DOCUMENT RESUME

ED 070 922 AC 014 067

AUTHOR	Showel, Morris
TITLE	An Evaluation of Alternative Programs for Training Beginning Typists in the Army.
INSTITUTION	Human Resources Research Organization, Alexandria, Va.
SPONS AGENCY	Office of the Chief of Research and Development (Army), Washington, D.C.
REPORT NO	HumRRO-TR-72-33
PUB DATE	Nov 72
NOTE	105p.; Work Unit TYPETRAIN
EDRS PRICE	MF-$0.65 HC-$6.58
DESCRIPTORS	Adult Vocational Education; Clerical Workers; *Enlisted Men; Evaluation Methods; Military Personnel; *Military Training; *Program Evaluation; Research; Student Evaluation; Technical Reports; *Training Techniques; *Typewriting
IDENTIFIERS	*United States Army

ABSTRACT

This report presents the results of research to develop an improved training program for Army typists, and the material needed to implement that program. The research was conducted at Fort Ord and Fort Knox. First, baseline learning curves were determined. Eight experimental programs then were examined, and the results of various modifications in training were compared with the baseline learning curves. The effect of selected training variables and training systems was evaluated, and the relationship between straight-copy typing and production-copy typing was explored. Several alternative revised training programs were field tested, and suggestions for revising the training program now in use were made. (Author)

Technical
Report
72-33
HumRRO-TR-72-33

HumRRO

An Evaluation of Alternative Programs for Training Beginning Typists in the Army

Morris Showel

HUMAN RESOURCES RESEARCH ORGANIZATION
300 North Washington Street • Alexandria, Virginia 22314

November 1972

Prepared for

Office of the Chief of Research and Development
Department of the Army
Washington, D.C. 20310

HumRRO
Technical
Report
72-33

An Evaluation of Alternative Programs for Training Beginning Typists in the Army

Morris Showel

HumRRO Division No. 3
Presidio of Monterey, California

HUMAN RESOURCES RESEARCH ORGANIZATION

Work Unit TYPETRAIN

November 1972

Prepared for

Office of the Chief of Research and Development
Department of the Army
Washington, D.C. 20310

The Human Resources Research Organization (HumRRO) is a nonprofit corporation established in 1969 to conduct research in the field of training and education. It is a continuation of The George Washington University Human Resources Research Office. HumRRO's general purpose is to improve human performance, particularly in organizational settings, through behavioral and social science research, development, and consultation. HumRRO's mission in work performed under contract with the Department of the Army is to conduct research in the fields of training, motivation, and leadership.

Published
November 1972
by
HUMAN RESOURCES RESEARCH ORGANIZATION
300 North Washington Street
Alexandria, Virginia 22314

Distributed under the authority of the
Chief of Research and Development
Department of the Army
Washington, D.C. 20310

FOREWORD

This document reports a research effort by the Human Resources Research Organization directed toward improvement of the Army training program for beginning typists. The sponsor of the research was the U.S. Army Adjutant General School, Fort Benjamin Harrison, Indiana.

The research was conducted under Work Unit TYPETRAIN at HumRRO Division No. 3, Presidio of Monterey, Monterey, California. The Director of the Division is Dr. Howard H. McFann. Dr. Joseph Ward was the Work Unit Leader during Sub-Units I and II. Dr. Morris Showel was Work Unit Leader during Sub-Unit III and was responsible for the preparation of this document. Members of the TYPETRAIN staff who made a significant contribution to the research effort included SP5 Paul Ryan, SP5 Peter Purchia, and SP4 Rickey Wheeler. Dr. James S. DeGracie, a member of the HumRRO staff, assisted in the statistical treatment of the data.

Administrative and logistical support for the research effort was provided by the U.S. Army Training Center Human Research Unit, Presidio of Monterey, whose chief is COL Ullrich Hermann; by the faculty and staff of the Basic Army Administration Course, Fort Ord, California; and by the faculty and staff of the Clerk Course, Fort Knox, Kentucky.

HumRRO research for the Department of the Army is conducted under Contract DAHC 19-73-0004. Army Training Research is conducted under Army Project 2Q062107A745.

Meredith P. Crawford
President
Human Resources Research Organization

SUMMARY AND CONCLUSIONS

PROBLEM

The Army, like large civilian organizations, has a continuing need for skilled typists. To meet this need, typing instruction is currently being given annually to approximately 18,000 men in the 71B and 71H clerical training courses at Army training centers. A significant number of these students can be classified as beginning typists (i.e., they type 10 or less net words per minute on 5-minute, straight-copy test trials). In order to improve the training of these students, the U.S. Army Adjutant General School, the proponent agency for typing training programs, requested HumRRO Division No. 3 to initiate research on typing training. The objective of the research was to develop an improved training program, and the material needed to implement that program.

APPROACH

The research was divided into three sub-units. Sub-Unit I was directed toward establishing a baseline against which to compare the effectiveness of experimental training programs. Baseline data from the Army Subject Schedule authorized training program were collected at Fort Ord in 1969-70 and at Fort Knox in 1971. Sub-Unit II was concerned with measuring the effect of selected training variables on the acquisition of straight-copy typing skill. This effort took the form of a number of small pilot studies conducted at Fort Ord in 1970. Sub-Unit III, incorporating the results attained in Sub-Unit II, field tested a number of experimental training programs. These field tests were conducted at Fort Ord in 1970-71.

Data on the effectiveness of the control and the experimental training programs were obtained by administering standardized 5-minute typing tests to students at entry, and after every four hours of practice thereafter.

For purposes of analyses, students were divided into three groups on the basis of the gross words per minute (GWPM) they typed on the entry tests: (a) slow, those who typed between 1.0 and 5.0 GWPM; (b) intermediate, those who typed between 5.1 and 10.0 GWPM; and (c) fast, those who typed between 10.1 and 15.0 GWPM.

RESULTS

A number of experimental training programs proved to be superior to the control (baseline) training program in increasing the typing skill of fast, intermediate, and slow students. Over a two-week period (32 hours of practice), the best experimental programs increased the typing speed of slow and intermediate typists between two and three gross words per minute, and the typing speed of fast typists between four and six gross words per minute, with no appreciable increase in errors.

CONCLUSIONS

(1) All students, even those who say they have typed before, should be given about one hour of instruction on how to type and then given three 5-minute entry-test trials, each trial on different copy. The average of these three trials should be considered the

student's entry-test typing score. This score should be used to identify students who require (and can profit from) beginning typing instruction and provide a base against which to measure the student's subsequent progress.

(2) Serious consideration should be given to dropping from the typing program those few students who average five or less GWPM on the entry typing tests. Very few of these students were able to meet the Army typing minimum typing standards in any of the programs tested.

(3) Training should be conducted in two phases—a brief (five or six hours) keyboard learning phase, followed by an extensive speed building phase. The keyboard learning phase should consist of lock-step instruction and practice. The speed-building phase should be self-paced, with the students instructed to concentrate on reaching specific speed goals. Two of the experimental programs incorporated these two concepts—the Audio 6, Forced-Pace program, which presented keyboard instruction by means of audio tapes, and the Video 6, Forced-Pace program, which presented keyboard instruction by means of video tapes. Both programs were superior to the present program and used equipment and materials readily available in training centers.

(4) The present system of early and frequent evaluation of student progress should be continued. Students should be tested immediately following the keyboard-learning phase, and after every four hours of typing practice thereafter. These tests should consist of three 5-minute trials, each trial on different copy. The average of these three trials should be considered the student's score. Once the student meets acceptable standards, he should be moved out of the beginning typing program.

(5) The copy used for tests and for practice should be similar in terms of level of difficulty.

(6) During all practice and tests the typewriter keyboard should be uncapped.

(7) It is not desirable to require students to type for more than two consecutive hours.

(8) Serious consideration should be given to having students do some production-copy typing as soon as they have completed the keyboard-learning phase of the program.

CONTENTS

Figures

An Evaluation of Alternative Programs for Training Beginning Typists in the Army

Chapter 1

INTRODUCTION

The Army, like any large civilian organization, has a continuing need for skilled typists. To meet this need, typing instruction is currently being given annually to approximately 18,000 men in the 71B and 71H clerical training courses at Army Training Centers. It is likely that this figure underestimates the number of new recruits who will be using typewriting skills once they are assigned to jobs. An unknown but considerable amount of additional typing training is being conducted in the Army through other courses (e.g., Supply) and the various educational centers. Any increase in the effectiveness of the training would benefit the Army directly through increased typing proficiency and possible reductions in training time.

The U.S. Army Adjutant General School, the proponent agency for typing training programs, requested HumRRO Division No. 3 to initiate research on typing training. The objective of the research was to develop an improved training program, and the material needed to implement that program.

The research was conducted in three phases: Sub-Unit I was designed to determine (a) the relationship between straight-copy typing skill and production-copy typing skill, and (b) baseline learning curves against which to compare any modifications in the typing training program. Sub-Unit II was designed to evaluate the effect of selected training variables and training systems on the acquisition of straight-copy typing skill. Sub-Unit III was designed to field test a number of alternative, revised training programs.

Data on the effectiveness of the baseline or control program were gathered at Fort Ord, California in 1969-70, and at Fort Knox, Kentucky in 1971. All experimental programs were field tested at Fort Ord. Since the bulk of the research was conducted at Fort Ord, the detailed description that follows is largely limited to the Ford Ord setting.

This document presents the methodology and the results for all three Sub-Units.

Chapter 2

THE TRAINING SETTING

This chapter describes the setting in which both the control and the experimental training programs were conducted. It includes a description of the MOS, organization for training, the nontyping component of the training program, elements common to both experimental and control typing programs, the evaluation of training, and the subjects.

BACKGROUND

MILITARY OCCUPATIONAL SPECIALTIES

At the present time, the Basic Army Administration Course (BAAC) at Fort Ord trains men for the following Military Occupational Specialties (MOSs): Clerk (71B10), Clerk-Typist (71B20-30), Personnel Specialist (71H20), and Key Punch Operator (71U20). Tentative assignments to these MOSs are based on the student's aptitude scores and entry-typing speed. Formal award of an MOS depends upon the student's performance in the training program.

The tentative MOS assignment usually given to a *beginning* typist is Clerk (71B10). To be awarded this MOS, the student must type 20 NWPM (net words per minute)[1] and pass eight tests on academic (nontyping) material.

ORGANIZATION FOR TRAINING

The Basic Army Administration Course at Fort Ord is organized into four training committees (Groups I, II, III, and IV) and an End-of-Course (testing) committee. All students in the Fort Ord BAAC are assigned to one of the four training committees on the basis of their entry-typing skill. Students who have never typed before and students who type 10 or less net words per minute (NWPM) on 5-minute trials are assigned to Group IV for training.[2] Students who are more skilled are assigned to a different group, depending on their typing skill and tentative MOS assignment.

TRAINING DURATION AND STANDARDS

To be eligible for MOS 71B10 qualification testing by the End-of-Course committee, a student must have passed nine criterion tests on academic material and typed a minimum of 20 NWPM on three 5-minute trials. Both academic and typing tests are given by the training committee.

[1] After deducting five words for every error.

[2] The criterion has recently been changed to 14 or less NWPM.

A total of four weeks is normally allowed to meet both the academic and the typing standards. Although students whose entry-typing test scores were at least 11 NWPM can spend up to four weeks in Group III, many of them complete the program in less time.

Students whose entry-typing test scores were *less* than 11 NWPM also have only four weeks in which to meet both academic and typing standards. A maximum of two weeks can be spent in Group IV, the remaining time in Group III. To move from Group IV to Group III, the student must type 11 NWPM and pass three criterion tests on academic material. (It is assumed that the student will pass the six remaining criterion tests and increase his typing speed to 20 NWPM while in Group III.) Starting with the fourth day of Group IV training, straight-copy typing tests are administered daily to measure the student's progress. Students who do not show satisfactory progress may be dropped from the course, and students who show exceptional progress may be advanced to Group III before the end of the two-week period.

For research purposes, an important modification was made in the duration of Group IV training at Fort Ord. To develop learning curves over the two-week period, students assigned to Group IV remained with this group for a full two weeks (9 1/2 days) regardless of their progress or lack of progress. Such an arrangement could not be made at Fort Knox.

INSTRUCTION

ACADEMIC (CLERICAL NONTYPING) INSTRUCTION

The academic (clerical, but nontyping) component of the BAAC program at Fort Ord is conducted by means of programmed books, commonly known as PIs. The student reads instructions, reads a question, writes (or types) an answer, and then compares his answer with the one given in the book. When he completes a particular PI, he takes a criterion test to determine whether he has mastered the material. The PIs are given to the students in a prescribed sequence and the student moves through the sequence at his own speed.

TYPING INSTRUCTION

This section describes those elements of the typing instruction system that were *common* to both control and experimental training programs at Fort Ord. The *unique* features of the control and experimental training programs are described in the next chapter.

Amount of Typing Practice

During TYPETRAIN I and II at Fort Ord about 56 hours were allocated to move a man from Group IV to Group III.[3] Approximately 35 of these 56 hours were scheduled

[3]Nine days containing seven 50-minute periods and one day containing four 50-minute periods. The remaining time (thirteen 50-minute periods) was set aside for company-controlled training.

for typing instruction or practice, the remainder for PIs and administration. During this period, the student was expected to attain a minimum straight-copy typing speed of 11 NWPM and complete a minimum of three PIs.

