An experiment to determine the effectiveness of the pipe organ method as compared with the traditional method on skill development in the typewriting of figures.

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Boston University
BOSTON UNIVERSITY
SCHOOL OF EDUCATION

Thesis

AN EXPERIMENT TO DETERMINE THE EFFECTIVENESS
OF THE PIPE ORGAN METHOD AS COMPARED WITH
THE TRADITIONAL METHOD ON SKILL DEVELOPMENT
IN THE TYPEWRITING OF FIGURES

Submitted by

William Reginald Smith
(B. S., University of New Hampshire, 1949)

In partial fulfillment of the requirements for
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First Reader: Lester I. Sluder, Associate Professor of Business Education

Second Reader: James F. Baker, Assistant Professor of Education
Sincere appreciation is extended to Professor Lester I. Sluder for his guidance and interest in helping to complete this study.
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CHAPTER I
INTRODUCTION

Statement of the Problem

The purpose of this study was to determine the effectiveness of the pipe organ method in comparison to the traditional method in the development of skill in the typewriting of figures. The problem resolves itself into determining the effects of each method upon (1) gross stroking speed, and (2) control or accuracy in typewriting figures.

Justification of the Problem

Much has been written about the teaching of the top row of keys on the typewriter keyboard. In the past, many educators have said that it was wasteful to devote much time to the teaching of figures. Heye¹ illustrated this thinking when she quoted Smith as follows:

Do not teach extra characters and numbers by touch. It is unlikely that the average typist writes the extra characters and numbers by touch because they are not used enough to keep her absolutely familiar with them . . . Obviously, then, it is a waste of time to require students to learn extra characters by touch. The time saved by not having to drill on these keys can be used for other important units.

¹As quoted by Hermine Heye in A Study of Visual Methods in Relation to the Top Row of Typewriter Keyboard, Master's Thesis, University of Iowa, 1938, p. 3.
This attitude may have been applicable to business requirements of yesterday, but it does not meet today's needs. Now it is advocated that numbers be automatized and that teaching methods be changed to insure that this takes place. This change in thought occurred because "the work of the typist in business became more and more involved with figures as people, machine parts, and manufactured products came to be referred to by number as well as or instead of by name."\(^1\)

High school business graduates are frequently criticized by employers because they lack the ability to type figures. This criticism also reflects adversely upon the business educator. Therefore, it seems desirable that serious consideration be given to methods of improving instruction if our business graduates are to be prepared to do better those things which they are required to do in today's business world.

Lloyd\(^2\) stated that this problem merits attention because teaching students to type figures with accuracy, and without hesitation is one of the irksome problems existing in most typewriting classrooms today. It seems logical to assume that a study of methods in this area might prove of some value to those teachers who "over and over have occasion

\(^{1}\)Evans, Viola P., *The History of Typewriting Instruction*, Service Paper, Boston University, 1949, p. 159.

\(^{2}\)Lloyd, Alan C., "For Positive Number Control," *Business Teacher*, vol. 29, November, 1951, p. 50.
to remark on the slowness and lack of accuracy of students when typing figures and symbols.  

1

Delimitation of the Problem

In this experiment a plan was developed wherein students in a control group would be taught the traditional method of typewriting figures, and students in an experimental group would be taught the pipe organ method of typewriting figures. By means of testing, recording, and analyzing results it was hoped that findings would reveal whether or not one method was more effective than the other in increasing gross stroking and/or control or accuracy in the typewriting of figures. Only the figures and hyphen located on the top row of the keyboard were introduced in this experiment. The symbols struck by these keys were not included in order to simplify the learning situation, and to keep the interpretation of results less involved.

In carrying out this research three classes in first-year vocational typewriting in Nashua High School, Nashua, New Hampshire, were studied. From the 79 students in the three classes, 26 pairs of students were selected for the experiment. The students in the control group were all

included in one class, while the students in the experimental group were included in the other two classes.

The vocational typewriting classes met five times a week. Each class met for the same length of time each day, approximately one hour. The classes included were scheduled for the same hour each day, but as they did not meet at either the first or last periods none of them was subjected to early morning lethargy nor end-of-the-day fatigue.

All classes selected for the experiment used the same classroom, textbooks, typewriters, and instructional materials. All of the classes were under the direction of the same teacher. Detailed lesson plans were prepared in order to insure uniformity in all classes.

Definition of Terms

To insure clarity of understanding of the two methods of teaching figures included in this study they are defined below.

The term "traditional" is used to describe that method of typewriting figures which is presented in virtually all textbooks and which calls for the 3-2, D-3, F-4, F-5, J-6, J-7, K-8, L-9, ;-0, ;-hyphen pattern as illustrated in Figure 1. This method requires each finger to act independently when reaching from the home-row keys to the figure row.
FIGURE 1  TRADITIONAL METHOD

FIGURE 2  PIPE ORGAN METHOD
The term "pipe organ" is used to describe that method of typewriting figures (as illustrated in Figure 2) which is presented in The New Expert Typewriting.¹

Place the hands in the regular position over the second row of keys; move both hands to the top row, being careful not to move to the left. You will find that the A finger is over 2 and the F finger is over 5; the ; finger is over hyphen and the J finger is over 3. This is a secondary hand position used only when writing figures and other characters on the fourth row; ... The F finger should be used for 6 as well as 5, and the J finger should be used for 7 as well as 8.

In the pipe organ method the plan is to move the entire hand upward from second row to the fourth row whenever a figure is struck.

Organization of Chapters

Chapter I introduces the problem; Chapter II summarizes previous work in the field; the procedures used in conducting the experiment are explained in Chapter III; the data are treated and interpreted in Chapter IV; and Chapter V sets forth conclusions and recommendations based on the data.

CHAPTER II
REVIEW OF RELATED RESEARCH

In order to obtain a background for this study, a review of experimental research in the field of typewriting was made. A brief summary of some recent experiments conducted to determine effective methods to increase speed and accuracy in beginning typewriting is given in the following paragraphs.

