THE FEASIBILITY OF PREDICTING THE RESULTS OF FIVE-MINUTE EFFORTS FROM THE RESULTS OF ONE-MINUTE EFFORTS IN MEASURING TYPEWRITING SKILL

by

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CHAPTER I

THE PROBLEM

Introduction

One problem that has arisen in the teaching of typewriting is the frequent misuse of timed writings. Brendel recently wrote:

> Probably the one teaching device in typewriting most frequently ill-used is the timed writing--ill-used in these instances particularly:
>
> 1. As a 5-, 10-, and 15-minute rest period for the teacher.
>
> 2. As a testing device to evaluate work for a grade.
>
> 3. As a prognostic device
>
> 4. As a speed test.[1]

This study is designed to determine whether or not one of these misuses can be eliminated. If the teachers of typewriting accept the results of this study, they can decide whether or not to eliminate five-minute timings as a testing device to evaluate work for a grade.

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[1] Leroy A. Brendel, "The Uses and Abuses of Timed Writings." Business Education World, September, 1957. p. 22.

The Need for the Study

One of the problems of typewriting instruction today is to perfect the skill in the time alloted for such instruction. Odell and Stuart have this to say:

> . . . One of the major difficulties with typewriting instruction at the present time lies in the extensive amount of time needed to perfect the skill. Any study will be most welcome which reveals means whereby the amount of learning time may be reduced.[2]

The Virginia Course of Study in Typewriting makes this statement:

> There is considerable evidence to justify the contention that much time is wasted in teaching typewriting. Results of time and motion studies support this claim. Inefficient teaching procedures and classroom organization appear to be the main causes of prolonged typewriting courses.[3]

It is hoped that this study will be of aid to the typewriting instructor by reducing the amount of time needed for evaluation and thereby increasing the amount of time used for instructional purposes.

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[2]William R. Odell and Esta Ross Stuart, Principles and Techniques for Directing the Learning of Typewriting, (Boston: D. D. Heath and Company, 1945), p. 238.

[3]Business Education Service of the Division of Vocational Education, Commonwealth of Virginia, State Department of Education, "State Course of Study, Business Education, Part II. Typewriting. Suggested Content, Instructional Procedures and Achievement Goals for Virginia High Schools." Richmond, Virginia, 1950. (Mimeographed). p. 11.

Purposes of the Study

This study has two purposes:

1. To determine, through experimentation and with the use of statistical methods, the degree of linear relationship between one-minute timings and five-minute timings in measuring straight-copy skill in typewriting.

2. To determine, by statistical methods, the feasibility of predicting the amount of skill that would be obtained for a five-minute timing by using the results of a one-minute timing.

Limitations

The study will be limited to the following number of measurements:

1. An average score obtained from six timed writings of one hundred students in the control group.

2. An average score obtained from six timed writings of one hundred students in the experimental group.

Even though the sample size of the experiment was rather small, it was felt to be large enough to furnish the desired data for adequate testing. As Leonard J. West recently wrote:

> . . . larger numbers give better estimates of population values, but they have nothing whatever

to do with representativeness. Larger numbers increase the precision of a measure; they do not affect its relevance.[4]

The length of our experiment will be limited to six days.

Definitions

1. Straight-copy material shall mean material that is arranged in paragraph form.

2. One-minute timing shall mean the rate of speed (based upon gross words typed) per minute for one minute.

3. Five-minute timing shall mean the rate of speed (based upon gross words typed) per minute for five minutes.

Assumptions

1. It is assumed that all environmental factors are homogeneous because of the plan of rotation between the control group and the experimental group. The students in the control group and the students in the experimental group will be the same students.

2. It is assumed that the rotation of the control group and the experimental group will not affect the results of the experiment because of the pattern of the rotation.

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[4]Leonard J. West, "The Logic of Drawing Inferences from Research Data." Journal of Business Education, February, 1958. p. 209.

3. It is assumed that all students received the same instruction.

4. It is assumed that the stress given to five-minute timings by the instructors of the subjects will have no effect upon the results of the experiment.

CHAPTER II

REVIEW OF LITERATURE

Introduction

A review of literature in the fields of typewriting instruction and psychology revealed many facts which helped the author in getting the proper background for this study. From the review of literature the author gathered a brief history of typewriting instruction and its evolution, the psychological principles in teaching typewriting and other manual skills, and the status of typewriting in our public schools today.

History of the Evolution of Typewriting Instruction

Typewriting instruction began about 1880. Erickson has this to say about early typewriting instruction:

> . . . Most of the early operators were self-instructed. They used one or two fingers on each hand and typed by the sight method (looking at the keyboard.)[1]

At that time there was little known about skill learning. The thing to do was to learn to use the new writing machine by

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[1]Lawrence W. Erickson, "Typewriting Instruction." UBEA Forum, May, 1957. p. 14.

sight in the best manner you saw fit. The individual practice method prevailed, generally, until World War I. Frank E. McGurrin was one of the first typists to use all his fingers. He was a great exponent of the "touch method" of typewriting.