During TYPETRAIN III, administrative requirements imposed by Fort Ord reduced the time allocated for training Group IV students to about 48 hours, while leaving the typing and PI standards unchanged.[4] The 48 hours available were distributed as follows: typing, 32 hours; typing make-up, 2 hours; PIs, 12 hours; and administration, 2 hours.

The hours scheduled for typing instruction are an overestimation of the amount of time actually spent typing. Factors such as late starting of classes, typewriter malfunction, scoring of practice papers, and student boredom or fatigue, resulting from the highly repetitive nature of the typing task, probably reduced actual typing time to about 20 hours.

Massed Versus Distributed Typing Practice

Since beginning typists at Fort Ord were retained in Group IV status for two weeks regardless of their typing progress, it was possible to distribute their practice typing over this time period. Distribution was accomplished by using nontyping classes (PIs, company training) as buffers between typing classes. As a result, the student normally typed no more than two consecutive 50-minute periods. Students were given a 10-minute break every hour.

There were two exceptions to the model. First, students who were absent from scheduled typing classes were required to type during buffer periods to make up lost time. Second, when administrative requirements (e.g., holidays, pay day) forced the cancellation of training, lost typing time was made up by having all students type during buffer periods.

Facilities and Faculty

Both control and experimental training programs at Fort Ord were conducted in two classrooms; each was equipped with about 40 typewriters.[5] With only a few exceptions, typing was done on R.C. Allen manual typewriters.[6] The control training program and all but three of the experimental training programs (Kee, Model 1025; Kee, Model 44; and Mind) were conducted on open keyboards.

At Fort Ord, there was one NCO instructor in each classroom. He was occasionally aided by an assistant instructor; however, two instructors seldom were present at the same time. These instructors, assigned by the BAAC, had full responsibility for the conduct of the control (baseline) training programs and for all but one of the experimental training programs tested in Sub-Unit II (portions of the experimental Kee program

[4] Fifty-one 50-minute periods and ten 30-minute periods. The change was prompted by the need to shift company-controlled Saturday morning classes to weekdays and to allow more time for the noon meal.

[5] One exception should be noted. The experimental Kee program required the use of expensive electronic equipment. This program was conducted in a small room adjacent to one of the large classrooms.

[6] Commercial designations are used only for precision in describing the experiment. Their use does not constitute endorsement by the Army or by the Human Resources Research Organization.

were supervised by TYPETRAIN personnel). All experimental programs conducted in Sub-Unit III were under the direct supervision of two enlisted men of the U.S. Army Training Center Human Research Unit assigned to Work Unit TYPETRAIN.

EVALUATION OF TRAINING

Student achievement in both control and experimental training programs was measured by both school and HumRRO testing procedures.

SCHOOL TESTING PROCEDURES

Prior to the beginning of the research, the progress of Group IV students at Fort Ord was periodically measured by requiring students to take three five-minute, straight-copy[7] tests. Scores on these tests were recorded and used as a basis for advancing the student to Group III. After the research had begun, these tests were discontinued and the HumRRO test scores were recorded by the faculty.

Although the emphasis in Group III is on *academic* instruction, students are required to do some typing and are tested daily to measure their progress. Once the student has passed the nine criterion tests on PI (academic) material and has typed 20 NWPM on three five-minute, straight-copy trials, he is assigned to the End-of-Course committee for his 71B10 MOS qualification tests. (Students who do not meet these standards are dropped from the course.) The end-of-course typing standard remains 20 NWPM, but the copy is considerably more difficult than the copy used by the Group III committee for training or testing.[8] The academic component consists of tests on eight of the nine academic subjects covered in Groups III and IV.[9]

HumRRO TESTING PROCEDURE

To measure the student's progress in the acquisition of straight-copy typing skill, three five-minute tests were administered to students at entry and after every four hours of practice thereafter (Table 1). At each test session, the three trials were administered under three conditions—one in which the student was to emphasize speed, one in which he was to emphasize accuracy, and one in which he was to strive for both speed and accuracy.

The copy used for these tests was commercially prepared[10] and was more difficult (average SI of 1.51) than the copy used during practice typing. Different copy was used for each trial.

[7] I.e., typing line for line and word for word.

[8] One measure of copy difficulty is its "syllabic intensity (SI)," i.e., the average number of syllables per word. Copy with an SI of 1.00 is considered very easy, copy with an SI of 1.65 very hard. The SI of both practice and test copy used in Groups III and IV is 1.31, while that of the test copy used by the End-of-Course committee is 1.63 and 1.82. The copy used to retest students who fail the first two trials has an SI of 1.23 and 1.36.

[9] Map reading is not included on the End-of-Course tests.

[10] Golden Gate Publishing Company, Inc., San Jose, California.

Table 1

Basic Schedule for Typing Practice and Tests

Minutes Allocated	Activity	Cumulative Hours After Test
50	Orientation	
30	Entry Tests	
200	Practice	
30	+5 Tests	
200	Practice	
30	+10 Tests	9
200	Practice	
30	+15 Tests	
200	Practice	
30	+20 Tests	17
200	Practice	
30	+25 Tests	
200	Practice	
30	+30 Tests	24
200	Practice	
30	+35 Tests	
200	Practice	
30	+40 Tests	32

Two scores were derived from each of these trials—a speed score (the number of words typed per minute) and an accuracy score (the number of errors made per five minutes). Test papers were scored by the staff of TYPETRAIN.

To obtain a meaningful baseline (entry) typing score, all students were given a one-hour orientation on how to use the typewriter *before* taking the three entry timed writing trials. This one-hour class was given either by the instructor or by means of an audio tape and programmed book prepared by the TYPETRAIN staff (the programmed book can be used without the supplementary audio tape). The class included instruction and practice on setting the paper guide, line space lever, and left and right margin stops; inserting and removing paper from the typewriter; using the carriage return lever; and typing upper and lower case letters, numbers, and symbols. Students were urged, but not required, to use proper typing form (i.e., keep their eyes on the copy and use the correct fingers to strike the keys).

SUBJECTS

The subjects for the control and experimental programs were Group IV students who typed 15 or less *gross* words per minute (GWPM) on the third trial of the HumRRO test (given after a one-hour orientation on the use of the typewriter). For purposes of analysis, these students were classified into three groups on the basis of their entry-test typing score: slow—1.0 to 5.0 GWPM; intermediate—5.1 to 10.0 GWPM; fast—10.1 to 15.0 GWPM. The fast group is underrepresented in this sample because the more accurate students among this group were assigned to Group III for training.

The only aptitude prerequisite for assignment to the BAAC is a minimum score of 100 on the Clerical Aptitude Area of the Armed Forces Qualification Test (AFQT).[11] (A few subjects had CL scores under 100.) Several aptitude scores and related measures—AFQT, VE, AR, GT, ACS, and years of civilian schooling completed—were obtained for each of the subjects. However, entry-test typing score was used as the basis for classification of the subjects into groups because it is the best predictor of subsequent typing performance. The correlation between GWPM at +40 and four possible predictors are as follows: AFQT .26, GT .27, CL .28, and GWPM at entry, .69.

Personal and military demands frequently resulted in students being absent from class. As much as possible, all lost typing time was made up by having the students type during periods set aside for academic instruction.[12] Since Fort Ord students were only available for a 9 1/2-day period, students who had excessive absences were not always able to make up lost typing time. As a consequence, the number of students available for the +25 through the +40 tests was frequently less than the number of students tested earlier in the program. (See Appendix A.)

[11] The AFQT is designed to measure overall aptitude for military training. It consists of four subtests—verbal expression, arithmetic reasoning, pattern analysis, and use of tools. The VE (Verbal Expression) test involves selecting the correct synonym for the underlined word in a series of short sentences. The AR (Arithmetic Reasoning) test requires solving some arithmetic problems. The ACS (Army Clerical Speed) test requires the examinee to determine whether pairs of two-digit numbers are different or identical and to use a key to identify the correct code numbers associated with a series of words. The GT (General Technical) Aptitude Area score is the mean of the VE and AR scores; the CL (Clerical) Aptitude Area score is the mean of the VE and ACS scores.

[12] Since it was not possible to make up classes conducted by means of video tapes, students who missed any of these classes were dropped from the study.

Chapter 3

THE TRAINING SYSTEMS

This chapter describes the control and experimental training systems that were studied in TYPETRAIN I, II, and III, and presents data on their effectiveness.

CONTROL (AUDIO, FREE-PACE) SYSTEM

The Army Subject Schedule (1) specifies the training system to be used to train Group IV (beginning) typists. The components of this system are a programmed book designed to familiarize the student with the basic parts of the typewriter; an introductory taped lesson designed to teach the student how to insert and align paper in the typewriter and how to set margin stops; and 15 audio-taped lessons designed to teach the student how to use the keyboard.

Each of the lessons covers certain keys and incorporates some simple words that can be formed from these keys. Not until the 15th lesson has the student covered all the keys on the keyboard. Each taped lesson has an accompanying booklet that includes the copy presented on the tape as well as some supplementary exercises involving the use of the same keys covered on the tape.[1]

The tapes are played from a tape player located in the front of the classroom, and the students type in unison while simultaneously listening to the tape and following the copy in the booklet. Each tape runs approximately 15 to 20 minutes, and normally one tape is scheduled for each 50-minute period. The student spends the remainder of each period "free typing" the supplementary exercises in the lesson booklet. (When free typing, the student types at his own speed; when typing in response to the audio tapes, he is typing to dictation.)

Data on the control training system were gathered at Fort Ord in 1969-70 and at Fort Knox in 1971. In addition to differences in time and geographic location, and possibly student body and faculty, there were differences between the Fort Ord and Fort Knox research settings. At Fort Ord, the 16 taped lessons were distributed over a five-day period, the intervening time being devoted to nontyping instruction; at Fort Knox, these lessons were massed into a 2 1/2-day period. At Fort Ord, it was possible to study the students' progress over a two-week period;[2] at Fort Knox, student progress could be studied for only 2 1/2 days, because, after this time, most students were assigned to Group III training. At Fort Ord, students typed on old R.C. Allen typewriters; at Fort Knox, they used new Remington typewriters.

A total of 222 students were studied in the Army Subject Schedule specified program—166 at Fort Ord and 56 at Fort Knox. On the basis of their entry typing test scores, these students were classified as follows:

	Ford Ord	Fort Knox
Slow typists	4	0
Intermediate typists	99	44
Fast typists	63	12

[1] Forty-one additional lessons in booklet (but not audio tape) form are available but are normally not used for Group IV typists.

[2] Fort Ord subjects spent the remainder of the two-week period free typing.

Figures 1 and 2 compare the results obtained at Fort Knox and Fort Ord.[3] Since none of the subjects at Fort Knox typed between 1.0 and 5.0 GWPM at entry, direct comparisons can only be made for the intermediate and fast groups. Comparisons were made by fitting straight lines to the plots of gross words per minute by time and to the plots of errors per five minutes by time from entry through +20, the period for which we have comparable data. The slope of these lines constitutes an estimate of change over 17 hours. In the case of words per minute, the greater the slope, the faster the typing speed. In the case of errors per five minutes, the greater the slope, the larger the number of errors. Analysis of variance was then used to determine whether the difference between the slopes was statistically significant; a separate analysis was performed for each subject group (fast and intermediate typists).

The results of the analysis indicate that the Fort Knox program is significantly better than the Fort Ord program in increasing the speed of intermediate and fast typists, and that the two programs do not significantly differ in the incidence of errors (see Appendix B). While the speed differences are statistically significant, they are too small to be of any practical value. The greater effectiveness of the Fort Knox program may be due to the fact that all their training was concentrated in a three-day period. Over an extended period of time, the Fort Ord and Fort Knox learning curves probably would be even more similar than our data indicate; when the Fort Knox lines are compared with the Fort Ord lines through +35, the Fort Knox advantage disappears.

In subsequent analysis, Fort Ord's data will be considered the baseline against which all comparisons will be made. Using data from Fort Ord has certain advantages: (a) Both experimental and control training programs will have been conducted at the same training center; (b) the data are more complete, extending as far as +35.[4] The Fort Ord and Fort Knox programs were roughly equal in their effectiveness.

The subsequent comparison of experimental programs with the baseline program followed the procedure described earlier. Straight lines were fitted to the plots of gross words per minute by time and to the plots of errors per five minutes by time, for each training program *within* each group (fast, intermediate, and slow). The slopes of the resulting lines are shown in Appendix C. An analysis of variance was then performed for each group separately, in order to determine whether the slopes were essentially the same for all training programs. The hypothesis that the slopes were the same was rejected at the .05 level of significance in all three groups. Pair comparisons using the student's t distribution were then made of the nine estimated slopes within each group (Appendix D). The comparisons of each experimental program with the baseline program are presented in the next section.

EXPERIMENTAL TRAINING SYSTEMS

The control (baseline) training system was compared with the eight experimental training systems conducted at Fort Ord. Each system will be described and then its effectiveness compared with the control system conducted at Fort Ord.

[3] The scores shown are from the third trial at each test session (time interval) when the subjects were instructed to strive for both speed and accuracy. The third trial was not necessarily the student's "best" trial. See Appendix A for corresponding tables.

[4] Because Fort Ord data at +40 were incomplete, this period has been eliminated.

