

1965

# An Analysis of the Comparative Reading Times for 11-pica and 15-pica Copy

Jack Wesley Nuckols

Follow this and additional works at: <https://openprairie.sdstate.edu/etd>

---

## Recommended Citation

Nuckols, Jack Wesley, "An Analysis of the Comparative Reading Times for 11-pica and 15-pica Copy" (1965). *Electronic Theses and Dissertations*. 3066.  
<https://openprairie.sdstate.edu/etd/3066>

This Thesis - Open Access is brought to you for free and open access by Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact [michael.biondo@sdstate.edu](mailto:michael.biondo@sdstate.edu).

AN ANALYSIS OF THE COMPARATIVE READING  
TIMES FOR 11-PICA AND  
15-PICA COPY

BY

JACK WESLEY NUCKOLS, JR.

A thesis submitted  
in partial fulfillment of the requirements for the  
degree Master of Science, Major in  
Printing Management, South Dakota  
State University

1965

20018

AN ANALYSIS OF THE COMPARATIVE READING  
TIMES FOR 11-PICA AND  
15-PICA COPY

This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable as meeting the thesis requirements for this degree, but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

\_\_\_\_\_  
Thesis Adviser

\_\_\_\_\_  
Date

\_\_\_\_\_  
Head of the Major Department

\_\_\_\_\_  
Date

## ACKNOWLEDGMENTS

The author wishes to express his sincere appreciation to Professor J. K. Hvistendahl of the Department of Printing and Journalism for his guidance, assistance, and encouragement during the preparation of this thesis.

He would also like to thank Otto H. Silha, vice-president of the Minneapolis Star and Tribune, for his cooperation in supplying reproduction proofs for the research efforts.

The author would also like to express his indebtedness to Mr. Floyd Johnson of Brookings Junior High School, Mr. Virgil Bell of Brookings Senior High School, and the faculty members of South Dakota State University who made their classes available to the writer for this study.

My appreciation is also extended to Mr. Jock Wilson for his reading of this thesis and to Frank Ouseley and Al Leicht, fellow graduate students, for their untiring efforts in recording the data.

Lastly, he would like to thank his parents for their encouragement and financial assistance. The writer would also like to express appreciation to his friends and relatives for their moral support.



## TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION . . . . .	1
<u>Review of the Literature.</u> . . . . .	1
<u>Reasons for Undertaking the Study</u> . . . . .	3
II. METHODOLOGY. . . . .	11
<u>Questionnaire and Reading Construction.</u> . . . . .	11
<u>Description of Sample Used in the Study</u> . . . . .	12
<u>Administration of Questionnaire and Reading Forms</u> . . . . .	14
III. RESULTS. . . . .	16
<u>Comparison of Reading Speeds.</u> . . . . .	16
<u>Comparison of Reading Speeds on Basis of Sex.</u> . . . . .	17
<u>Comparison of Reading Speeds to Various Age Groups.</u> . . . . .	21
<u>Comparison of Reading Speed in Relation to Expresses Amount of Reading</u> . . . . .	24
<u>Comparison of Reading Speed to Year in Junior and Senior High School.</u> . . . . .	26
<u>Comparison of Reading Speeds to Year in College</u> . . . . .	27
IV. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER STUDY. . . . .	30
<u>Summary</u> . . . . .	30

Chapter	Page
<u>Conclusions</u> . . . . .	32
<u>Recommendations for Further Study</u> . . . . .	33
LITERATURE CITED . . . . .	35
APPENDIX A . . . . .	37
APPENDIX B . . . . .	41

## LIST OF TABLES

Table		Page
1.	Number of Junior High and Senior High School Participants. . . . .	13
2.	Number of University Participants. . . . .	14
3.	Mean Reading Speeds From the 11-Pica and 15-Pica Copies, Total Sample . . . . .	17
4.	Mean Reading Speeds of Males and Females from the 11-Pica and 15-Pica Copy. . . . .	18
5.	Mean Reading Speeds of Students Who Wear and Students Who Do Not Wear Glasses . . . . .	20
6.	Mean Reading Speeds of Various Age Groups. . . . .	22
7.	Mean Reading Speeds in Relation to Expressed Amount of Reading. . . . .	23
8.	Mean Reading Speed as Compared to Year in Junior High School and Senior High School. . . . .	27
9.	Mean Reading Speed as Compared to Year in College. . . . .	29

## LIST OF FIGURES

Figure	Page
I. Mean Reading Speeds of Various Age Groups. . .	23

## CHAPTER I

## INTRODUCTION

Review of the Literature

Research concerning reading speed, type size, leading, and line width has been conducted in a systematic way for the past 50 years. Donald G. Paterson and Miles A. Tinker, professors of psychology at the University of Minnesota, were the first researchers to use scientific procedure to study the effect of varied typographical arrangements on a broad scale-- their

. . . results indicate that a definite range of optimal line widths exists and lines shorter than or longer than the optimal range definitely retard reading speed.

In a series of eleven reading performance experiments they found that excessive short lines (9 picas) and excessively long lines (43 picas) are both read much more slowly than lines of moderate width (19 picas).

It appears that the decreased efficiency with which a very short line is read is due to the reader's inability to make maximum use of horizontal peripheral cues.