The typewriter brought about a business-office revolution with a great demand for typists. Because of this demand, after World War I, the self-instruction method gave way to the group-instruction method. As the group-instruction method was coming into view, the educational thinking of the country was also changing. The thought of men like John Dewey and E. L. Thorndike was becoming a strong force in educational psychology. One of the first psychologists to be concerned with skill development as it applied to typewriting was William F. Book, who had this to say about typewriting:

> One of the most remarkable achievements in the acquisition of human skills is the phenomenal increase in speed and accuracy that has been made in typewriting during the past 20 years. The fact that the number of words written per minute and per hour has practically doubled and that the quality of the copy written has been correspondingly improved does not begin to tell the story. . . . Nothing short of a detailed analysis of the entire process of acquiring such feats of skill can reveal what a learner must do to attain it.[2]

As a result of this trend, typewriting instruction came to be based upon psychological principles of skill learning.

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[2]William F. Book, <u>Learning to Typewrite</u>. (New York: The Gregg Publishing Co., 1925), p. 166.

Today educators and teachers are searching to learn more about the psychological principles of skill learning to aid them in the teaching of typewriting. As a result, many controversial issues have arisen concerning typewriting instruction. One of these issues is the use of timed writings. Here is a comment from an article which appeared recently:

> . . . Office experience and common sense make it doubtful that the longer timings can be justified in the training stages of typewriting. It is rare that a typist on a job is called on to type 5-, 10-, or 15-minute periods without stopping to relax her fingers for a split second, to ponder over a shorthand outline, to adjust paper, to make a correction, to answer the telephone, to refer to a file or reference book, to answer a question, to greet a caller or fellow employee, or to handle any of the other hundred-and-one interruptions in an office.[3]

Clem has a different view of timed writings.

> There are two kinds of timed efforts: short timed writings of from ¼ to 5 minutes, and long timed tests of 5 or more minutes, 5, 10, and 15 minutes being the length of time generally used. Short timed writings are particularly helpful when an improvement in speed is the immediate aim. Long timed tests are particularly helpful in developing the endurance and steady fluency that give sustained skill. The timed writing, or test, may be used whenever motivation to intensive effort for speed, accuracy, and fluency is desired.[4]

The Psychological Principles in Teaching Typewriting

The psychological principles involved in the teaching of

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[3]Brendel, op. cit., p. 22.

[4]Jane E. Clem, Techniques of Teaching Typewriting. (New York: The Gregg Publishing Company, 1929), p. 246.

typewriting are very numerous. Only a few of these principles were gathered from the review of literature for this study. The investigator tried to find the principles which best pertained to the subject of the study.

1. The length of practice. The psychological principle for the length of practice in manual skills is that short periods of practice are more effective than long periods of practice. In defense of this principle in relation to typewriting, Lamb says:

> Drills should be short, intensive and precise in objective. Progress in typing is achieved through short spurts of intense effort aimed at a specific goal . . . In the short timed writing, the student proves to himself that he can type at such-and-such a rate, and this success--followed by plenty of practice--enables him to convert his gains into sustained writing power at the advanced level.[5]

Blackstone and Smith recommended short efforts as a building process.

> . . . Most gains in typing are secured at first in short, intensive efforts, and these gains may later be consolidated and developed so that they may be maintained for longer periods. Repeated, short, intense periods of activity are better than long periods of activity.[6]

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[5]Marion M. Lamb, Your First Year of Teaching Typewriting. (New York: South-Western Publishing Company, 1947), p. 41.

[6]E. G. Blackstone and Sofrona L. Smith, Improvement of Instruction in Typewriting. (New York: Prentice-Hall, Inc., 1949), p. 91.

One of the many misuses of long timings in the teaching of typewriting is for testing. Rowe has this to say about ten- and fifteen-minute timings.

> . . . There is little place for any ten- or fifteen-minute timed writings (tests) in typewriting classes; instead, the emphasis throughout the course should be placed upon improvement rather than absolute achievement. As a result, timed writings should be a skill-building device rather than an excuse for the teacher to sit at his desk for periods of ten or fifteen minutes.[7]

2. The element of fatigue. In any study comparing short timings and long timings, the element of fatigue must be considered. Book tells us the following:

> Habits Cannot be Fixed When the Learners are Fatigued. Another factor which influences the fixing of habits in learning to typewrite is fatigue. . . Making a wrong response on the machine not only weakens the habit to be established, but fixes a wrong response. It also displeases the learner and tends to develop a wrong attitude towards the practice. Such tendencies to error increase with fatigue; and since incorrect practice is worse than no practice at all, the matter of determining how long a profitable type of practice can be sustained by different learners and at different levels of skill, is an important problem that every teacher of typewriting must solve if he is to obtain the best results for fixing the specific habits that must be established.[8]

Typewriting Status in our Public Schools

Typewriting enrollments now exceed all other business subjects in our public schools as a result of recognition of

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[7]John L. Rowe, The Bulletin of the National Association of Secondary-School Principals, XXXIII (November, 1949), p. 144.

[8]Book, op. cit., p. 219.

the practical use of the typewriter as a writing instrument. The objective of many students is the personal use of the typewriter. Also, today there is a great demand for skilled typists, which has also caused increased enrollment. A survey conducted in 1949 showed the enrollment of typewriting to be 1,216,142.[9] Today the enrollment is even larger. Blackstone and Smith have this to say about the popularity of the subject.

