF SENTENCES CONTAINING EMBEDDING TRANSFORMATIONS IN
EACH BASAL READER SERIES

	Series A	Series B	Series C
Relative Clause	8.7	7.6	20.7
With Phrase	-	2.5	3.6
Adjective	24.6	24.1	36.2
Appositive	1.4	-	1.7
Gerundive Adj.	1.4	3.8	-
Compounds	18.8	16.4	19.0
Genitives	8.7	13.9	17.2
That + S Object	2.9	2.5	3.4
VP Comp.	1.4	-	-
WH + S Object	-	2.5	1.7
Infinitive as Obj.	2.9	1.3	6.9
Infinitive of Purp.	8.7	6.3	13.8
Ing-Nominalization	8.7	5.1	5.2
Ing-Nominalization of Purp.	1.4	-	5.2
Pronoun(Genitive)	15.9	20.3	20.7
Verb + C	8.7	3.8	6.9
Adv. Replacement	24.6	15.2	24.1
Adverb Expansion	1.4	2.5	1.1

TABLE LXII

PERCENTAGE OF SENTENCES CONTAINING CONJOINING, DELETION, SIMPLE, AND
POSITION SHIFT TRANSFORMATIONS IN EACH BASAL READER SERIES

	Series A	Series B	Series C
Conjoining			
Conjoining	29.0	22.8	44.8
Deletion			
Common Elem. Deletion	24.6	15.2	37.9
WH Deletion	1.4	2.5	5.2
WH BE Deletion	14.5	12.9	27.6
(That) + S Object	2.9	7.6	3.4
(That) + S Obj.Quot	8.7	11.4	13.8
Comparative Deletion	2.9	-	5.2
Adv. Replace. Del.	-	1.3	1.7
Position Shift			
NP - V Inversion	2.9	10.1	5.2
Adv.Position Shift	21.7	15.2	22.4
Adv.Replace. Shift	11.6	6.3	12.1
(That) + S Obj.Quot.Shift	7.2	10.1	6.9
Simple			
Passive	7.2	3.8	13.8
Question	2.9	6.3	8.7
There Inversion	-	3.8	12.1
Negation	14.5	17.7	19.0
Imperative	1.4	5.1	5.2
Contraction	11.6	5.1	-
Comparative	2.9	-	6.9
Pronoun(Simple)	60.9	54.4	56.9
Indirect Object	-	5.1	1.7
Reflexive-Intensive	1.4	1.3	1.7
Vocative	2.9	2.9	3.4
Expletive	1.4	7.6	3.4

APPENDIX K

SUMMARY OF ANALYSIS OF VARIANCE OF TRANSFORMATION DIFFICULTY BY:

1. Grade

2. Sex

3. Reading Achievement

4 Mental Ability

TABLE LXIII

SUMMARY OF ANALYSIS OF VARIANCE OF TRANSFORM DIFFICULTY BY GRADE LEVEL

Transforms	Source of Variance and Sums of Squares		Mean Squares		df		F
	Among means of trans.	Within trans.	Among means of trans.	Within trans.	Among means of trans.	Within trans.	
Relative Clause	2826.875	43813.500	1413.44	371.29	2	118	3.81**
With Phrase	3103.761	14630.359	1551.88	1045.03	2	14	1.49
Adjective	3709.000	160868.000	1854.50	614.00	2	262	3.02**
Appositive	543.214	1548.500	271.61	387.12	2	4	0.07
Gerundive	659.312	7712.375	329.66	385.66	2	20	0.85
Compounds	5576.000	91763.187	2788.00	488.10	2	188	5.71*
Genitive	5569.812	94497.000	2784.91	660.82	2	143	4.21*
That + S	364.566	3043.671	188.28	217.41	2	14	0.84
VP Complement	102.167	2616.750	51.08	290.75	2	9	0.18
WH + S Object	156.000	317.500	78.00	105.83	2	3	0.74
Infinitive as Obj.	49.750	18076.187	24.87	430.39	2	42	0.06
Infinitive of Purp.	814.812	35124.812	407.41	403.73	2	87	1.01
Ing-Nominalization	2660.500	28548.687	1180.25	426.10	2	67	2.77
Ing-Nom. of Purp.	1487.535	64481.790	743.77	586.20	2	11	1.27
Pronoun(gen)	1902.625	191319.870	951.31	865.70	2	221	1.10
Verb + C	1391.937	26761.250	695.97	418.14	2	64	1.66
Adv. Replacement	5204.562	65196.125	2602.28	297.70	2	219	8.74*
Adv.Expans. + S	2404.625	10517.625	1202.31	618.68	2	17	1.94
Conjoining	8201.000	103684.000	4100.50	319.03	2	325	12.85*

TABLE LXIII (Continued)

Transforms	Source of Variance and Sums of Squares		Mean Squares		df		F
	Among means of trans.	Within trans.	Among means of trans.	Within trans.	Among means of trans.	Within trans.	
Com. Elem.Del.	3082.187	110164.000	1541.09	430.33	2	256	3.58**
WH Deletion	2907.187	21400.687	1453.59	611.45	2	35	2.38
WH BE Deletion	7703.375	84535.312	3851.69	469.64	2	180	8.20*
(That) + S Object	168.437	3073.437	84.22	153.67	2	20	0.55
(That) + S Obj.Quot.	3883.750	30182.000	1991.87	245.38	2	123	7.91*
Comparative Deletion	2291.937	8987.500	1145.97	374.48	2	24	3.06
Adv. Replace. Del.	1164.414	2238.085	582.21	319.73	2	7	1.82
Passive	2205.062	28104.500	1102.53	446.10	2	63	2.47
There Inversion	2091.125	17481.375	1045.56	397.30	2	44	2.63
Question	1876.375	14911.312	938.19	310.65	2	48	3.02
Negation	1208.125	136205.000	604.06	1008.93	2	135	0.60
Aspect	7658.375	94348.687	3829.19	476.51	2	198	8.04*
Imperative	2022.187	11208.127	1011.09	311.34	2	36	3.25**
Contraction	835.312	30969.625	417.66	533.96	2	58	0.78
Comparative	1376.875	10756.125	688.44	597.56	2	18	1.15
Pronoun(Simple)	9386.000	239324.000	4693.00	377.48	2	634	12.438·
Indirect Object	274.000	16217.437	137.00	463.36	2	35	0.30
Reflexive-Intensive	678.167	5308.750	339.08	589.86	2	9	0.57
Vocative	1839.937	27519.562	919.97	948.95	2	29	0.97
Expletive	2109.812	32336.437	1054.91	734.92	2	44	1.44
NP - V Inversion	1101.125	21862.625	550.56	376.94	2	58	1.46
Adv. Position Shift	4522.000	108236.500	2261.00	527.98	2	205	4.28*
Adv. Replace. Shift	3985.062	40274.062	1992.53	359.59	2	112	5.54*
(That) + S Obj.Quot.Shift	5751.062	27202.437	2875.53	329.03	2	85	8.99*
Multi-transforms.	4765.136	15881.297	2382.57	387.35	2	41	6.158

* significant at the .01 level
** significant at the .05 level

TABLE LXIV.

SUMMARY OF ANALYSIS OF VARIANCE OF TRANSFORM DIFFICULTY BY SEX

Transform	Source of Variance and Sums of Squares		Mean Squares		df		F
	Among means of trans.	Within trans.	Among means of trans.	Within trans.	Among means of trans.	Within trans.	
Relative Clause	3967.250	42677.125	3967.25	358.59	1	119	11.06*
With Phrase	3261.648	14472.473	3261.65	964.83	1	15	3.38
Adjective	8743.000	155834.000	8743.00	592.52	1	263	14.76*
Appositive	1249.714	842.000	1249.71	168.40	1	5	7.42**
Gerundive	289.812	8081.875	289.81	384.85	1	21	0.75
Compounds	10912.437	86426.750	10912.44	457.28	1	198	23.86*
Genitive	4532.437	95534.375	4532.44	663.43	1	144	6.83*
That + S	760.804	2647.433	760.80	176.50	1	15	4.31**
VP Complement	290.082	2428.835	290.08	242.88	1	10	1.19
WH + S Object	280.164	193.335	280.16	48.33	1	4	5.80
Infinitive as Obj.	1281.125	16844.812	1281.12	391.74	1	43	3.27
Infinitive of Purp.	2627.062	33312.562	2627.06	387.55	1	88	6.94*
Ing-Nominalization	2424.937	28484.250	2424.94	418.94	1	68	5.79*
Ing-Nom. of Purpose	4322.570	3612.144	4322.57	301.10	1	12	14.36*
Pronoun(genitive)	3275.875	189946.620	3275.87	855.62	1	222	3.83**
Verb + C	3848.500	24304.687	3848.50	373.92	1	65	10.29*
Adv. Replacement	8816.062	61584.625	8816.06	279.93	1	220	31.49*
Adv. Expans. + S	3398.437	9528.812	3398.44	529.10	1	18	6.42**
Conjoining	15230.000	96655.000	15230.00	296.49	1	326	51.37*
Common Elem.Del.	11486.250	101759.400	11486.25	395.95	1	257	29.01*
WH Deletion	3450.125	20857.750	3450.12	579.38	1	36	5.95*
WH BE Deletion	5043.187	87195.500	5043.19	481.74	1	181	10.47*

TABLE LXIV (Continued)

Transforms	Source of Variance and Sums of Squares		Mean Squares		df		F
	Among means of trans.	Within trans.	Among means of trans.	Within trans.	Among means of trans.	Within trans.	
(That) + S Object	682.937	2558.937	682.94	121.85	1	21	5.60**
(That) + S Obj.Quot.	4017.875	30047.875	4017.87	242.32	1	124	16.58*
Comparative Del.	664.500	10614.937	664.50	424.60	1	25	1.57
Adv. Replace. Del.	510.441	2892.085	510.41	361.51	1	8	1.41
Passive	1917.375	28392.187	1917.37	443.63	1	64	4.32**
There Inversion	2684.187	16888.312	2684.19	375.30	1	45	7.15*
Question	1188.375	15599.312	1188.37	318.37	1	49	3.73**
Negation	4437.500	13297.562	4437.50	966.76	1	136	4.54**
Aspect	8699.962	93307.500	8699.56	468.88	1	199	18.55*
Imperative	655.250	12575.125	655.25	339.87	1	37	1.93
Contraction	2004.750	29800.187	2004.75	505.09	1	59	3.97**
Comparative	1742.000	10391.000	1742.00	546.89	1	19	3.19
Pronoun(Simple)	28203.000	220507.000	28203.00	347.25	1	635	81.22*
Indirect Obj.	1528.437	14963.000	1528.44	415.64	1	36	3.68
Reflexive-Intensive	4.082	5982.835	4.08	598.28	1	10	0.01
Vocative	5538.812	23820.687	5538.81	794.02	1	30	6.98*
Expletive	5994.687	28451.562	5994.69	632.26	1	45	9.48*
NP - V Inversion	1972.812	20990.937	1972.81	255.78	1	59	5.55**
Adv. Pos. Shift	9234.312	10352.419	9234.31	502.54	1	206	18.38*
Adv.Replace. Shift	4410.750	39848.375	4410.75	352.64	1	113	12.51*
(That) + S Obj.Quot.Shift	2768.625	30184.750	2768.62	350.99	1	86	7.89*
Multi-transforms	2394.113	18252.320	2394.11	434.58	1	42	5.51**

* significant at the .01 level
** significant at the .05 level

TABLE LXV

SUMMARY OF ANALYSIS OF VARIANCE OF TRANSFORM DIFFICULTY BY READING ACHIEVEMENT

Transforms	Source of Variance and Sums of Squares		Mean Squares		df		F
	Among means of trans.	Within trans.	Among means of trans.	Within trans.	Among means of trans.	Within trans.	
Relative Clause	4923.750	33502.000	4923.75	670.04	1	50	7.35*
With Phrase	54.000	177.335	54.00	44.33	1	4	1.22
Adjective	3644.750	49487.250	3644.75	610.95	1	81	5.97*
Appositive	2128.168	28.667	2128.17	7.17	1	4	296.94*
Gerundive	28.125	4741.750	28.13	790.29	1	6	0.04
Compounds	2268.125	17708.812	2268.12	295.15	1	60	7.68*
Genitive	5226.437	30157.562	5226.44	558.47	1	54	9.36*
That + S	5940.488	9003.125	5940.49	562.70	1	16	10.56*
VP Complement	132.250	380.500	132.25	190.25	1	2	0.70
WH + S Object	160.167	146.667	160.17	36.67	1	4	4.37
Infinitive as Obj.	283.500	872.875	283.50	72.74	1	12	3.90
Infinitive of Purp.	4651.500	15772.437	4651.50	394.31	1	40	11.80*
Ing-Nominalization	682.867	3811.187	682.69	173.24	1	22	3.94**
Ing-Nom. of Purp.	380.250	3312.500	380.25	1656.25	1	2	0.23
Pronoun(genitive)	3235.187	49699.562	3235.19	662.66	1	75	4.88**
Verb + C	1213.687	13503.812	1213.69	465.65	1	29	2.61
Adv. Replacement	3279.312	17181.750	3279.31	242.00	1	71	13.55*
Adv.Expans. + S	3251.586	9137.601	3251.56	537.51	1	17	6.05**
Conjoining	4984.625	33262.500	4984.62	326.10	1	102	15.29*
Com.Elem.Del.	3732.187	37552.562	3732.19	463.19	1	81	8.05*
WH Deletion	1482.687	3923.714	1482.69	301.82	1	13	4.91**
WH BE Deletion	2496.125	27410.750	2496.12	472.60	1	58	5.28**

TABLE LXV (Continued).