In 1949, Gibbs\(^1\) reported the results of an experiment conducted to determine the effectiveness of forced correction of errors as a technique for developing control in first-year typewriting. Thirty pairs of students were selected to participate in this experiment. Students in the experimental group were taught and required to erase, while students in the control group were neither taught nor allowed to erase. For six weeks, periodic tests were given to both groups and results compared. Conclusions drawn from these results were as follows:

1. The forced correction of errors had no significant effect upon the gross stroking speed of the students, although the non-erasing group was slightly favored.

2. Although the erasing group was slightly favored, no significant effect upon the

\(^1\)Gibbs, William T., An Experiment to Determine the Effectiveness of Forced Correction of Errors as a Technique for Developing Control in First-Year Vocational Typewriting, Master's Thesis, Boston University, 1949.
accuracy or per cent of error in typewriting was revealed as a result of forced correction of errors.

An experiment dealing with time patterns was conducted by Dritsas\(^1\) in 1950, with 60 students participating. The problem was to determine the effectiveness of a relative massing time pattern as compared with an additive time pattern for developing accuracy and speed in the teaching of typewriting to beginners. A control (relative massing pattern) group met for nine successive days for typing lessons. Students in the experimental group met for classes according to the additive time pattern, practice periods occurring on the following days: 1, 2, 3, 5, 8, 13, 21, 34, 55. A constant drill developed from the letters taught in the first lesson was given each period. At the end of each lesson a test was given. Both the constant drills and the tests were scored and results compared.

As a result of the experiment the following findings were made:

1. No statistically significant difference was found in the mean gains of the gross words per minute or the per cent of error scores between the two groups on the constant drill.

2. No statistically significant difference was found in the mean gains of the per cent of

\(^1\)Dritsas, Anastasia, A Study to Determine the Effectiveness of a Relative Massing Time Pattern as Compared with an Additive Time Pattern on Development in Typewriting, Master's Thesis, Boston University, 1950.
error scores between the two groups on the test.

3. A statistically significant difference was found in the mean gains of the gross words per minute scores on the test in favor of the relative massing pattern group.

Lynch\(^1\) conducted a study in 1952, to determine the effect that previewing timed writing material has on speed and accuracy in beginning typewriting. Timed writings were given to each group three days each week and results recorded and compared. The experimental group which received the preview was given a chance to practice on words from the timed writings given which were unusual, contained difficult combinations, or were repeated often in the copy. The control group received no preview. In the sixth week of the study, the 60 pupils participating were given timed writings with no preview for either the control or the experimental group. Some of the conclusions were as follows:

1. The previewing group showed improvement in gross stroking speed and net rate over the non-previewing group, but the difference was not statistically significant.

2. Students in the previewing group did not gain in control as a result of the experiment. Results revealed a greater increase in errors by this group, but the increase was not statistically significant.

To determine the effectiveness of using selected motivation devices on the speed and accuracy of first year

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\(^1\)Lynch, Doris T., An Experiment to Determine the Effect of Previewing Timed Writing Material on Speed and Accuracy in Beginning Vocational Typewriting, Master's Thesis, Boston University, 1950.
typewriting students, Janes\textsuperscript{1} performed an experiment upon 60 students in 1950. Speed tests were presented with some specified motivation to the experimental group, while no special motivation was provided for the control group. A test was administered one month following the conclusion of the experiment to determine to what extent the effect of the motivation might still be evident. Conclusions drawn from findings on these tests were as follows:

1. Students receiving special motivation showed greater increases in progress over the non-motivated students in gross stroking speed, net words per minute, and reduction in the per cent of error. These increases were statistically significant.

2. Results of the follow up test administered one month after the experimental period showed that the motivated students had not only maintained the gains made during the experimental period, but to a slight extent had increased them.

Experimental studies dealing with instruction in the top row of the typewriter keyboard are not common. In his analysis of 500 studies concerned with different phases of typewriting instruction, Rhae\textsuperscript{2} lists only one completed experimental thesis dealing with the top row of the keyboard.

\textsuperscript{1}Janes, Ruth, \textit{An Experiment to Determine the Effect of Motivation on Speed and Accuracy in First-Year Vocational Typewriting}, Master's Thesis, Boston University, 1950.

This study by Heye,² completed in 1938, was conducted to evaluate the effectiveness of presenting typewriting of the top row through two methods, the sight, and the touch.

In the sight method, students were allowed to look at the number keys whenever they felt any doubt as to the correctness of their reach. At no time during the experimental period was the use of the eyes discouraged in locating the number keys. The touch method called for learning the location of keys on the top row by finger reaches without the use of the eyes. Students using the touch method located the number keys by position from the beginning of the learning period and were to continue to use that method throughout the experimental period. The 17 students included in each group to be experimented upon were selected from two classes in personal typewriting both under the direction of the same teacher. Tests were administered at the end of the 8th, 14th, and 17th weeks. The following conclusions were reached:

1. The experiment did not show a significant difference in speed between the touch and the sight methods of typewriting numbers.

2. The errors made by both groups were about equal.

3. The control group with the exception of four individuals admitted that even though they

were typewriting by the touch method they looked at the keyboard to type accurately.

4. The experiment was limited in value by the small number of students participating.

The preceding paragraphs summarize some of the recent studies conducted in an effort to discover more effective methods to increase speed and accuracy in first-year typewriting. This study attempts to determine the effectiveness of the pipe organ method in comparison to the traditional method in the development of speed and accuracy in the typewriting of figures and provides data which the writer hopes may be of value in improving instructional practices.
CHAPTER III
PROCEDURES FOLLOWED IN CONDUCTING THE EXPERIMENT

In conducting this experiment to determine the effect of the pipe organ method in comparison to the functional method in the development of skill in the typewriting of figures, the following procedures were employed:

1. A study was made of theses, monographs, periodicals, and books to obtain information pertinent to the experiment.

2. Arrangements were made with the proper authorities in the school department in Nashua, New Hampshire, for using three Typewriting I classes in the high school for the study.