Gross Words per Minute Typed at Various Time Intervals in Fort Knox Audio 16 and Fort Ord Audio 16, Free-Pace Typing Programs, by GWPM Typed at Entry

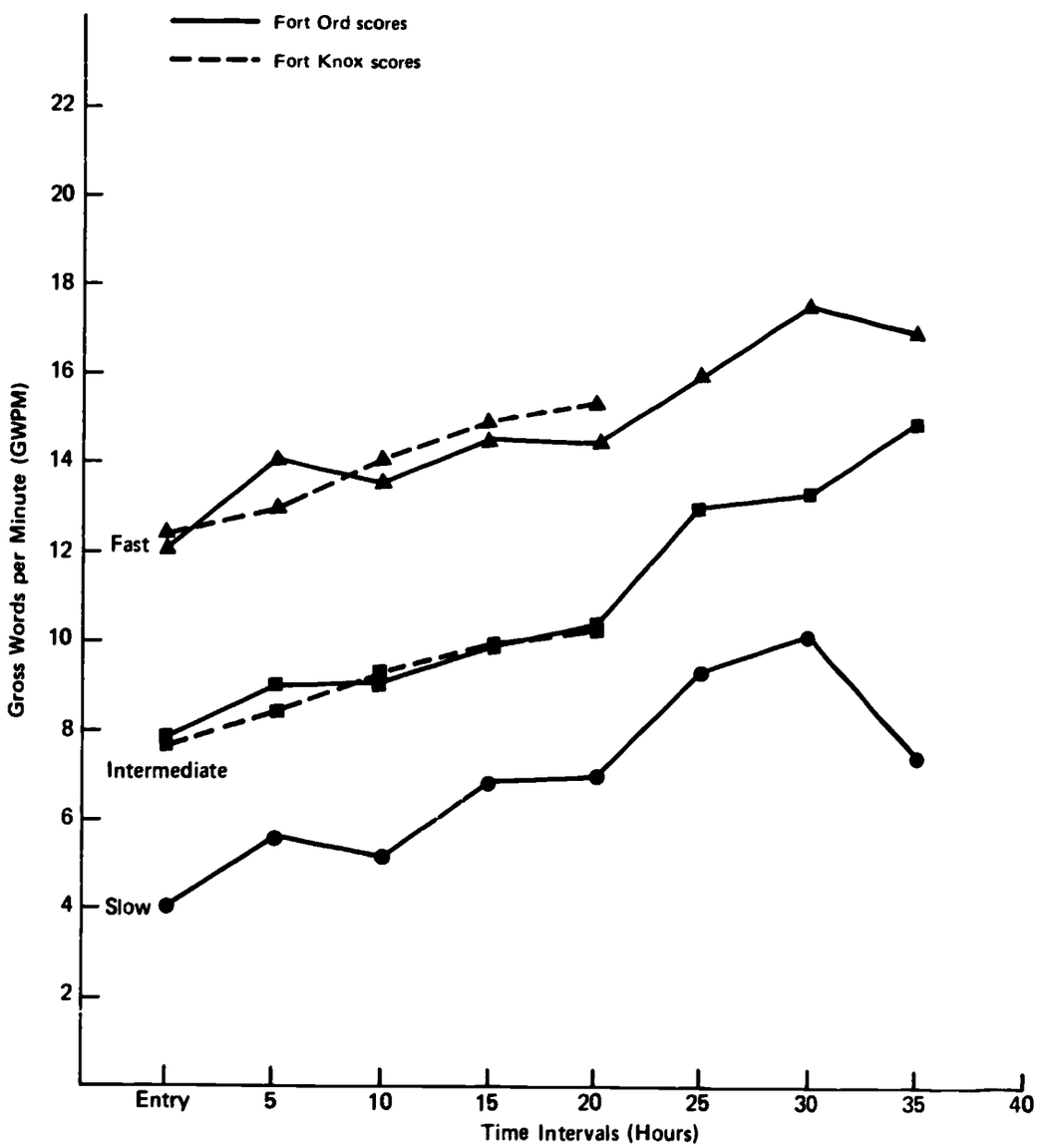


Figure 1

Errors per Five Minutes Typed at Various Time Intervals in Fort Knox Audio 16 and Fort Ord Audio 16, Free-Pace Typing Programs, GWPM Typed at Entry

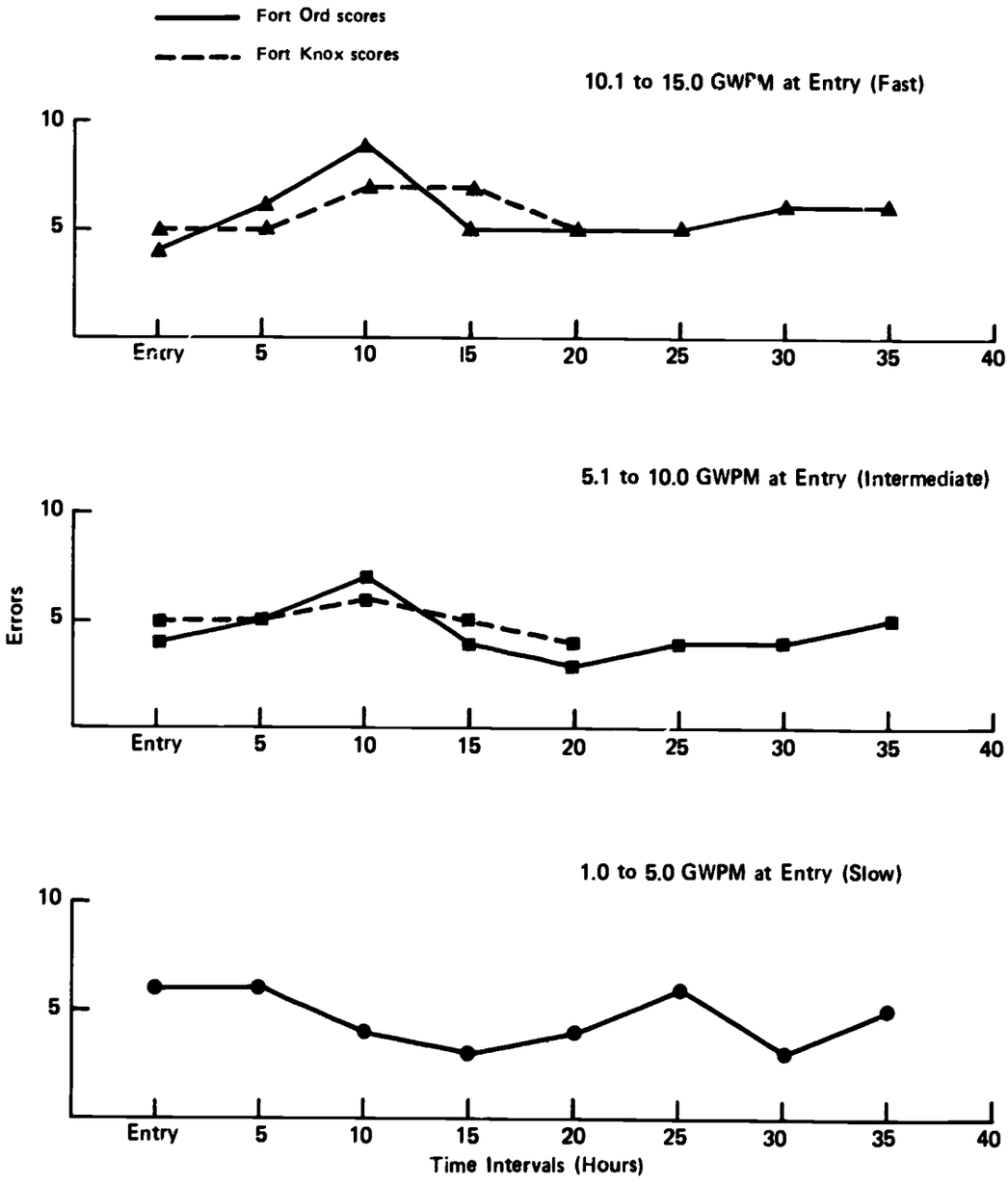


Figure 2

MIND (AUDIO) SYSTEM

The Mind system[5] is a self-paced, audio-tape system that can be used with any typewriter. The special equipment involved consists of the text *Power Typing* (2), 27 audio-tape cassettes (each containing a lesson), a cassette tape player, and an earphone attachment that allows students in a group setting to work without disturbing each other. Twelve sets of this equipment were available for research purposes.

The first seven lessons are designed to teach the alphabet keys on the keyboard. During these lessons, the student watches a diagram of the keyboard and strikes keys as dictated on the audio tape. Home row keys are taught first, followed by selected other keys. By lesson eight, the student is using all his fingers and is typing words and sentences.

Starting with lesson eight, copy is presented in the text and on the tape and the student gets his copy by reading and listening. The copy used during these lessons is relatively difficult straight-copy material, periodically interspersed with number and symbol exercises.

Although the audio tapes contain the same copy as the text, the rate of dictation on the tapes ranges from four to six WPM on the first tape to 50 to 55 WPM on the last tape. In addition, there is a tape that emits a tone at various rates of speed instead of dictating copy. This frees the student from dependence on the text and allows him to type any copy he chooses, while still being paced by the audio tape.

Each lesson in the Mind system runs approximately 35 minutes. Students were allowed to repeat part or all of any lesson or move on to a new lesson depending on their judgment of their progress. Students trained on the Mind system spent all of the two week period working on the Mind equipment.

Forty-nine students were enrolled in the Mind program. On the basis of their entry-typing test scores, 21 were classified as slow, 22 as intermediate, and 6 as fast typists.

Figures 3 and 4 compare the baseline (Audio 16, Free-Pace) program with the Mind program. A statistical comparison of the slopes of the gross words per minute on time regression lines indicates that the Mind program is significantly superior to the baseline program for slow and intermediate typists, and that the two programs are equally effective for fast typists.

KEE (VISUAL-CUE, FREE-PACE) SYSTEM: MODEL 1025

The Kee system[6] is a self-paced, visual display system. There are two versions of the Kee system, the Model 1025 and the more advanced Model 44. The equipment in the Model 1025 system consists of the Model 1025 console, 20 punched tapes, and the text, *Skill Typewriting*(3). The components of the console are a blank-key typewriter,[7] a visual display panel showing a typewriter keyboard with a light for each key and the space bar, a punch tape reader, an error counter, and two error indicators—one audio and the other visual. Four sets of this equipment were made available for research purposes.

[5] Mind, Inc., 153 Harvard Avenue, Stamford, Connecticut 06902.

[6] Kee, Inc., 1911 Jefferson Davis Highway, Arlington, Va. 22202. Note: Subsequent to the research, Kee, Inc. has made extensive changes in their training program. This involved completely redesigning (physically and functionally) the hardware, utilizing software developed by the Gregg Division of McGraw-Hill, and incorporating remedial and power drills developed at Syracuse University. The revised program is being tested at seven different educational institutions.

[7] For testing purposes, students typed on standard, manual typewriters.

Gross Words per Minute Typed at Various Time Intervals in Baseline and Mind: Audio Typing Programs, by GWPM Typed at Entry

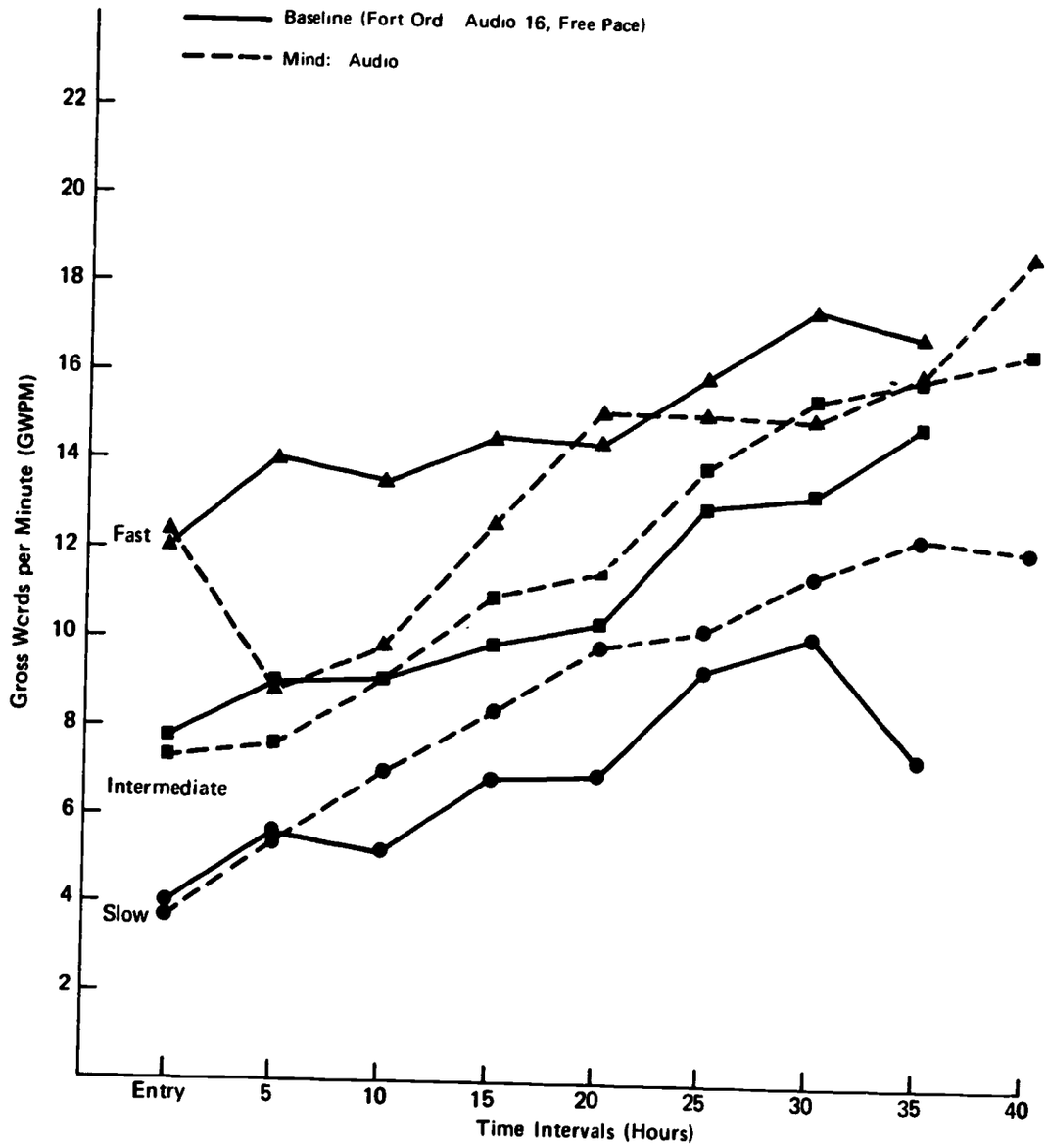


Figure 3

Errors per Five Minutes Typed at Various Time Intervals in Baseline and Mind: Audio Typing Programs, by GWPM Typed at Entry