> Typewriting has been playing an increasingly important role in the commercial curriculum for the past decade or more. Today its enrollment is greater than any other business subject and the tendency seems to be that it will increase still more. . . It is even conceivable that the movement will continue until every secondary school student will be expected to take some typewriting, even as today each elementary school pupil is expected to take penmanship.[10]

As a result of this growth in the enrollment of typewriting, a greater emphasis should be placed upon the improvement of the typewriting instruction that is offered.

> A movement of such proportions should justify great effort to determine the best possible means of providing instruction in a subject having such widespread

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[9] _____________, National Summary of Offerings and Enrollments in High School Subjects 1948--1949. Statistical Circular 294, May, 1951, U. S. Office of Education, Washington 25, D. C.

[10] Blackstone and Smith, op. cit., p. v.

appeal. Yet today a great deal of dispute and debate exist concerning teaching procedures in this field.[11]

Summary

The enrollment in typewriting greatly exceeds the enrollment of any other business subject. When typewriting instruction began, it was on an individual basis. However, as the practical value of the typewriting increased, group instruction began. Today most typewriting instruction is based upon sound psychological principles. Because of the many complexities of typewriting instruction, many controversial questions about the type of instruction to be offered have arisen. Among these is the question of short timings or long timings.

However, typewriting teachers are continually searching for the best methods of instruction.

> . . . As typewriting teachers we should question everything we do in the typewriting classroom. Can each thing be justified according to sound principles of skill learning? Again, it may be well to remind ourselves that everything that happens in the typewriting classroom has what Kilpatrick has called a "forward reference." It either helps or hinders the development of typewriting skill.[12]

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[11] Ibid., p. v.

[12] L. W. Erickson, "Some Confusions in the Teaching of Typewriting." UBEA Forum, November, 1957. p. 13.

CHAPTER III

PROCEDURE

Selection of Problem

The author selected this study for two reasons:

1. He was interested in finding the effectiveness of using statistical methods to determine a relationship between short-period efforts and long-period efforts in manual skills.

2. It was hoped that other similiar experiments would be conducted because of this study and that these studies would use statistical methods.

Selection of Students

The author decided to use one hundred subjects in this experiment. He felt this number was large enough to make the experiment effective, yet small enough not to make the cost of the experiment too prohibitive.

The experiment included five first-year typewriting classes, a total of 180 students, in Blacksburg High School, Blacksburg, Virginia. The experiment also included three first-year typewriting classes, a total of 90 students, in Christiansburg High School, Christiansburg, Virginia. A grand total of 270 students participated in the experiment.

Eighty-four students did not complete all phases of the experiment. The author eliminated the data of these students because he did not want any missing values in the experiment. This left a total of 186 students still participating in the experiment.

To eliminate another variable, it was necessary to determine whether each student received the same number of hours of instruction. In order to accomplish this, the investigator chose only students enrolled in the second semester of the first-year of typewriting instruction. However, in these classes there were five students who were repeating the course. The data of these students were eliminated because the students had received approximately twice as much instruction. This left a balance of 181 students.

The author tried to be certain that all students had had the same amount of practice time. In order to accomplish this, all students who had access to typewriters outside of the classroom were eliminated. Seventy-eight students indicated to the teacher in charge that they had access to a typewriter outside of the classroom; and, therefore, the data that they contributed were eliminated from the experiment. This left a balance of 103 students.

As the investigator had previously decided on one hundred subjects to be used in the experiment, he placed the names of the remaining 103 students in a box and drew out the first one hundred names, whose score averages were then used in the statistical treatment.

Number of Timings Used

The investigator had to determine the number of timings needed from each student to get an effective measure of the one-minute efforts and the five-minute efforts. The investigator felt that five or six timings would be enough to eliminate the extraneous factors that might cause abnormal deviations. He decided that both a one-minute and a five-minute timing would be given to each participating student on each successive class day of the experiment.

Because of the rotation pattern, an even number of timings was needed. Rather than reduce the number from five to four, the investigator decided to add one day. This made a total of six one-minute timings and six five-minute timings that were used to obtain average scores for the statistical analysis part of the experiment.

Plan of Rotation

The students used as subjects for the control group were also used as subjects for the experimental group. By using the same students for both groups, the author hoped to eliminate as many extraneous factors as possible.

In order to use the same students for both groups, a careful rotation plan had to be devised. The following rotation schedule was designed and adopted.

TABLE 1

ROTATION SCHEDULE TO PROVIDE
FOR EXPERIMENTAL AND CONTROL FACTORS

Day of Experiment	Timing Given First	Timing Given Second
First day	One-minute timing	Five-minute timing
Second day	Five-minute timing	One-minute timing
Third day	One-minute timing	Five-minute timing
Fourth day	Five-minute timing	One-minute timing
Fifth day	One-minute timing	Five-minute timing
Sixth day	Five-minute timing	One-minute timing

Selection of Material

The typing material used in the experiment was carefully examined by the investigator to be certain it was as homogeneous as possible without using the same material for both the experimental and control groups. All the timings for the control and experimental groups had the same syllabic intensity. (Syllabic intensity of words is the standard means used by many textbooks to measure difficulty of copy.) For the first five days of the experiment the syllabic intensity was 1.30. For the sixth day of the experiment the syllabic intensity was 1.35. All the timings came from the sixth edition of 20th Century Typewriting.[1]

The Experiment

The experiment lasted six days, beginning on March 26, 1958. The following table gives the assignments and rotation patterns for each day of the experiment.