3. A plan for conducting the study was prepared to determine the scope and the procedures of the experiment.

4. Data pertaining to age, English grades, and sex of students were taken from the school's permanent records to be used as a basis for pairing students and equating the groups.

5. A test,\(^1\) consisting of three five-minute timed writings, was given to the groups selected to provide typewriting scores for pairing students.

6. Lesson plans to cover a ten-day period were prepared for the teaching of the traditional and pipe organ methods of typewriting figures.

7. A test was constructed to be used as a pretest on

\(^1\)See Appendix for straight-copy test.
the third day of the experiment after all figures on the top row of the keyboard had been introduced. This test was to be used also as a final test. In constructing this test, the frequency of each digit was distributed so that there would be equality of concentration on each figure.

8. A test was constructed to be used as a daily test on the fourth through the ninth day to measure daily growth during the experiment. In this test the frequency of each digit was equally distributed.

9. The control group was taught the traditional method of typewriting figures. The first three lessons, taught on consecutive days, contained material introducing all the figures on the top row of the keyboard.

10. The pipe organ method of typewriting figures was taught to the experimental group. All figures appearing on the top row of the keyboard were introduced in the first three lessons which were taught on consecutive days.

11. A five-minute figure test was administered to each group at the end of the practice period on figures on the third day of the experiment. Speed and accuracy scores from each student's paper were recorded and each group's mean scores were computed.

12. Daily lessons on figures were continued for a seven day period. The student time allotted for figure practice was the same for each group. The balance of instruction and practice for each period in both groups was
composed of regular lesson work taken from the same textbook.

The Plan of the Experiment

Factors used in pairing students and equating groups. One week before the experiment was started a test in typing straight-copy material was given to all students to determine their speed and accuracy scores. This test consisted of three five-minute timed writings from *20th Century Typewriting*.\(^1\) Scores from the best of the three writings were taken for each individual.

In addition to typewriting scores, data were obtained from student's permanent records relative to English grades, chronological age, and sex and used as bases for preliminary and final pairing of students.

Three Typewriting I classes were available for use in this experiment with 30 students in one class and a total of 49 in the other two classes. The class of 30 was selected to be the control group which was taught the traditional method of typewriting figures. The remaining two classes were selected to be the experimental group, and out of these two classes 30 students were paired against those in the control group.

From the 30 pairs of students selected in the preliminary analysis of matching factors, four pairs were lost because of absence during the experimental period. At the end of the experimental period, therefore, 26 pairs of students remained and their progress was analyzed.

Final pairings were determined on the basis of the following factors: (1) typewriting scores, including gross words per minute, and per cent of error as found by dividing the total errors by the gross strokes, on the best of the timed writings of the straight-copy test, (2) English grades, (3) chronological age, and (4) sex. Primary consideration was given to typewriting scores.

Table I shows the final pairings of students on the basis of the straight-copy typewriting scores. The means for the experimental and control groups were as follows: gross words per minute, 31.5, experimental, and 31.3, control; number of errors, 4.6, experimental, and 4.2, control; and per cent of error, .573, experimental, and .571, control. A comparison of the means of the two groups on the above-listed factors shows extremely small differences, and such differences as do exist are due to pure chance.

Table II shows final pairings of students on the basis of English grades, chronological age, and sex. English grades as shown in the table are the averages of all English grades for each student up to the beginning of the experiment.
TABLE I
PAIRINGS OF STUDENTS ON STRAIGHT-COPY TYPING WRITING SCORES

<table>
<thead>
<tr>
<th>Student</th>
<th>GWPM C</th>
<th>GWPM X</th>
<th>No. of Errors C</th>
<th>No. of Errors X</th>
<th>% of Error C</th>
<th>% of Error X</th>
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Means:

GWPM C: 31.3 31.5
GWPM X: 4.2 4.6
No. of Errors C: 4.7 4.6
No. of Errors X: 4.6 4.6
% of Error C: .571 .573
% of Error X: .418 .307

\( \sigma \):s

GWPM C: 8.5 7.5
GWPM X: 2.7 2.9
No. of Errors C: 2.7 2.9
No. of Errors X: 2.9 2.9
% of Error C: .571 .573
% of Error X: .418 .307

Diff.:

GWPM C: .2
GWPM X: .4
No. of Errors C: 2.2
No. of Errors X: 4.4
% of Error C: .002
% of Error X: .444
**TABLE II**

PAIRINGS OF STUDENTS ON THE BASES OF ENGLISH GRADES, CHRONOLOGICAL AGE, AND SEX

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<td>C X</td>
<td>C X</td>
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</tr>
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<td>15- 5</td>
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</tr>
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<td>15- 9</td>
<td>16- 3</td>
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<td>16- 1</td>
<td>15- 1</td>
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<td>14-11</td>
<td>15- 4</td>
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<td>15.</td>
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<td>16- 3</td>
</tr>
<tr>
<td>26.</td>
<td>71 73</td>
<td>15- 0</td>
<td>16- 4</td>
</tr>
</tbody>
</table>

**Means**: 80.9 80.5 15- 7 15- 8

**Diff.**: .4 0- 1
Chronological ages are computed to the nearest half month at the beginning of the experimental period. Examination of the means of the groups reveals little difference for English grades or chronological age. The means of the English grades of the experimental group is 80.5, while that of the control group is 80.9. The mean of the chronological ages of the experimental group is 15 years 8 months, while that of the control group is 15 years 7 months. In each group there are seven boys and they are paired boy for boy, as is shown in Table II.

**Conducting the experiment.** The introduction of figures was delayed until the ninth week of the first semester. This theory of delaying the introduction of figures was recommended by Eldridge\(^1\) in 1931, and was reasserted by Leslie and Pepe in 1951, in the following statement:

The authors' experience has proved to them that the numerals and special characters should be postponed about 40 lessons—about two months in high school. During this time, all or nearly all the practice has been focused on keyboard speed and accuracy in the use of the alphabet and the punctuation marks.\(^2\)

The purpose of this experiment was explained to each group in order that maximum effort would be evoked. The

---


control group was introduced to the top row of the keyboard according to Lesson Plan A, and the experimental group was taught according to Lesson Plan B. One teacher administered these lesson plans to both groups.