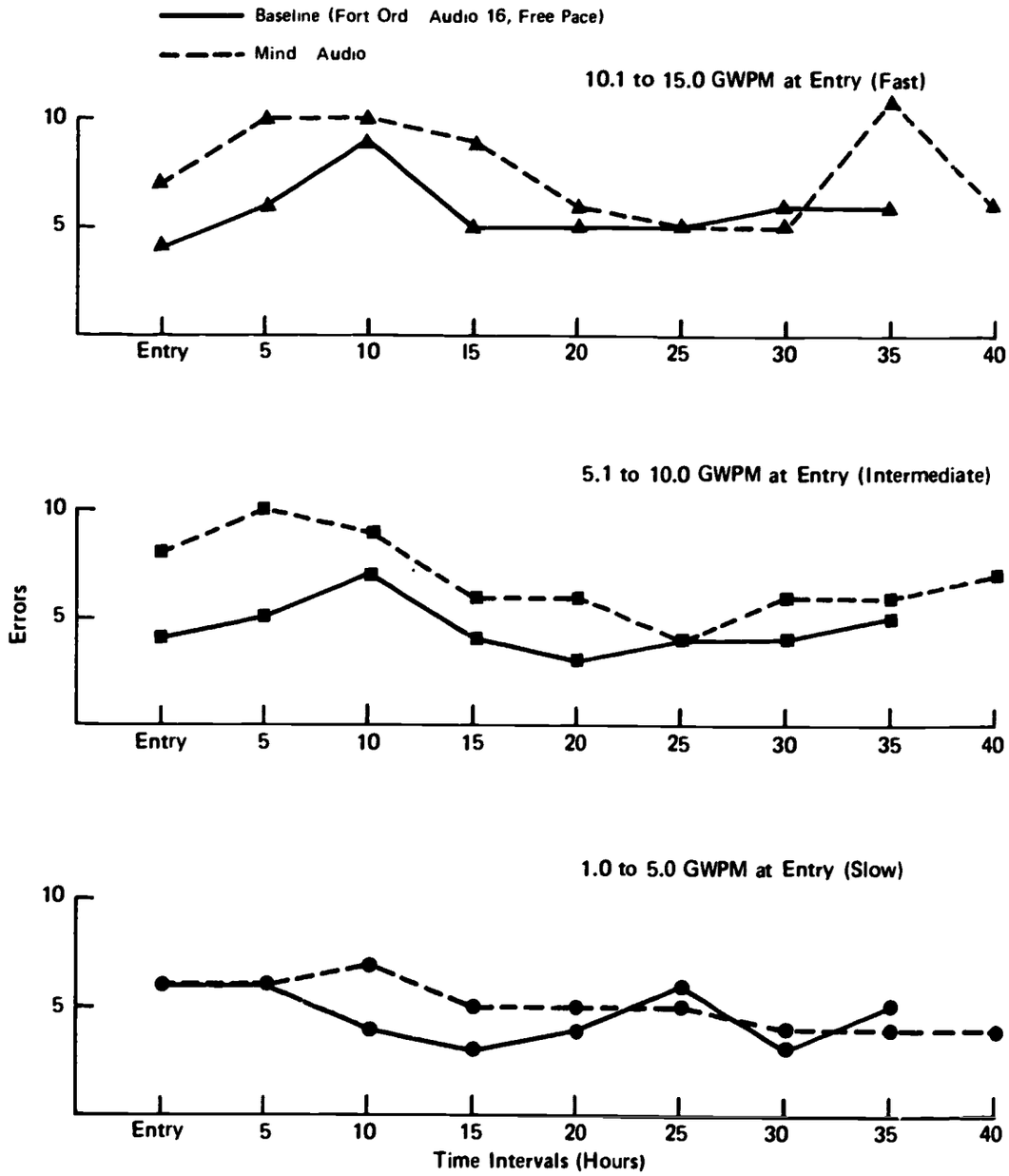


Figure 4

The pattern of punches in the Kee Model 1025 tape conforms to the copy in the typing text. (Each tape contains between 20 and 30 lines of copy.) As the punched tape moves through the punch tape reader, it activates a light on the visual display panel that shows the student which key to strike. When the light is on, the student can see the key's identification (letter, symbol, or number); when the light is off, the key's identification is not visible. If he strikes the correct key, the punched tape advances one position and activates the next light on the visual-display panel telling the student which key to strike next. If he strikes an incorrect key, the error indicator, by means of a light or a buzzer, tells the student that he has made an error, and the error is recorded on the error counter. The student then turns off the error indicator and tries again. When he strikes the correct key, the punched tape advances one position and activates the next light on the visual display panel telling the student which key to strike next. A special indicator on the display panel tells the student when to return the carriage.

The display panel and the error indicators and counter can be deactivated by pushing a switch. The typewriter then operates as a manual typewriter.

The copy in the typing text, *Skill Typewriting*, consists of 333 exercises ranging from six-word, straight-copy sentences that use only the letters that can be stroked with two fingers on each hand, to multiparagraph straight-copy and production-copy materials, requiring the use of all the fingers on both hands as well as all the keys. When new keys are being taught, the text includes a fingering diagram as well as the copy. Thus the student can refer to the fingering diagram (or to the visual display panel) to assist him in locating the key on the keyboard.

The Model 1025 system program was conducted in a small room with one member of the TYPETRAIN staff acting as the instructor. It should be noted that the instructor/student ratio was one to four—far smaller than that attained for any other training system.

Following is the basic procedure used to train students in the Model 1025 system. The instructor explained and demonstrated the procedure for typing the home row keys. Students first rehearsed the striking motion without actually touching the keys and then typed three repetitions of the home row keys on the activated console, referring to the visual display panel or to the keyboard diagram in their text as a guide.

The instructor then explained and demonstrated typing certain other keys on the keyboard. Students rehearsed the striking motion, activated their console for practice typing, and typed the appropriate six to nine one-line practice exercises in the text, referring to either the text or the visual display panel as a guide.

When all the students had completed the practice exercises, the consoles were deactivated and students were given accuracy/speed/accuracy (ASA) drills. The instructor selected one of the practice exercises already typed and directed the students to type it as many times as they could in one minute, *emphasizing accuracy*. He then repeated the operation seven or eight times, this time directing the students to *emphasize speed.* Finally, the exercise was repeated, again *emphasizing accuracy.*

The instructor then explained and demonstrated typing certain other keys, and the whole sequence was repeated again—rehearsal practice typing on the activated console, and ASA drill on the deactivated console.

After the students had been taught all the keys on the keyboard, the explanation-demonstration phase was discontinued, but students continued to practice on the activated console and take ASA drills on the deactivated console. While the copy for the first few ASA drills was the same for all students, the copy for the later ASA drills was different for each student and depended upon the progress he had made in the typing text.

Students spent approximately one week working on the Model 1025 and one week in a large classroom free typing on manual typewriters.

Thirty-one students were enrolled in the Kee: Model 1025 typing program; nine were classified as slow, 14 as intermediate, and eight as fast on the basis of their entry-typing test score.

Figures 5 and 6 compare the effectiveness of the baseline program and the Kee: Model 1025 program. A comparison of the slope of the gross-words-per-minute regression lines indicates that the Kee: Model 1025 program is superior for slow typists; the two programs are equally effective for intermediate typists; and the Audio 16, Free-Pace program is superior for fast typists.

KEE SYSTEM: MODEL 44

An effort also was made to evaluate a more advanced training system developed by Kee consisting of the Model 44 console, 20 punched tapes, and a revised typing text. The Model 44 console is similar to the Model 1025 in that both have a punch tape reader, an error counter, a visual error indicator, and a visual display panel. It differs from the Model 1025, however, in a number of important respects. First, instead of a complete typewriter, the Model 44 has a "keyboard unit" with a keyboard similar to that on a teletypewriter, so the student does not need to insert or straighten paper, set margins, or return the carriage. Second, the keyboard is somewhat different from that on a typewriter; there are no capital letters and no separate bank of number and symbol keys, and numbers and symbols occupy the positions normally held by capital letters on a typewriter.[8] Third, keys on the keyboard unit are color coded according to the finger used to strike them.

While the copy in the typing text used in the Model 44 system is essentially the same as the copy used in the Model 1025 system, the specificity of the instructions and the training procedure are different. The Model 44 text is designed for self-instruction, with minimal intervention by the instructor. In Phase I, the student types from copy (cues) presented on the visual display panel, without referring to the typing text; each tape is typed three times. In Phase II, the student types the same copy, this time from his typing text. The visual display panel is activated during this phase, but the student is directed to use the typing text rather than the visual display panel as his primary guide. Each tape is typed twice. This two-stage procedure is followed for each tape in succession.

Because only one Model 44 console was available, only three students were trained in the Model 44 system; one was classified as a slow typist, and two were classified as intermediate typists. They spent approximately one week working on the Model 44. The balance of the time was spent free typing on standard typewriters.

Figures 7 and 8 compare the effectiveness of the baseline program and the Kee: Model 44 program. A comparison of the slopes of the gross words-per-minute regression lines indicates that the Kee: Model 44 program is superior to the baseline program for intermediate students, but not for slow students. Because of the extremely small Ns involved, these results are only suggestive.

WEST (AUDIO 6, FORCED-PACE) SYSTEM

As originally planned, TYPETRAIN III was to be a field test of a complete training system that incorporated the more promising findings from TYPETRAIN II. In December

[8] Even though there are no capital letters in the keyboard unit, there is a shift key which can be depressed when the copy calls for a capital letter.

Gross Words per Minute Typed at Various Time Intervals in Baseline and Kee: Model 1025 Typing Programs, GWPM Typed at Entry

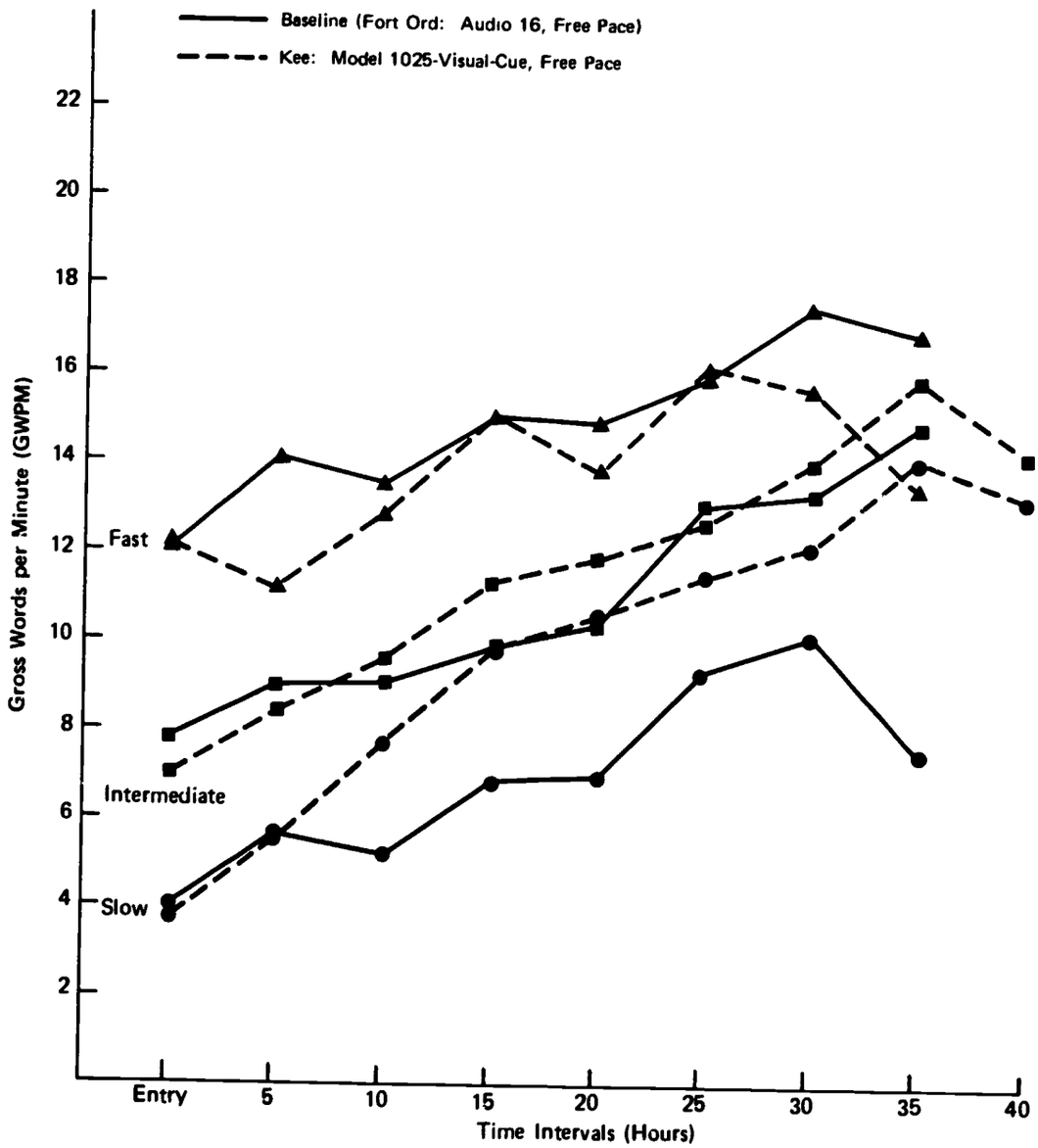


Figure 5

Errors per Five Minutes Typed at Various Time Intervals in Baseline and Kee: Model 1025 Typing Programs, by GWPM Typed at Entry