TABLE 2

TIMING MATERIALS AND ROTATION PATTERN

1st Day of Experiment	Timing Given First	Timing Given Second
Wednesday March 26, 1958	1-minute timing Guided Writing 76 page 109	5-minute timing Guided Writing 77 page 110
2nd Day of Experiment	**Timing Given First**	**Timing Given Second**
Thursday March 27, 1958	5-minute timing Guided Writing 78 page 112	1-minute timing Guided Writing 79 page 113

[1] D. D. Lessenberry and T. J. Crawford, 20th Century Typewriting, 6th edition. (New York: South-Western Publishing Company), 1952.

TABLE 2 (Continued)

TIMING MATERIALS AND ROTATION PATTERN

3rd Day of Experiment Friday March 28, 1958	Timing Given First 1-minute timing Guided Writing 80 page 114	Timing Given Second 5-minute timing Comparison Typing 91, page 129
4th Day of Experiment Monday March 31, 1958	Timing Given First 5-minute timing Timed Writing page 142	Timing Given Second 1-minute timing Timed Writing 119 page 168
5th Day of Experiment Tuesday April 1, 1958	Timing Given First 1-minute timing Timed Writing page 190	Timing Given Second 5-minute timing Timed Writing 146 page 197
6th Day of Experiment Wednesday April 2, 1958	Timing Given First 5-minute timing Selected-Goal Writing 159 page 212	Timing Given Second 1-minute timing Selected-Goal Writing 158 page 211

Measurement of Results

The experiment was designed to measure the functional relationship that exists between one-minute efforts and five-minute efforts in typewriting. In this study we were interested in postulating a functional relationship in the form of linear regression. The equation for linear regression is:

$$Y = \alpha + \beta X$$

Since we cannot find the true regression line, we must do the next best thing—get an estimate. The equation for estimating a linear regression line is:

$$\hat{Y} = a + bx$$

In the postulated regression equation, α and β are our parameters. The parameter α tells us the population value of y when x = 0, and the parameter β tells us the change which occurs in the y for a unit change in the x. the quantities a and b are, of course, only sample estimates of the population parameters. The formula to obtain an estimate of beta is:

$$b = \frac{SPxy}{SSx}$$

b is the symbol for the estimate of beta; SPxy is the symbol for the sum of products of x and y; SSx is the symbol for the sum of squares of x.

The formula to obtain an estimate of alpha is:

$$a = \bar{y} - b\bar{x}$$

a is the symbol for the estimate of alpha; $\bar{y}$ is the symbol for an estimate of the population mean of the yi's; $\bar{x}$ is the symbol for an estimate of the population mean of the xi's.

After we find these two estimates, we have our estimate of the true regression line. We then test for significance.

The first step is to construct an analysis of variance table.

TABLE 3

ANALYSIS OF VARIANCE

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Statistic
Regression	1	SSr = bSPxy	$s^2_r = \frac{SSr}{1}$	$\frac{s^2_r}{s^2_e}$
Error	n-2	SSe = SSy-SSr	$s^2_e = \frac{SSe}{n-2}$	
Total	n-1	SSy		

The next step is to set up our null hypothesis:

$$\beta = 0$$

To test this hypothesis we use the F statistic and the formula for this is:

$$F = \frac{s^2_r}{s^2_e}$$

For this test, the investigator will work at the 95 per cent level.

If we can reject our null hypothesis, we will know that the beta is significantly different from zero. Next we must determine the degree of linear association. The formula is as follows:

$$r = \sqrt{\frac{SSr}{SSy}}$$

At this point we should mention that the one-minute timings will be designated as our x's (constants) and the five-minute timings will be designated as our y's (variables).

If we can get a significant regression test from our analysis of variance of the data and if we get a high degree of linear association between one-minute timings and our five-minute timings, we will construct a table which will predict the results of five-minute timings from the results of one-minute timings. The column designated as the range in this table will be constructed at the 90 per cent confidence level. The formulas to determine our confidence intervals are:

$$L_1 = a + bx_0 - t_{(.90,n-2)} s_e \sqrt{\frac{1}{n} + \frac{(x_0 - \bar{x})^2}{SSx}}$$

$$L_2 = a + bx_0 + t_{(.90,n-2)} s_e \sqrt{\frac{1}{n} + \frac{(x_0 - \bar{x})^2}{SSx}}$$

CHAPTER IV

ANALYSIS OF DATA

Arrangement of Data

The first step in the analysis of the data was to get the data in its proper arrangement. In the process of the experiment over 1,200 timed writings had been collected. The one-minute timings were separated from the five-minute timings. We then had 600 one-minute timings and 600 five-minute timings. Next the investigator obtained an average score for each student by using the formulas:

$$\mu_y = \frac{1}{n} \sum_{i=1}^{n} yi \qquad \text{and} \qquad \mu_x = \frac{1}{n} \sum_{i=1}^{n} xi$$

Now the investigator had 100 average scores for the one-minute timings and 100 average scores for the five-minute timings. The next step was to estimate the regression line.

Estimate of Regression Line

The first parameter that must be estimated is the beta. When the data were placed into the formula, we got the following result.

$$b = \frac{171,772 - \frac{16,673,754}{100}}{196,910 - \frac{19,061,956}{100}} = .80$$

The second parameter that must be estimated is the alpha. By placing the data into the formula, we got the following:

$$a = 38.19 - (.80)(43.67) = 3.25$$

Now that we have estimates of the two parameters, we have an estimate of the regression line. Next we must make certain tests.