Analytical records derived from the reading of extremely long-line widths reveal that the task of locating the beginning of successive lines of print is accomplished only with great difficulty. (12-577)

The Minnesota eye-movement camera was used to reveal the specific patterns of eye movements involved in reading optimal versus non-optimal lines widths.

H. E. Burtt, a British psychologist, found that style and size of type, length of line, space between lines, spatial arrangement of page, color of printed material, and illumination of the printed page all affect legibility and, consequently, readability (3).

In contradiction to Tinker and Paterson, Matthew Luckiesh and Frank Moss concluded that the readability of 10-point Texttype with 2 points of leading diminishes as the length of line is increased from 13 to about 21 picas; and that further increases in line-length result in less important changes in readability (11).

W. F. Dearborn studied the effects of variation in line width on eye movements in reading and found that in short lines more fixations were required to read the same amount of material (4).

Leading (spacing between lines) appears to have a definite effect on the legibility of type. Griffing and Franz were among the first to experiment with the effect of leading on legibility of type. They found that a slight increase in readability resulted when leading was introduced in 5-point type (8). Later, an experimenter named Bentley found that with different amounts of leading the rate of reading changed. Un-leaded material was read relatively slowly. The reading

rate increased with additional leading up to 7 points, and then rapidly declined (2).

### Reasons for Undertaking the Study

Today, the newspaper is in strict competition with many other types of communication media. Television, magazines, motion pictures, and radio presumably all take some of the reader's time. The Audits and Surveys Company, in a special report prepared for the Newsprint Information Committee, found that over one-half (53.5%) of the newspaper readers spent less than 40 minutes every day reading the newspaper (1). Because the reader spends relatively so little time with the modern day newspaper, it would seem important that the newspaper have the best possible typographical arrangement along with the correct kind and size of type. A less readable product could well invite less readership with more reader reliance on news and information on all other competitive media.

The author feels that the modern newspaper format should be investigated and be changed, if necessary, so that newspapers can compete successfully for the reader's valuable time. Few studies concerning line width have been made since the early 1940's. Since

then most newspapers have changed type faces, type sizes, and line widths, but they have little empirical data on which to judge their typography.

Tinker and Paterson found that most newspapers before World War II were in a trend toward larger type sizes and longer line widths, but the newspapers changed to space-saving column form after the war started. Editorial line widths were more commonly 15 and 15½ picas, but were often reduced to 11½ to 12½ picas with 7 point type on an 8 point slug (13).

With the development and widespread use of teletypesetter units, the Associated Press and the United Press International selected a standard 11-pica width column for the newspaper format. Nearly all daily newspapers today use the 11-pica width column. Three well known publications, the Christian Science Monitor, the Wall Street Journal, and the National Observer, have abandoned the standard 11-pica line width arrangement and switched to a wider column measure.

One of the most recent changes was made March 1, 1965, by the Christian Science Monitor. The Monitor departed from its traditional eight-column style and adopted a five-column layout throughout the paper. At a press conference in New York, Bruce G. McCauley,



manager of the Christian Science Publishing Society, gave details of the new format and reasons for undertaking the change.

The new columns are 16 ems wide and the basic type is 9 point. In the previous makeup 7½ point type was set 10½ ems wide. There are no column rules in the new design. A more liberal use of photographs and artwork are a part of the new look.

Mr. McCauley said the three most important challenges faced by newspapers today are:

'1) The tremendous scope and complexity of today's news, particularly national and international.

'2) The rising role of radio and television in rapidly broadcasting the spot news, and the change this is making in the newspaper's function of news coverage.

'3) The increasing necessity that our citizens be better and more fully informed of the rapid developments in this space age.'

Mr. DeWitt John, editor, said the larger sized column was selected for two good reasons:

'1) Intensive research shows that the 16-pica column that we are using in the new layout is the most ideal for reading purposes.

'2) Because we needed a much larger column to accommodate a larger and easier-to-read type.'

The Wall Street Journal and the National Observer have been using a six-column format for several years. A fourth paper, the Louisville Courier-Journal, published an experimental issue January 27, 1965, containing the six-column arrangement. Lisle Baker Jr., executive vice-president and general manager, said the experiment was "to prove to ourselves what a six-column newspaper would look like and to have such a newspaper to show

to publishers and editors all around the country."

(6-12) The following reasons were given for the format change:

1) The 11-pica line width is too short for easy readability. Typographical experts are convinced that in 8 and 8½ point type, a 15-pica width is more nearly the ideal size. We are close to that in this edition.

2) The 11-pica width imposes great limitations on headline writing. No one knows the manhours spent on copy desks struggling to write good headlines in 11-pica restrictions.

3) Mechanically, the speed of typesetting, whether manual or TTS, is increased in terms of characters per hour by longer line lengths. Further, the frequency of hyphenation is reduced by longer line lengths. Normally, we hyphenate one line in five. We believe this edition will show a significant reduction in hyphenation.

4) Checks show that almost all national magazines presently have column widths of approximately 13.6 picas. This raises the speculative point as to whether our narrow column widths foreclose opportunities for advertising which we might otherwise obtain. Obviously, it is easy for any newspaper to alter requirements for local advertising, but it would require widespread industry action to sharply change requirements for national advertising.

'Summed up,' they said, 'what we did was to change for this one day from eight 11-pica columns with 3-point rules to six columns of 14.9 picas, keeping the 3-point space. Our normal form width of 89.9 picas remained unchanged.'