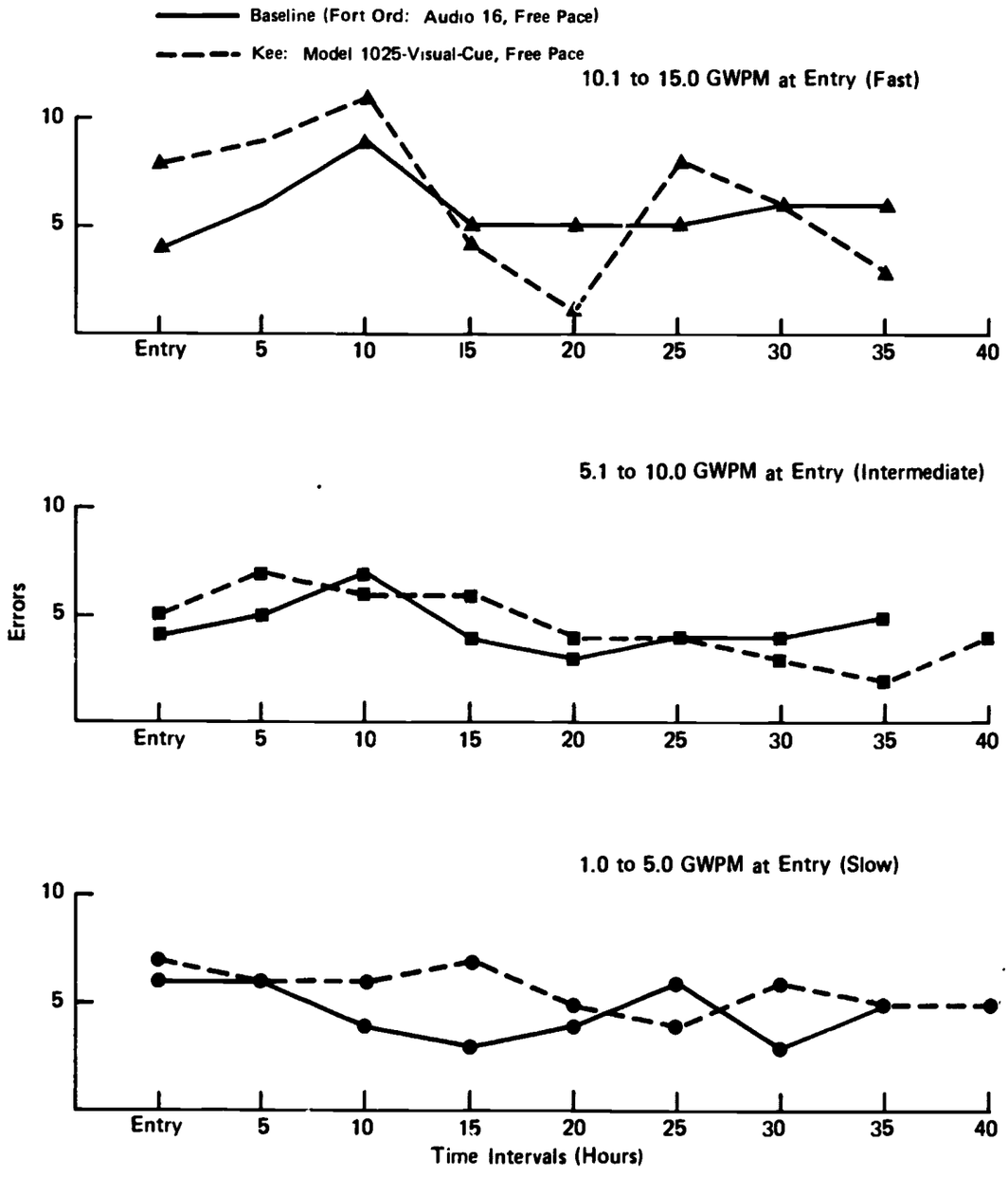


Figure 6

Gross Words per Minute Typed at Various Time Intervals in Baseline and Kee: Model 44 Typing Programs, by GWPM Typed at Entry

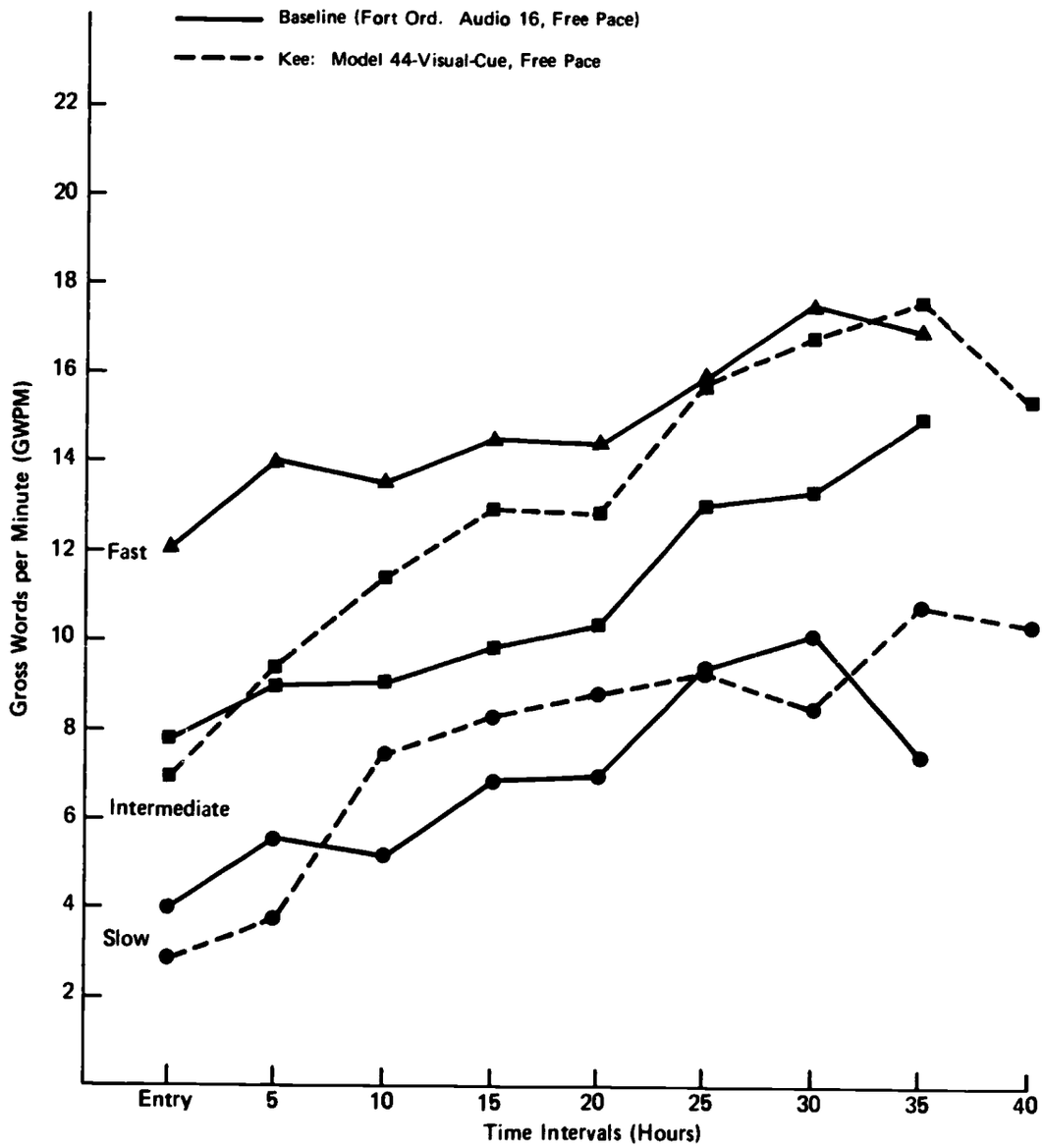


Figure 7

Errors per Five Minutes Typed at Various Time Intervals in Baseline and Kee: Model 44 Typing Programs, by GWPM Typed at Entry

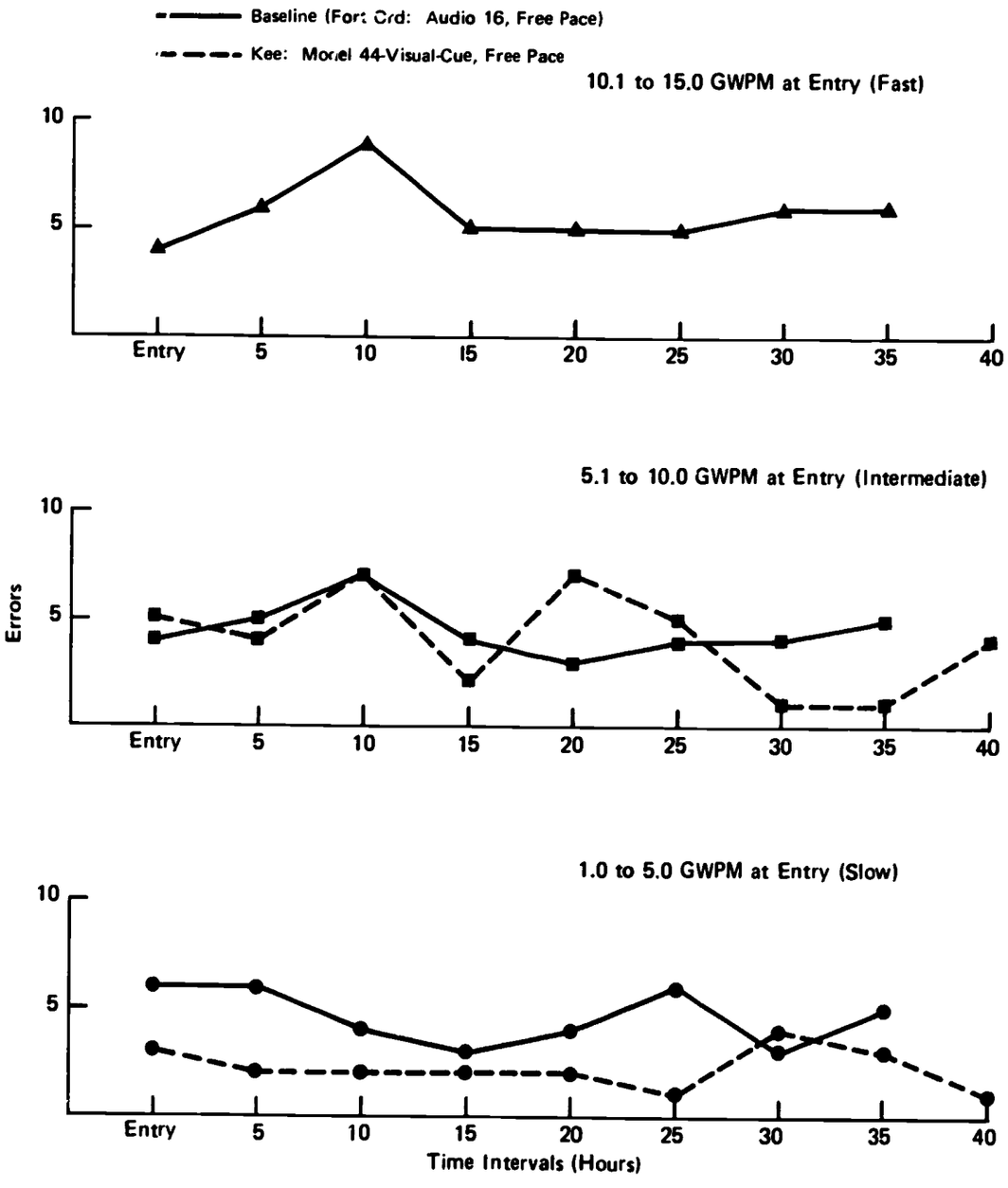


Figure 8

1970, prior to the analysis of the results of TYPETRAIN II, the Educational Advisor at the Adjutant General School requested that TYPETRAIN III be devoted to a field test of the training system advocated by Dr. Leonard West.