Transforms	Source of Variance and Sums of Squares		Mean Squares		df		F
	Among means of trans.	Within trans.	Among means of trans.	Within trans.	Among means of trans.	Within trans.	
(That) + S Object	1352.011	3655.418	1352.01	731.08	1	5	1.85
(That) + S Obj.Quot.	1330.000	13164.000	1330.00	253.15	1	52	5.25**
Comparative Del.	72.890	1467.203	72.90	183.40	1	8	0.40
Adv.Replace.Del.	2.250	1946.500	2.25	973.25	1	2	0.00
Passive	1092.000	4073.500	1092.00	203.67	1	20	5.36**
There Inversion	33.812	2737.437	33.81	152.08	1	18	0.22
Question	1369.312	2561.187	1369.31	160.07	1	16	8.55*
Negation	3982.875	33256.250	3982.87	831.41	1	40	4.79**
Aspect	2559.375	18949.250	2559.37	296.08	1	64	8.64*
Imperative	520.082	3856.835	520.08	385.68	1	10	1.35
Contraction	1330.320	15339.389	1330.32	589.99	1	26	2.25
Comparative	946.125	977.750	946.13	162.96	1	6	5.81**
Pronoun(Simple)	9480.687	46702.062	9480.79	291.89	1	160	32.48*
Indirect Obj.	456.312	1396.375	456.31	139.64	1	10	3.27
Reflexive-Intens.	23.408	1989.466	23.41	331.58	1	6	0.07
Vocative	980.101	5524.800	980.10	690.60	1	8	1.42
Expletive	1543.500	3856.859	1543.50	421.40	1	12	4.80
NP - V Inversion	1352.000	2142.000	1352.00	133.91	1	16	10.10*
Adv.Pos.Shift	3559.750	27652.500	3559.75	418.98	1	66	8.50*
Adv.Replace.Shift	2808.937	58355.250	2808.94	171.64	1	34	16.37*
(That) + S Obj.Quot.Shift	160.937	16833.000	160.94	510.09	1	33	0.32
Multi-transforms	1948.703	5543.109	1948.70	291.74	1	19	6.68*

* significant at the .01 level
** significant at the .05 level

TABLE LXVI

SUMMARY OF ANALYSIS OF VARIANCE OF TRANSFORM DIFFICULTY BY MENTAL ABILITY

Transforms	Source of Variance and Sums of Squares		Mean Squares		df		F
	Among means of trans.	Within trans.	Among means of trans.	Within trans.	Among means of trans.	Within means.	
Relative Clause	1339.625	18533.750	1339.62	378.24	1	49	3.54
With Phrase	18.109	2838.750	18.11	567.75	1	5	0.03
Adjective	1476.000	33558.000	1476.00	479.40	1	70	3.08
Appositive	1482.250	12.500	1482.25	6.25	1	2	237.16*
Gerundive	112.132	42.667	112.13	14.22	1	3	7.88
Compounds	4195.812	17945.562	4195.81	345.11	1	52	12.16*
Genitive	960.910	18252.055	960.91	730.08	1	25	1.32
That + S	337.500	471.335	337.50	117.83	1	4	2.86
VP Complement	380.250	328.500	380.25	164.25	1	2	2.32
WH + S Object	36.000	5.000	36.00	2.50	1	2	14.40
Infinitive as Obj.	696.875	2602.250	696.88	162.64	1	16	4.28
Infinitive of Purp.	625.625	9755.375	625.63	448.41	1	28	1.80**
Ing-Nominalization	644.238	3852.000	644.24	256.80	1	15	2.51
Ing-Nom. of Purp.	1876.296	1403.418	1876.30	280.68	1	5	6.68**
Pronoun(gen)	2319.625	63649.187	2319.62	936.02	1	68	2.48
Verb + C	946.937	6153.687	946.94	323.88	1	19	2.92
Adv. Replacement	2088.562	25939.125	2088.56	370.56	1	70	5.64**
Adv.Expans + S	1085.761	2669.668	1085.76	533.93	1	5	2.03
Conjoining	5346.937	37644.250	5346.94	321.75	1	117	16.62*
Common Elem. Del.	3480.062	41517.937	3480.06	441.68	1	94	7.88*
WH Deletion	1521.000	4531.000	1521.00	323.64	1	14	4.70**
WH BE Deletion	2145.250	27860.250	2145.25	398.00	1	70	5.39**

TABLE LXVI (Continued)

Transforms	Source of Variance and Sums of Squares		Mean Squares		df		F
	Among means of trans.	Within trans.	Among means of trans.	Within trans.	Among means of trans.	Within trans.	
(That) + S Object ***							
(That) + S Obj.Quot.	388.687	8000.125	388.69	216.22	1	37	1.80
Comparative	600.890	3742.890	600.89	233.93	1	16	2.57
Adv.Replace.Del.	54.000	771.335	54.00	192.83	1	4	-0.28
Passive	192.062	9754.562	192.06	487.83	1	20	0.39
There Inversion	2174.019	8579.125	2174.02	451.53	1	19	4.81**
Question	1044.062	4199.750	1044.06	221.04	1	19	4.72**
Negation	723.187	40881.937	723.19	1048.25	1	39	0.69
Aspect	977.750	39752.187	977.75	736.16	1	54	1.33
Imperative	0.667	210.667	0.67	52.67	1	4	0.01
Contraction	6.125	4438.750	6.12	739.79	1	6	0.01
Comparative	1029.640	4744.359	1029.64	364.95	1	13	2.82
Pronoun(Simple)	10922.000	91620.000	10922.00	406.61	1	227	27.06*
Indirect Object	1977.144	2898.550	1977.14	263.50	1	11	7.50*
Reflexive-Intens.	4.000	185.000	4.00	92.50	1	2	0.04
Vocative	2102.500	6822.000	2102.50	852.50	1	8	2.47
Expletive	2355.234	6958.000	2355.23	632.55	1	11	3.72
NP - V Inversion	651.062	9725.937	651.06	442.06	1	22	1.47
Adv. Pos. Shift	3170.250	21523.375	3170.25	384.35	1	56	8.25*
Adv.Replace.Shift	645.250	22041.750	645.25	479.17	1	46	1.35
(That) + S Obj.Shift	730.312	15365.812	730.31	590.99	1	26	1.24
Multi-transforms.	0.937	3059.953	0.94	436.28	1	7	0.00

* significant at the .01 level
** significant at the .05 level
*** insufficient data for this variable

APPENDIX L

NEWMAN-KEULS COMPARISON OF ORDERED MEANS OF:

1. Forms of Stories of Part II by Grade

2. Grade Differences on Each Form of Each Story

TABLE LXVII

NEWMAN-KEULS COMPARISON BETWEEN ORDERED MEANS OF FORMS OF STORIES OF PART II BY GRADE

Table of Newman-Keuls Comparison Between Ordered Means

Forms-Story 1
(Total Group)

Multiplier 1.24362

	Means	1	3	4	2
		49.446	48.724	44.945	44.000
2	44.000	5.446**	4.724**	0.945	0.000
4	44.945	4.500	3.779	0.000	
3	48.724	0.721	0.000		
1	49.446	0.000			

Forms-Story 2
(Total Group)

Multiplier 1.64815

	Means	1	3	4	2
		58.150	56.575	53.804	46.630
2	46.630	11.520*	9.946*	7.714**	0.000
4	53.804	4.345	2.771	0.000	
3	56.575	1.574	0.000		
1	58.150	0.000			

Forms-Story 3
(Total Group)

Multiplier 1.61826

	Means	1	4	2	3
		56.321	54.186	52.532	46.798
3	46.798	9.532*	7.388*	5.733	0.000
2	52.532	3.789	1.654	0.000	
4	54.186	2.135	0.000		
1	56.321	0.000			

* significant at the .01 level
** significant at the .05 level

TABLE LXVII (Continued)

Table of Newman-Keuls Comparison Between Ordered Means

Forms—Story 1 (Grade Four) Multiplier 1.84224

	Means	3	1	4	2
		45.473	45.375	41.673	40.778
2	40.778	4.695	4.597	0.895	0.000
4	41.673	3.800	3.702	0.000	
1	45.375	0.098	0.000		
3	45.473	0.000			

Forms—Story 2 (Grade Four) 2.51265

	Means	2	1	3	4
		53.868	51.346	46.723	45.979
4	45.979	7.889	5.367	0.745	0.000
3	46.723	7.145	4.623	0.000	
1	51.346	2.522	0.000		
2	53.868	0.000			

Forms—Story 3 (Grade Four) 2.59239

	Means	1	4	2	3
		53.188	50.043	47.093	41.173
3	41.173	12.014*	8.869	5.920	0.000
2	47.093	6.095	2.950	0.000	
4	50.043	3.145	0.000		
1	53.188	0.000			

Forms—Story 1 (Grade Five) 2.14335

	Means	2	3	4	1
		50.167	48.788	47.903	45.793
1	45.793	4.374	2.995	2.110	0.000
4	47.903	2.263	0.885	0.000	
3	48.788	1.379	0.000		
2	50.167	0.000			

TABLE LXVII (Continued)

Table of Newman-Keuls Comparison Between Ordered Means

Forms-Story 2 (Grade Five)

Multiplier 2.61367	Means	2	1	3	4
		61.865	60.967	57.722	46.241
4	46.241	15.634*	14.725*	11.481**	0.000
3	57.722	4.153	3.244	0.000	
1	60.967	0.908	0.000		
2	61.875	0.000			

Forms-Story 3 (Grade Five)

2.65505	Means	2	4	1	3
		57.938	57.622	55.567	51.533
3	51.533	6.404	6.088	4.033	0.000
1	55.567	2.371	2.055	0.000	
4	57.622	0.316	0.000		
2	57.938	0.000			

Forms-Story 1 (Grade Six)

2.42905	Means	1	3	4	2
		55.292	55.036	47.852	46.800
2	46.800	8.492	8.236	1.053	0.000
4	47.852	7.440	7.184	0.000	
3	55.036	0.256	0.000		
1	55.292	0.000			

Forms-Story 2 (Grade Six)

3.42547	Means	2	1	3	4
		63.042	60.222	57.862	51.464
4	51.464	11.577	8.758	6.398	0.000
3	57.862	5.180	2.360	0.000	
1	60.222	2.819	0.000		
2	63.042	0.000			

TABLE LXVII (Continued)

Table of Newman-Keuls Comparison Between Ordered Means

Forms-Story 3 (Grade Six)		Means	1	2	4	3
Multiplier 2.72552	3	52.370	62.500	57.360	56.517	52.370
	4	56.517	10.130	4.990	4.147	0.000
	2	57.360	5.983	0.843	0.000	
	1	62.500	5.140	0.000		
			0.000			

TABLE LXVIII

NEWMAN-KEULS COMPARISON OF ORDERED MEANS OF GRADE DIFFERENCES ON EACH
FORM OF EACH STORY

Table of Newman-Keuls Comparison of Ordered Means

Story 1 (Form 1-Conjoining)				3 55.292	2 51.345	1 43.375
	Multiplier 2.22360	1	45.375	9.917*	5.970	0.000
		2	51.345	3.947	0.000	
		3	55.292	0.000		

Story 1 (Form 2-Deletion)				3 46.800	2 45.694	1 40.778
	2.09474		Means			
		1	40.778	6.033	4.917	0.000
		2	45.694	1.106	0.000	
		3	46.800	0.000		

Story 1 (Form 3-Embedding)				3 55.036	2 48.788	1 45.473
			Means			
	2.31388	1	45.473	9.563*	3.315	0.000
		2	48.788	6.248	0.000	
		3	55.036	0.000		

Story 1 (Form 4-Simple)				3 47.903	2 47.852	1 41.673
			Means			
	1.99485	1	41.673	6.230**	6.179	0.000
		2	47.852	0.051	0.000	
		3	47.903	0.000		

Story 2 (Form 1-Conjoining)				3 60.967	2 60.222	1 51.346
			Means			
	2.87080	1	51.346	9.621**	8.876	0.000
		2	60.222	0.744	0.000	
		3	60.967	0.000		

Story 2 (Form 2-Deletion)				3 63.042	2 61.875	1 53.868
			Means			
	3.09970	1	53.868	9.174	8.007	0.000
		2	61.875	1.167	0.000	
		3	63.042	0.000		

Story 2 (Form 3-Embedding)				3 57.862	2 57.703	1 46.723
			Means			
	2.91308	1	46.723	11.139*	10.979**	0.000
		2	57.703	0.159	0.000	
		3	57.862	0.000		

TABLE LXVIII(Continued)

				3	1	2
Story 2						
(Form 4-Simple)	Multiplier		Means	51.464	45.979	45.655
	2.68536	2	45.655	5.809	0.324	0.000
		1	45.979	5.486	0.000	
		3	51.464	0.000		

			3	2	1
Story 3					
(Form 1-Conjoining)		Means	62.500	55.567	53.188
	1	53.188	9.312**	2.379	0.000
	2	55.567	6.933	0.000	
	3	62.500	0.000		

			3	2	1
Story 3					
(Form 2-Deletion)		Means	57.938	57.360	47.093
	1	47.093	10.845*	10.267**	0.000
	2	57.360	0.578	0.000	
	3	57.938	0.000		

			3	2	1
Story 3					
(Form 3-Embedding)		Means	52.370	51.533	41.173
	1	41.173	11.197*	10.360*	0.000
	2	51.533	0.837	0.000	
	3	52.370	0.000		

			3	2	1
Story 4					
(Form 4-Simple)		Means	57.622	56.517	50.043
	1	50.043	7.579	6.475	0.000
	2	56.517	1.104	0.000	
	3	57.622	0.000		

* significant at the .01 level
** significant at the .05 level

APPENDIX M

CORRELATIONS BETWEEN THE PRESENCE OF TRANSFORMATIONS,
THE NUMBER OF TRANSFORMATIONS PER SENTENCE, AND
SENTENCE AND PASSAGE DIFFICULTY

TABLE LXIX

CORRELATIONS BETWEEN THE PRESENCE OF TRANSFORMATIONS, THE NUMBER OF
TRANSFORMS PER SENTENCE, AND SENTENCE AND PASSAGE DIFFICULTY FOR
GRADE FOUR(N = 202)

	2	3	4	5	6	7	8	9
1.Sent. diff.	545	-136	-099	025	026	-103	013	-186
2.Pass.diff.		-053	-075	033	035	-030	016	-097
3.No.of T's			450	263	354	038	001	173
4.Rel.Clause				011	073	-033	062	055
5.With Phrase					245	-012	-021	142
6.Adjective						018	001	066
7.Appositive							-013	115
8.Gerundive								-070
9.Compounds								
10.Genitive								
11.That + S								
12.VP Comp								
13.WH + S Obj.								
14.Infin.Obj.								
15.Infin.of Purp.								
16.Ing-Nom.								
17.Ing-Nom.of Purp.								
18.Pron(gen)								
19.Verb + C								
20.Adv. Replace.								
21.Adv.Expans.								
22.Conjoin.								
23.Com.Elem.Del.								
24.WH Del.								
25.WH BE Del.								
26.(That) + S Obj.								
27.(That) + S Obj.Quot.								
28.Compar. Del.								
29.Adv.Replace.Del.								
30.Passive								
31.There Invers.								
32.Question								
33.Negation								
34.Aspect								
35.Imperative								
36.Contraction								
37.Comparative								
38.Pron(Simple)								
39.Indirect Obj.								
40.Reflex-Intens.								
41.Vocative								
42.Expletive								
43.NP - V Invers.								
44.Adv.Pos.Shift								
45.Adv.Replace.Shift								
46.(That) + S Obj.Quot.Shift								
47.Multi-transforms								
48.Non-trans. Units								