**Introductory lessons.** A time period of three days was allowed to introduce the figures on the top row to each class. Only the figure keys and the hyphen key were introduced during the experiment. The symbols that these keys strike were not mentioned. A drill period of ten minutes duration followed the lesson presentation each day.

**Pretest on figures.** At the end of the practice period on the third day a test was given to each group. This test was termed a pretest as the administration of such an instrument was required to obtain scores at the initial stage to compare against scores obtained at the final stage of the experiment in order to determine the amount of growth that occurred during the experimental period. It can be readily understood that the administration of such a pretest was impossible until after the figure row had been introduced. Students corrected their own papers and computed scores for gross words per minute and number of errors. These scores were checked and recorded by the teacher.

Table III shows scores obtained on the pretest on figures.

---

1See Appendix for Lesson Plans A and B.

2See Appendix for Pretest on figures.
<table>
<thead>
<tr>
<th>Student</th>
<th>GWPM C</th>
<th>No. of Errors C</th>
<th>% of Error C</th>
<th>GWPM X</th>
<th>No. of Errors X</th>
<th>% of Error X</th>
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</tr>
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<td>13</td>
<td>11</td>
<td>3.38</td>
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<td>2.40</td>
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<td>11</td>
<td>11</td>
<td>4.00</td>
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<td>20</td>
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</tr>
<tr>
<td>6.</td>
<td>8</td>
<td>6</td>
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<td>2</td>
<td>.80</td>
</tr>
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<td>7</td>
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<td>5</td>
<td>1.67</td>
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<td>7.56</td>
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<td>3.27</td>
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<td>26.</td>
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<td>7</td>
<td>4.00</td>
<td>6</td>
<td>10</td>
<td>6.67</td>
</tr>
<tr>
<td>Means</td>
<td>9.8</td>
<td>11.5</td>
<td>4.3</td>
<td>10.9</td>
<td>13.0</td>
<td>4.9</td>
</tr>
<tr>
<td>s's</td>
<td>2.3</td>
<td>5.6</td>
<td>1.9</td>
<td>2.2</td>
<td>7.7</td>
<td>2.9</td>
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<tr>
<td>Diff.</td>
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<td>1.5</td>
<td>.6</td>
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</table>
The means for the experimental and control groups are as follows: gross words per minute, 10.9, experimental, and 9.8, control; number of errors, 13.0, experimental, and 11.5, control; and per cent of error, 4.9, experimental, and 4.3, control. Comparison of the means of the two groups on the above listed factors reveals only a relatively small difference.

Daily lessons. Each day for seven days daily lessons on figures were presented to each group according to specific lesson plans. The lessons began with a short drill on selected keys on the top row of the typewriter in which the student and teacher participated. A time limit of three minutes was set for this presentation, and each group received the same amount of concerted drill practice. Then students continued to practice individually for eight minutes on figure drills from mimeographed copy. While these drills were constructed to conform to the traditional method for the control group and to the pipe organ method for the experimental group, they were constructed to be as similar as possible in content.

Daily test. At the conclusion of the figure practice period each day a five-minute test was given. The same test was given to both groups. Students corrected their own papers and scored them for gross words per minute and number of errors. These scores were checked and recorded by the teacher.
Final test. At the end of the concerted drill period on the tenth day of the experiment a final five-minute test was administered to each group. This test was the same one given as a pretest on the third day. Scores were taken for each of the paired students. These scores were used in determining achievement in speed and control, and in comparing with beginning scores to determine the amount of gain.

Analysis of the data. Means of the final scores of each group were computed. The mean difference in gross speed, number of errors, and per cent of error were found and critical ratios of the differences were computed to determine the significance of the difference in mean scores.

Conclusions and recommendations were prepared based on the findings of the experiment.
CHAPTER IV
ANALYSIS AND INTERPRETATION OF DATA

The data of this experiment consist of stroke and error scores obtained in the typewriting of figures of 26 pairs of first-year typewriting students. The main data consist of the beginning and ending mean scores of the groups. The stroke scores were computed in terms of mean gross words per minute, and error scores were computed in terms of mean number of errors and mean per cent of error. Additional data consist of mean scores obtained on daily tests given on six days to each group.

Mean scores for the pretest, six daily tests, and the final test are shown in Figures 3-5. The differences of the mean stroke and error scores of the control and experimental groups were studied to determine the effectiveness of the pipe organ method in comparison to the traditional method in the development of speed and control in the typewriting of figures. These differences must reveal critical ratios of 3 or more in order for the results to be considered significant in this study.¹

Analysis of Growth Curves

In analyzing the growth curves the difficulty of the

¹ CR = \( \frac{M_1 - M_2}{\text{SE}_{M_1-M_2}} \)
pretest-final test in comparison with the daily test must be considered. The pretest-final test was constructed of figure groupings of four digits, whereas the daily test was constructed of figure groupings of three digits. This fact may account for the drop in growth from the sixth daily test to the final test, as the drop occurs in both groups and varies slightly in degree.

**Gross words per minute.** The mean gross words per minute curve of the control group, as presented in Figure 3, starts at 9.8, rises steadily until it reaches its peak at the sixth daily test, 16.2, and levels off ending at 15.2. The mean gross words per minute curve of the experimental group starts at 10.9, rises steadily until it reaches its peak at the sixth daily test, 19.3, and levels off ending at 17.8. The difference of 1.1 in favor of the experimental group at the pretest point was found to be not statistically significant. However, this difference was not as large at the initial pairing of the groups from the straight-copy test point where the difference was only .2 in favor of the experimental group.