'Normally, our line length is 10.8 picas normal mat shrinkage of 3/8 of an inch remained.'

(6-12)

In the April 10, 1965, issue of Editor and Publisher the management of the Louisville Courier-Journal was quoted as saying that they plan to change

to a 6-column page format starting August 1:

The column width planned by the Louisville papers will be 14.9 picas or 2 7/16 inches, as compared to the 11-pica width used by most eight-column newspapers.

On January 27, 1965, the Courier-Journal published an experimental issue in the 6-column format. Public response from readers, advertisers, agencies and other newspapers was said to be so favorable the management decided to make the change permanent.

Mr. Baker said the wide column makes reading comprehension faster; requires fewer hyphenated words; reduces eye strain; and allows for more descriptive headlines and better use of photos.  
(7-22)

This same issue of Editor and Publisher stated that the Riverside (California) Press and Enterprise has followed the Louisville experiment and has gone to a six-column format on page one. Editor "Tim" Hays, Jr. reported that the editorial page and inside pages will be re-designed next (7).

Other investigations of type faces and type sizes have been made by psychologists and researchers. Tinker and Paterson made a study on the speed of reading nine point type in relation to line width and leading. Their results showed that an optimal reading rate occurs with line widths of 14 to 30 picas and with 1 to 4 points leading (14).

Some newspapers have realized that more legible type faces are desirable to enable readers to read

faster and more comfortably. The Rock Hill Evening Herald (South Carolina) decided to change its type face but could not find a suitable way to select one; hence, it asked the assistance of Professor R. Laffitte, director of the reading program at Winthrop College in Rock Hill, South Carolina. Professor Laffitte used an eye-motion camera at the college for evaluating the reading ease of the type faces that were selected for the tests.

The machine is an ophthalmograph, and Professor Laffitte often uses it in classroom work to determine whether or not a student is having eye trouble.

The machine, Professor Laffitte explains, is essentially nothing more than a 35mm camera, enclosed in a chassis. The camera is used in combination with a set of lenses, which look much like lenses on a microscope. The two lenses--one for each eye--are focused in front of the eyes. Two beams of light shine into the eyes, reflecting off the cornea (or eyeball) through the lenses and into the camera. The picture made by the camera is thus that of the light beam after it comes off the eyes and goes through the lenses. Thus, the camera records a picture of a moving spot of light.

Thirteen 3 x 5 cards, each containing a two-inch paragraph of a selected type face on newsprint, were used for the test. After the subject read all 13 of the cards, the film was removed from the camera and developed. Professor Laffitte read each negative. He counted the average number of eye fixations per line. The type face having the smallest number of fixations per line was considered the most readable. (9-69)

Nearly all of the previous studies on reading speed and line length seem to indicate that newspapers do not use the optimum column width. To further aggravate the problem of narrow-line widths, many newspapers have "mat shrinkage" which reduces the standard 11-pica column to an even narrower width. Mat shrinkage occurs when heat removes the moisture from the paper-asbestos mats that are used to cast page forms into lead for newspaper presses. Varying amounts of moisture can be removed to "shrink" the mat to the desired size. Mat shrinkage in newspaper plants has permitted a greater savings in newsprint (10). A savings of one-half to five-eighths of an inch-per page may be made on a full newspaper page, but this saving is made at the expense of narrower column widths in the published newspaper.

For example, the April 2, 1965, issues of three large metropolitan newspapers all had different line widths because of the variation introduced by mat shrinkage. The St. Louis Post-Dispatch, the Los Angeles Times and the Philadelphia Inquirer measured 10.0, 10.2, and 10.4 picas, respectively, after mat shrinkage.

The purpose of this study is to determine whether any difference exists in the reading speed of newspaper copy set in a modern type face (not tested by Tinker and

Paterson) on an 11-pica line width as compared to the same copy set on a 15-pica line width. Subsidiary reasons for undertaking this study are to ascertain whether there is any relationship between reading speed and these characteristics of readers: (1) sex; (2) age; (3) year in school; (4) wearing reading glasses; (5) self appraisal of amount of reading done.

## CHAPTER II

## METHODOLOGY

Questionnaire and Reading Construction

The objective of this study was to determine whether any reading speed difference exists between newspaper copy set in two different line widths. The Flesch readability formula was used on several wire service articles to select one that would typify a general newspaper story.

The article selected (see Appendix A) had a reading ease score of about 60. According to Flesch this score would rate the story standard to fairly difficult in reading ease. The syllables per 100 words came to about 150, and the average sentence length was around 20 words. This article would be equivalent to one that could be read by someone who finished the 7th, 8th, or early years of high school. The Associated Press teletypesetter wire service was used as the source for the newspaper copy which was selected for use in the investigation.

Correspondence was then made with the research department of the Minneapolis Star and Tribune. Otto H. Silha, vice-president of the Tribune, had the type

set for identical copy in an 11-pica and a 15-pica column width. The type was set in 9-point Imperial on a 9½ slug, the Tribune's ordinary type face.

In order to duplicate a newspaper as closely as possible the copy was set in two columns, separated by a column rule and printed offset on a newsprint composition type of paper. Form A represented the copy set in an 11-pica column width, and form B represented the same copy set in an 15-pica column width.