The West system, as described in *Acquisition of Typewriting Skills* (4), is essentially a set of training *principles* rather than a complete package of training materials. It was recognized by both the advisor and the TYPETRAIN staff that these principles would have to be translated into training materials and procedures and that both materials and procedures would have to be appropriate for the unique problems encountered in an Army training center.

Although the West system does not specify an initial orientation to the typewriter, the one-hour orientation (Basic Operations) was given to all students in order to ensure that they had some familiarity with the typewriter before taking the entry-typing test.

West identifies three phases in learning how to type, and indicates a training procedure appropriate for each phase: a brief *non-associative* key-stroking phase, a longer *associative* key-stroking phase, and an extended *skill-building* phase.

In the *non-associative* key-stroking phase, the emphasis is on having the student acquire the correct, ballistic type, key-stroking motion. West states that in this phase the student should type in response to the instructor's dictation, and that the instructor should specify the finger to be used rather than the key to be struck.[9] For example, the instructor would first indicate that the students are to only use the index finger of each hand to hit their home row keys and would then dictate as follows: "left right space left right space left right space." The student would type "fj fj fj" in response to the instructor's dictation.

In the *associative* key-stroking phase, the emphasis is on having the student learn the correct fingering for striking every letter key on the keyboard. West specifies that during this phase the student first types in response to the instructor's description of how to strike a key, then types the same copy in response to the instructor's stroke-by-stroke dictation, and finally free types the same copy (i.e., types the copy to his own dictation). During this phase, the copy consists of meaningful words arranged into short sentences.

After completing the class on Basic Operations, students began the non-associative and associative key-stroking phases of the training. These two phases, taught by means of six 50-minute audio tapes, are henceforth referred to as Key Drills. Each Key Drill consisted of approximately five minutes of non-associative material and 45 minutes of associative material.

The non-associative material consisted of four to eight home row letters and symbols. The associative material consisted of select letters and symbols from throughout the keyboard. The keys included in each Key Drill are shown in Table 2.

Table 2

Letters and Symbols Covered in Six Key Drills

Key Drill	Non-Associative	Associative
1	a s d f j k l ;	a m p s .
2	f j s l	e f l o r ,
3	a s d f j k l ;	b g h u y .
4	a ; f j	c d j k ;
5	a s d f j k l ;	i n q t :
6	d k s l	v w x z ?

[9] While West does not specify which keys are to be used during this phase, his examples are limited to fingers striking home row keys.

Two training aids were given to the students during the Key Drill phases: (a) a sheet containing the words covered in the associative portion of the Key Drill[10] to ensure that there was no ambiguity as to what keys were being covered, and (b) a life-size mock-up of the typewriter keyboard, to be used when following the description of key stroking in the associative portion of the Key Drill.[11]

The third phase in the West system consists of skill building. During this phase, the emphasis is on building up speed. West indicates that this can be accomplished by having the student set realistic speed goals for himself and then strive to reach these goals by *free typing*. Realizing that increased speed results in increased errors, West indicates that after a student attains an appreciable gain in speed, he should reduce his errors by typing at a somewhat slower speed. When the errors have been reduced, the cycle is repeated, and the student again tries to build up his speed.

West states that a realistic speed goal is an increase of between two and four words per minute and that a reasonable error goal is a maximum of two errors per minute. He also states that while early skill-building practice trials can be one minute in duration, the student should be moved rapidly to practice trials that equal test trials in duration. The copy should be of normal difficulty and the student should be allowed to repeat copy on successive practice trials until he reaches his goal.

After completing the six Key Drills, the students began the skill-building phase, implemented as follows:

(1) A special Progress Booklet was prepared and given to each student (Appendix E). This booklet organized skill building into a series of steps.[12] Each step specified the copy in *Sustained Timed Writing* (5) that the student was to type; the general goal (increase or reduce speed); the specific goal (minimum words or maximum errors); and the next step when the goal was attained. Each step provided space for the student to record the word count and error count he made on each trial.

(2) All typing was done in 5-minute trials, thus matching the duration of test trials in Sub-Units I and II.

(3) Timing for all practice trials was accomplished by preparing and playing a special timing tape during all skill-building periods. The narration on the tape was as follows: "Get ready" (five seconds of silence); "start" (five minutes of silence); "stop" (100 seconds of silence); "get ready". . . .The 100-second pause was provided to give the students time to count their words or errors, and record their count in their Progress Booklet.

(4) All typing was done from copy in *Sustained Timed Writing*. While this copy is somewhat easier than that in the test booklets (average syllabic intensity of 1.32 versus 1.51), the text was available and thus required no extra expenditure of funds.

(5) Speed goals were set in 10-word intervals, two words per minute (e.g., the speed goal for Step 5 was 30 words, the goal for Step 6 40 words).

[10]The Key Drill Sentences were:

1. Pass Sam a map.
2. Some rolls are free.
3. Buy her grey rugs.
4. Jack job cool had kids; Jack had cool kids;
5. One fish queen thin quit: One thin queen quit:
6. Was vex six wave lazy? Was wave six lazy?

[11]In accordance with Dr. West's recommendation, typewriter keys were uncapped during all phases of the training program.

[12]A special 5-minute trial was administered to all students at the start of skill building in order to determine on which step the student would start. From then on, the student followed instructions in the "Progress Booklet."

(6) Students reduced their speed and strove for accuracy after they had increased their speed 20 to 30 words over their previous accuracy trial.

(7) Accuracy goals were set at 10 errors per trial (two errors per minute).

(8) The particular selection the students were to type was specified, and the student took repeated trials on the same selection until he reached his speed or accuracy goal.

(9) Students were taught how to use word-counting scales to count the number of words typed by having them read and complete a special one-page Word Counting Exercise (see Appendix F), and how to identify and count typing errors by having them read and complete a two-page Error Counting Exercise (see Appendix G).

The sequence of events for the skill-building phase was as follows: Students were first given a brief orientation on the purpose and conduct of skill building. Second, they were given the Word Counting Exercise, and each man's performance was critiqued by the instructor. Then they were given the Error Counting Exercise, and their performance critiqued. Fourth, students took a 5-minute entry trial from copy in *Sustained Time Writing* and counted the words that they had typed. The instructor then told them on which step in the Progress Booklet to record their first word count (see Appendix H), and examined each student's booklet to ensure that he had recorded his first word count in the proper place, had turned to the correct page in *Sustained Timed Writing* for his next practice trial, and knew his next goal.

Students spent the remainder of the time in the West training program typing in response to the 5-minute timing tape. Periodically, the instructor examined each student's Progress Booklet to ensure that word count and error count were being properly recorded. During most periods, the instructor also spent two to five minutes informing the students about typing practices or reminding them of previously learned, but forgotten, practices (e.g., spacing after punctuation).

Although typing during the basic-operations and key-drill phases was primarily group-paced, typing during the skill-building phase was self-paced. At any point in time (beyond the entry trial) students differed widely in the step they were on, the copy they were typing. and their goal. It should be noted that a student's movement from phase to phase was a function of time spent in the classroom rather than of demonstrated mastery of the material.

The West system does not provide clear guidance on the massing or distribution of typing practice. It was decided that students would *not* be required to type for more than two consecutive hours. This distribution of typing practice was attained by using nontyping classes as a buffer. Most of these nontyping buffer classes were spent on programmed instruction[13] (Appendix I).

The West training system was field tested in two separate classrooms. The instructor complement in each classroom normally consisted of an NCO assigned by the Basic Army Administration Course and a specialist from the TYPETRAIN staff. Although the intent was to have the specialist act as an advisor to the NCO, in most cases the specialist conducted the training.

A distinction can be made between the instructor's administrative and his teaching responsibilities. The major administrative responsibilities of the instructor are to check attendance, maintain order in the classroom, distribute supplies (books, paper, ribbons), and correct minor malfunctions in the typewriters. The general teaching responsibilities of the instructor are to give the students a brief orientation prior to the start of each phase of the training program and to motivate the students to persist in a task which is highly

[13] Students who were absent from scheduled typing classes typed during programmed instruction periods in order to make up lost time.

repetitive. The specific teaching responsibilities are a function of the particular phase of the training program.

As has been noted earlier, the bulk of the instruction during the basic-operations and key-drill phases is given by means of audio tape or of audio tape in conjunction with a programmed book; the instructor's main role is to observe and critique the student's form (posture, fingering, etc.) and product (script).

The early stage of skill building is somewhat different. The student must be taught how to count the words typed, how to identify and count errors, and how to progress through the skill building phase. While detailed instructions are provided in the Word Counting Exercise, the Error Counting Exercise, and the Progress Booklet, the instructor is required to examine each student's Exercises and Booklet to ensure that he has mastered the correct procedures. For this monitoring and critiquing activity, it is desirable to have two instructors present.

During the later stages of skill building, the instructor's role is again limited to monitoring and critiquing the student's form (posture, fingering, etc.) and product (typescript and Progress Booklet).

One hundred and fifty-six students were enrolled in the West program. On the basis of their entry-typing test scores, 11 of the students were classified as slow, 104 as intermediate, and 41 as fast.

Figures 9 and 10 compare the effectiveness of the West program and the baseline program. An examination of the slopes of the gross-words-per-minute regression lines indicates that the West program is superior to the baseline program for intermediate and fast students and that the two programs are equally effective for slow students.

FREE-PACE, FORCED-PACE SYSTEM

During the conduct of the field tryout of the West training system, two areas of possible improvement became apparent—the Key Drills and the speed and accuracy goals during skill building. Revisions were made in these two components, and four successive classes were field tested on the revised training system.

Observation of student performance during Key Drills revealed that although some of them were irritated by the detailed description of finger-stroking motions and the slow pace of the dictation, others were not bothered at all. In order to test the hypothesis that the less able students needed the detailed instruction and the slow pace of the taped material while the more able students could dispense with this phase, the Key Drill tapes were replaced by four printed Key Exercises (Appendix J)—Keys in Patterned Order, One-Syllable Words, Two-Syllable Words, and Three- and Four-Syllable Words.[14] The students free-typed for four hours on these exercises, one hour on each exercise. The student received no instruction from the Key Exercises, merely graded copy to type.

If the printed Key Exercises prove to be as effective as the taped Key Drills, the Key Exercises would be the preferred media because of their lower cost and greater versatility. Since the number of classrooms is limited, the use of a sound tape compels group-paced instruction; the use of printed material, on the other hand, permits self-paced instruction.

The important differences between the taped Key Drills and printed Key Exercises are given in Table 3.

Observation of student performance during skill building revealed that speed goals were relatively difficult to attain while accuracy goals were relatively easy to attain. This

[14]The words were those most commonly used as reported by Edward I. Thorndike, and Irving Lorge in *The Teacher's Word Book of 30,000 Words*, 6.

Gross Words per Minute Typed at Various Time Intervals in Baseline and West Typing Programs, by GWPM Typed at Entry

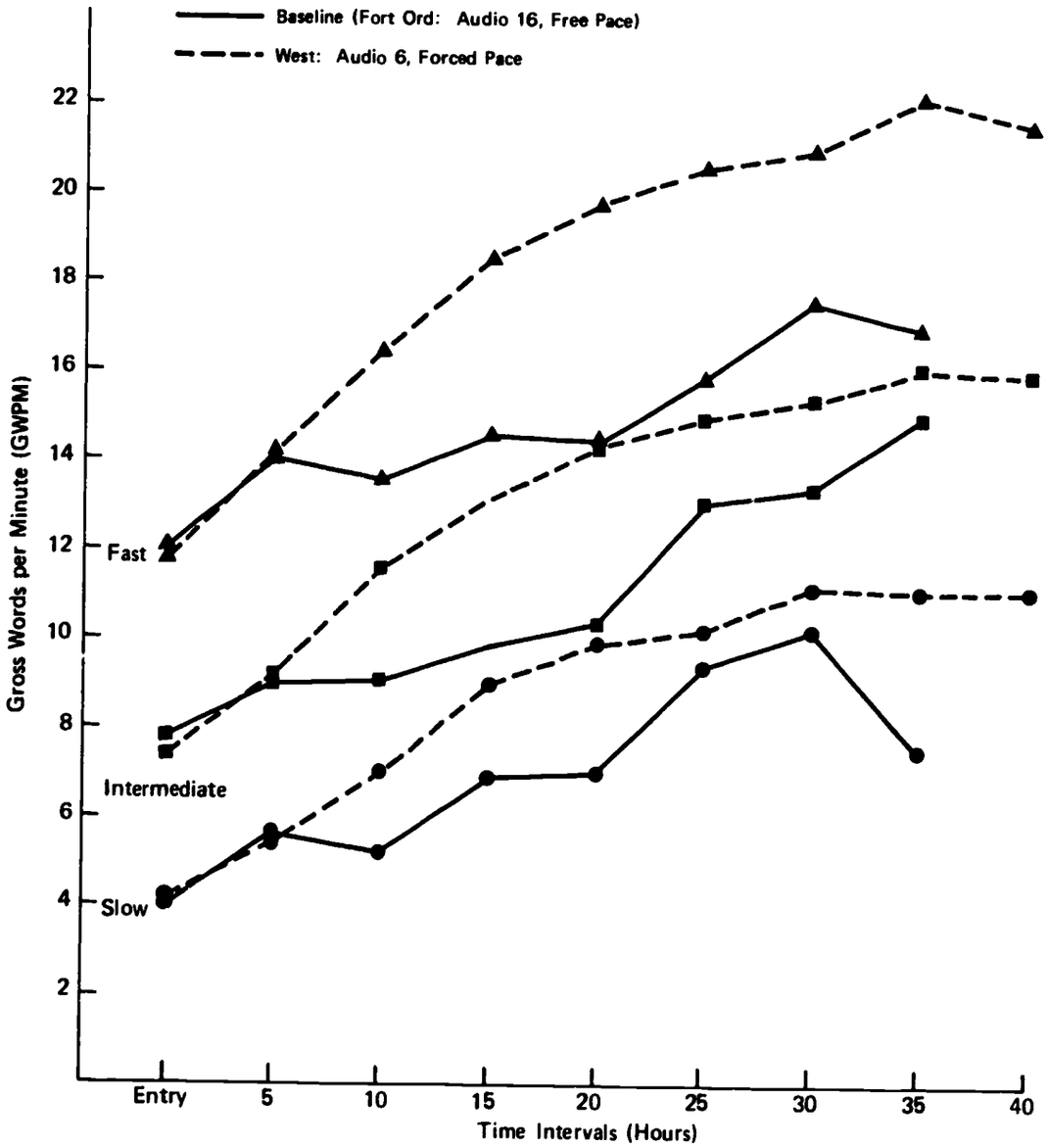


Figure 9

Errors per Five Minutes Typed at Various Time Intervals in Baseline and West Typing Programs, by GWPM Typed at Entry