**Number of errors.** The mean number of errors curve of the control group, as presented in Figure 4, starts at 11.5, drops to 7.6 on the second daily test, rises and drops again ending at 7.5. The mean number of errors curve of the experimental group starts at 13.0, drops steadily until the fourth test 6.2, rises and drops again ending at 6.2.
FIGURE 3
MEAN GROSS WORDS PER MINUTE SCORES ON FIGURE MATERIAL
OF TWO GROUPS IN FIRST-YEAR VOCATIONAL TYPWRITING

Words per minute

Pretest 1 2 3 4 5 6 Final test

Daily tests

--- Control group

----- Experimental group
FIGURE 4
MEAN NUMBER OF ERRORS ON FIGURE MATERIAL OF TWO GROUPS
IN FIRST-YEAR VOCATIONAL TYPEWRITING

Number of errors

13 12 11 10 9 8 7 6 5

Pretest 1 2 3 4 5 6 Final test

Daily tests

----- Control group

----- Experimental group
Per cent of error. The mean per cent of error curve of the control group, presented in Figure 5, starts at 4.3, drops to 2.5 on the second daily test, rises and drops again ending at 1.9. The mean per cent of error curve of the experimental group starts at 4.9, drops to 1.4 on the fourth daily test, rises and drops again ending at 1.4.

Comparison of Mean Gains

Gross words per minute. The control group started at 9.8 gross words per minute and ended at 15.2, revealing a mean gain of 5.4. The experimental group started at 10.9 gross words per minute and ended at 17.8, showing a mean gain of 6.9. Comparison of the mean gains of the groups in terms of gross words per minute shows a difference of 1.5 in favor of the experimental group. This difference is not considered to be statistically significant.

Number of errors. The control group started with a mean number of errors of 11.5 and ended with 7.5, revealing a gain in control of 4.0. The experimental group started with a mean number of errors of 13.0 and ended with 6.2, revealing a gain in control of 6.8. The difference between the mean gains in control of the two groups is 2.8 in favor of the experimental group, and is not a statistically significant difference.

Per cent of error. The control group started with a
FIGURE 5

MEAN PER CENT OF ERROR SCORES ON FIGURE MATERIAL OF TWO GROUPS IN FIRST-YEAR VOCATIONAL TYPWRITING

![Graph showing mean per cent of error scores on figure material of two groups in first-year vocational typewriting. The graph includes a legend indicating the control group and the experimental group.](image-url)
# TABLE IV
DIFFERENCES IN MEAN SCORES OF THE OBSERVED GROUPS

<table>
<thead>
<tr>
<th>Unit of Score</th>
<th>Beginning Score</th>
<th>Ending Score</th>
<th>Mean Gain</th>
<th>Difference in Mean Gain</th>
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</tr>
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<td>5.4</td>
<td></td>
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<tr>
<td><strong>No. of Errors</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>6.2</td>
<td>6.8</td>
<td>2.8</td>
</tr>
<tr>
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<td>7.5</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td><strong>% of Error</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
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<td>1.4</td>
<td>3.5</td>
<td>1.1</td>
</tr>
<tr>
<td>Control</td>
<td>4.3</td>
<td>1.9</td>
<td>2.4</td>
<td></td>
</tr>
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</table>
mean per cent of error of 4.3 and ended at 1.9, revealing a
again in control of 2.4. The experimental group started with
a mean per cent of error of 4.9 and ended at 1.4, revealing
a gain of 3.5. The difference in the mean gains of the
groups in terms of per cent of error was found to be 1.1 in
favor of the experimental group, and is not a statistically
significant difference.

Analysis of Final Mean Scores

Gross words per minute. The differences of the final
mean scores of the two groups are presented in Table V.
The mean gross words per minute of the control group in the
final test was 15.2, and of the experimental group, 17.8,
revealing a difference of 2.6. The critical ratio for this
difference was found to be 2.68, in favor of the experimental
group.

The pipe organ method of typewriting figures taught to
the experimental group revealed a gain in stroking speed
over the traditional method taught to the control group, but
the difference was not a statistically significant one.

Number of errors. The mean number of errors for the
control group was 7.5, and for the experimental group, 6.2.
The difference between the means was 1.3. The critical
ratio for the difference between the means was found to be
0.96, in favor of the experimental group. This difference
## TABLE V

**Pairings of Students on Final Typewriting Scores on Figures**

<table>
<thead>
<tr>
<th>Student</th>
<th>GWPM C</th>
<th>GWPM X</th>
<th>No. of Errors C</th>
<th>No. of Errors X</th>
<th>% of Error C</th>
<th>% of Error X</th>
</tr>
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<td>1.05</td>
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<td>0.94</td>
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<td>4</td>
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<td>3</td>
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<td>8</td>
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<td>5</td>
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<th>7.5</th>
<th>6.2</th>
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<th>1.4</th>
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<td>5.4</td>
<td>4.1</td>
<td>1.4</td>
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<td>Diff.</td>
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<td>1.3*</td>
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<td>2.68</td>
<td>.96</td>
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*Reduction in the number of errors or the per cent of error is in favor of the experimental group.
was considered not statistically significant.

Per cent of error. The mean per cent of error for the control group was 1.9, and for the experimental group, 1.4. The difference between the means was .5. The critical ratio for the difference between the means was found to be .15, in favor of the experimental group. This difference was considered not statistically significant.
CHAPTER V
SUMMARY AND CONCLUSIONS

In conducting this experiment to determine the effectiveness of the pipe organ (experimental) method as compared with the traditional (control) method in the development of skill in the typewriting of figures, the groups were matched at the beginning primarily on the basis of straight-copy timed writing scores. A comparison of the means obtained on these straight-copy timed writings at this initial point reveals a difference which is very slight in degree.

At the end of the third day of the experiment, after the figure row had been introduced to both groups, a pretest on figures was given. The difference between the means on scores obtained on the pretest on figures is greater in degree than the difference between the means on scores obtained on the straight-copy test, but the difference in the pretest scores between the experimental and control groups is not considered statistically significant. This variation between the matching and pretest differences was uncontrollable as it was necessary to match the pairs before the start of the experiment, and it was impossible to pair them on the basis of figure pretest scores which could not be obtained until after the completion of the introduction of the top row of the keyboard on the third day of the experimental period. It is believed also that on the pretest
on figures the gross words per minute difference of 1.1 in favor of the experimental group is offset by the greater number of error difference of 1.5 which the experimental group scored on the same test.