A cover sheet (see Appendix B) was attached to each of the forms A and B. Questions included on the cover sheet were selected by the author on the basis of which demographic variable might bear on the findings. Also, information about the study and directions for reading the copy were given on the cover sheet.

#### Description of Sample Used in the Study

The author selected local junior high, senior high, and college students to participate in the study. This sample of students is not purported to be a random sample of all students in these three schools. Because of availability, students in junior high and senior high were obtained from the study halls only.

The Brookings Junior High School and Senior High School were selected as being fairly typical of



schools throughout the country. The schools have a total enrollment of approximately 1120 students in the 1964-65 school year and serve the surrounding farms and community of Brookings, South Dakota. The students tested, seventh through the twelfth grade, represent both rural and urban families. Table 1 shows the number of participants used from the junior and senior high school.

Table 1. Number of Junior High and Senior High School Participants

School	11-Pica Copy	15-Pica Copy
Junior High School	50	46
Senior High School	68	76
Total	118	122

Students were selected from the classes made available to the author. Students in college who might have had contact with printing, journalism, or speed reading courses were avoided in order to keep down the chance of a biasing error in the study. Table 2 indicates the number of college participants contacted.

Table 2. Number of University Participants

<u>Year in School</u>	<u>11-Pica Copy</u>	<u>15-Pica Copy</u>
Freshman	36	34
Sophomore	31	28
Junior	45	52
Senior	31	28
Graduate	5	3
Total	148	145

### Administration of Questionnaire and Reading Forms

The author realized the importance of proper administration of the questionnaire and the conducting of the timed reading test. Care was taken to present identical directions to all subjects in the study. The Testing Service Office at South Dakota State University gave the author useful advice on how to administer a reading test correctly.

The participants were instructed to answer the questions on the cover sheet, study the directions for the timed reading on the preceding page, and then wait for the examiner's signal to begin. Care was taken not to mention the word "test" or "speed reading". Directions made it clear that the participants were to read at their normal rate and that the study was not any

kind of a speed test. The reading material was attached to the cover sheet, and the subjects were timed with a stop watch for exactly one minute. At the end of that time the participant marked the word he was on when the examiner gave the "stop" signal. The author then explained the reasons for undertaking the study to the participants.

## CHAPTER III

## RESULTS

Comparison of Total Reading Speeds

Results of the study seem to indicate that there is a considerable difference in the reading speed of copy set on a 11-pica column width as compared to the same copy set on a 15-pica column width.

The mean reading speed of 266 participants on the 11-pica copy was 225.8 words a minute. Reading the same copy set on a 15-pica width, a total of 267 participants read at a rate of 235.0 words a minute, an increase of 4.1%. Comparing the means by the use of Fisher's t-test, the author found the differences were significant beyond the .01 level. (The .05 level or less was accepted as being significant for the purposes of this paper.) Table 3 indicates the mean reading speed results.

Table 3. Mean Reading Speeds From the 11-Pica and 15-Pica Copies, Total Sample

Reading Groups	Number of Participants	Mean Reading Speeds
11-Pica Copy	266	225.8**
15-Pica Copy	267	235.0**
Total	533	230.4

~~\*\* Significant beyond the .01 level.~~

#### Comparison of Reading Speeds on Basis of Sex

Findings from the investigation appears to show that sex difference affects the reading speed only slightly. The females, however, appear to be slightly better readers than the males. Women who wear glasses seem to read the 15-pica copy more slowly than the 11-pica copy, an unaccountable reversal of other findings in this study. Men who wear glasses were found to read the two widths at about the same rate.

Of the 266 participants reading the 11-pica width, 97 were females while 169 were males. The males had a reading mean speed of 220.3 words per minute as compared to 235.4 words per minute for the females. Table 4 shows the results of male and female participants reading copy of different lengths.

Table 4. Mean Reading Speeds of Males and Females  
From the 11-Pica and 15-Pica Copy

Sex	Number of Participants		Mean Reading Speeds		Per Cent of Increase or Decrease
	11-Pica	15-Pica	11-Pica	15-Pica	
Male	169	161	220.3	235.1	+6.7%**
Female	97	106	235.4	234.8	- .3%
Total	266	267	225.8	235.0	+4.1%**

\*\*Significant beyond the .01 level.

When one compares the males reading 11-pica copy to males reading 15-pica width copy, he finds that the mean reading speed increases significantly to 235.1 words per minute or almost 7%. In contradiction to this is the finding that females read slightly slower (but not significantly slower) on the longer 15-pica column width by reading 234.8 words per minute or a decrease of .3%

This decrease of mean reading speed for the females on the 15-pica copy, as shown in Table 4, could be due to the fact that more of them happened to be wearing glasses. A total of 62.5% of the females were wearing glasses when reading the 15-pica copy compared to 53.6% on the 11-pica copy. This may have had the effect of reducing the total mean reading speed for the females on the longer width copy.

The author found that males with glasses did not seem to read either faster or slower as the column width was increased. The females wearing glasses read 5.5% faster on 11-pica width than the females with glasses reading the 15-pica width, reversing most of the other findings in this study. Table 5 indicates these results.

Table 5. Mean Reading Speeds of Students Who Wear and Students Who Do Not Wear Glasses

Sex	Wear Glasses	Number*** of Participants		Mean Reading Speeds		Per Cent of Increase or Decrease
		11-Pica	15-Pica	11-Pica	15-Pica	
Male	Yes	68	52	226.6	226.2	- .2%
Female	Yes	52	65	247.6	234.1	- 5.5%**
Male	No	99	107	217.1	241.1	+11.1%**
Female	No	45	39	221.2	238.4	+ 7.8%**

\*\* Significant beyond the .01 level.