	10	11	12	13	14	15	16	17	18	19	20	21	22
1.	-068	-004	-126	023	032	-042	-146	-121	-108	-043	-106	-039	-030
2.	-050	018	-090	043	003	-050	-056	-072	001	021	-084	049	-023
3.	249	090	137	148	009	136	219	017	328	055	288	062	362
4.	058	087	126	205	284	016	117	-050	-042	082	011	074	154
5.	120	-018	-014	-010	-028	030	045	125	121	-036	-070	125	081
6.	073	026	-060	130	-114	014	-017	105	199	-017	112	-033	166
7.	-036	-011	571	-006	-018	-027	-023	-012	100	-023	181	-012	071
8.	-059	-019	-015	-011	-030	-045	-039	-021	058	-039	-075	-021	-058
9.	255	051	088	-034	-019	-036	-062	090	087	025	051	-013	081
10.		074	-041	-029	004	-060	029	003	263	-069	142	120	054
11.			-013	572	-025	-038	-033	-018	-067	320	042	-018	-038
12.				-007	-021	-031	-027	-014	072	-027	078	-014	159
13.					-014	-032	-019	-010	-038	285	-037	-010	031
14.						043	065	-028	-035	065	006	-028	054
15.							085	103	037	-078	-075	-042	019
16.								-036	138	117	291	127	049
17.									121	-036	-020	125	-005
18.										028	071	121	189
19.											-017	127	-048
20.												029	-032
21.													-005
22.													
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	23	24	25	26	27	28	29	30	31	32	33	34	35
1.	-136	-133	-139	065	067	-090	-094	-039	-050	114	-141	-037	045
2.	-082	-119	-156	-017	-008	-035	-009	001	-076	003	-065	003	031
3.	326	301	162	051	139	056	012	059	334	-021	377	381	077
4.	176	161	038	-057	-047	163	-033	117	215	-082	259	222	-066
5.	060	187	041	-022	-050	-022	-012	045	164	-032	003	188	-025
6.	080	-006	109	-090	-041	-090	089	087	219	-041	092	086	-105
7.	-051	-017	-041	-014	-032	-014	-008	-023	-019	-020	052	111	-016
8.	-041	-028	030	-023	064	-023	-013	114	-032	224	105	023	-027
9.	-030	102	031	-074	-076	017	-042	025	039	-040	-037	069	-086
10.	039	096	137	-063	-039	040	-036	-069	111	-090	055	016	016
11.	-073	-024	-059	-020	-046	-020	-011	-033	-027	-029	201	048	-023
12.	-059	262	-048	-016	-037	-016	-009	-027	233	-024	112	084	-019
13.	-042	-014	-034	-011	-026	-011	-006	-019	-015	-017	187	154	-013
14.	053	-038	-016	-031	063	-031	-018	182	-043	-045	-079	-023	-037
15.	063	156	020	-047	082	-047	-027	085	032	023	-060	009	-055
16.	089	071	-029	-041	-021	103	-023	024	054	-059	194	-009	-048
17.	-032	-027	-064	-022	076	-022	-012	-036	-030	-032	061	-016	-025
18.	156	079	113	002	088	088	-173	-136	050	034	008	211	-021
19.	-041	-050	-029	103	-057	-041	-023	024	-000	-059	062	019	-048
20.	004	-059	041	052	015	008	-045	-017	-007	-083	162	110	137
21.	-032	080	-011	-022	-050	234	-012	-036	-030	-032	061	-067	-025
22.	757	001	-081	-066	-159	-028	137	000	062	-123	177	097	-055
23.		-040	-022	-048	-100	-007	160	-041	-027	-040	076	057	-068
24.			145	-030	-068	064	-017	131	318	-044	096	-016	-035
25.				-073	-117	066	-041	029	184	-037	-032	040	-084
26.					054	-025	-014	103	-034	126	040	014	069
27.						-056	-032	-021	007	278	-064	051	322
28.							-014	248	-034	-036	-063	-076	-029
29.								-023	-019	-020	-036	-043	-016
30.									218	-059	-102	-009	-048
31.										012	189	-000	-039
32.											020	-109	-042
33.												201	-073
34.													-010
35.													
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	36	37	38	39	40	41	42	43	44	45	46	47	48
1.	027	-076	044	043	-020	104	138	028	-038	-063	-000	002	-017
2.	115	001	-105	021	061	066	126	087	064	-060	-023	082	-027
3.	034	140	203	169	-098	064	-016	099	-042	233	115	101	-098
4.	-016	199	170	022	-038	-018	-077	020	-000	016	-004	011	011
5.	-034	125	-131	-027	-014	-026	-030	-034	-017	-047	-039	-029	004
6.	-031	-033	-086	-041	-060	-033	064	050	082	-020	-112	-022	-110
7.	237	-012	074	-017	-009	-016	-019	-022	-044	067	-025	135	038
8.	-037	-021	-107	071	-015	-027	-032	123	-072	-051	100	-031	-091
9.	068	038	056	064	-049	-086	-100	-085	-007	004	-077	011	040
10.	-028	061	-107	010	-041	016	-006	039	-047	104	-020	079	-031
11.	-032	-018	061	-024	-013	-023	-027	-032	-062	-044	-036	-026	-063
12.	199	-014	085	-020	-011	-019	-022	-026	-051	-036	-029	-021	045
13.	-018	-010	-015	-014	-007	-013	-015	-018	-036	-025	-021	-015	-173
14.	072	-028	104	-038	-021	042	-043	-049	-097	-068	-002	101	085
15.	011	-042	080	049	-031	-055	-064	-074	.007	-102	143	-062	045
16.	-064	127	095	-050	-027	-048	-055	-064	075	279	-030	172	048
17.	-034	-019	032	-027	-014	-025	-030	-034	-067	-047	112	-029	059
18.	-015	072	-054	115	-055	-096	-047	070	-065	192	081	025	-054
19.	-016	-036	049	010	-027	014	-055	-016	-039	095	-030	172	-045
20.	-006	029	239	050	-052	214	-107	022	053	567	-011	102	043
21.	-034	270	-049	-027	-014	-025	-030	050	-017	147	-039	-029	059
22.	-061	037	045	001	-069	-055	033	-085	015	067	-141	-076	199
23.	-140	060	-013	-040	-059	038	003	-085	-045	099	-013	-117	188
24.	-047	080	035	121	-020	-035	-041	-047	-055	-065	-054	-040	-040
25.	-113	-011	075	-088	-048	-084	-098	-051	073	032	-074	-058	035
26.	-039	-022	129	159	-016	069	-034	-039	-077	-054	022	-033	-029
27.	209	-050	-083	024	-037	273	092	432	-084	-008	725	056	-232
28.	-039	491	-051	-030	-016	-029	-034	-039	-032	003	-045	-033	-078
29.	-022	-012	-050	-017	-009	-016	-019	-022	-044	067	-025	-018	038
30.	-064	127	-135	-050	-027	-048	-055	-064	046	-042	-073	-054	-294
31.	-053	-030	-044	030	-022	-039	084	118	100	014	-060	-044	-278
32.	-056	-032	030	092	-024	028	-049	106	-110	-036	224	-047	-287
33.	-097	-055	123	096	-041	-028	-006	039	-006	153	-050	079	-009
34.	062	-016	159	-016	-050	-010	-103	-058	-017	180	024	041	-009
35.	-045	-025	-101	377	-019	395	110	217	-011	037	240	038	-176
36.		-034	-039	-047	-026	-045	-053	140	-030	-084	243	431	-089
37.			-090	-027	-014	-025	-030	-034	-017	017	-039	-029	059
38.				005	-129	055	-099	-184	-050	185	-048	055	166
39.					-020	-035	102	-047	-093	030	-054	-040	-163
40.						-019	-022	-026	083	-036	-029	-021	045
41.							259	217	-011	037	181	038	-091
42.								290	-069	-073	-060	-044	-056
43.									-060	-007	378	125	-415
44.										-005	-110	-065	090
45.											-062	154	046
46.												098	-226
47.													-178
48.													

TABLE LXX

CORRELATIONS BETWEEN THE PRESENCE OF TRANSFORMATIONS,THE NUMBER OF
TRANSFORMS PER SENTENCE,AND SENTENCE AND PASSAGE DIFFICULTY FOR
GRADE FIVE(N = 129)

	2	3	4	5	6	7	8	9
1.Sent.diff.	511	-045	-089	-066	076	-083	-005	-123
2.Pass.diff.		-030	-067	-163	026	-001	013	-017
3.No. of T's			313	-011	276	-069	037	109
4.Rel.Clause				-091	020	-017	087	045
5.With Phrase					-111	-019	011	-100
6.Adjective						-028	020	058
7.Appositive							-007	126
8.Gerundive								-001.
9.Compounds								
10.Genitive								
11.That + S								
12.VP Comp								
13.WH + S Obj.								
14.Infin. Obj.								
15.Infin. Purp.								
16.Ing-Nom.								
17.Ing-Nom.of Purp.								
18.Pron(gen)								
19.Verb + C								
20.Adv.Replace.								
21.Adv.Expans.								
22.Conjoin.								
23.Com.Elem.Del.								
24.WH Del.								
25.WH BE Del.								
26.(That) + S Obj.								
27.(That) + S Obj.Quot.								
28.Compar. Del.								
29.Adv.Replace.Del.								
30.Passive								
31.There Inversion								
32.Question								
33.Negation								
34.Aspect								
35.Imperative								
36.Contraction								
37.Comparative								
38.Pron(Simple)								
39.Indirect Obj.								
40.Reflex-Intens.								
41.Vocative								
42.Expletive								
43.NP - V Invers.								
44.Adv.Pos.Shift								
45.Adv.Replace.Shift								
46.(That) + S Obj.Quot.Shift								
47. Multi-transforms								
48. Non-trans.Units								

	10	11	12	13	14	15	16	17	18	19	20	21	22
1.	007	-113	-091	020	071	-125	-084	-095	-026	-004	-044	-030	-039
2.	016	-059	-144	-019	050	-161	-000	-032	061	-030	-092	052	-034
3.	120	009	036	018	-019	-048	070	018	115	-028	136	182	226
4.	023	-033	076	039	242	-125	056	-030	-119	056	003	053	124
5.	-104	273	373	030	047	574	-080	-033	-134	-080	-136	-038	-184
6.	074	-092	-107	-006	-082	-129	006	023	234	-025	157	-056	220
7.	-019	-012	261	-006	-011	-027	-011	-004	120	-011	118	-005	092
8.	-050	059	075	-016	-030	-023	-031	-012	-006	-031	-061	-014	013
9.	239	013	-002	-048	-050	-136	-091	048	053	018	092	-043	038
10.		036	-027	104	-035	-143	-039	-033	147	-080	143	044	055
11.			151	081	-049	318	-050	-020	-099	128	-066	-024	-099
12.				-023	026	247	-044	-018	-048	-044	-049	-021	-013
13.					-025	055	-026	-010	-051	085	-052	-012	-011
14.						-011	079	-019	-057	079	-022	-022	034
15.							-018	102	-113	-114	-171	-054	-180
16.								-020	080	135	254	225	087
17.									125	-020	-040	-009	-051
18.										099	072	-046	155
19.											-062	101	-004
20.												096	-005
21.													-059
22.													
23.													
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25.													
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46.													
47.													
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	23	24	25	26	27	28	29	30	31	32	33	34	35
1.	109	-157	-105	020	109	047	-074	-003	-008	139	-074	-048	133
2.	-052	-079	-075	-009	044	-006	027	-030	-133	027	008	-036	145
3.	175	175	124	059	151	160	005	235	162	001	141	141	067
4.	167	138	021	-046	-051	101	-017	093	183	-068	241	181	-009
5.	-153	-054	-147	-050	-121	-046	-019	-043	-069	-075	-125	-110	-066
6.	110	-035	119	-075	-006	-069	097	090	251	021	048	090	-062
7.	-025	-007	-021	-007	-017	-006	-002	-012	-010	-010	-018	120	-009
8.	033	-031	-000	-019	018	-018	-007	152	-027	071	144	102	-025
9.	017	096	097	-057	-010	-053	-021	-022	045	-007	032	095	-076
10.	-000	004	121	011	-008	020	-019	-082	115	-075	040	029	029
11.	-110	-034	-093	-032	-076	-029	-012	-052	-044	-047	002	-065	-042
12.	-097	164	-081	-028	-067	-025	-010	-045	114	-041	022	-048	-037
13.	-057	-017	-048	-016	-039	-015	-006	-026	-022	-024	035	012	-021
14.	032	-032	-011	-030	060	-027	-011	135	-041	-044	-074	-020	-039
15.	-146	014	-133	-072	-039	-066	-027	-024	-062	-039	-156	-150	-095
16.	091	055	-090	-031	-031	073	-011	009	027	-046	217	-025	-040
17.	-044	-013	-037	-012	169	-011	-004	-020	-017	-018	-031	-039	-016
18.	075	036	164	047	100	119	120	-099	037	060	-006	198	-038
19.	-074	-033	-016	158	-074	-028	-011	069	-042	-046	049	-025	-040
20.	-004	-015	096	100	048	059	-023	002	075	-016	207	153	085
21.	-051	163	-043	-014	-035	192	-005	-024	-020	-021	048	-046	-019
22.	739	046	-066	013	-105	-023	092	047	063	-117	259	173	-032
23.		-072	-018	-067	-047	-007	108	-046	-018	-064	103	075	-011
24.			-007	-021	-050	127	-007	138	273	-031	129	-014	-027
25.				-057	-085	070	-021	014	132	-006	-040	057	-075
26.					-047	-018	-007	152	-027	-029	144	047	-025
27.						027	-017	006	032	340	-058	026	394
28.							-006	168	-024	-026	-044	-056	-023
29.								-012	-010	-010	-018	-022	-009
30.									160	-047	-079	038	-042
31.										-040	219	037	-035
32.											017	-090	-038
33.												236	-064
34.													-038
35.													
36.													
37.													
38.													
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	36	37	38	39	40	41	42	43	44	45	46	47	48
1.	-008	-125	128	-010	-116	103	-005	022	023	-042	115	-023	045
2.	054	-097	002	-100	003	089	-029	-071	117	-116	053	009	169
3.	-001	329	076	-027	-101	031	-001	058	-009	098	104	095	-159
4.	-014	144	191	035	-039	-052	-056	-045	008	063	-020	084	035
5.	-069	173	-299	204	030	-002	199	-019	-108	-079	-067	022	-460
6.	003	-025	021	-076	-063	-085	-020	029	131	001	-046	-032	016
7.	271	-009	056	-012	-006	-008	-014	013	-022	-016	-014	-010	034
8.	-027	-025	-129	-034	-016	-032	-038	048	-060	-042	038	-027	003
9.	087	-076	118	-002	-048	-065	-114	-039	-028	096	005	045	133
10.	-023	-018	-092	-016	-042	052	-000	088	-061	104	032	022	-046
11.	-044	-042	-083	-002	-026	-036	083	048	-098	-069	-063	024	-239
12.	038	122	-074	194	098	-031	165	068	-086	040	-055	114	-181
13.	-022	-021	-061	-029	-013	-018	058	-030	-051	-036	-032	-022	-180
14.	030	-039	043	004	-025	-034	044	001	-092	-065	-007	030	-006
15.	-026	055	-258	132	-002	-038	066	-045	-092	-133	040	-026	-389
16.	-042	031	082	-054	-026	-035	-061	-056	-095	211	-061	097	087
17.	-017	-016	098	-022	-010	-014	-025	-023	-039	-027	210	-017	059
18.	-003	003	033	-011	-051	-069	-062	046	-043	135	024	-043	087
19.	027	-040	108	-054	-026	-035	-061	-056	-024	-021	-061	097	087
20.	-004	-039	355	018	-052	073	-122	044	075	584	-035	-004	091
21.	121	127	061	-026	-012	-016	-029	-026	026	156	-029	-020	011
22.	-040	002	069	-002	-066	-007	-007	-116	055	079	-107	-075	242
23.	-093	027	-011	-060	-057	102	-025	-093	002	027	001	-093	223
24.	-028	076	049	123	-017	-023	-041	-038	-064	021	-041	-028	-066
25.	-078	-075	141	-101	-048	-065	-113	-038	082	099	-083	-078	111
26.	-027	-025	151	136	-016	-022	-038	-035	-060	-042	-038	-027	003
27.	228	-062	035	-005	-039	179	047	295	-095	027	786	032	-058
28.	-024	217	053	-032	-015	-020	-036	-032	003	114	-036	-024	-009
29.	-010	-009	-048	-013	-006	-008	-014	-013	-022	-016	-014	-010	034
30.	-044	028	-033	-056	-026	-026	-063	-058	040	-024	-063	-044	-100
31.	-037	-035	-029	142	-022	-030	061	136	120	152	-053	-037	-230
32.	-040	-038	085	066	-024	-033	-057	178	-089	-014	263	-040	-166
33.	-066	-064	196	104	-041	-055	-027	023	-027	243	-061	124	070
34.	037	003	199	-043	-051	-069	-121	-110	-038	188	-004	-084	087
35.	-035	-034	-016	151	-021	365	067	146	-037	-001	306	212	-081
36.		-035	000	-047	-022	-030	-052	013	038	-058	290	201	028
37.			-140	085	-021	-029	067	017	-037	-001	008	047	-115
38.				-063	-109	065	-106	-142	052	250	042	000	336
39.					071	-039	205	-013	-074	092	-023	-047	-199
40.						-018	058	-030	078	048	-032	-022	025
41.							229	181	-068	-048	229	-030	-012
42.								242	-119	-046	-077	003	-168
43.									-046	004	152	013	-313
44.										030	-090	-042	165
45.											-084	046	069
46.												061	-052
47.													-036
48.													