Tests for Regression

First we will test the null hypothesis: $\beta = 0$. If we can reject this hypothesis, we can say that beta is significantly different from zero. To test this hypothesis, we used an F statistic; and to use an F statistic, we had to construct an analysis of variance table, which appears in Table 4.

From the analysis of variance table we got an F statistic value of 687.3. The investigator then looked in the probability tables and found the value for one degree and ninety-eight degrees of freedom at the 95 per cent level. When he did this, he found the figure 3.94. Since the F statistic figure (687.3) exceeded this figure, the null hypothesis was rejected. However, still another test must be made.

TABLE 4

ANALYSIS OF VARIANCE
(with inserted data)

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F
Regression	1	4,027.57	4,027.57	687.3
Error	98	573.82	5.86	
Total	99	4,601.39		

We now wish to know the degree of linear association of the regression line. The investigator placed the data into the formula and got the following result:

$$r = \sqrt{\frac{4,027.57}{4,601.39}} = .94$$

We see that the degree of linear association was .94. A perfect linear regression would have had an r value of only 1.00. Therefore, we can say that we have a highly significant degree of linear association.

Since the experiment had positive results, a table was constructed that will predict the results of five-minute timings from the results of one-minute timings.

TABLE 5

PREDICTION OF FIVE-MINUTE TIMINGS

Results of one-minute timings	Predicted results of five-minute timings (range)
25	22 - 24
26	23 - 25
27	24 - 26
28	25 - 27
29	26 - 27
30	27 - 28
31	27 - 29
32	28 - 30
33	29 - 30
34	30 - 31
35	31 - 32
36	31 - 33
37	32 - 33
38	33 - 34
39	34 - 35
40	35 - 36
41	36 - 36
42	36 - 37

TABLE 5 (Continued)

PREDICTION OF FIVE-MINUTE TIMINGS

Results of one-minute timings	Predicted results of five-minute timings (range)
43	37 - 38
44	38 - 39
45	39 - 40
46	40 - 40
47	40 - 41
48	41 - 42
49	42 - 43
50	43 - 44
51	43 - 45
52	44 - 45
53	45 - 46
54	46 - 47
55	47 - 48
56	47 - 49
57	48 - 50
58	49 - 50
59	50 - 51
60	50 - 52

TABLE 5 (Continued)

PREDICTION OF FIVE-MINUTE TIMINGS

Results of one-minute timings	Predicted results of five-minute timings (range)
61	51 - 53
62	52 - 54
63	52 - 55
64	53 - 56
65	54 - 56
66	55 - 57
67	55 - 58
68	56 - 59
69	57 - 60
70	58 - 61

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of the experiment was to establish the degree of linear association between the scores of one-minute timings (in terms of gross words a minute) and the scores of five-minute timings (in terms of gross words a minute). If a high degree of linear association could be established, it would seem feasible to prepare a table from which you might predict the results of five-minute timings from the results of one-minute timings. The purpose of establishing this table was not to eliminate five-minute timings as a teaching device. It was intended, however, to show that five-minute timings are unnecessary as a measuring device.

Since we were unable to obtain enough students in Blacksburg High School, students of Christiansburg High School were also used. The experiment began on March 26, 1958 and was concluded eight days later on April 2. Six class days were involved.

The students in the control group were also used in the experimental group. They rotated according to the rotation pattern which had been previously prepared.

After the experiment was concluded, the data were then gathered. It was assembled and organized into workable form. At this point, the data were analyzed by statistical methods. From this analysis we reached our conclusions.

The author would like to mention that even though every justifiable means was taken to conduct the experiment as scientifically as possible, it has many limitations.

The first of these is that the investigator was unable to conduct the experiment personally. Therefore, he had to rely upon others to do this job. He was left to assume that his instructions were followed implicitly.

The investigator was forced to use two schools and four teachers in the experiment in order to obtain the desired number of measurements.

Due to the prohibitive cost, the author was unable to obtain a larger sample. Also, he was unable to obtain a random sample.

Conclusions

The following conclusions were drawn from the results of this study:

1. <u>That one-minute and five-minute timings have a high degree of linear association</u>. According to the data used in this study, it was found that the linear association was .94, which is a high degree of linear association. Because of this result, the author feels that it is feasible to predict the results of five-minute timings from the results of one-minute timings by using the formula: $\hat{y} = 3.25 + .80x$. (x is any given one-minute result.)

2. <u>That five-minute timings could be eliminated as skill measuring devices in the instruction of typing</u>. The author does not advocate the elimination of five-minute timings as an instructional device. However, where the abusive use of five-minute timings as a measuring device is concerned, the author suggests that one-minute timings be used as a measuring device.

Recommendations

As a result of this study, the following recommendations are made:

1. <u>That one-minute timings be used as measuring devices when measuring devices are needed, and that five-minute timings be used as measuring devices as little as possible.</u> This should give the teacher more teaching time in the classroom. If scores are needed for five-minute timings, it is suggested that the teacher use the table designed in this study to predict the results of five-minute timings from the results of the one-minute efforts.