\*\*\*Six of the subjects failed to give a response to the question.



Males and females who do not wear glasses seem to benefit the most by a column width increase. Reading speed of males increased 11.1% from 217.1 to 241.1 words per minute on the 15-pica width copy. Females also made a significant increase from 221.2 to 238.4 words a minute or an increase of approximately 8%.

#### Comparison of Reading Speeds to Various Age Groups

Table 6 shows that the line width increase appears to benefit subjects of all age groups. Also, reading speed tends to increase significantly with age. There was a significant increase in the mean reading speed between 11- and 15-pica measure in all age groups to at least the .05 level.

Table 6. Mean Reading Speeds of Various Age Groups

Groups	Number of Participants		Mean Reading Speeds		Per Cent of Increase
	11-Pica	15-Pica	11-Pica	15-Pica	
10-13 Years	39	32	196.7	200.7	2.3%*
14-17 Years	74	80	199.5	208.3	4.4%*
18-21 Years	117	117	244.3	253.2	3.6%*
22-25 Years	21	24	244.0	250.8	2.8%*
26-or More	15	14	260.5	286.3	9.9%*
Total	266	267	225.8	235.0	4.1%*

\*Significant beyond the .05 level.

The participants whose ages were 26 years or more had the greatest reading speed increase (9.9%). The 14 to 17 year age group was next with over a 4% increase or an 8.8 word per minute faster mean reading speed.

The average college age group, 18 to 21 years, increased their reading speeds almost 4% on the 15-pica width copy. The remaining two groups, 10 to 13 and 22 to 25 years, had mean reading speed increases of over 2%. Comparing the total 11-pica copy mean reading speed against the 15-pica copy shows the total increase is slightly over 4%. The mean reading speed results of the various age groups are shown in Figure 1.

Some tendency is apparent for the wider type width to benefit older readers more. However, a larger sample of persons in the oldest age group would have to be obtained before this conclusion could be warranted.

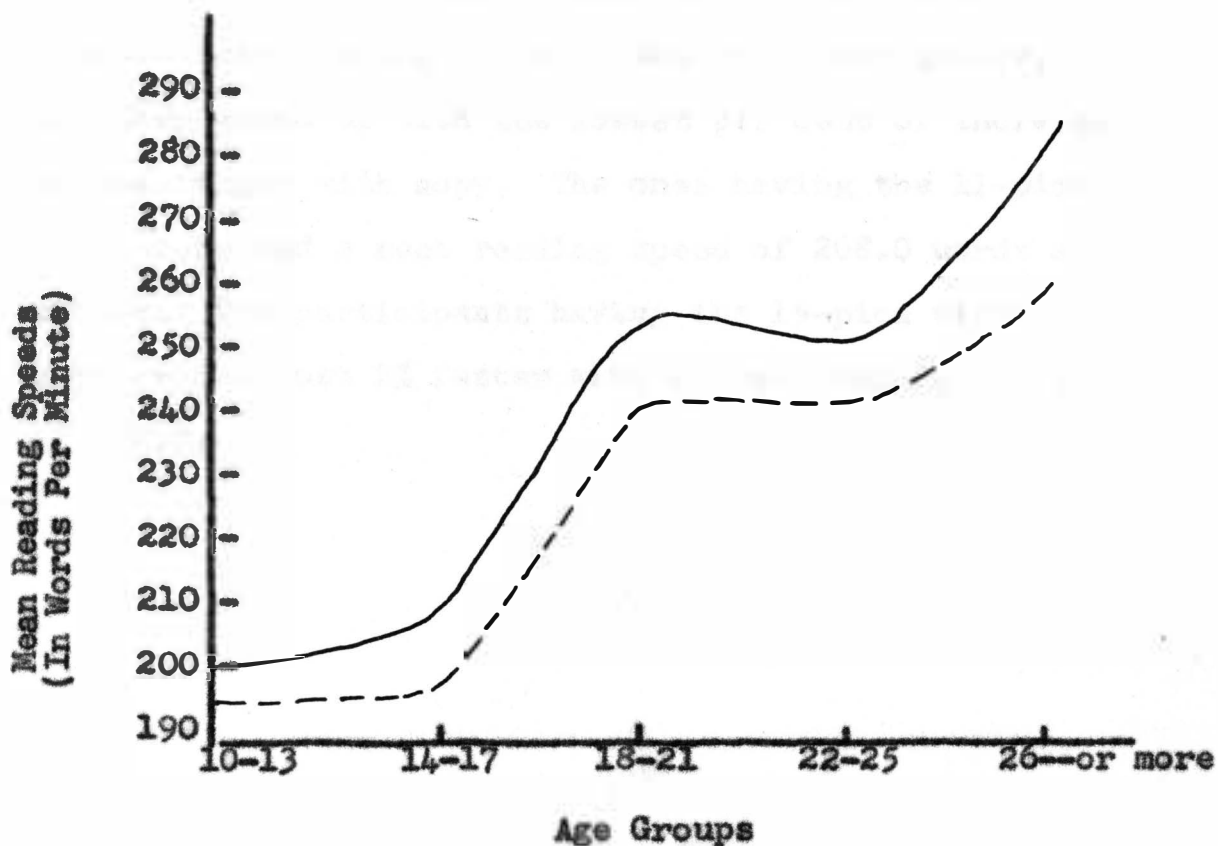


Figure I. Mean Reading Speeds of Various Age Groups

----- 11-Pica Width Copy  
 \_\_\_\_\_ 15-Pica Width Copy

### Comparison of Reading Speed in Relation to Expressed Amount of Reading

The participants in this study were given the opportunity to express opinions on the amount of reading they did in comparison to the amount of reading they think others their own age did.