The data of this experiment in which two methods of typewriting figures were compared to determine the effect of each method upon speed and accuracy in the typewriting of figures in first-year vocational typewriting reveal the following:

1. The students of the experimental group showed a greater increase in gross stroking speed for this ten-day instructional period than did the control group. The critical ratio for this difference was considered not statistically significant.

2. The students in the experimental group showed a greater reduction in the number of errors made in five-minute timed writings on figures than did the control group. The difference in achievement in reduction of errors was not statistically significant.

3. The students in the experimental group made greater gains than students in the control group in reducing the percent of error in five-minute timed writings on figures, but not to a statistically significant degree.
Conclusions

The purpose of this study was to determine the effectiveness of the pipe organ method in comparison to the traditional method of typewriting figures upon (1) gross stroking speed, and (2) control or accuracy in typewriting figures. Analysis of the data points to the following conclusions:

1. The pipe organ method had no statistically significant effect over the traditional method upon the gross stroking speed of students in the typewriting of figures, although the experimental group using the pipe organ method was slightly favored.

2. The pipe organ approach showed no statistically significant effect over the traditional approach in reducing the number of errors or per cent of error in typewriting figures, but the experimental group was slightly favored.

Recommendations

As a result of this study, the following recommendations for further investigation of methods of typewriting figures are made:

1. The plan of this experiment should be repeated with slight modification. More students should be included than in the present study, and the study should be continued
over a longer period of time with provision for periodic measurement to provide data for comparative growth curves of the groups.

2. The pipe organ method might be applied in different situations than the one outlined in this study, such as in advanced typewriting classes, or in personal use typewriting classes.

3. The plan of this experiment might be used to compare the pipe organ method used in this experiment with methods other than the traditional method of teaching the top row of the typewriter keyboard.

4. The plan of this experiment might be used to compare the traditional method used in this experiment with methods other than the pipe organ method of teaching the top row of the typewriter keyboard.


5. Gibbs, William T., An Experiment to Determine the Effectiveness of Forced Correction of Errors as a Technique for Developing Control in First-Year Vocational Typewriting, Master's Thesis, Boston University, 1949.


APPENDIX
PRETEST-FINAL TEST

1024 3567 9835 6417 8091 2357 4260 8319 5049 8627
2675 4831 5184 9036 7290 1506 5423 9718 3482 6907
5069 3142 8470 2513 9172 8603 6584 2196 4305 9768
8235 1470 9125 7386 6925 4430 6065 7878 9132 4019
4218 6346 3462 5619 1580 9745 7837 8970 2309 1052
3049 5286 7104 8923 4615 3507 9672 6328 1017 8954
6574 2630 4805 3961 5094 7283 8234 1789 9101 2675
9102 7234 1345 4456 3567 5678 2789 3890 8901 6012
7096 8985 6874 1763 2652 6541 3430 4327 5218 9109
1829 9378 2647 8565 7546 6473 1823 5190 4102 3901
4571 3182 5493 9604 8315 7826 6237 2748 7059 1960
9808 6419 8729 5335 7646 2554 1260 4071 3193 4782
### DAILY TEST

| 317 | 568 | 471 | 230 | 694 | 140 | 826 | 745 | 613 | 782 |
| 950 | 394 | 601 | 278 | 185 | 426 | 390 | 507 | 953 | 892 |
| 623 | 802 | 760 | 980 | 571 | 456 | 395 | 248 | 135 | 639 |
| 207 | 640 | 803 | 912 | 714 | 591 | 486 | 379 | 258 | 147 |
| 809 | 576 | 940 | 352 | 786 | 293 | 507 | 136 | 120 | 191 |
| 485 | 769 | 342 | 856 | 475 | 283 | 104 | 621 | 374 | 890 |
| 251 | 340 | 623 | 741 | 658 | 930 | 249 | 897 | 904 | 467 |
| 965 | 327 | 589 | 160 | 247 | 853 | 615 | 820 | 817 | 301 |
| 126 | 582 | 348 | 613 | 752 | 946 | 513 | 279 | 360 | 586 |
| 741 | 623 | 790 | 453 | 781 | 928 | 940 | 507 | 194 | 800 |
| 468 | 203 | 160 | 548 | 321 | 562 | 410 | 783 | 924 | 701 |
| 306 | 423 | 879 | 615 | 928 | 704 | 583 | 765 | 959 | 197 |
| 501 | 634 | 758 | 120 | 836 | 945 | 701 | 826 | 379 | 514 |
| 724 | 309 | 615 | 429 | 706 | 342 | 968 | 530 | 718 | 982 |
STRAIGHT-COPY TIMED WRITING

Directions: Set margins at 12 and 77. Use double spacing. Set tabulator key for a 5-space indentation. Type the paragraph for 5 minutes. Circle every error. Figure your gross words per minute.

If you want to learn to write good letters, learn to say what you need to say in such a way that the reader will never be in doubt of your meaning. Letters are forceful or weak as the choice of words is good or bad. You should study the use of words as a good workman studies the use of the tools of his trade. In fact, words are the tool of the writer of letters.
LESSON PLAN A
Introducing Figures by the Traditional Method

First Day
Key Control Drill:
Introduce 1, 3, 7, 6.
(a) Small 1 also figure 1.
   d finger strikes 3. Teacher calls and students type de3d until familiar with reach.
   j finger strikes 7. Teacher calls and students type ju7j until familiar with reach.
   j finger strikes 6. Teacher calls and students type j6j until familiar with reach.
(b) Type three lines of each line:
   d3d j7j j6j d3d j7j j6j d3d j7j j6j d3d j7j j6j d3d j7j j6j
d3j7j6 d3j7j6 d3j7j6 d3j7j6 d3j7j6 d3j7j6 d3j7j6 d3j7j6
   137 136 371 361 316 317 371 367 671 673 173 176 167 676 767 373 376

Second Day
Key Control Review:
d3d j7j j6j (Have pupils type while teacher calls and points at chart.)
Key Control Drill:
Introduce 4, 5, 8.
(a) f finger strikes 4. Teacher calls and students type frkf until familiar with reach.
    f finger strikes 5. Teacher calls and students type f5f until familiar with reach.
k finger strikes 8. Teacher calls and students type k8k until familiar with reach.