TABLE LXXI
CORRELATIONS BETWEEN THE PRESENCE OF TRANSFORMATIONS, THE NUMBER OF
TRANSFORMS PER SENTENCE, AND SENTENCE AND PASSAGE DIFFICULTY FOR
GRADE SIX(N = 109)

	2	3	4	5	6	7	8	9
1.Sent.diff.	715	-073	-080	-050	005	-104	-037	-147
2.Pass.diff.		-026	-024	027	-006	-029	-015	-060
3.No. of T's			285	393	323	-078	006	189
4.Rel.Clause				-044	031	-025	068	004
5.With Phrase					228	-009	-019	-002
6.Adjective						-042	002	028
7.Appositive							-011	161
8.Gerundive								-068
9.Compounds								
10.Genitive								
11.That + S								
12.VP Comp								
13. WH + S Obj.								
14.Infin. Obj.								
15.Infin.of Purp.								
16.Ing-Nom.								
17.Ing-Nom.of Purp.								
18.Pron(gen)								
19.Verb + C								
20.Adv.Replace.								
21.Adv.Expans.								
22.Conjoining								
23.Com.Elem.Del.								
24.WH Del.								
25.WH BE Del.								
26.(That) + S Obj.								
27.(That) + S Obj.Quot.								
28.Compar.Del.								
29.Adv.REplace.Del.								
30.Passive								
31.There Invers.								
32.Question								
33.Negation								
34.Aspect								
35.Imperative								
36.Contraction								
37.Comparative								
38.Pron(Simple)								
39.Indirect Obj.								
40.Reflex-Intens.								
41.Vocative								
42.Expletive								
43.NP - V Invers.								
44.Adv.Pos.Shift								
45.Adv.Replace.Shift								
46.(That) + S Obj.Quot Shift								
47.Multi-transforms.								
48.Non-trans.Units								

	10	11	12	13	14	15	16	17	18	19	20	21	22
1.	-011	-004	-141	-032	015	-041	-109	-033	-036	-026	-079	-034	-006
2.	011	090	-070	097	003	-035	-050	-026	-016	028	-091	050	-024
3.	271	071	050	117	-023	114	151	033	187	-019	228	299	312
4.	010	094	133	213	271	028	121	-036	-063	060	-001	080	133
5.	008	-016	-013	-009	077	041	-034	192	042	-032	-066	138	053
6.	079	027	-059	131	-090	022	004	124	196	-036	138	-032	177
7.	-030	-009	703	-005	-015	-021	-019	-007	147	-018	145	-010	111
8.	-061	-019	-015	-011	-032	-044	-039	-015	018	-038	-076	-021	-019
9.	247	045	090	-034	-027	-028	-063	090	095	005	088	-011	086
10.		070	-043	-030	-011	-062	017	-043	264	-103	178	113	066
11.			-013	572	-027	-038	-034	-013	-065	328	093	-018	006
12.				-007	-022	-031	-028	-011	078	-026	076	-014	157
13.					-015	-021	-019	-007	-037	292	053	-010	111
14.						134	050	105	-007	057	-043	-030	030
15.							084	163	054	-074	-050	-041	032
16.								-028	114	117	301	123	061
17.									078	-026	-053	-014	-070
18.										-041	099	029	110
19.											-044	131	-020
20.												027	-003
21.													-050
22.													
23.													
24.													
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	23	24	25	26	27	28	29	30	31	32	33	34	35
1.	-046	-129	-099	021	027	-025	021	-045	-043	076	-122	-028	047
2.	-069	-045	-089	003	-026	-051	035	-012	001	-043	-010	-019	025
3.	283	251	110	045	096	063	015	043	281	-055	276	246	048
4.	075	219	031	-048	-067	189	-036	104	150	-074	187	204	-064
5.	078	090	-001	-018	-046	-019	-013	-032	-026	-027	015	218	-023
6.	102	-005	101	-079	-039	-084	063	052	236	003	054	082	-104
7.	-041	-014	-033	-010	-026	-011	-007	-018	-015	-015	-028	157	-013
8.	003	-028	031	115	005	-022	-015	042	-031	-032	167	026	-027
9.	-019	067	023	-064	-071	030	-048	010	014	-027	-021	028	-084
10.	046	090	106	-057	-046	045	-043	-101	112	-087	080	-009	012
11.	-072	-024	-058	-018	-046	-019	-013	-032	-026	-027	209	050	-023
12.	-059	262	-047	-014	-037	-015	-011	-026	242	-022	118	086	-019
13.	-041	-014	-033	-010	-026	-011	-007	-018	-015	-015	195	157	-013
14.	004	030	009	-030	007	-032	-022	176	-044	-046	-041	002	-039
15.	071	215	000	-041	086	-044	-031	100	040	035	-020	018	-054
16.	109	067	-062	-037	-025	110	-028	028	055	-057	231	-039	-049
17.	-059	121	022	-014	045	-015	-011	-026	-021	-022	038	018	-019
18.	071	161	118	079	080	111	144	-124	063	-074	035	190	-016
19.	-088	-048	-054	131	-090	-038	-026	035	-052	-054	041	-030	-046
20.	031	-025	056	027	032	015	-053	-010	064	-042	172	146	133
21.	-031	187	-063	-019	-050	251	-014	-034	-029	-030	066	-066	-025
22.	740	-007	-081	-007	-161	-019	157	038	070	-143	192	117	-057
23.		-038	-032	-078	-078	003	187	-028	-019	-057	051	035	-031
24.			108	-027	-068	172	-020	078	257	-041	148	024	-035
25.				-010	-138	031	-047	012	199	-097	-019	051	-083
26.					-050	-021	-014	136	-029	-030	126	037	-025
27.						-053	-037	-014	013	261	-107	034	419
28.							-015	283	-031	-032	-057	-070	-027
29.								-026	-021	-022	-044	-049	-019
30.									185	-053	-094	-025	-045
31.										-044	169	009	-038
32.											-081	-101	-039
33.												227	-070
34.													-007
35.													
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	36	37	38	39	40	41	42	43	44	45	46	47	48
1.	-039	-047	075	051	-067	096	076	003	-059	-011	029	-039	-001
2.	026	-033	-092	098	074	050	135	064	029	-057	045	004	-004
3.	-019	099	155	131	-076	061	-038	069	034	156	072	023	-039
4.	-013	163	181	-066	-036	-064	-074	-009	-009	-031	-045	017	065
5.	-032	152	-067	-024	-013	-023	-027	-032	-007	-044	-040	-026	059
6.	-036	-023	-075	028	-059	-032	034	079	052	-025	-085	-053	-096
7.	292	-009	-088	-014	-007	-013	-015	-018	-036	-025	-023	-015	034
8.	-038	-019	-103	-028	-015	-027	-032	203	-072	-051	085	-031	-030
9.	066	054	072	067	-048	-084	-098	-051	036	080	-040	087	037
10.	-038	008	-105	005	-043	012	-011	033	-038	116	-016	112	-040
11.	-032	-016	108	-024	-013	-023	-027	-032	-062	-044	-040	-026	-054
12.	193	-013	-018	-020	-011	-019	-022	-026	-051	-036	-032	-021	048
13.	-018	-009	063	-014	-007	-013	-015	-018	-036	-025	-023	-015	-161
14.	057	-027	097	-041	-022	-038	-046	-053	-104	-073	-066	089	098
15.	010	-038	081	052	-031	-054	-063	-073	-013	-100	122	-061	081
16.	-067	138	087	-051	-028	-049	-057	-065	-016	270	-004	166	063
17.	-026	-013	088	-020	-011	-019	-022	-026	-051	-036	060	-021	048
18.	-012	-011	-055	088	-052	-092	025	081	-103	141	085	-000	-005
19.	031	-032	024	048	-026	-046	-054	-062	-005	-011	-078	178	-005
20.	-015	040	233	047	-053	209	-109	077	-005	623	-015	030	000
21.	131	138	-004	-027	-014	-025	-030	-034	084	082	-043	-029	064
22.	-070	053	061	031	-070	-057	030	-089	009	082	-165	-049	196
23.	-142	078	-015	-038	-059	040	004	-111	-042	102	-038	-084	172
24.	-048	090	040	121	-020	-045	-041	-047	-093	-065	-059	-040	010
25.	-115	-058	083	-087	-047	-083	-097	-049	059	035	-089	-094	053
26.	-035	-o18	076	187	-014	-025	-030	050	-067	-047	026	-029	-094
27.	200	-046	-055	024	-037	322	092	357	-084	-008	807	013	-226
28.	-038	420	-025	-025	-015	-027	-032	-037	-072	070	-046	-031	-030
29.	-026	-013	-018	-020	-011	-019	-022	-026	-051	135	-032	-021	048
30.	-062	152	-104	-047	-026	-045	-053	-061	-000	-007	-077	-051	-259
31.	-052	-026	-051	034	-031	-038	089	185	110	064	-064	-043	-232
32.	-054	-027	070	-041	-022	110	019	061	-104	-073	216	-044	-255
33.	-096	-047	150	148	-040	-070	-001	047	-016	112	-060	086	043
34.	059	-005	205	-014	-049	-007	-101	-086	-046	141	-020	009	-009
35.	-046	-023	-126	296	-019	481	110	217	-011	037	267	-038	-158
36.		-032	-068	-048	-026	-046	-054	085	-005	-086	245	410	-066
37.			-023	-024	-013	-023	-027	-032	-062	096	-040	-026	059
38.				-019	-126	060	-092	-176	-022	230	-036	061	148
39.					-020	-035	174	078	-093	030	-007	-040	-067
40.						-019	-022	-026	083	-036	-032	-021	048
41.							259	217	-011	037	159	-038	-077
42.								233	-104	-073	-066	-044	-078
43.									-060	030	255	007	-352
44.										017	-101	-100	074
45.											-043	109	014
46.												032	-215
47.													-160
48.													

TABLE LXXII

CORRELATIONS BETWEEN THE PRESENCE OF TRANSFORMATIONS,THE NUMBER OF
TRANSFORMS PER SENTENCE,AND SENTENCE AND PASSAGE DIFFICULTY FOR
THE TOTAL GROUP (N = 440)

	2	3	4	5	6	7	8	9
1.Sent.diff.	655	-084	-090	-017	029	-100	-010	-151
2.Pass.diff.		-034	-051	-015	008	-031	000	-061
3.No.of T's			344	129	317	-030	013	161
4.Rel.Clause				-053	043	-025	072	035
5.With Phrase					038	-017	-004	-024
6.Adjective						-012	008	052
7.Appositive							-010	133
8.Gerundive								-048
9.Compounds								
10.Genitive								
11.That + S								
12.VP Comp.								
13.WH + S Obj.								
14.Infin.as Obj.								
15.Infin.of Purp.								
16.Ing.Nom.								
17.Ing.Nom.of Purp.								
18.Pron(gen)								
19.Verb + C								
20.Adv.Replace.								
21.Adv.Expans.								
22.Conjoin.								
23.Com.Elem.Del.								
24.WH Del.								
25.WH BE Del.								
26.(That) + S Obj.								
27.(That) + S Obj.Quote								
28.Compar.Del.								
29.Adv.Replace.Del.								
30.Passive								
31.There Invers.								
32.Question								
33.Negation								
34.Aspect								
35.Imperative								
36.Contraction								
37.Comparative								
38.Pron(Simple)								
39.Indirect Obj.								
40.Reflex-Intens.								
41.Vocative								
42.Expletive								
43.NP-V Invers.								
44.Adv.Pos.Shift								
45.Adv.Replace.Shift								
46.(That)+ S Obj.Quote Shift								
47.Multi-trans.								
48.Non-trans.Units								