Table 7 indicates that the students who thought they read more than most people their age had the highest mean reading speed of the other two groups, but they ended up with the lowest per cent of increase on the longer with copy. The ones having the 11-pica width copy had a mean reading speed of 268.0 words a minute. The participants having the 15-pica width copy read almost 2% faster with a mean reading speed of 272.7.

Table 7. Mean Reading Speeds in Relation to Expressed Amount of Reading

Expressed Amount of Reading	Number of Participants		Mean Reading Speeds		Per Cent of Increase
	11-Pica	15-Pica	11-Pica	15-Pica	
Read More Than Most People Your Age	49	43	268.0	272.7	1.8%*
Read About As Much As Most People Your Age	181	182	220.1	232.4	5.6%*
Read Less Than Most People Your Age	34	38	199.0	212.0	6.5%*
Total	264	263	226.3	236.0	4.3%*

\* Significant beyond the .05 level.

\*\*\*Six of the subjects failed to give a response to the question.

The groups that thought they read about the same as others their own age had a reading speed increase of almost 6% on the 15-pica width copy. Over 68% of the total participants in the study indicated that they thought they read about as much as others their own age.

The third group had the lowest mean reading speed but appeared to benefit most in the line width increase. Their mean reading speed went from 199.0 to 212.0 words a minute on the longer 15-pica line width. This gives a 6.5% increased reading speed to the ones who thought they read less than others their own age.

#### Comparison of Reading Speed to Year in Junior and Senior High School

The students tested from these two schools had varied responses from grade to grade. There were two grades in which students increased reading speeds on the 11-pica copy while students in the other five grades increased reading speed on the 15-pica copy.

Table 8. Mean Reading Speed as Compared to Year in Junior High School and Senior High School

Year in School	Number of Participants		Mean Reading Speed		Per Cent of Increase or Decrease
	11-Pica	15-Pica	11-Pica	15-Pica	
7th Grade	28	26	192.1	186.8	- 2.8%
8th Grade	22	20	207.5	223.9	+ 7.9%*
9th Grade	40	45	192.1	196.9	+ 2.5%*
10th Grade	14	9	208.4	226.8	+ 8.8%
11th Grade	6	9	226.2	218.6	- 3.4%
12th Grade	8	13	185.1	213.2	+15.2%
Total	118	122	198.2	204.7	+ 3.3%

\*Significant beyond the .05 level.

Table 8 indicates a tendency for the students' reading speed to increase with the number of years in school. The author does not consider the few number of participants in the 10th, 11th, and 12th grades to be sufficient enough for a fair representation. The 8th and 9th grades have increases of 7.9% and 2.5% in reading speed on the 15-pica width copy. Both of these increases are significant to the .05 level.

#### Comparison of Reading Speeds to Year in College

The author tested 253 participants from the college level. The students were then divided into

freshman, sophomore, junior, and graduate level groups. The results indicate a definite reading speed increase as the student progresses through the grades.

The freshman group had a slight increase of 2% in reading speed on the 15-pica width copy. The increase was about 4.3 total words per minute on the longer width copy than on the 11-pica width copy.

The sophomore group was the only one that read more words per minute on the 11-pica copy than on the 15-pica copy. They read over 7% faster on the shorter measure.

Table 9 indicates that the junior group had about a 4.5% increase in reading speed on the 15-pica width measure. The author tested more college students from this group than any other.

The participants in the senior group had the greatest reading speed increase on the 15-pica as compared to the other two undergraduate groups. The reading speed increased from 255.2 to 295.7 words per minute or an increase of 16% on the 15-pica width copy.

Although the graduate group had a larger increase in reading speed on the 15-pica copy the author feels this does not adequately represents a true speed because of the few number of participants tested in the study.



Table 9. Mean Reading Speed as Compared to Year in College

Year in College	Number of Participants		Mean Reading Speeds		Per Cent of Increase or Decrease
	11-Pica	15-Pica	11-Pica	15-Pica	
Freshman	36	34	222.0	226.3	+ 1.9%*
Sophomore	31	28	244.1	226.4	-7.8%
Junior	45	52	262.7	274.3	+ 4.4%*
Senior	31	28	255.2	296.7	+16.0%*
Graduate	5	3	274.8	396.3	44.2%
Total	148	145	247.8	260.4	+ 5.1%*

\*Significant beyond the .05 level.

## CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS  
FOR FURTHER STUDYSummary

The purpose of this study was to find if any reading speed difference existed in newspaper copy set in two different line widths. Similar studies have been made by researchers on the reading speed of varied line widths, but very few recent studies have been made on varied line widths using a modern newspaper type face.