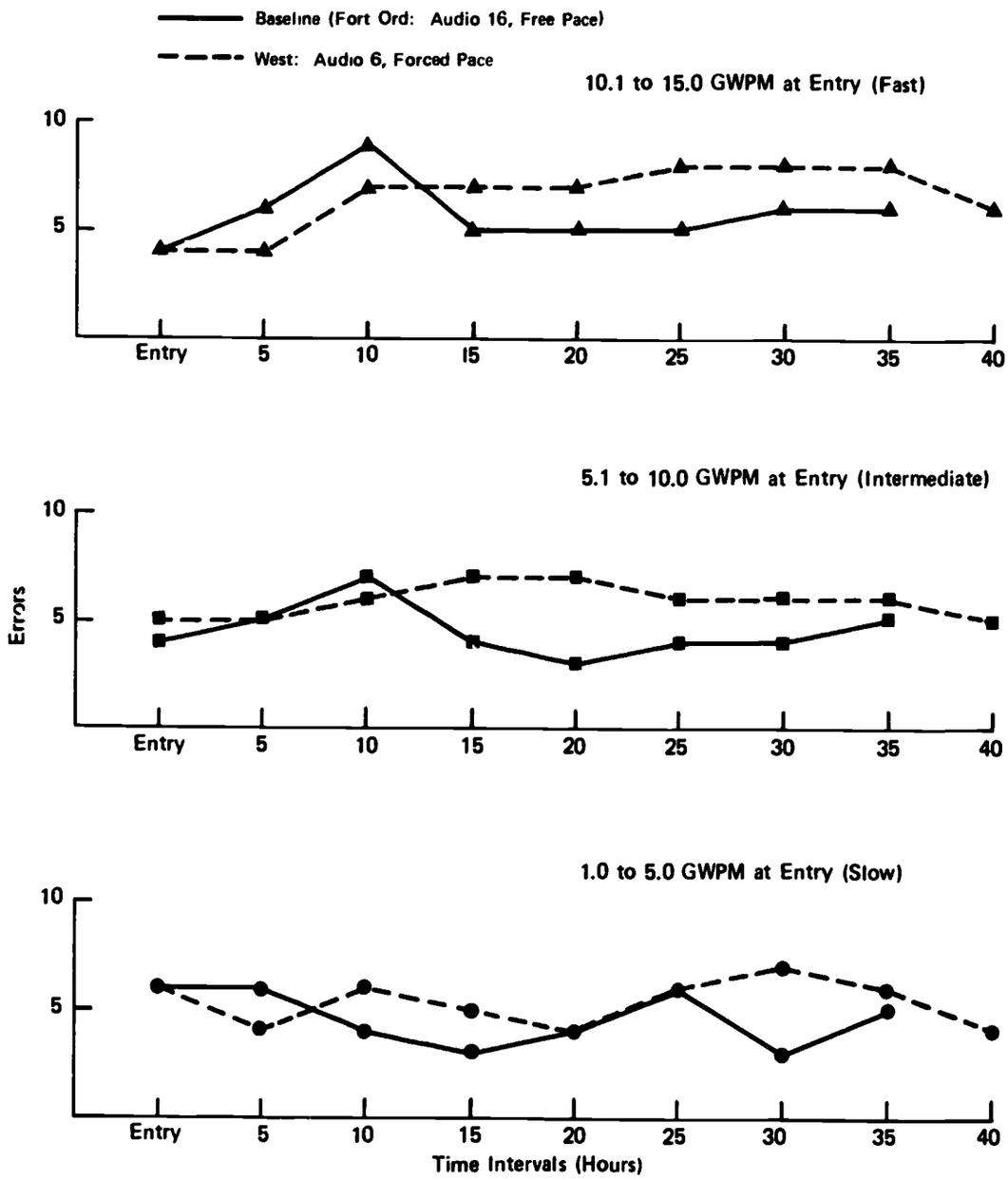


Figure 10

Table 3

Differences Between Taped Key Drills and Printed Key Exercises

Variables	Materials	
	Taped Key Drills	Printed Key Exercises
Correct fingering	Explained	Not explained
Range of copy	Narrow	Wide
Volume of copy	Light	Heavy
Source of copy	Sound tape	Printed page
Control of pace	Narrator	Student

was evident from the fact that some students required as many as 25 trials on the same page of copy to reach a speed goal, but required only two or three trials on a page of copy to reach an accuracy goal. The difficulty of attaining speed goals not only frustrated the student but also resulted in his spending an excessive and irritating amount of time on the same copy. The fact that accuracy goals were so easily attained suggested that the standards were too low.

The Progress Booklet was revised to eliminate these two problems (see Appendix K). In order to lessen student frustration and increase the variety of copy typed, speed goals were changed from 10-word increments to five-word increments; in order to give greater emphasis to accuracy, accuracy goals were changed from a maximum of 10 errors per 5-minute trial to a maximum of five errors.

One hundred and five students were enrolled in the Free-Pace, Forced-Pace program—eight slow typists, 73 intermediate typists, and 24 fast typists.

Figures 11 and 12 compare the effectiveness of the baseline program and the Free-Pace, Forced-Pace program. Although little instruction is given on correct fingering, an examination of the slopes of the gross-words-per-minute regression lines indicates that all students do better in the Free-Pace, Forced-Pace program than in the baseline program.

Two factors may have contributed to the rapid rise in typing speed in the Free-Pace, Forced-Pace program. First, starting with the second practice hour, students were given meaningful words to type (one-syllable words); only one hour was devoted to typing letters in patterned order. Second, the absence of extensive instruction on correct fingering may have encouraged students to develop their own typing form without regard to correct typing form.[15] (When typing form is emphasized, beginning typists are slowed down by their desire to follow that form.) Although the suspected failure to adhere to form results in increased speed over the two-week period, students who fail to follow proper form may find it difficult to reach speeds of 30 to 40 words per minute. Our data, limited to a two-week period (32 hours), do not shed light on this hypothesis.

VIDEO 12, FREE-PACE SYSTEM

The Video 12, Free-Pace system consisted of 12 video tapes, each lasting between 35 and 40 minutes. The tapes were part of a 20-tape series developed by the U.S. Army

[15] All students were taught correct fingering in the Basic Operations class given prior to the Entry test. During all Key Exercises, students could refer to their keyboard mock-up when in doubt about correct fingering.

Gross Words per Minute Typed at Various Time Intervals in Baseline and Free-Pace, Forced-Pace Typing Programs, by GWPM Typed at Entry

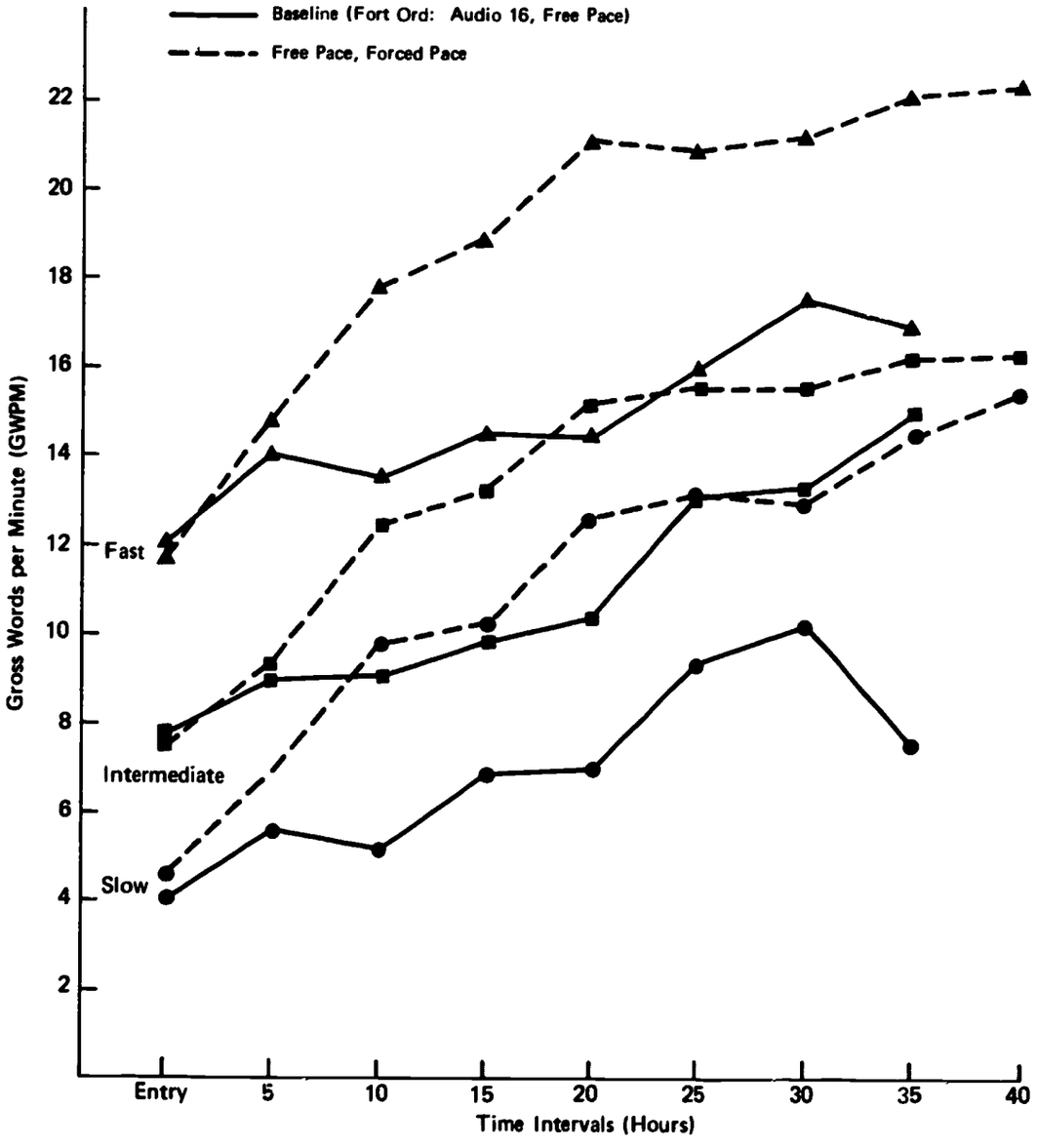


Figure 11

Errors per Five Minutes Typed at Various Time Intervals in Baseline and Free-Pace, Forced-Pace Typing Programs, GWPM Typed at Entry