	10	11	12	13	14	15	16	17	18	19	20	21	22
1.	-024	-037	-095	008	039	-054	-112	-092	-065	-029	-077	-035	-046
2.	-005	025	-068	039	019	-043	-038	-056	-007	020	-081	039	-031
3.	221	044	058	080	-012	049	151	023	212	002	221	191	302
4.	031	032	097	131	265	-040	102	-039	-071	068	005	071	141
5.	-027	191	264	025	034	396	-039	048	-038	-056	-101	035	-071
6.	076	-028	-080	068	-095	-046	-001	089	210	-025	136	-038	188
7.	-028	-012	429	-006	-015	-028	-018	-008	121	-018	153	-009	090
8.	-057	014	024	-013	-030	-036	-036	-016	025	-036	-071	-019	-022
9.	249	030	040	-040	-032	-078	-069	080	082	017	078	-019	072
10.		050	-036	024	-014	-097	006	-020	231	-084	157	098	061
11.			095	294	-035	174	-042	-019	-082	224	004	-021	-056
12.				-013	002	143	-035	-016	012	-035	013	-018	068
13.					-019	027	-022	-010	-044	196	-018	-011	032
14.						045	063	016	-033	066	-020	-027	039
15.							036	105	-028	-092	-111	-048	-071
16.								-028	115	123	286	151	066
17.									109	-028	-034	049	-036
18.										000	084	043	151
19.											-038	123	-023
20.												047	-010
21.													-034
22.													
23.													
24.													
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	23	24	25	26	27	28	29	30	31	32	33	34	35
1.	-096	-134	-113	030	060	-033	-036	-034	-037	098	-116	-039	068
2.	-068	-072	-098	-014	-004	-037	017	-017	-053	-015	-029	-020	049
3.	266	248	131	051	125	087	013	102	263	-027	269	257	062
4.	140	176	031	-051	-055	155	-029	106	184	-075	230	204	-047
5.	-053	030	-067	-033	-080	-033	-019	-020	-004	-050	-061	025	-042
6.	098	-013	110	-082	-029	-082	078	077	236	-006	066	087	-091
7.	-040	-013	-032	-010	-026	-010	-006	-018	-015	-016	009	128	-013
8.	-002	-026	021	022	030	-021	-012	101	-030	091	139	049	-027
9.	-009	089	050	-065	-054	002	-038	007	033	-025	-010	064	-082
10.	031	070	122	-038	-031	037	-033	-084	113	-084	060	012	019
11.	-090	-030	-074	-024	-059	-024	-014	-041	-034	-036	107	-004	-031
12.	-077	199	-063	-021	-050	-021	-012	-035	169	-031	065	019	-026
13.	-049	-016	-040	-013	-032	-013	-007	-022	-018	-019	120	090	-016
14.	029	-011	-006	-030	043	-030	-018	164	-043	-045	-064	-013	-038
15.	-028	108	-052	-055	028	-055	-032	039	-006	-001	-090	-057	-069
16.	099	067	-057	-036	-025	098	-021	022	047	-054	215	-023	-046
17.	-041	026	-028	-016	090	-016	-009	-028	-023	-024	031	-010	-021
18.	106	099	132	041	090	106	149	-120	053	096	015	202	-025
19.	-065	-044	-033	129	-073	-036	-021	042	-030	-053	052	-009	-045
20.	013	-033	065	058	032	026	-041	-008	042	-048	181	137	119
21.	-035	142	-037	-019	-045	231	-011	-031	-026	-028	060	-060	-024
22.	748	015	-074	-022	-143	-022	136	028	066	-127	209	129	-048
23.		-046	-022	-063	-075	-002	159	-037	-021	-053	079	056	-038
24.			092	-026	-063	120	-015	115	284	-039	125	-000	-033
25.				-047	-114	056	-037	020	174	-047	-029	050	-081
26.					-010	-021	-012	129	-030	029	100	032	008
27.						-031	-030	-010	017	292	-077	038	379
28.							-012	239	-030	-031	-055	-068	-027
29.								-021	-017	-018	-032	-038	-015
30.									190	-053	-092	-000	-045
31.										-022	192	014	-038
32.											-014	-100	-040
33.												222	-069
34.													-018
35.													
36.													
37.													
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46.													
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	36	37	38	39	40	41	42	43	44	45	46	47	48
1.	-009	-077	062	029	-062	094	068	011	-030	-038	046	-019	-008
2.	049	-032	-083	020	044	052	076	031	047	-066	-004	039	004
3.	003	189	146	083	-090	054	-019	075	-001	164	094	068	-091
4.	-013	164	182	-000	-038	-044	-069	-011	-000	014	-023	036	039
5.	-053	160	-213	115	013	-016	113	-022	-064	-062	-051	-003	-273
6.	-022	-027	-043	-033	-061	-048	021	053	088	-017	-083	-035	-053
7.	263	-011	017	-015	-008	-013	-017	-018	-034	-017	-021	048	038
8.	-034	-022	-111	000	-016	-026	-034	126	-068	-048	076	-029	-034
9.	074	-002	086	038	-049	-079	-106	-059	003	059	-038	048	077
10.	-029	012	-097	-002	-042	026	-007	052	-047	108	-001	074	-034
11.	-039	025	-005	-008	-018	-029	034	005	-078	-055	-049	-005	-161
12.	114	065	-027	097	044	-025	082	019	-067	-033	-041	037	-086
13.	-021	-014	-019	-019	-010	-016	023	-022	-042	-030	-026	-018	-177
14.	054	-032	079	-022	-023	-010	-009	-033	-098	-069	-027	074	051
15.	-012	016	-085	098	-015	-050	-009	-058	-045	-115	087	-047	-176
16.	-058	091	093	-053	-027	-044	-059	-066	-005	258	-029	149	070
17.	-026	-017	070	-024	-012	-020	-027	-028	-053	-037	118	-023	058
18.	-008	018	-019	056	-053	-086	-032	066	-070	159	066	-003	021
19.	014	-037	062	-032	-027	-020	-058	-044	-022	025	-056	153	019
20.	-007	003	277	035	-055	173	-115	047	041	594	-019	045	053
21.	067	172	001	-027	-014	-022	-030	-001	033	126	-037	-026	048
22.	-055	025	066	005	-069	-040	013	-097	028	078	-138	-065	219
23.	-125	049	-006	-049	-059	058	-010	-097	-027	081	-017	-097	200
24.	-041	078	045	117	-019	-031	-042	-044	-070	-041	-052	-036	-024
25.	-102	-051	102	-093	-048	-078	-104	-046	072	054	-082	-076	073
26.	-034	-022	119	157	-016	011	-034	-009	-068	-048	004	-029	-034
27.	211	-053	-032	012	-038	263	073	362	-087	002	775	034	-160
28.	-034	360	-008	-031	-016	-026	-034	-036	-035	058	-042	-028	-034
29.	-020	-013	-030	-018	-009	-015	-020	-021	-040	079	-025	-017	044
30.	-057	094	-088	-052	-027	-043	-058	-061	028	-028	-071	-049	-205
31.	-047	-031	-039	070	-023	-036	075	146	110	073	-059	-041	-236
32.	-050	-033	062	040	-023	039	-031	115	-101	-042	233	096	-226
33.	-087	-057	158	112	-041	-050	-014	036	-015	167	-057	-007	041
34.	055	-006	190	-027	-050	-025	-109	-085	-009	170	-000	067	030
35.	-043	-028	-080	263	-020	416	093	193	-019	025	271	358	-132
36.		-035	-039	-049	-025	-041	-055	083	-000	-077	257	000	-033
37.			-095	027	-016	-027	018	-012	-039	031	-021	040	-026
38.				-035	-121	062	-106	-166	-001	223	-012	-043	241
39.					018	-027	170	004	-087	051	-028	-022	-157
40.						-019	011	-027	080	-007	-032	-008	035
41.							244	206	-026	013	187	-027	-054
42.								253	-100	-064	-069	049	-119
43.									-055	009	261	-070	-351
44.										014	-100	096	116
45.											-061	107	048
46.												063	-153
47.													-116
48.													

APPENDIX N

CORRELATIONS BETWEEN THE DIFFICULTY OF TRANSFORMATIONS
THE NUMBER OF TRANSFORMATIONS PER SENTENCE, AND
SENTENCE AND PASSAGE DIFFICULTY

TABLE LXXIII

CORRELATIONS BETWEEN THE DIFFICULTY OF TRANSFORMATIONS, THE NUMBER OF TRANSFORMS PER SENTENCE AND SENTENCE AND PASSAGE DIFFICULTY
GRADE FOUR(N = 202)

	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
1.Sent.diff.	0.547	-0.128	0.591	-0.414	0.474	0.961	0.067	0.049	0.260	0.623	-0.275	1.000	0.689	0.642	0.750	0.220	0.483	0.663	0.817	0.443	0.699	0.617
2.Pass.diff.		-0.062	0.643	0.163	0.266	0.945	0.377	0.454	-0.038	0.768	-0.843	1.000	0.553	0.634	0.559	0.495	0.197	0.498	0.496	0.574	0.421	0.370
3.No. of T's			-0.218	0.275	-0.087	0.721	-0.108	-0.186	-0.129	-0.108	0.692	0.000	-0.246	-0.364	-0.202	0.714	0.190	0.050	0.057	0.433	-0.214	-0.115
4.Rel.Clause				0.000	0.063	0.000	-1.000	-0.212	-0.708	1.000	1.000	1.000	0.297	-0.193	0.424	0.000	-0.692	0.307	-0.357	1.000	-0.003	0.230
5.With Phrase					0.882	0.000	0.000	0.982	0.859	0.004	0.000	0.000	0.008	0.000	0.000	0.000	-0.866	0.000	0.000	0.000	0.347	0.959
6.Adjective						0.000	0.000	0.628	0.211	0.005	0.009	1.000	0.000	0.943	0.843	0.766	0.021	0.126	0.205	0.000	0.536	0.350
7.Appositive							0.000	-1.000	0.000	0.003	1.000	0.000	0.009	0.000	0.000	0.000	-1.000	0.000	0.624	0.000	0.000	0.000
8.Gerundive								0.000	0.000	0.000	0.007	0.000	0.008	0.000	0.000	0.000	-0.895	0.000	0.000	0.000	0.000	0.000
9.Compounds									0.426	1.000	0.008	0.000	-1.000	0.753	1.000	0.979	0.032	0.595	0.311	0.000	-0.323	-0.496
10.Genitive										1.000	0.005	0.000	-1.000	1.000	0.876	0.000	0.014	0.000	0.206	-0.855	0.107	-0.163
11.That + S											0.000	1.000	0.009	0.000	0.000	0.000	0.000	0.309	1.000	0.000	0.000	0.000
12.VP Comp												0.000	0.007	0.000	0.000	0.000	0.000	0.000	-1.000	0.000	-0.902	0.000
13.WH + S Obj.														0.000	0.000	0.000	1.000	1.000	0.000	0.001	0.000	0.000
14.Infin. as Obj.														1.000	1.000	0.000	1.000	1.000	0.967	0.004	0.000	0.000
15.Infin.of Purp.															0.846	1.000	-0.260	0.985	-0.365	-1.000	0.141	0.000
16.Ing-Nom.																0.000	0.326	0.000	0.369	0.000	0.361	0.323
17.Ing-Nom.of Purp.																	-0.256	0.000	0.000	0.000	0.586	0.254
18.Pron(gen)																		-0.061	0.261	-0.151	1.000	0.000
19.Verb + C																			0.629	-1.000	0.168	0.070
20.Adv.Replace.																				1.000	0.494	0.786
21.Adv.Expans.																					0.562	0.549
22.Conjoining																					-1.000	0.000
23.Com.Elem.Del.																						0.800
24.WH Del.																						
25.WH BE Del.																						
26.(That) + S Obj.																						
27.(That) + S Obj.Quot.																						
28.Compar. Del.																						
29.Adv.Replace.Del.																						
30.Passive																						
31.There Invers.																						
32.Question																						
33.Negation																						
34.Aspect																						
35.Imperative																						
36.Contraction																						
37.Comparative																						
38.Pron(Simple)																						
39.Indirect Obj.																						
40.Reflex-Intens.																						
41.Vocative																						
42.Expletive																						
43.NP - V Invers.																						
44.Adv.Pos.Shift																						
45.Adv.Replace.Shift																						
46.(That) + S Obj.Quot.Shift																						
47.Multi-trans.																						
48.Non-trans.Units																						

TABLE LXXIII (Continued)

	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	0.347	0.323	0.811	0.811	0.493	1.000	0.640	0.840	0.647	0.487	0.646	0.434	0.549	0.677	0.426	0.605	0.638	0.444	0.648	0.222	0.346	0.652	0.724	0.599	0.705
	0.253	-0.173	0.222	0.245	-0.061	0.629	0.326	0.613	0.432	0.356	0.319	0.293	0.380	-0.111	0.434	0.697	-0.289	0.452	0.607	0.005	0.322	0.446	0.200	0.574	0.359
	-0.441	-0.079	-0.429	0.216	-0.332	-0.901	-0.523	-0.278	0.219	0.165	-0.057	-0.302	0.118	-0.588	-0.051	-0.409	-0.899	-0.101	0.300	0.039	0.159	0.019	0.302	0.195	-0.154
	-0.170	-0.585	0.000	0.297	-0.560	0.030	-0.122	-0.313	0.000	-0.139	0.636	0.060	-1.000	0.471	0.322	1.000	0.000	0.000	0.000	0.980	0.081	-0.511	0.297	1.000	0.335
	1.000	1.000	0.001	0.000	0.000	0.001	0.000	-1.000	0.000	0.000	-0.803	0.006	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.086	0.000	0.000	-0.245
	0.651	0.262	0.006	0.785	0.000	1.000	0.354	0.097	-0.914	-0.256	0.116	0.003	0.622	0.000	0.133	0.000	0.004	1.000	0.000	0.824	0.044	0.000	1.000	0.626	0.251
	0.000	0.000	0.007	0.000	0.004	0.009	-1.000	0.000	0.000	0.000	-1.000	0.001	1.000	0.000	0.834	-1.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.990
	0.000	-1.000	0.006	1.000	0.005	0.090	-1.000	0.000	-0.524	-0.630	-1.000	0.002	1.000	1.000	1.000	0.000	0.003	0.000	0.000	1.000	0.000	-0.006	1.000	0.000	-0.497
	0.866	0.510	0.006	0.486	-1.000	0.011	0.716	0.549	1.000	0.849	-0.279	0.022	0.253	-1.000	0.249	-1.000	0.001	1.000	0.000	0.000	0.542	-0.010	-0.332	0.394	0.360
	-0.072	0.438	0.000	-0.398	-1.000	0.001	0.000	-0.546	0.000	-0.167	-0.274	0.020	0.000	0.000	0.279	0.000	0.000	0.632	-1.000	0.019	-0.286	0.000	0.000	0.702	0.061
	-0.003	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.674	1.000	0.022	-1.000	0.000	-0.685	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.751
	-1.000	0.000	0.009	0.000	0.003	0.030	0.000	1.000	1.000	-1.000	1.000	0.022	-1.000	0.000	0.976	0.000	0.001	0.070	0.003	0.000	0.000	0.000	0.000	0.000	0.122
	0.000	0.000	0.000	0.000	0.002	0.030	0.000	0.000	0.000	1.000	-1.000	0.001	-1.000	0.000	0.000	0.000	0.000	0.077	0.033	0.000	0.000	0.000	0.336	0.000	0.000
	0.000	1.000	0.008	0.770	0.000	0.001	0.767	0.000	0.000	-1.000	0.519	0.000	1.000	0.000	0.484	0.000	0.004	-0.005	0.044	0.000	-0.844	0.000	0.000	-1.000	0.490
	0.908	0.274	0.000	0.333	0.000	0.000	0.871	1.000	0.549	0.279	0.965	0.000	-0.959	0.572	0.094	1.000	0.030	0.050	0.001	0.000	0.564	0.583	0.000	0.664	0.253
	1.000	0.984	0.000	1.000	-1.000	0.008	1.000	0.000	0.000	0.650	0.000	0.008	0.000	0.000	0.421	1.000	0.000	0.001	0.011	0.000	0.000	0.000	1.000	0.000	0.323
	0.496	0.051	-1.000	0.750	0.000	0.070	0.000	0.360	0.000	0.915	0.117	1.000	0.000	0.000	-0.022	0.375	0.000	0.000	-1.000	0.121	0.317	-0.002	0.552	0.771	0.152
	0.000	-0.472	1.000	0.000	-0.477	-0.992	0.000	-0.766	0.000	0.458	0.959	0.000	0.460	1.000	0.071	-0.870	0.000	0.000	0.000	0.000	0.918	0.969	0.000	0.605	0.337
	0.000	0.299	1.000	0.530	0.000	0.000	0.987	0.000	0.000	1.000	0.652	-0.166	0.109	0.500	0.318	0.925	0.061	0.000	0.000	-0.238	0.826	0.988	0.552	0.650	0.417
	0.000	0.000	0.000	0.878	-1.000	0.000	0.000	0.000	0.000	0.406	0.000	0.000	0.000	0.675	0.302	1.000	0.001	-1.000	0.000	0.000	0.000	-0.892	1.000	0.000	0.182
	-0.831	0.000	0.000	0.000	1.000	-0.968	0.555	0.000	0.233	0.137	0.474	1.000	0.000	0.000	0.192	1.000	0.000	0.632	0.358	-0.903	-0.316	0.278	0.000	-1.000	0.352
	-1.000	0.260	0.000	0.961	-1.000	-1.000	0.971	0.983	0.000	-0.949	0.371	0.000	0.000	0.000	0.237	1.000	0.000	0.000	-0.067	0.000	-0.083	0.163	0.821	0.000	0.339
		0.067	0.000	0.894	-1.000	0.000	0.940	-0.951	-1.000	0.237	1.000	0.000	0.000	0.000	0.325	0.000	0.000	0.000	0.000	-1.000	0.000	0.000	0.000	0.000	-0.155
		0.036	0.000	0.000	0.000	0.000	0.998	-0.879	1.000	-0.949	1.000	0.000	0.000	0.000	0.122	1.000	0.000	0.000	0.000	-1.000	0.396	0.000	-1.000	0.000	0.206
			0.000	-1.000	-0.269	0.000	1.000	0.253	0.968	1.000	-0.133	0.822	0.450	0.000	0.760	1.000	0.001	0.293	0.000	-0.218	0.706	0.671	0.948	-0.179	0.087
			0.000	1.000	0.000	0.000	1.000	0.000	0.000	1.000	0.000	0.000	0.000	-0.307	0.286	1.000	0.000	0.000	-0.070	0.000	0.000	0.751	0.000	0.000	0.142
							0.887	1.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.397	0.000	0.088	0.000	0.000	0.000	0.730	0.000	0.000	0.000	-0.714
							0.000	0.000	0.000	0.000	-0.709	0.000	0.000	1.000	0.000	0.000	0.001	0.000	-1.000	0.000	0.594	0.000	0.000	0.000	0.542
								0.000	0.000	0.739	0.999	0.000	0.000	0.000	0.614	1.000	0.033	0.000	0.000	-0.995	0.446	1.000	0.988	0.000	0.782
								0.226	0.000	0.999	0.065	0.000	0.000	0.000	0.580	1.000	0.030	0.000	1.000	0.481	0.000	0.000	1.000	0.000	0.738
															0.089	0.958	0.001	0.000	0.000	-0.709	0.293	0.472	0.347	0.717	0.417
															0.151	0.000	0.000	0.653	1.000	1.000	0.190	0.590	0.655	0.000	0.312
															0.294	0.000	0.000	0.000	-1.000	0.014	1.000	1.000	0.841	0.000	-0.423
															0.898	0.000	0.000	0.443	0.858	-0.240	0.259	0.000	0.556	0.293	0.354
															0.348	0.000	0.000	0.000	0.000	0.000	0.000	0.553	0.000	0.000	0.252
															1.000	0.280	0.000	0.000	0.609	0.756	0.000	1.000	0.000	0.000	-0.604
																				0.805	0.000	1.000	-0.043	0.000	-0.908
																				0.688	1.000	-1.000	-0.189	0.000	0.739
																							0.000	0.999	0.559
																								0.747	-0.090
																								-0.306	0.126
																									-0.882
																									0.765