The author attempted to duplicate the column typography of the Minneapolis Star and Tribune as closely as possible. The same type face was used (9-point Imperial), and the copy was set in the Star and Tribune plant. The copy was printed on newsprint paper. The copy was set in a conventional newspaper width of 11-picas and in a 15-pica width. A questionnaire was attached to each copy. Demographic data that the author thought pertinent was included. This questionnaire sheet contained directions to the participants for a timed reading of the newspaper copy.

To insure a random distribution, the copy set in the two-line widths was alternated between the

the students of each group tested.

All groups tested by the author were given identical oral instructions. The subjects were then instructed to read the copy for a timed period.

The sample used in this investigation were students from the Brookings Junior High School, Brookings Senior High School, and South Dakota State University.

The results of this study indicate that: (1) the total number of participants read the 15-pica width copy significantly faster (4.1%) than the participants reading the 11-pica copy; (2) males had a significant increase in reading for the 15-pica copy, and females had a slight decrease in reading speed for the 15-pica copy; (3) females who wore glasses read the 15-pica measure more slowly, and males who wore glasses read the two measures at about equal speed; (4) both females and males who did not wear glasses read the 15-pica measure significantly faster than the 11-pica measure; (5) every age group tested had read significantly more material from the 15-pica copy as compared to the 11-pica copy (6) participants who thought they read more than, about as much as, or less than, other people their age also showed a significant reading speed increase for the 15-pica measure as compared to the

11-pica measure; (7) all pre-college students except those in grades 7 and 11 had increases in reading speed for the 15-pica measure; (8) and all college students except sophomores had significant increases in reading speed for the 15-pica width.

### Conclusions

Several conclusions can be drawn from the findings of this study which can represent the totality of newspaper readers as a whole. It would seem feasible to say that copy set on a 15-pica line width can be read with greater ease than copy set on an 11-pica line width, but caution must be used because a different sample might produce entirely different results. It also seems evident that the wearing of glasses has a direct bearing on which measure (11-pica or 15-pica) is read faster. It was found that female readers who wear glasses read the 11-pica measure faster while males with glasses read both widths at about the same rate.

Other conclusions that seem important are as follows: (1) all age groups read faster on the whole from the 15-pica copy; (2) all school grades tested except 7th, 11th, and sophomore in college read faster from the 15-pica copy; and (3) all groups who were

classified on the expressed amount of reading (i.e. read more than, about as much as, or less than) read more from the 15-pica copy.

#### Recommendations for Further Study

This study has indicated that line width has a definite functional relationship to reading speed. In this respect, the author recommends that a comprehensive study be made, with other modern newspaper type faces, to ascertain the relationship between reading speed and various other line widths, in order to produce an optimum line width for various commonly-used type faces.

Results of this investigation indicate that the wearing of glasses can have an effect upon the optimum line width for readers. The writer suggests that a comparative study be made between readers who wear glasses and those who do not.

The author suggests that studies be undertaken to determine which groups of readers will benefit the most from an increased line widths. This study should show whether participants over 25 years of age gain more reading speed from the 15-pica line width than the younger participants tested. Since the sample size for this age group (26 and over) was relatively

small (29), it is necessary to undertake further investigations with older readers. It would be desirable to determine whether the poorer reader or the better reader gained the most from the longer line width.

It may also prove rewarding to investigate the relationship between type of reading material and the comparison of reading with the shorter and longer line widths. It is possible that different types of reading material (newspapers, technical articles, text books, etc.) would demand different optimum line widths.

## LITERATURE CITED

- (1) \_\_\_\_\_, A National Study of Newspaper Reading, Audits and Surveys Company, Inc., New York, March-April 1961.
- (2) Bentley, M., "Leading and Legibility," Psychological Monographs, 30:48-61 (1921).
- (3) Burt, H. E., "Typography and Readability," Elementary English, 26:212-221 (1946).
- (4) Dearborn, W. F., "The Psychology of Reading," Archives of Philosophy, 99-115 (1906).
- (5) Editor and Publisher, "5 Wide Columns in 'New' Monitor," 98:40, March 1965.
- (6) Editor and Publisher, Louisville Courier-Journal "Tries Wider Column Makeup," 98:12, January 1965.
- (7) Editor and Publisher, "Louisville 6-Column Page Cuts Advertising Cost," 98:22, April 1965.
- (8) Griffing, H. and Franz, S. I., "On the Condition of Fatigue in Reading," Psychological Review, pp. 513-530, September 1896.
- (9) Inland Printer/American Lithographer, "Newspaper Uses Science to Select a Type Face," 149:69 (1962).
- (10) Kubler, George A., A New History of Sterotyping, J. J. Little and Ives Company:New York, 1941.
- (11) Luckiesh, Mathew and Moss, Frank K., "The Effect of Line-Length on Readability," Journal of Applied Psychology, 25:75 (1941).
- (12) Paterson, Donald G. and Tinker, Miles A., "Influence of Line Width on Eye Movement," Journal of Experimental Psychology, 27:572-577 (1940).
- (13) Paterson, Donald G. and Tinker, Miles A., "Wartime Changes in Newspaper Body Type," Journalism Quarterly, 21:7-11 (1944).

- (14) Tinker, Miles A. and Paterson, Donald G., "Speed of Reading Nine Point Type in Relation to Line Width and Leading," Journal of Applied Psychology, 33:81-82 (1949).