2. <u>That similiar studies be conducted to verify or refute the results of this study.</u> This study was designed to test the feasibility of predicting five-minute efforts from one-minute efforts. Before this theory can be accepted as a significant possibility, a great amount of research and investigation must be made. It is hoped that this study will motivate others to conduct experiments along this line to verify or refute the results of this study.

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APPENDICES

A. Instructions to teachers

B. One-minute timing results

C. Five-minute timing results

APPENDIX A

Instructions to teachers

INSTRUCTIONS TO TEACHERS

1. Have students place name in upper right-hand corner of paper.

2. Have students place current date below name.

3. Give the students the timings in the order indicated in the following pattern: (All the timings are found in the 20th Century Typewriting Book, 6th Edition.)

1st Day of Experiment Wednesday March 26, 1958	Timing Given First 1-minute timing Guided Writing 76 page 109	Timing Given Second 5-minute timing Guided Writing 77 page 110
2nd Day of Experiment Thursday March 27, 1958	Timing Given First 5-minute timing Guided Writing 78 page 112	Timing Given Second 1-minute timing Guided Writing 79 page 113
3rd Day of Experiment Friday March 28, 1958	Timing Given First 1-minute timing Guided Writing 80 page 114	Timing Given Second 5-minute timing Comparison Typing 91, page 129
4th Day of Experiment Monday March 31, 1958	Timing Given First 5-minute timing Timed Writing page 142	Timing Given Second 1-minute timing Timed Writing 119 page 168
5th Day of Experiment Tuesday April 1, 1958	Timing Given First 1-minute timing Timed Writing page 190	Timing Given Second 5-minute timing Timed Writing 146 page 197

INSTRUCTIONS TO TEACHERS
(continued)

6th Day of Experiment	Timing Given First	Timing Given Second
Wednesday April 2, 1958	5-minute timing Selected-Goal Writing 159 page 212	1-minute timing Selected-Goal Writing 158 page 211

APPENDIX B

One-minute timing results

ONE-MINUTE TIMING RESULTS

Date of Timings		3/26	3/27	3/28	3/31	4/1	4/2	Average
1.	Betty Akers	28	50	50	45	46	47	44
2.	Evelyne Alls	36	45	40	50	43	42	43
3.	Mary Rose Baker	51	56	52	52	57	53	54
4.	Shirley Bain	55	43	45	43	42	35	44
5.	Ann Bowyer	55	57	58	64	59	64	60
6.	Linda Caldwell	28	26	23	31	34	34	29
7.	Constance Long	43	44	41	52	49	54	47
8.	Mary Matusevich	41	47	54	41	45	41	45
9.	Pat Myers	53	59	54	56	59	56	56
10.	Martha Oliver	46	47	46	52	48	51	48
11.	Leda Price	35	42	38	47	46	34	40
12.	Marie Ray	36	42	37	44	41	37	40
13.	Judy Roark	55	58	48	57	57	57	55
14.	Shirley Simpson	53	56	46	50	49	46	50
15.	Geraldine Slusser	45	43	42	46	50	50	46
16.	Joan Smith	44	45	43	53	43	45	46
17.	Rebecca Smith	18	25	26	27	24	28	25
18.	Shelva A. Stiff	42	45	48	56	47	47	48
19.	Loula Akers	45	48	45	49	47	53	48
20.	LeRoy Baldwin	35	40	38	42	38	40	39

ONE-MINUTE TIMING RESULTS

Date of Timings		3/26	3/27	3/28	3/31	4/1	4/2	Average
21.	Dianne Broce	50	48	52	31	47	45	46
22.	Audrey Caldwell	26	38	33	34	38	31	33
23.	Mildred Carr	36	42	40	36	36	43	39
24.	Claude Dove	39	40	27	43	42	41	39
25.	Virginia Dove	48	49	53	48	51	48	50
26.	Anna Earley	28	33	23	26	33	33	29
27.	Ruth Heck	35	43	43	39	46	46	42
28.	Beulah Hunter	55	60	61	60	64	64	61
29.	Delman Jarrell	34	39	40	36	38	40	38
30.	Maxine Linkous	42	43	50	40	47	44	44
31.	Tom Maher	44	42	43	42	47	44	44
32.	Jennings McClung	35	42	45	42	32	37	39
33.	Elsie Perfater	39	41	36	36	42	41	39
34.	Etta F. Smith	46	45	46	49	47	50	47
35.	Rubye Mae Smith	50	50	57	52	53	55	53
36.	Edith Yarborough	33	34	35	34	38	38	35
37.	Joyce Atkins	50	47	46	47	50	43	47
38.	Buddy Byrne	51	49	50	50	51	56	51
39.	Nancy Engel	56	58	59	64	63	63	61
40.	Sandra Fields	64	67	55	53	54	55	58