TABLE LXXIV

CORRELATIONS BETWEEN THE DIFFICULTY OF TRANSFORMATIONS, THE NUMBER OF TRANSFORMS PER SENTENCE AND SENTENCE AND PASSAGE DIFFICULTY

GRADE FIVE(N = 129)

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1.Sent.diff.	0.512	-0.046	0.686	0.297	0.570	0.000	-0.342	0.504	0.426	0.291	0.560	0.501	0.345	0.643	0.605	0.802	0.373	0.792	0.639	0.656	0.675	0.586
2.Pass.diff.		-0.030	0.382	0.208	0.085	0.000	0.242	0.490	0.166	0.397	0.022	0.197	0.229	0.260	0.462	0.924	0.071	0.189	0.358	0.183	0.494	0.451
3.No. of T's			-0.189	-0.109	-0.022	0.000	-0.626	-0.231	-0.352	0.529	-0.090	0.489	0.178	0.037	-0.104	-0.305	0.186	0.189	0.151	-0.706	-0.256	-0.293
4.Rel.Clause				0.000	-0.544	0.000	-1.000	-0.168	-0.698	0.000	0.803	0.011	0.581	1.000	0.315	0.001	0.000	-0.327	0.446	0.007	0.121	0.292
5.With Phrase					0.508	0.000	0.000	0.000	0.000	-0.137	0.878	0.000	0.981	0.194	0.000	0.003	-0.003	-0.627	0.000	0.044	0.000	0.000
6.Adjective						0.000	-1.000	0.753	0.373	0.000	0.000	0.000	0.000	0.000	0.654	0.003	0.000	0.000	0.028	0.077	0.339	0.215
7.Appositive							0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.000	0.000	0.000	0.009	0.000	0.000
8.Gerundive								0.000	0.000	0.000	0.900	0.033	0.000	0.000	0.088	0.030	0.000	0.000	0.000	0.003	0.000	0.000
9.Compounds									0.305	-0.973	0.000	0.009	0.001	0.000	0.067	0.008	-0.812	0.526	0.040	0.009	0.000	0.000
10.Genitive										0.985	0.000	0.002	0.009	0.637	0.001	0.009	0.403	0.000	0.235	0.000	0.109	-0.302
11.That + S											0.836	0.000	0.001	1.000	0.088	0.099	0.000	0.974	0.000	0.088	0.192	-0.446
12.VP Comp.												0.000	0.088	0.141	0.010	0.000	0.000	0.000	0.000	0.077	-0.249	0.000
13.WH + S Obj.													0.066	0.729	0.088	0.000	0.000	0.000	0.000	0.033	0.000	0.000
14.Infin. as Obj.														-0.246	0.011	0.001	0.000	0.000	0.000	0.006	0.000	0.804
15.Infin.of Purp.															-1.000	1.000	-0.618	0.851	0.596	0.004	0.345	0.504
16.Ing-Nom.																0.500	0.000	0.000	-0.181	0.005	-0.016	0.357
17.Ing-Nom.of Purp.																	0.416	0.000	0.000	0.001	0.000	0.000
18.Pron(gen)																		0.009	-0.066	0.000	-0.175	0.005
19.Verb + C																			0.000	0.001	0.710	0.000
20.Adv. Replace.																				0.000	0.459	0.159
21.Adv.Expans.																					1.000	0.000
22.Conjoining																						0.865
23.Com.Elem.Del.																						
24.WH Del.																						
25.WH Be Del.																						
26.(That) + S Obj.																						
27.(That) + S Obj.Quot.																						
28.Compar.Del.																						
29.Adv.Replace.Del.																						
30.Passive																						
31.There Invers.																						
32.Question																						
33.Negation																						
34.Aspect																						
35.Imperative																						
36.Contraction																						
37.Comparative																						
38.Pron(Simple)																						
39.Indirect Obj.																						
40.Reflex-Intens.																						
41.Vocative																						
42.Expletive																						
43.NP - V Invers.																						
44.Adv.Pos.Shift.																						
45.Adv.Replace.Shift																						
46.(That) + S Obj.Shift																						
47.Multi-transforms.																						
48.Non-trans.Units																						

TABLE LXXIV (Continued)

24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
0.483	-0.012	0.493	0.736	0.556	0.000	0.681	0.727	0.795	0.596	0.640	0.458	0.091	0.577	0.432	0.405	-0.420	0.429	0.070	0.500	0.263	0.604	0.613	0.223	0.601
0.493	0.020	0.275	0.252	-0.031	0.000	0.384	0.673	0.425	0.405	0.353	0.383	0.484	-0.158	0.290	0.601	-0.957	0.279	0.266	0.306	-0.060	0.093	0.232	0.065	0.377
0.051	0.059	-0.129	0.195	-0.396	0.000	0.392	0.025	-0.188	-0.050	-0.026	0.051	0.572	-0.541	-0.180	0.053	0.072	-0.468	-0.130	-0.259	0.205	0.135	0.310	0.386	-0.012
0.998	-0.496	0.007	1.000	1.000	0.001	0.344	0.229	0.000	0.387	0.866	0.000	0.000	-0.395	0.068	0.500	0.004	0.000	0.000	0.000	-0.545	0.116	0.000	-0.511	0.580
0.000	0.000	0.022	0.000	0.001	0.000	0.000	0.000	0.000	0.000	-1.000	0.000	0.000	0.437	1.000	0.138	0.004	0.000	-0.241	0.161	-0.178	0.746	0.000	0.000	-0.372
0.000	-0.336	0.022	0.462	0.066	0.001	0.438	0.672	0.087	-0.245	0.196	0.000	0.192	1.000	0.193	1.000	0.001	0.000	-0.433	0.000	0.000	0.000	0.355	0.000	-0.016
0.000	0.000	0.009	0.000	0.077	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.009	0.000	0.006	0.009	-1.000	0.000	0.000	0.007	-0.843	0.000	0.000	0.000	0.000	0.000	-0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.894	0.000	0.001	0.115	0.005	0.001	1.000	0.000	-1.000	0.836	0.235	0.000	0.816	0.000	0.133	0.948	0.005	0.000	0.000	1.000	0.363	-0.354	0.654	0.179	-0.300
0.000	-0.230	0.077	-0.997	0.001	0.001	0.000	-0.570	0.007	0.885	0.419	1.000	0.000	0.000	0.664	1.000	-0.044	0.000	0.908	0.690	0.496	0.589	-0.997	1.000	0.310
0.300	-0.195	0.001	0.000	0.000	0.000	0.000	0.000	0.009	1.000	0.000	0.099	0.000	1.000	-0.579	0.000	-0.011	-1.000	-0.975	1.000	0.000	-1.000	0.000	0.001	-0.058
0.000	0.000	0.006	0.000	0.000	0.008	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	-0.540	0.259	0.009	0.004	-0.003	1.000	0.000	0.000	0.000	0.000	-0.969
0.000	0.000	0.005	0.000	0.056	0.088	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.162
0.000	0.000	0.000	-0.441	-0.005	0.003	0.890	0.000	0.002	0.000	1.000	0.001	0.000	0.000	0.613	0.000	0.000	0.044	-1.000	0.000	0.000	0.000	0.000	0.011	0.000
-1.000	-0.547	0.009	-0.552	0.044	0.000	0.585	0.000	1.000	0.000	0.999	0.000	1.000	0.619	-0.168	0.342	0.004	0.003	0.511	-0.934	-0.334	0.000	-0.230	0.009	0.281
0.000	0.000	0.009	0.000	0.001	0.004	0.000	0.000	0.000	0.566	1.000	0.001	0.000	0.000	0.355	0.000	0.008	0.004	0.000	0.000	0.000	-0.095	0.000	0.005	-0.009
0.000	0.000	0.000	1.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.421	0.000	0.001	0.001	0.000	0.000	0.000	0.000	1.000	0.006	0.453
1.000	-0.010	1.000	0.823	0.878	0.004	0.000	0.041	0.788	0.502	0.016	0.000	-1.000	0.000	0.219	0.797	0.099	0.001	1.000	0.000	0.460	0.159	0.914	0.000	0.741
0.000	1.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.779	1.000	0.000	0.000	0.000	0.349	0.000	0.000	0.011	0.000	-0.444	1.000	0.000	0.000	1.000	0.122
0.000	-0.379	0.875	0.012	1.000	0.011	0.975	0.739	1.000	0.245	0.754	-0.975	1.000	0.000	0.472	0.566	0.000	-0.926	0.000	0.000	0.748	0.986	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.563	0.000	0.000	0.588	0.675	0.000	0.000	0.000	0.000	-0.510	0.000	1.000	0.000	1.000	0.137
0.884	-0.150	0.000	0.000	0.000	0.000	0.559	0.912	0.000	0.339	0.523	1.000	0.000	0.627	0.566	0.815	0.004	1.000	0.854	0.000	0.071	-0.111	0.000	0.000	0.746
0.000	-0.208	0.000	0.637	0.000	0.004	1.000	1.000	0.000	0.443	0.670	0.000	0.000	0.000	0.378	1.000	0.033	0.682	0.943	0.000	0.143	-0.283	1.000	0.000	0.342
0.000	0.000	0.000	0.000	0.000	0.003	1.000	0.890	0.000	0.980	0.000	0.000	0.000	0.000	0.342	1.000	0.003	0.000	0.000	0.000	0.000	0.000	0.637	0.000	0.079
	0.000	0.000	-1.000	1.000	0.002	1.000	-0.076	-1.000	0.687	-0.085	0.000	0.000	0.000	-0.230	1.000	0.009	0.000	0.000	0.000	0.248	0.436	0.000	0.000	0.318
		0.000	0.000	0.000	0.003	1.000	0.000	0.694	0.994	-1.000	0.748	0.510	-1.000	0.462	-1.000	0.003	-0.161	0.953	-1.000	-1.000	0.000	0.000	0.000	-0.189
			0.000	0.000	0.000	1.000	-1.000	0.000	0.000	0.208	0.000	0.000	0.000	0.627	-1.000	0.001	0.004	0.000	0.000	0.000	0.163	0.956	1.000	-0.504
						1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.882	0.000	0.088	0.001	0.000	0.014	-1.000	1.000	0.000	0.000	0.498
						0.000			0.801	-0.687	0.000	0.000	0.009	0.000	0.000	0.009	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.440
									0.000	0.523	0.000	0.000	0.088	0.381	0.829	0.001	0.009	0.000	0.000	-0.265	0.000	0.805	0.000	0.404
										0.000	0.000	0.832	0.006	0.500	1.000	0.005	0.302	1.000	-0.973	-0.797	0.928	0.000	0.000	1.000
										0.272		0.000	0.000	0.311	0.725	0.004	0.000	1.000	0.965	0.879	0.000	0.694	-0.655	0.472
													0.000	0.182	1.000	0.006	0.558	0.000	-0.986	-0.132	0.050	0.746	0.000	0.270
														0.332	-0.289	0.000	0.000	-1.000	0.000	0.269	0.527	0.590	-0.190	-0.352
														0.023	0.000	0.000	0.000	0.612	-0.934	0.000	0.000	0.795	0.000	0.280
														0.249	-1.000	0.000		0.000	0.000	0.422	0.569	0.737	0.384	0.434
														0.000	-0.090			0.971	-0.316	0.000	0.431	0.000	0.000	0.185
																			0.000	-1.000	0.000	-0.161	0.000	0.485
																			-0.420	1.000	-1.000	0.142	0.000	-0.650
																					0.941	0.000	1.000	0.200
																							0.000	0.234
																								0.067
																								0.129
																								0.011
																								-0.379
																								0.494

TABLE LXXV

CORRELATIONS BETWEEN THE DIFFICULTY OF TRANSFORMATIONS, THE NUMBER OF TRANSFORMS PER SENTENCE AND SENTENCE AND PASSAGE DIFFICULTY

GRADE SIX (N = 109)

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1.Sent.diff.	0.717	-0.074	0.759	0.481	0.464	1.000	0.620	0.635	0.337	0.848	0.873	1.000	0.453	0.544	0.606	0.807	0.462	0.731	0.800	0.422	0.775	0.640
2.Pass.diff.		-0.026	0.647	0.368	0.378	1.000	0.753	0.560	0.159	0.101	0.676	1.000	0.290	0.436	0.672	0.900	0.286	0.317	0.531	0.065	0.637	0.448
3.No. of T's			-0.436	-0.606	-0.027	0.000	-0.072	-0.294	0.031	-0.503	0.539	0.000	-0.024	-0.168	-0.163	-0.885	0.171	-0.415	-0.061	-0.932	-0.277	-0.323
4.Rel.Clause				0.000	0.000	0.000	1.000	0.176	-0.744	1.000	1.000	1.000	0.189	0.949	0.611	0.000	-0.413	0.984	0.143	1.000	0.521	0.672
5.With Phrase					0.349	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.995	0.993
6.Adjective						0.000	1.000	0.000	0.228	1.000	1.000	1.000	0.000	0.511	0.433	0.884	0.569	0.000	0.484	0.000	0.311	0.048
7.Appositive							0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-1.000	0.000	1.000	0.000	1.000	0.000
8.Gerundive								0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	-1.000	-1.000
9.Compounds									0.000	1.000	0.000	0.000	1.000	0.977	-1.000	1.000	-0.423	0.388	0.502	0.000	0.646	0.524
10.Genitive										1.000	1.000	1.000	1.000	1.000	0.708	0.000	0.457	0.000	0.436	-1.000	0.330	0.116
11.That + S											0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.945	0.980	0.000	1.000	0.000
12.VP Comp.												0.000	0.000	0.000	0.000	0.000	-1.000	0.000	0.000	0.000	0.879	0.000
13.WH + S Obj.													0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	1.000	0.000
14.Infin. as Obj.														0.790	0.000	0.000	0.997	1.000	1.000	0.000	0.881	0.995
15.Infin. of Purp.															0.502	1.000	-0.223	0.000	1.000	0.000	0.668	0.463
16.Ing-Nom.																0.000	-0.184	0.505	0.869	1.000	0.396	0.196
17.Ing-Nom. of Purp.																	1.000	0.000	0.113	0.000	0.000	0.000
18.Pron(gen)																		0.812	0.124	-1.000	0.365	0.112
19.Verb + C																			0.981	1.000	0.756	1.000
20.Adv. Replace.																				1.000	0.549	0.335
21.Adv.Expans.																					0.000	0.000
22.Conjoining																						0.872
23.Com.Elem.Del.																						
24.WH Del.																						
25.WH BE Del.																						
26.(That) + S Obj.																						
27.(That) + S Obj.Quot.																						
28.Compar.Del.																						
29.Adv.Replace.Del.																						
30.Passive																						
31.There Invers.																						
32.Question																						
33.Negation																						
34.Aspect																						
35.Imperative																						
36.Contraction																						
37.Comparat've																						
38.Front(Simple)																						
39.Indirect Obj.																						
40.Reflex-Intens.																						
41.Vocative																						
42.Expletive																						
43.NP - V Invers.																						
44.Adv.Pos.Shift																						
45.Adv.Replace.Shift.																						
46.(That) + S Obj.Quot.Shift.																						
47.Multi-transforms.																						
48.Non-trans.Units																						