APPENDICES

1. The first appendix contains a list of the names of the members of the committee who were appointed to study the problem of the... (text is very faint and difficult to read)

2. The second appendix contains a list of the names of the members of the committee who were appointed to study the problem of the... (text is very faint and difficult to read)

3. The third appendix contains a list of the names of the members of the committee who were appointed to study the problem of the... (text is very faint and difficult to read)

4. The fourth appendix contains a list of the names of the members of the committee who were appointed to study the problem of the... (text is very faint and difficult to read)

5. The fifth appendix contains a list of the names of the members of the committee who were appointed to study the problem of the... (text is very faint and difficult to read)

APPENDICES

1. The first appendix contains a list of the names of the members of the committee who were appointed to study the problem of the... (text is very faint and difficult to read)

2. The second appendix contains a list of the names of the members of the committee who were appointed to study the problem of the... (text is very faint and difficult to read)

3. The third appendix contains a list of the names of the members of the committee who were appointed to study the problem of the... (text is very faint and difficult to read)

4. The fourth appendix contains a list of the names of the members of the committee who were appointed to study the problem of the... (text is very faint and difficult to read)

5. The fifth appendix contains a list of the names of the members of the committee who were appointed to study the problem of the... (text is very faint and difficult to read)

## APPENDIX A

Automotive engineers give a lot of thought to bettering an auto's performance, but their No. 1 project is an increase in auto safety.

That conclusion was drawn from a study of papers presented at the Society of Automotive Engineers Annual Congress and Exposition here last week.

Representatives of two universities -- Wayne State and Michigan -- gave exhaustive reports on causes of auto injuries and other reports covered everything from the need for better windshield wipers to ways of making highways more skid resistant.

The University of Michigan report, presented by Donald F. Huelke and Paul W. Gikas of the university's medical school, showed that the biggest cause of traffic deaths was ejection from the vehicle on impact.

The Huelke-Gikas team said that a study of 104 fatal accidents resulting in 136 deaths showed that the "majority of the victims could have survived by use of the simple seat belt."

The biggest killer of those not tossed out of a car on impact was the end of the steering column or the steering wheel proper. It took about 18 per cent of the lives, compared with 38 per cent who died when

they were tossed out of the car.

Of drivers killed by contact with the steering mechanism, the report added, "The majority of these driver fatalities could not have been saved even with the seat belt or shoulder harness restraint."

It added, "Other than death by ejection, the instrument panel was the leading cause of death of front seat passengers, most of whom could have survived by using seat belts. Impacts to the door caused invasion of the passenger compartment and most occupants would have died even if restraints had been used."

The Michigan team suggested that to "decrease the number of fatal injuries from automobile accidents, future designs of automobile interiors must include adequate crash attenuation features."

In a further word of advice to auto makers, they said: "Instrument panels must be designed in terms of function as well as safety. Increased structural rigidity, it appears, need be placed on the side of the car, mostly about the doors, the frame, and possibly the roof."

Lawrence M. Patrick of Wayne's department of engineering mechanics, told the SAE:

"One has only to examine current model automobiles to find many flagrant examples of complete disregard

for the most rudimentary principles of safety design. Whether this is attributed to 'styling over safety,' public apathy towards safety, or lack of concrete specifications for safe design is immaterial -- they are still unsafe."

Patrick reported that much of his work, financed in large part by the auto companies as part of their safety campaign, has been devoted to efforts to lessen the danger from contact with windshields in auto accidents. He has worked with glass and plastic companies, too.

Safety experts know that injuries are less severe if heads of accident victims striking the windshield do not penetrate it, he said, adding that the goal is to make an interlayer in the windshield more stretchable so that it will allow an impacting head to deform the windshield temporarily without piercing it.

Researchers feel that if they can develop a windshield glass which will prevent penetration of the head at speeds of 35 miles per hour or more, it should drastically reduce the number of such fatalities, he said.

Joseph J. Cornish of Mississippi State's aerophysics department attacked the safety problem from a different angle. He said that high speeds now

attainable with big, high-performance engines actually make cars partially airborne.

"In many modern automobiles, the lift generated is now of such magnitude that significant deterioration in stability and control characteristics is being felt at high speeds," he said. He suggested that some relatively simple changes would make cars hold the road better at high speeds.

APPENDIX B  
QUESTIONNAIRE

1.  (1) Male  (2) Female
2. Check the age group to which you belong:  
 10-13  14-17  18-21  22-25  26-29  
 30-33  34-37  38-41  42-45  46-or more
3. What grade are you now in?  
 Junior High School  7th  8th  
 Senior High School  9th  10th  11th  12th  
 College  Fr  So  Jr  Sr
4. Do you use glasses when reading?  
 (1) Yes  (2) No
5. Would you say that you:  
 (1) Read more than most people your age  
 (2) Read about as much as people your age  
 (3) Read less than people your age

**DIRECTIONS**

The purpose of this reading is to collect data for a research project in printing. The examiner will tell you when to start and when to stop. Read the short article on the next page in the same way that you ORDINARILY read any article. Read at your NORMAL rate and be sure you understand what you read. Turn to the next page and start reading when the examiner tells you to do so. After a few minutes the examiner will tell you to "Mark". When he does so STOP IMMEDIATELY and circle the word you are then reading.

**DO NOT TURN THIS PAGE** until the examiner tells you to do so.