ONE-MINUTE TIMING RESULTS

Date of Timings		3/26	3/27	3/28	3/31	4/1	4/2	Average
41.	Winona Foushee	42	44	45	42	44	49	44
42.	Patricia Grubb	38	45	55	51	47	50	48
43.	Ruby Hylton	44	42	43	36	33	43	40
44.	Ralph Lafon	38	48	44	50	47	53	47
45.	Kitty Linkous	31	44	45	50	44	43	43
46.	Glenn Manning	44	49	50	45	57	58	51
47.	Roberta Martin	45	45	50	52	53	49	49
48.	Scott Orcutt	47	50	46	48	49	51	49
49.	Charles Pascoe	63	71	73	72	67	70	69
50.	Phyllis Thompson	36	35	31	30	42	41	36
51.	Myra Toney	45	52	56	53	50	55	52
52.	Mary A. Ussery	58	62	29	58	46	67	53
53.	Norma J. Witt	45	49	43	52	50	50	48
54.	Velma Wrenn	20	42	33	40	40	42	36
55.	Nettie Akers	55	48	49	55	53	55	53
56.	Romona Church	37	40	26	42	40	41	38
57.	Marion Cowan	56	51	53	41	58	55	52
58.	Carl Gallimore	35	40	40	42	39	40	39
59.	Chris Kappas	34	37	42	39	42	47	40
60.	Hugh Miles	57	43	48	56	55	58	53

ONE-MINUTE TIMING RESULTS

Date of Timings		3/26	3/27	3/28	3/31	4/1	4/2	Average
61.	Gale Pearman	43	48	55	48	55	55	51
62.	Susan Smyth	45	46	40	42	51	55	47
63.	Phebe Turner	45	47	48	55	45	49	48
64.	Louise Bain	33	38	36	38	40	52	40
65.	Cynthia Furtsch	65	70	67	64	62	61	65
66.	Mary Haney	39	40	37	39	40	43	40
67.	Linwood Lytton	24	36	28	34	35	35	32
68.	Nancy Raines	45	43	43	42	48	56	46
69.	Bobby Scott	29	31	27	37	33	35	32
70.	Sidney Taylor	34	31	30	38	35	37	34
71.	Bonnie Akers	36	37	37	35	38	48	39
72.	Janice Akers	52	37	34	39	42	43	41
73.	Marvin Bishop	36	34	34	43	33	45	38
74.	Danny Compton	30	40	41	43	32	46	39
75.	Kathryn Gill	29	33	30	33	38	38	34
76.	Bobby Huff	40	45	43	46	40	47	44
77.	Helen Willis	31	43	28	42	43	39	38
78.	Brenda Akers	30	36	30	37	33	40	34
79.	Margaret Akers	48	26	36	57	41	48	43
80.	Joyce Compton	41	42	41	46	43	43	43

ONE-MINUTE TIMING RESULTS

Date of Timings		3/26	3/27	3/28	3/31	4/1	4/2	Average
81.	Carol Creasy	21	50	44	47	45	55	44
82.	Bill King	31	35	33	31	33	42	34
83.	Shirley Martin	41	47	43	43	45	49	45
84.	Buddy Poff	31	39	30	36	34	38	35
85.	Ruby Quesenberry	35	41	35	42	31	55	40
86.	Sam Richardson	45	50	46	49	43	45	46
87.	Ray Summer	39	46	36	38	38	52	42
88.	Alleta Trussler	36	47	37	43	43	47	42
89.	Carolyn Adams	36	44	40	42	37	46	41
90.	Clinton Bishop	30	30	38	38	31	40	35
91.	Bettie Carroll	27	30	27	30	25	28	28
92.	Elizabeth Eanes	30	36	39	39	37	39	37
93.	Nancy Hall	43	39	45	49	43	45	44
94.	Charles Hancock Jr.	32	40	48	46	37	40	41
95.	Zola Keister	35	38	42	36	38	43	39
96.	Etta Mae Martin	32	40	48	42	42	38	40
97.	Dora Poff	34	32	40	36	37	39	36
98.	Peggy Poff	47	53	50	45	47	45	48
99.	Karen Shafer	36	40	50	41	31	42	40
100.	Jackie Walters	36	35	38	42	37	45	39

APPENDIX C

Five-minute timing results

FIVE-MINUTE TIMING RESULTS

Date of Timings	3/26	3/27	3/28	3/31	4/1	4/2	Average
1. Betty Akers	39	37	39	38	39	40	39
2. Evelyne Alls	38	37	41	40	35	39	38
3. Mary Rose Baker	45	40	45	49	45	44	45
4. Shirley Bain	33	33	36	30	37	27	33
5. Ann Bowyer	50	51	60	56	50	51	53
6. Linda Caldwell	33	28	35	35	32	31	32
7. Constance Long	39	37	39	40	35	47	40
8. Mary Matusevich	39	34	39	37	37	38	37
9. Pat Myers	50	47	47	47	48	49	48
10. Martha Oliver	39	40	41	45	39	45	42
11. Leda Price	36	34	34	35	37	39	36
12. Marie Ray	33	34	35	35	36	36	35
13. Judy Roark	49	37	46	56	47	51	48
14. Shirley Simpson	45	43	45	43	44	42	44
15. Geraldine Slusser	40	38	44	26	45	43	39
16. Joan Smith	39	38	43	42	38	44	41
17. Rebecca Smith	20	18	21	24	21	22	21
18. Shelva A. Stiff	36	37	43	41	37	39	39
19. Loula Akers	45	41	45	43	41	42	43
20. LeRoy Baldwin	35	35	36	37	36	36	36