(b) Type three lines of each line:

```
flf f5f k8k flf f5f k8k flf f5f k8k flf f5f k8k flf f5f k8k flf f5f k8k flf f5f k8k flf f5f k8k
3h5678 3h5678 3h5678 3h5678 3h5678 3h5678 3h5678 3h5678
1h5 1h5 1h5 1h5 1h5 1h5 1h5 1h5 1h5 1h5 1h5 1h5 1h5 1h5 1h5
```

Third Day

Key Control Review:

d3d flfl f5f j7j j6j k8k (Teacher calls and points at chart while pupils type.)

Key Control Drill:

Introduce 2, 9, 0, -.

(a) s finger strikes 2. Teacher calls and students type sw2s until familiar with reach.

l finger strikes 9. Teacher calls and students type l091 until familiar with reach.

i finger strikes 0. Teacher calls and students type 0; until familiar with reach.

j finger strikes -. Teacher calls and students type -; until familiar with reach.

(b) Type three lines of each line:

```
s2s 191 0; s2s 191 0; s2s 191 0; s2s 191 0; s2s 191 0; s2s 191 0;
s2s d3d flf f5f j6j j7j k8k 191 0; s2s d3d flf f5f j6j j7j k9k 191 0;
123h567890 123h567890 123h567890 123h567890 123h567890 123h567890
121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139
```
(c) Administer Pretest.

Fourth Day
(a) Warm-up drill. Teacher and pupils call together:
   a; 29dkh7ghh7dk29a; 29dkh7ghh7dk29a; 29dkh7ghh7dk29a; 29dkh7ghh7dk29a;
(b) Type three lines of each line:
   s2s d3d fhf f5f ;0; 191 k8k j7j j6j s2s d3d fhf f5f ;0; 191 k8k j7j j6j
   1 0 100 2 0 200 3 0 300 h 0 400 5 0 500 6 0 600 7 0 700 8 0 800 9 0 900
   9 0 909 8 0 808 7 0 707 6 0 606 5 0 505 h 0 h0h 3 0 303 2 0 202 1 0 101
   1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923
(c) Daily test.

Fifth Day
(a) s2s d3d fhf f5f ;0; 191 k8k j7j j6j (Teacher and pupils call.)
(b) Type three lines of each line:
   January 20, 1930; February 25, 1951; June 6, 1929; April 7, 1946;
   October 28, 1934; September 7, 1948; July 3, 1942; March 4, 1937;
   December 6, 1938; November 27, 1950; May 25, 1943; August 6, 1932;
   The three Art Lectures are scheduled for 3:45; 4:45; and 7:30 P.M.
(c) Daily test.

Sixth Day
(a) Warm-up drill. (Teacher and pupils call together.)
   a; 29dkh7ghh7dk29a; 29dkh7ghh7dk29a; 29dkh7ghh7dk29a; 29dkh7ghh7dk29a;
(b) Type three lines of each line:
   2022 2021 1020 1021 1009 1008 1007 1006 1005 1004 1003 1002 1001
   1 3 5 7 9 11 13 15 17 19 21 22 24 27 29 31 33 35 37 39 #1 #3 #5 #7 #9
The telephone numbers of the hospital are Main 1357 and Main 2466.

(c) Daily test.

Seventh Day

(a) Warm-up drill. Teacher calls and points at chart while pupils type:
sw13 s33 frh f5 f 109 18k ju7 j 6j
(b) Type three lines of each line:
123 321 124 131 41b 156 651 167 761 178 871 189 981 190 091
1 0 101 2 0 202 3 0 303 h 0 40h 5 0 505 6 0 606 7 0 707 8 0 808 9 0 909
6 0 600 7 0 700 5 0 500 8 0 800 h 0 400 9 0 900 3 0 300 1 0 100 2 0 200
1 2 12 1 3 1 4 1 h 1 5 1 6 1 7 1 8 1 9 1 9 2 0 2 0 2 1 21
(c) Daily test.

Eighth Day

(a) Teacher calls and points at chart while pupils type:
s22 ddd 333 fff lhh lff 555 j9j 000 111 999 kick 888 j9j 777 ljj 666
(b) Type three lines of each line:
101 102 103 104 105 106 107 108 109 110 111 112 113 11h 115 116 117 118 119
100l 1002 1003 100h 1005 1006 1007 1008 1009 1008 1007 1006 1005 1004 1003
s22 s22 ded d3d fff fff f9j h 0; 101 191 kik kik juj j7j f5f j6j
(c) Daily test.

Ninth Day

(a) Warm-up drill:
123h 567890 0987654321 123h 567890 0987654321 123h 567890 0987654321
(b) Type three lines of each line:
d3d j7j d3d j7j 137 137 d3d j7j 137 He is 37. It totals 731.

k8k k8k k8k 1h8 1h8 hf 8k He is 48. He has 148 books.

150 150 f5f 0; 150 Read page 150. f5f 0;
s2s 191 s2s 191 129 s2s 191 129 This is Route 129. s2s 191

(c) Daily test.

d3d j7j d3d j7j 137 137 d3d j7j 137 He is 37. It totals 731.

k8k k8k k8k 1h8 1h8 hf 8k He is 48. He has 148 books.

150 150 f5f 0; 150 Read page 150. f5f 0;
s2s 191 s2s 191 129 s2s 191 129 This is Route 129. s2s 191

(c) Daily test.