TABLE LXXV (Continued)

	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
1	0.668	0.454	0.936	0.801	0.617	0.907	0.778	0.817	0.962	0.622	0.729	0.431	0.628	0.807	0.561	0.262	0.039	0.666	0.969	0.673	0.408	0.780	0.868	-0.057	0.764
2	0.437	0.369	0.463	0.510	0.351	0.893	0.459	0.822	0.535	0.620	0.479	0.425	0.717	0.498	0.447	0.193	0.378	0.663	0.787	0.785	0.344	0.627	0.467	0.033	0.613
3	-0.471	0.092	-0.287	0.348	-0.589	0.475	-0.342	-0.497	0.419	0.048	-0.136	-0.340	-0.359	-0.680	-0.141	-0.111	0.175	-0.351	0.047	-0.103	-0.042	-0.192	0.339	0.033	-0.077
4	0.203	0.268	0.000	1.000	0.749	0.000	0.845	0.689	0.000	0.010	0.731	0.000	1.000	0.999	0.634	0.001	0.001	0.000	0.001	-1.000	0.333	0.573	1.000	1.000	0.571
5	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.205	0.005	0.000	0.000	0.128	0.005	0.008	1.000	0.001	0.003	0.001	0.003	0.003	0.090	-0.309
6	0.890	0.178	0.077	0.443	0.000	1.000	0.733	0.536	0.966	0.434	0.218	0.003	0.000	0.000	0.001	0.906	0.004	0.003	0.714	0.152	-0.146	0.240	0.028	0.000	0.357
7	0.000	0.000	0.009	0.000	0.000	0.001	0.000	0.000	0.000	0.000	1.000	0.004	1.000	0.000	1.000	0.006	0.000	0.007	0.003	0.003	0.009	0.001	0.000	0.003	1.000
8	0.000	1.000	0.009	0.000	-1.000	0.011	0.843	0.866	0.000	0.978	0.353	0.009	0.534	-1.000	0.450	0.001	0.002	0.000	0.003	0.007	0.000	0.000	1.000	0.001	0.690
9	0.000	0.311	0.008	0.932	-1.000	0.009	0.000	-0.467	-1.000	0.882	0.307	0.001	1.000	0.001	0.364	0.828	0.000	1.000	0.000	1.000	1.000	0.314	0.932	0.566	0.519
10	0.891	0.291	0.001	-0.003	0.000	0.007	0.000	0.000	0.002	0.040	1.000	1.000	1.000	0.000	0.748	1.000	0.000	1.000	-1.000	-0.060	0.277	0.378	-0.003	-0.884	0.012
11	0.375	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.022	-0.383	1.000	0.009	1.000	0.011	1.000	0.009	0.004	0.000	0.002	0.000	0.001	0.090	0.090	0.009	0.417
12	0.000	0.000	0.011	0.000	0.000	0.034	0.680	1.000	0.099	1.000	1.000	0.008	1.000	0.055	-1.000	0.000	0.003	0.000	0.001	0.001	0.004	0.001	0.010	0.001	0.933
13	1.000	0.000	0.004	0.000	0.000	0.055	0.989	1.000	0.008	-1.000	-0.110	0.001	-1.000	0.044	0.079	0.000	0.004	0.003	0.008	0.003	0.005	0.040	0.000	1.000	0.000
14	0.000	0.912	0.002	1.000	1.000	0.004	1.000	1.000	0.000	0.000	0.839	0.011	0.000	0.000	0.054	1.000	0.001	0.001	0.000	0.004	0.000	0.004	0.070	0.080	0.239
15	0.000	0.053	0.033	0.696	0.000	0.003	0.000	0.000	1.000	-0.805	0.904	0.005	0.000	1.000	0.343	0.000	0.004	0.000	0.001	0.000	0.000	0.000	0.000	0.718	0.151
16	0.763	1.000	0.022	1.000	1.000	0.000	1.000	0.143	0.006	0.398	0.000	0.044	0.000	0.000	-0.426	0.005	0.001	0.004	0.001	0.001	-0.644	0.140	0.069	0.009	0.525
17	1.000	0.000	0.033	0.000	0.000	0.648	-0.116	0.000	0.001	0.000	0.058	0.009	0.435	0.000	0.183	0.403	0.000	0.004	0.684	0.274	-0.089	0.002	1.000	0.561	0.995
18	1.000	0.000	0.098	0.585	-0.158	0.000	0.918	0.431	0.000	0.484	0.604	1.000	1.000	0.003	0.674	0.001	0.000	-0.089	0.001	0.000	0.001	1.000	0.040	-0.135	0.325
19	0.000	0.125	1.000	0.000	0.000	0.000	0.892	0.965	0.011	-0.180	0.559	0.000	0.862	1.000	0.621	-0.128	0.004	0.001	0.000	0.484	0.436	0.990	0.645	-0.394	0.585
20	0.203	1.000	1.000	0.719	1.000	0.000	1.000	0.998	1.000	0.214	0.000	-0.116	1.000	0.001	0.771	0.004	0.005	1.000	0.009	0.008	0.304	1.000	0.000	-0.090	0.537
21	0.000	0.310	0.000	0.000	1.000	0.890	1.000	0.746	0.000	1.000	0.703	0.000	0.812	-0.189	0.441	-0.063	0.001	0.790	0.000	0.448	0.578	0.288	0.865	-0.643	-0.020
22	1.000	0.000	0.000	0.729	1.000	-0.380	1.000	0.307	0.000	0.297	0.717	1.000	0.000	0.327	0.364	1.000	0.005	0.001	0.771	0.001	0.994	0.031	0.000	0.009	0.587
23	1.000	0.308	0.000	0.814	1.000	0.005	0.931	0.000	1.000	0.262	0.372	-1.000	0.000	0.000	0.278	1.000	0.000	0.004	0.521	0.000	0.231	0.040	1.000	0.008	0.432
24	0.000	-0.018	0.000	0.000	0.000	0.044	0.000	1.000	0.000	0.194	-0.103	0.000	0.000	0.000	0.010	0.003	0.009	0.004	0.003	1.000	0.552	0.730	0.814	0.000	0.581
25	0.760	0.249		0.000	0.000	0.066		0.000	1.000	0.384	-1.000	0.000	0.704	0.002	0.485	1.000	0.003	0.628	0.101	1.000	0.001	0.000	0.030	0.001	0.152
26	1.000					0.005		0.000	0.000	0.756	0.432	0.482	0.009	0.990	0.259	0.004	0.002	0.001	0.000	0.019	0.366	0.000	1.000	1.000	0.560
27								0.096	0.000	0.000	0.000	0.000	0.011	0.001	0.839	0.000	0.002	0.009	0.740	0.003	0.000	0.784	-0.009	0.090	0.534
28									0.953	0.000	0.151	0.001	0.088	1.000	1.000	0.007	0.000	0.008	0.004	0.003	0.000	1.000	1.000	0.060	0.741
29									0.004	0.000	0.841	0.055	0.011	0.006	0.311	0.004	0.009	0.007	0.001	0.000	0.247	1.000	0.004	0.005	0.556
30									0.006	0.400	0.000	0.006	0.009	0.001	0.736	0.004	0.004	1.000	0.001	0.673	0.001	0.982	0.005	0.005	0.626
31									0.005	0.000	0.363	0.005	0.000	0.000	0.454	0.574	0.001	0.005	1.000	1.000	0.000	0.070	0.010	0.006	0.915
32									0.001			1.000	0.000	0.003	0.391	1.000	0.000	0.926	0.009	0.638	0.000	0.198	0.000	-0.087	0.595
33												1.000	0.908	0.000	0.458	0.708	0.009	0.001	1.000	0.004	0.000	0.428	0.983	0.175	0.422
34													0.000	0.003	-0.964	0.000	0.004	-0.382	1.000	0.763	-0.447	-1.000	1.000	0.004	0.534
35														0.009	0.070	0.001	0.001	0.000	0.004	-0.316	0.145	0.090	0.524	0.474	-0.364
36															-0.525	0.694		0.007	0.005	0.003	0.539	1.000	0.704	0.009	0.234
37																			0.000	0.500	0.375	-1.000	0.090	-0.019	0.598
38																			0.910	0.163	-1.000	0.000	0.433	-0.008	0.439
39																			0.976	0.001	0.091	0.030	0.001	0.090	-0.205
40																			0.000	0.000	0.000	0.001	0.854	0.010	0.445
41																			0.980	0.912	0.008	0.356	0.090	0.040	0.527
42																				0.921	0.000	0.708	-0.111	0.009	0.853
43																					0.009		-1.000	0.000	0.709
44																								-0.394	0.208
45																									-0.448
46																								1.000	0.566
47																									0.370

TABLE LXXVI

CORRELATIONS BETWEEN THE DIFFICULTY OF TRANSFORMATIONS, THE NUMBER OF TRANSFORMS PER SENTENCE AND SENTENCE AND PASSAGE DIFFICULTY
TOTAL GROUP(N = 440)

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1.Sent.diff.	0.656	-0.083	0.668	0.059	0.527	0.698	0.297	0.587	0.417	0.790	0.662	0.800	0.439	0.517	0.623	0.580	0.452	0.727	0.795	0.439	0.740	0.524
2.Pass.diff.		-0.039	0.608	0.422	0.314	0.772	0.525	0.531	0.209	0.487	0.142	0.840	0.265	0.477	0.543	0.758	0.258	0.417	0.548	0.418	0.573	0.435
3.No. of T's			-0.248	-0.346	-0.031	0.119	-0.099	-0.217	-0.096	-0.154	0.424	0.010	-0.118	-0.231	-0.167	0.176	0.169	-0.127	-0.002	-0.377	-0.236	-0.220
4.Rel.Clause				0.001	0.041	0.090	0.726	-0.035	-0.668	0.826	0.686	0.732	0.434	0.467	0.384	0.080	-0.349	0.597	-0.070	0.601	0.254	0.389
5.With Phrase					0.630	0.000	0.001	0.978	-0.160	0.090	0.008	0.000	0.008	-0.786	0.009	0.000	0.441	0.008	0.000	0.000	0.687	0.911
6.Adjective						-1.000	0.130	0.555	0.322	0.107	0.000	0.000	1.000	0.583	0.516	0.322	0.284	0.190	0.355	1.000	0.447	0.221
7.Appositive							0.080	0.205	0.001	0.000	0.495	0.070	0.000	0.010	0.008	0.000	-0.882	0.000	0.697	0.000	0.526	0.030
8.Gerundive								0.090	0.000	0.008	0.050	0.007	0.000	0.003	0.000	0.004	-0.882	0.040	0.070	0.003	-0.113	0.268
9.Compounds									0.301	0.902	0.569	0.000	0.514	0.834	0.861	0.931	-0.227	0.537	0.368	-1.000	0.511	0.151
10.Genitive										0.956	0.001	0.003	0.666	0.687	0.783	0.003	0.314	0.004	0.334	-0.675	0.282	-0.088
11.That + S											0.030	0.566	0.003	0.008	0.000	0.022	0.008	0.718	0.935	0.002	-0.321	0.001
12.VP Comp												0.004	0.002	0.000	0.080	0.080	-0.602	0.003	0.773	0.001	0.421	0.030
13.WH + S Obj.													0.010	0.004	0.001	0.055	0.009	0.265	0.001	0.000	0.740	0.000
14.Infin. as Obj.														0.683	0.753	0.955	0.801	0.876	0.522	0.040	0.669	0.000
15.Infin.of Purp.															0.763	0.000	-0.376	0.001	0.511	0.000	0.466	0.843
16.Ing-Nom.																0.000	0.065	0.848	0.221	-0.066	0.273	0.274
17.Ing-Nom.of Purp.																	0.334	0.010	0.030	-0.020	1.000	0.063
18.Pron(gen)																		0.168	0.220	-0.307	0.207	0.002
19.Verb + C																			0.821	-0.629	0.416	0.144
20.Adv.Replace.																				0.799	0.498	0.851
21.Adv.Expans.																					-0.982	0.412
22.Conjoining																						0.022
23.Com.Elem.Del.																						0.819
24.WH Del.																						
25.WH BE Del.																						
26.(That) + S Obj.																						
27.(That) + S Obj.Quot.																						
28.Compar.Del.																						
29.Adv.Replace.Del.																						
30.Passive																						
31.There Invers.																						
32.Question																						
33.Negation																						
34.Aspect																						
35.Imperative																						
36.Contraction																						
37.Comparative																						
38.Pron(Simple)																						
39.Indirect Obj.																						
40.Reflex-Intens.																						
41.Vocative																						
42.Expletive																						
43.NP - V Invers.																						
44.Adv.Pos.Shift																						
45.Adv.Replace.Shift																						
46.(That) + S Obj.Quot.Shift																						
47.Multi-transforms.																						
48.Non-trans.Units																						

TABLE LXVI (Continued)