FIVE-MINUTE TIMING RESULTS

Date of Timings		3/26	3/27	3/28	3/31	4/1	4/2	Average
21.	Dianne Broce	43	46	44	45	46	43	45
22.	Audrey Caldwell	27	30	32	31	31	31	30
23.	Mildred Carr	32	26	37	36	35	35	34
24.	Claude Dove	30	32	35	36	32	36	34
25.	Virginia Dove	48	42	48	46	43	45	45
26.	Anna Earley	28	27	30	30	27	31	29
27.	Ruth Heck	32	33	39	35	35	35	35
28.	Beulah Hunter	46	43	49	50	45	47	47
29.	Delman Jarrell	30	32	33	31	33	33	32
30.	Maxine Linkous	40	41	42	39	41	37	40
31.	Tom Maher	44	43	36	44	35	39	40
32.	Jennings McClung	33	32	37	33	32	33	33
33.	Elsie Perfater	36	31	33	33	34	34	34
34.	Etta F. Smith	43	42	44	46	44	43	44
35.	Rubye Mae Smith	48	51	52	50	48	51	50
36.	Edith Yarborough	29	30	31	30	29	31	30
37.	Joyce Atkins	45	40	47	42	44	45	44
38.	Buddy Byrne	46	43	48	43	42	47	45
39.	Nancy Engel	48	48	54	54	54	56	52
40.	Sandra Fields	48	47	53	49	45	49	49

FIVE-MINUTE TIMING RESULTS

Date of Timings	3/26	3/27	3/28	3/31	4/1	4/2	Average
41. Winona Foushee	38	21	37	39	34	37	34
42. Patricia Grubb	40	36	40	67	41	46	45
43. Ruby Hylton	34	38	34	35	29	31	34
44. Ralph Lafon	39	34	40	40	40	40	39
45. Kitty Linkous	34	34	39	37	33	35	35
46. Glenn Manning	42	39	44	42	40	42	42
47. Roberta Martin	44	41	45	42	40	44	43
48. Scott Orcutt	45	48	45	44	41	42	44
49. Charles Pascoe	62	59	65	62	62	63	62
50. Phyllis Thompson	32	26	25	21	30	30	27
51. Myra Toney	45	45	47	42	46	45	45
52. Mary A. Ussery	55	49	54	48	46	48	50
53. Norma J. Witt	44	40	42	43	41	45	43
54. Velma Wrenn	38	41	39	38	37	33	38
55. Nettie Akers	45	47	47	46	45	48	46
56. Romona Church	32	31	31	34	31	31	32
57. Marion Cowan	45	43	45	44	45	48	45
58. Carl Gallimore	33	30	36	34	31	34	33
59. Chris Kappas	30	35	33	33	31	32	32
60. Hugh Miles	47	42	42	40	42	42	43

FIVE-MINUTE TIMING RESULTS

Date of Timings		3/26	3/27	3/28	3/31	4/1	4/2	Average
61.	Gale Pearman	44	44	44	49	41	37	43
62.	Susan Smyth	36	34	36	37	40	38	37
63.	Phebe Turner	36	37	58	41	43	47	44
64.	Louise Bain	32	35	34	34	26	32	32
65.	Cynthia Furtsch	61	47	52	51	46	46	50
66.	Mary Haney	31	31	34	34	31	34	33
67.	Linwood Lytton	25	26	24	30	26	29	27
68.	Nancy Raines	39	38	42	48	40	42	42
69.	Bobby Scott	29	26	26	29	26	30	28
70.	Sidney Taylor	29	30	32	34	28	29	30
71.	Bonnie Akers	37	38	36	34	38	38	37
72.	Janice Akers	32	33	32	32	33	31	32
73.	Marvin Bishop	34	34	40	35	37	36	36
74.	Danny Compton	33	36	34	34	31	34	37
75.	Kathryn Gill	28	30	31	31	31	29	30
76.	Bobby Huff	36	33	35	39	39	35	36
77.	Helen Willis	30	33	35	31	32	34	33
78.	Brenda Akers	33	32	36	36	31	33	34
79.	Margaret Akers	28	33	33	35	36	38	34
80.	Joyce Compton	38	38	40	34	39	39	38

FIVE-MINUTE TIMING RESULTS

Date of Timings		3/26	3/27	3/28	3/31	4/1	4/2	Average
81.	Carol Creasy	31	44	46	41	45	44	42
82.	Bill King	35	31	30	29	30	30	31
83.	Shirley Martin	36	37	41	38	40	42	39
84.	Buddy Poff	31	30	29	30	32	30	30
85.	Ruby Quesenberry	34	31	36	33	37	40	35
86.	Sam Richardson	45	41	41	41	42	43	42
87.	Ray Summer	34	38	39	32	39	42	37
88.	Alleta Trussler	40	39	39	40	38	38	39
89.	Carolyn Adams	33	33	38	35	36	38	36
90.	Clinton Bishop	26	27	33	31	29	30	29
91.	Bettie Carroll	24	25	23	24	25	25	24
92.	Elizabeth Eanes	32	34	31	33	30	31	32
93.	Nancy Hall	32	38	40	38	37	41	38
94.	Charles Hancock Jr	36	37	38	41	33	39	37
95.	Zola Keister	34	34	37	35	34	37	35
96.	Etta Mae Martin	34	37	39	35	34	41	37
97.	Dora Poff	31	37	30	34	31	35	33
98.	Peggy Poff	42	44	45	41	43	45	41
99.	Karen Shafer	36	40	42	41	34	41	39
100.	Jackie Walters	34	39	35	38	31	42	37

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