Tenth Day

(a) Warm-up drill: s2s d3d f5f 0; 191 k8k j7j j6j

(b) Administer Final Test.
LESSON PLAN B

Introducing Figures by the Pipe Organ Method

First Day

Key Control Drill:

Demonstrate typing figures of left hand.

(a) Small j also figure 1.
(b) Raise left hand from home row to figure row and place:
   f finger on 5 (also controls 6)
   d finger on 4
   s finger on 3
   a finger on 2
(c) 1234565 (Call this drill several times until pupils get the
     feeling of placement and typing with left hand on
     the figure row.)
(d) Type three lines of each line:
   222 333 444 555 666 777 888 999 000 111 222
   aaa 222 aaa sss 333 sss ddd lll lll ddd fff 555 fff ggg 666 ggg fff 555 fff
   a2a s3s ddd f5f g6g f5f ddd s3s a2a s3s ddd f5f g6g f5f ddd s3s a2a
   fad 52l sad gag 626 gag gag 623 gas dad 424 dad sad 326 sad add 2ll add

Second Day

Key Control Review:

(a) 1234565 (Have pupils type 2 lines while teacher calls.)
(b) a2a s3s ddd f5f g6g f5f ddd s3s a2a (Have pupils type 2 lines
    while teacher calls.)
Key Control Drill:

(a) Raise right hand from home row to figure row and place:
   \[ \text{j finger on 8 (also controls 7)} \]
   \[ \text{k finger on 9} \]
   \[ \text{l finger on 0} \]
   \[ \text{m finger on -} \]

(b) -0987690- (Call this drill several times until students get the
    feeling of placement and typing with right hand on
    figure row.)

(c) Type three lines of each line:

--- 000 999 888 777 888 999 000 --- 000 999 888 777 888 999 000 ---

--- 111 000 111 kkk 999 kkk jii jii hhh 777 hhh jii jii 888 jii jii

--- 101 k9k j8j h7h j8j k9k 101 j=; 101 k9k j8j h7h j8j k9k 101 j=;

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Third Day

(a) Alternate finger drill—teacher and pupils call together:
2-30h9586758h9302- 2-30h9586758h9302- 2-30h9586758h9302- 2-30h9586758h9302-

(b) Type three lines of each line:

a2a a3s dld f5f g6g f5f dld s3s a2a j=; 101 k9k j8j h7h j8j k9k 101 j=;
1 0 100 2 0 200 3 0 300 4 0 400 5 0 500 6 0 600 7 0 700 8 0 800 9 0 900
dash h237 dash fall 5200 fall asks 2393 asks jags 8263 jags lads 02h3 lads

(c) Administer Pretest.

Fourth Day

(a) Alternate finger drill—teacher and pupils call together:
2-30h9586758h9302- 2-30h9586758h9302- 2-30h9586758h9302- 2-30h9586758h9302-
(b) Type three lines of each line:

a2h2a s353s d42hd f525f f656f j8-8j j767j
a2-2a s303s d49hd f585f f676f j858j j767j
a25-; s360l d79k f568j f678j ; 8a 1073s k96hd j875f j765f
flask 50239 glass 60233 salad 3202h flash 50237 flags 50263 halls 72003

(c) Daily test.

Fifth Day

(a) Teacher calls and points while students type:
a2a s3s dhd f5f g6g h7h j8j k9k 101 ;-

(b) Type three lines of each line:

January 20, 1930; February 25, 1951; June 6, 1929; April 7, 19h6;
October 28, 1934; September 7, 1948; July 3, 1942; March 4, 1937;
December 6, 1938; November 27, 1950; May 25, 1943; August 6, 1932;
The three Art Lectures are scheduled for 3:15; 4:15; and 7:30 P. M.

(c) Daily test.

Sixth Day

(a) Warm-up drill. Teacher calls and students type:
a2a ;-
s3s 101 dhd k9k f5f j8j g6g h7h

(b) Type three lines of each line:

2022 2021 1020 1010 1009 1008 1007 1006 1005 1004 1003 1002 1001
7205 half 7205 602h glad 602h 8293 jaks 8293 3237 sash 3237
52003 falls 30237 slash 62003 galls 37200 shall 30263 slage 62553 gaffs
The telephone numbers of the hospital are Main 13h8 and Main 13h9.

(c) Daily test.
Seventh Day

(a) Warm-up drill. Teacher and students call together:

123 321 134 431 145 541 156 651 167 761 178 871 189 981 190 091
10 101 20 202 30 303 40 404 50 505 60 606 70 707 80 808 90 909
6 0 600 7 0 700 5 0 500 8 0 800 1 0 400 9 0 900 3 0 300 1 0 100 2 0 200
1 2 12 1 3 13 1 4 1 5 1 6 1 6 1 7 1 8 1 8 1 9 1 9 2 0 2 0 2 1 21

(b) Type three lines of each line:

Type the lines of each line:

101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119
1001 1002 1003 1004 1005 1006 1007 1008 1009 1005 1006 1007 1006 1005 1004 1003

(c) Daily test.

Eighth Day

(a) Warm-up drill. Teacher and students call together:

a2a 3-3 s3s 101 dhk k9k f5f j8j g6g h7h f5f j8j dhk k9k s3s 101 a2a 3-3

(b) Type three lines of each line:

Type three lines of each line:

101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119
1001 1002 1003 1004 1005 1006 1007 1008 1009 1005 1006 1007 1006 1005 1004 1003

(c) Daily test.

Ninth Day

(a) Warm-up drill. Teacher and students call together:

a2a 3-3 s3s 101 dhk k9k f5f j8j g6g h7h f5f j8j dhk k9k s3s 101 a2a 3-3

(b) Type three lines of each line:

2a 2-2 s3s 303 dhk h9h fzf 585 g6g 676 fzf 585 dhk h9h s3s 303 a2 2-2

(c) Daily test.
(c) Daily test.

Tenth Day

(a) Teacher and pupils call and type three lines of the following:
a2a j-; s3s 101 dhd k9k f5f j8j g6g h7h f5f j8j dhd k9k s3s 101 a2a j-;

(b) Final Test.