24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
0.533	0.371	0.786	0.797	0.634	0.667	0.725	0.816	0.771	0.530	0.705	0.530	0.483	0.725	0.502	0.602	0.547	0.188	0.761	0.429	0.382	0.718	0.798	0.330	0.741
0.421	0.290	0.402	0.468	0.278	0.757	0.437	0.721	0.544	0.430	0.459	0.496	0.553	0.159	0.435	0.563	0.554	0.249	0.651	0.357	0.320	0.480	0.465	0.133	0.516
-0.382	0.026	-0.281	0.245	-0.302	0.255	-0.084	-0.308	0.144	0.096	-0.073	-0.220	0.309	-0.498	-0.114	-0.250	-0.402	-0.280	0.065	-0.130	0.062	-0.061	0.267	0.181	-0.094
0.194	-0.230	0.030	0.470	0.232	0.001	0.282	0.119	0.090	0.035	0.735	0.001	0.046	0.175	-0.383	0.612	0.000	0.000	0.000	-0.706	-0.011	-0.205	0.208	-0.043	0.483
0.859	0.451	0.002	0.002	0.001	0.050	1.000	-1.000	0.004	1.000	-0.254	0.090	0.001	0.584	-0.594	0.009	0.001	0.001	0.001	0.001	0.967	0.000	0.000	0.000	-0.115
0.619	0.162	0.000	0.595	0.090	0.627	0.486	0.475	0.244	0.007	0.207	0.000	0.084	0.752	0.150	0.673	0.854	0.000	0.247	0.386	-0.050	0.279	0.281	0.313	0.281
0.002	0.003	0.099	0.001	0.000	0.000	0.090	0.008	0.009	0.003	0.527	0.033	0.823	0.000	0.799	0.003	0.001	0.033	0.000	0.000	0.000	0.001	0.872	0.090	0.680
0.001	0.622	0.040	0.800	0.033	0.010	0.601	0.000	-0.612	0.229	-0.007	0.001	0.010	0.900	0.654	0.009	0.000	0.003	0.008	0.843	0.003	0.090	0.759	0.000	0.030
0.869	0.261	0.000	0.576	0.458	0.099	0.702	0.607	0.680	0.768	0.217	0.080	0.476	-0.218	0.378	0.677	0.099	0.000	0.000	0.418	0.640	0.148	-0.105	-0.167	0.463
-0.100	0.257	0.022	-0.164	-0.017	0.000	0.001	-0.426	0.080	0.042	0.277	0.552	0.901	0.000	0.431	0.529	0.841	0.010	-0.029	0.121	-0.106	0.391	0.000	-0.347	0.176
0.044	0.009	0.044	0.008	0.040	0.033	0.090	0.003	0.000	0.111	0.803	0.000	0.000	0.033	0.616	0.090	0.000	0.005	0.001	0.008	0.000	0.000	0.000	0.000	0.186
0.899	0.030	0.001	0.010	0.000	0.020	0.000	0.920	0.003	0.411	0.498	0.088	0.001	0.008	-0.158	0.000	0.033	0.055	0.000	0.000	0.009	0.099	-1.000	0.088	0.867
0.000	0.033	0.001	0.040	0.001	0.005	0.033	0.003	0.000	0.312	-0.275	0.001	0.001	0.000	-0.575	0.001	0.000	0.099	0.009	0.000	0.009	0.099	0.447	0.000	0.090
0.003	0.263	0.000	0.002	0.008	0.000	0.694	0.080	0.033	0.000	0.697	0.080	0.778	0.044	0.260	0.003	0.001	0.090	0.000	0.010	0.080	0.003	0.974	-0.245	0.286
0.551	0.104	0.030	0.442	0.044	0.010	0.839	0.553	0.423	-0.785	0.919	0.022	0.446	0.740	0.052	0.728	0.030	0.080	0.002	0.003	-0.687	0.030	0.900	0.472	0.215
0.513	0.988	0.000	0.953	0.581	0.003	0.915	0.737	0.000	0.457	-1.000	0.000	0.001	0.000	0.395	0.070	0.000	0.000	0.003	0.000	0.486	0.462	0.549	0.008	0.412
0.022	0.000	0.000	0.900	0.000	0.000	0.033	0.080	0.080	0.921	0.113	0.004	0.080	0.429	-0.073	0.000	0.000	0.000	0.030	0.009	0.000	0.000	0.000	0.431	0.687
0.104	0.101	0.339	0.607	0.000	0.000	0.000	0.332	0.626	0.397	0.737	0.644	-0.024	0.003	-0.172	0.194	0.010	0.044	0.305	0.090	0.416	0.097	0.632	0.194	0.256
0.000	-0.535	0.885	0.010	0.048	0.048	0.575	0.001	0.001	0.269	0.662	-0.212	0.697	0.807	0.456	0.088	0.003	0.080	0.001	0.000	0.704	0.903	0.000	0.000	0.426
0.486	0.226	0.787	0.584	0.000	0.001	0.691	0.410	0.382	0.294	0.000	0.003	0.644	0.958	0.503	-0.494	-0.127	0.000	0.003	0.000	0.721	0.990	0.735	-0.423	0.458
0.261	0.003	0.030	0.001	0.820	0.020	0.002	0.000	0.009	0.324	0.588	0.881	0.779	0.459	0.566	0.579	0.088	0.077	0.001	0.029	0.913	-0.154	0.773	0.003	0.297
0.507	0.334	0.408	0.595	0.769	0.000	0.630	0.879	0.000	0.349	0.601	0.622	0.583	0.814	0.387	0.797	0.611	0.008	0.533	0.000	0.005	0.179	0.000	0.000	0.490
0.639	0.162	0.080	0.793	0.250	0.000	0.872	0.672	0.233	0.253	0.338	0.000	0.000	-0.193	0.322	0.657	0.751	0.009	0.529	0.207	0.191	0.058	0.846	0.004	0.404
	0.184	0.001	0.000	0.689	0.556	0.936	0.150	0.001	-0.118	-0.066	0.020	0.001	0.000	0.411	0.000	0.000	0.000	0.000	-0.537	0.000	0.659	1.000	0.007	0.344
		0.033	0.011	-0.111	0.214	0.962	0.294	-0.611	0.261	0.045	0.010	0.033	0.003	0.038	0.000	0.033	0.001	0.010	0.001	0.459	0.000	0.975	-0.389	0.177
			1.000	0.442	0.080	0.869	0.080	1.000	0.841	0.285	0.716	0.620	0.030	0.607	0.420	0.030	0.090	0.044	0.418	0.008	0.515	0.000	0.000	0.010
				0.000	0.000	0.787	0.890	0.887	0.644	0.000	0.000	0.050	0.403	0.463	0.428	0.387	0.088	0.426	0.009	0.415	0.958	0.001	0.000	0.562
				1.000	0.003	0.906	0.009	0.030	0.000	0.001	0.030	0.000	0.001	0.484	0.001	0.077	0.000	0.000	-0.160	1.000	1.000	0.099	0.001	0.587
					0.000	0.090	0.000	0.001	0.090	-0.411	0.010	0.001	0.801	0.953	0.000	0.000	0.000	0.000	0.007	0.471	0.978	0.000	0.022	0.604
					0.088		0.222	0.003	0.009	0.849	0.011	0.099	0.003	0.454	0.785	0.010	0.080	0.030	0.080	-0.068	0.601	0.932	-0.307	0.846
								0.033	0.563	0.000	0.000	0.000	0.000	0.644	0.967	0.006	0.001	0.363	0.000	0.008	1.000	0.871	0.237	0.633
									0.952	0.236	0.475	0.763	0.589	0.304	0.631	0.511	0.000	0.000	0.129	0.523	0.241	0.777	-0.362	0.431
												0.000	0.010	0.255	0.948	0.000	0.011	0.849	-0.295	0.172	0.535	0.817	-0.061	0.435
													0.001	0.391	0.913	0.078	0.004	0.009	0.667	-0.015	0.096	0.655	0.000	-0.310
														0.382	0.011	0.550	0.069	0.065	-0.257	0.000	0.650	0.000	0.108	0.327
														0.290	0.080	0.008	0.000	0.003	0.233	0.276	0.597	0.549	0.080	0.510
														0.345	0.369	0.181	0.099	0.010	-0.058	0.000	-0.139	0.000	0.000	0.329
																0.008	0.000	0.733	0.000	0.144	0.000	0.033	0.002	-0.266
																	0.001	0.003	0.291	0.624	0.511	0.280	0.022	0.210
																		0.755	0.000	1.000	0.449	0.011	0.970	0.579
																			0.040	0.682	0.833	-0.152	1.000	0.561
																			0.854			0.307	-0.430	0.360
																			0.544			0.933		0.202
																								0.289
																								0.613
																								0.453

APPENDIX O

CORRELATIONS BETWEEN CLOZE SCORES AND SELECTED VARIABLES

TABLE LXXVII

CORRELATIONS BETWEEN CLOZE SCORES AND SELECTED VARIABLES
TOTAL GROUP(N = 440)

	2	3	4	5	6	7	8	9	10	11
1. C. Age	143*	081	261*	448*	396*	140*	061	091	092	120*
2. Cloze(6 stories)		735*	759*	611*	745*	681*	845*	840*	849*	-205*
3. Cloze(3 stories)			679*	529*	651*	639*	747*	759*	769*	-208*
4. SCAT(Verbal)				682*	913*	791*	781*	779*	776*	-271*
5. SCAT(Quant.)					917*	626*	616*	620*	617*	-154*
6. SCAT(Total)						775*	757*	759*	758*	-224*
7. STEP							758*	750*	751*	-223*
8. Cloze 1								938*	937*	-309*
9. Cloze 2									933*	-264*
10.Cloze 3										-272*
11.SES										

* significant at the .01 level

TABLE LXXVIII

CORRELATIONS BETWEEN CLOZE SCORES AND SELECTED VARIABLES
GRADE FOUR(N = 202)

	2	3	4	5	6	7	8	9	10	11
1. C. Age	-300*	-302*	-260*	-168*	-227*	-253*	-331*	-372*	-376*	150**
2. Cloze(6 stories)		760*	788*	559*	765*	680*	861*	866*	864*	-175*
3. Cloze(3 stories)			689*	491*	659*	610*	716*	747*	755*	-221*
4. SCAT(Verbal)				601*	908*	808*	782*	779*	780*	-327*
5. SCAT(Quant.)					870*	546*	607*	581*	583*	-234*
6. SCAT(Total)						781*	785*	772*	775*	-312*
7. STEP							711*	692*	719*	-313*
8. Cloze 1								938*	936*	-332*
9. Cloze 2									935*	-297*
10.Cloze 3										-310*
11.SES										

* significant at the .01 level
** significant at the .05 level

TABLE LXXIX

CORRELATIONS BETWEEN CLOZE SCORES AND SELECTED VARIABLES
GRADE FIVE(N = 129)

	2	3	4	5	6	7	8	9	10	11
1. C. Age	-134	-033	-165**	056	-125	-230*	-135	-167	-172	317*
2. Cloze(6 stories)		609*	577*	548*	649*	550*	754*	692*	690*	-190**
3. Cloze(3 stories)			644*	459*	638*	573*	731*	678*	675*	-149
4. SCAT(Verbal)				498*	862*	737*	757*	701*	694*	-213*
5. SCAT(Quant.)					866*	532*	605*	554*	552*	-108
6. SCAT(Total)						730*	782*	720*	714*	-177**
7. STEP							768*	750*	747*	-141
8. Cloze 1								907*	900*	-243
9. Cloze 2									904*	-178**
10. Cloze 3										-178*
11. SES										

* significant at the .01 level
** significant at the .05 level

TABLE LXXX

CORRELATIONS BETWEEN CLOZE SCORES AND SELECTED VARIABLES
GRADE SIX(N = 109)

	2	3	4	5	6	7	8	9	10	11
1. C. Age	-322*	-351*	-354*	-118	-270*	-253*	-322*	-361*	-374*	339*
2. Cloze(6 stories)		709*	732*	541*	705*	725*	872*	865*	858*	-310*
3. Cloze(3 stories)			567*	514*	596*	652*	746*	761*	768*	-246*
4. SCAT(Verbal)				614*	904*	737*	768*	748*	721*	-333*
5. SCAT(Quant.)					899*	664*	600*	621*	588*	-206**
6. SCAT(Total)						776*	755*	752*	731*	-299**
7. STEP							756*	768*	748*	-201*
8. Cloze 1								955*	945*	-357*
9. Cloze 2									950*	-308*
10. Cloze 3										-321*
11. SES										

* significant at the .01 level
** significant at the .05 level

APPENDIX P

NEWMAN-KEULS COMPARISON OF ORDERED MEANS OF GRADE DIFFERENCES
OF SEVENTEEN SELECTED TRANSFORMS

TABLE LXXXI

NEWMAN-KEULS COMPARISON OF ORDERED MEANS OF GRADE DIFFERENCES OF
SEVENTEEN SELECTED TRANSFORMS

Transforms			Table of Ordered Means		
Relative Clause			3	2	1
	Multiplier	Means	66.667	61.375	54.881
	3.03551	1 54.881	11.786**	6.494	0.000
		2 61.375	5.292	0.000	
		3 66.667	0.000		
Adjective			3	2	1
		Means	75.460	71.000	66.281
	2.63661	1 66.281	9.179**	4.719	0.000
		2 71.000	4.460	0.000	
		3 75.460	0.000		
Compounds			3	2	1
		Means	65.444	61.234	52.469
	2.76892	1 52.469	12.976*	8.766	0.000
		2 61.234	4.210	0.000	
		3 65.444	0.000		
Genitive			3	2	1
		Means	61.365	55.800	46.612
	3.69138	1 46.612	14.753*	9.188	0.000
		2 55.800	5.565	0.000	
		3 61.365	0.000		
Adverb Replacement			3	2	1
		Means	68.840	66.000	57.425
	2.00585	1 57.425	11.415*	8.575*	0.000
		2 66.000	2.840	0.000	
		3 68.840	0.000		
Conjoining			3	2	1
		Means	70.063	67.878	58.550
	1.70850	1 58.550	11.512*	9.328*	0.000
		2 67.878	2.184	0.000	
		3 70.063	0.000		
Common Elements Del.			3	2	1
		Means	62.310	57.095	54.000
	2.23304	1 54.000	8.310**	3.095	0.000
		2 57.095	5.215	0.000	
		3 62.310	0.000		

TABLE LXXXI(Continued)

WH BE Deletion			3	1	2
	Multiplier	Means	63.290	50.935	48.492
2.77547	2 48.492		14.799*	2.444	0.000
	1 50.935		12.355	0.000	
	3 63.290		0.000		

(That) + S Obj.Quote			3	2	1
		Means	73.854	68.932	60.268
2.41845	1 60.268		13.585*	8.664**	0.000
	2 68.932		4.922	0.000	
	3 73.854		0.000		

Question			3	2	1
		Means	76.625	71.167	61.765
4.27971	1 61.765		14.860	9.402	0.000
	2 71.167		5.458	0.000	
	3 76.625		0.000		

Aspect			3	2	1
		Means	66.076	58.209	50.956
2.66704	1 50.956		15.120*	7.253	0.000
	2 58.209		7.867	0.000	
	3 66.076		0.000		

Imperative			3	2	1
		Means	63.250	60.933	46.500
4.92089	1 46.500		16.750	14.433	0.000
	2 60.933		2.317	0.000	
	3 63.250		0.000		

Pronoun(Simple)			3	2	1
		Means	79.601	78.634	71.087
1.33382	1 71.087		8.514*	7.547*	0.000
	2 78.634		0.967	0.000	
	3 79.601		0.000		

Adverb Position Shift			3	2	1
		Means	56.246	54.043	45.420
2.75962	1 45.420		10.826**	8.623	0.000
	2 54.043		2.204	0.000	
	3 56.246		0.000		

Adverb Replacement Shift			3	2	1
		Means	68.895	64.250	54.595
3.06438	1 54.595		14.300*	9.655	0.000
	2 64.250		4.645	0.000	
	3 68.895		0.000		

TABLE LXXXI(Continued)

				3	2	1
(That) + S Object			Means	73.188	70.931	54.704
Quote Shift	Multiplier	1	54.704	18.484*	16.227*	0.000
	3.31106	2	70.931	2.256	0.000	
		3	73.188	0.000		

				1	2	3
Multi-transforms			Means	45.400	35.212	20.333
	5.14180	3	20.333	25.067*	14.881	0.000
		2	35.214	10.186	0.000	
		1	45.400	0.000		

* significant at the .01 level
** significant at the .05 level