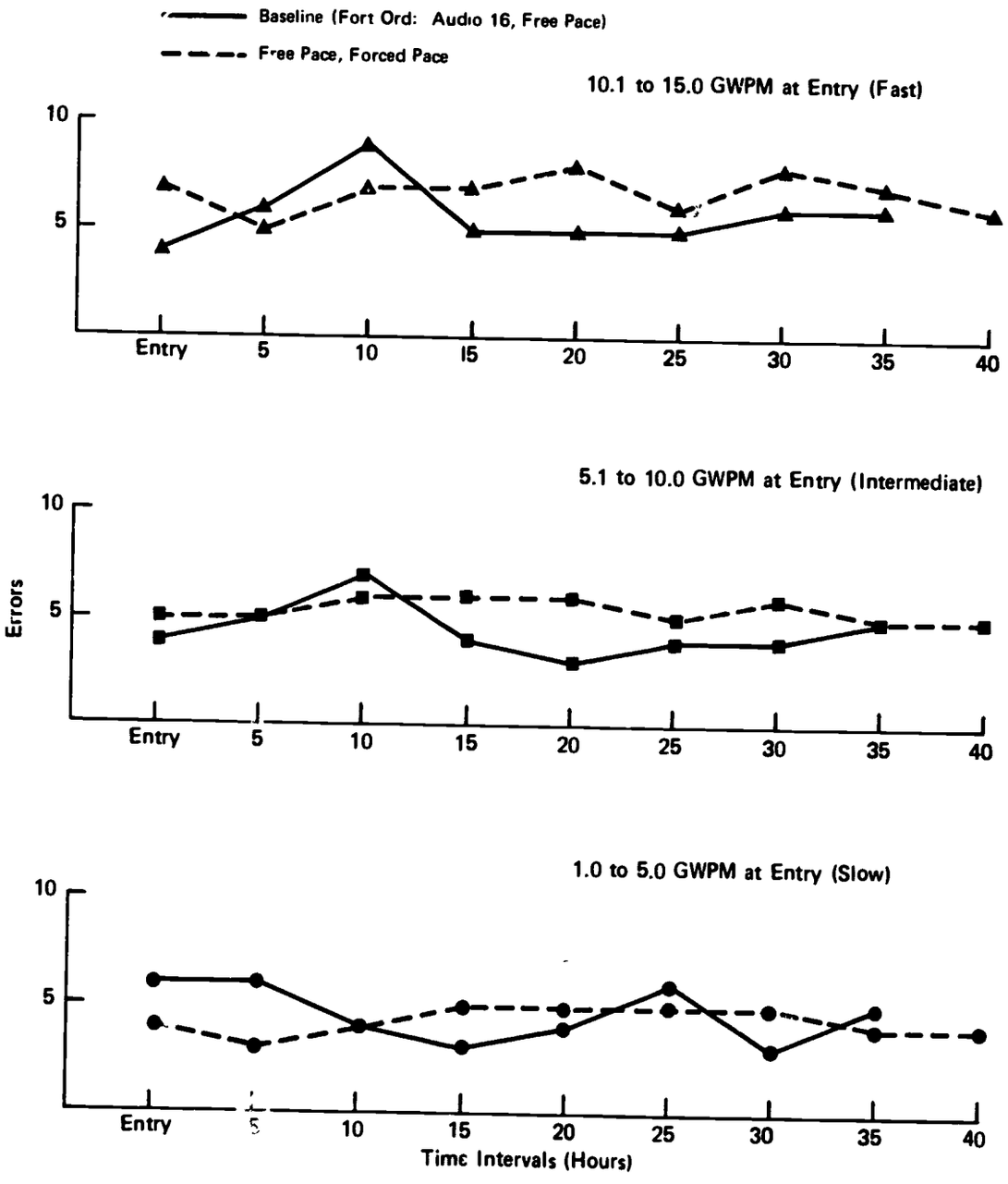


Figure 12

Southeastern Signal School to teach radio-teletypewriter operators. The key-board on a radio-teletypewriter differs from a conventional typewriter keyboard in two important respects: there is no separate row of keys for symbols and numbers, and all letters are upper case.

The 12 tapes in effect constitute six pairs, the material covered in the two tapes comprising a pair being substantially the same. Each tape covers certain keys and some simple words and sentences that can be formed from the selected letters. The student does not cover all the letter keys on the keyboard until the 12th tape. (See Appendix L for a list of video tapes.)

The material was transmitted from a central studio and received in the classroom on eight TV receivers. The student typed while watching the picture and listening to the narration. Instruction during the TV phase was group paced and the students tried to type in unison as key strokes were simultaneously shown on the screen and dictated by the narrator. For the remainder of their time in Group IV, students free typed from instructor-specified copy in *Sustained Timed Writing* (5).

Fifty-one students were enrolled in the Video 12, Free-Pace program. Based upon their entry-typing test scores, three were classified as slow, 40 as intermediate, and eight as fast.

Figures 13 and 14 compare the effectiveness of the Video 12, Free-Pace program and the baseline program. A comparison of the slopes of the GWPM regression lines indicates that the two programs are not significantly different from one another.

VIDEO 12, FORCED-PACE SYSTEM

The Video 12, Forced-Paced system differed from the Video 12, Free-Pace system only in that once the video-tape portion had been completed, the student spent the remainder of his time forced-pace typing, using the skill-building procedures and materials developed for the Free-Pace, Forced-Pace system.

Fifty-seven students were enrolled in the Video 12, Forced-Pace program; six were classified as slow, 37 as intermediate, and 14 as fast.

Figures 15 and 16 compare the effectiveness of the baseline program and the Video 12, Forced-Pace program. An analysis of the slopes of GWPM regression lines indicates that the Video 12, Forced-Pace program is significantly superior for intermediate and fast students, but is no better than the baseline program for slow students.

VIDEO 6, FORCED-PACE SYSTEM

The Video 6, Forced-Pace system differed from the Video 12, Forced-Pace system in that it used only one of the two tapes in each of the six pairs. The time saved was used for forced typing from *Sustained Timed Writing*, (5) using the materials and procedures first used in the Free-Pace, Forced-Pace system.

The decision to evaluate a six-tape system was prompted by the fact that a video-tape system is rigid in that it is difficult to reschedule video tapes for students who have been absent from class; therefore, the fewer video tapes used, the better. Because the Video 12, Forced-Pace program was more effective than the Video 12, Free-Pace program for both intermediate and fast students (see Appendix M), it was decided to use the six-tape system in conjunction with *forced* pace rather than *free* pace.

Forty-nine students were enrolled in the Video 6, Forced-Pace program; 4 were slow typists, 31 intermediate typists, and 14 fast typists.

Gross Words per Minute Typed at Various Time Intervals in Baseline and Video 12, Free-Pace Typing Programs, by GWPM Typed at Entry

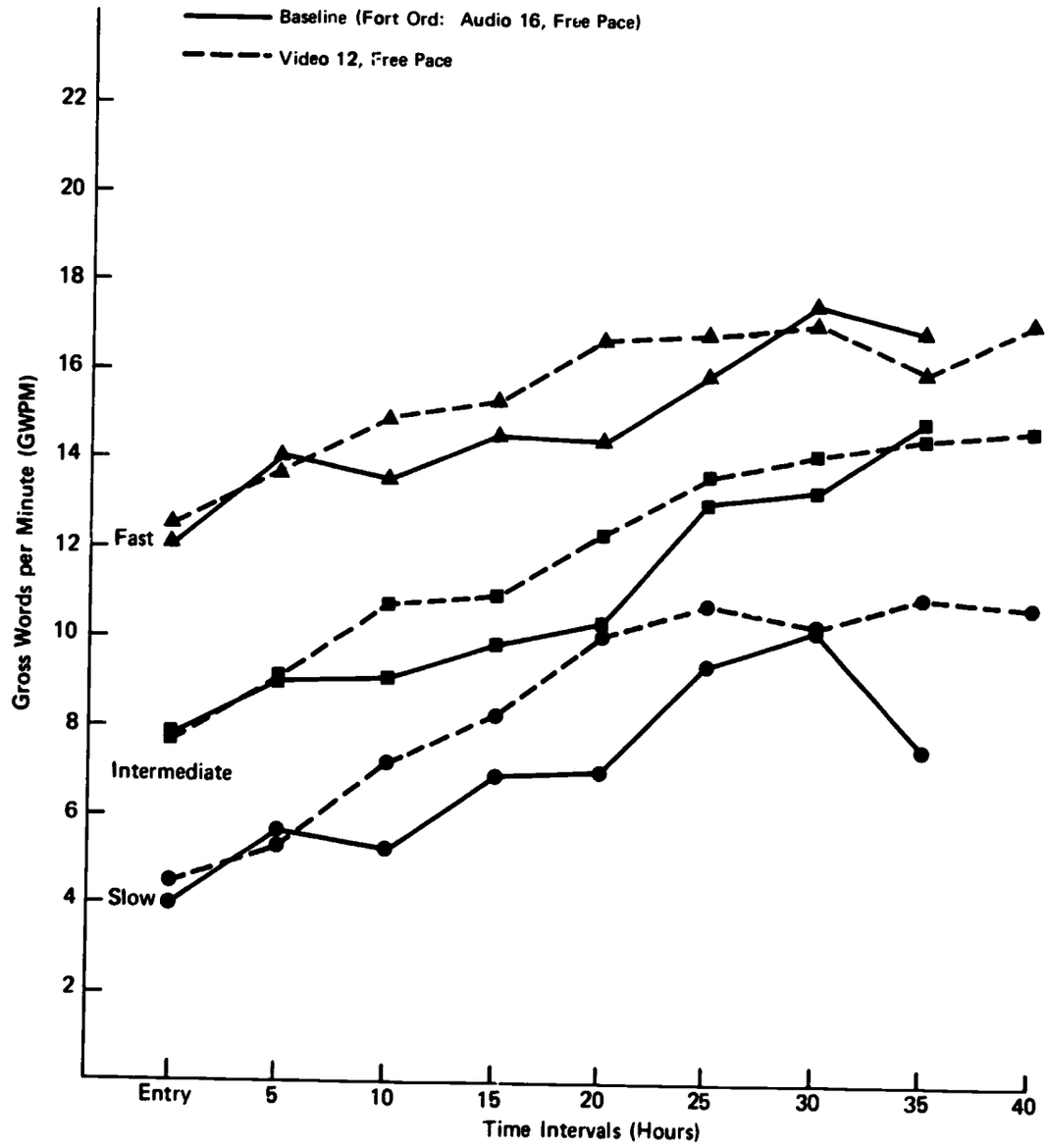


Figure 13

Errors per Five Minutes Typed at Various Time Intervals in Baseline and Video 12, Free-Pace Typing Programs, by GWPM Typed at Entry

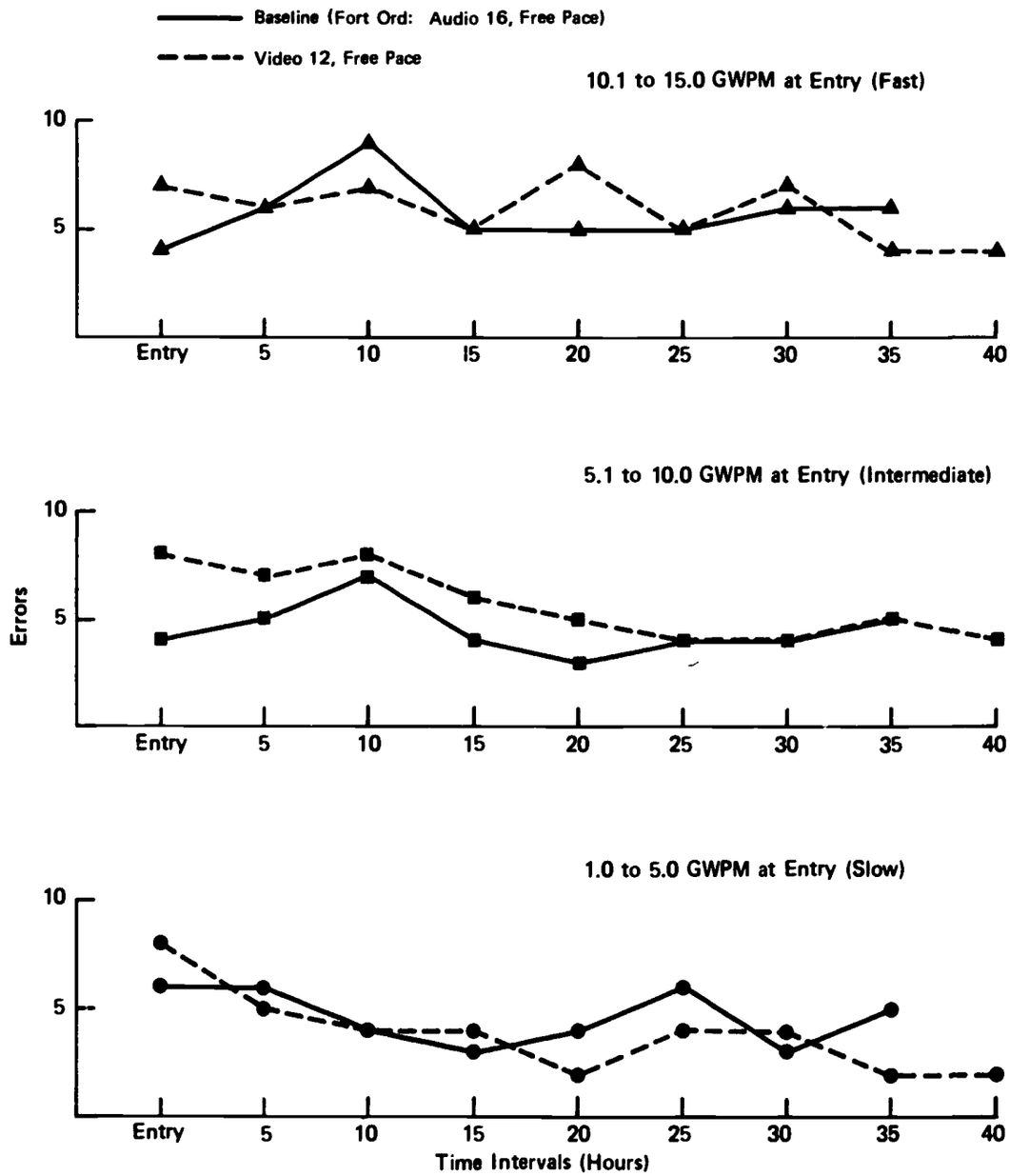


Figure 14

Gross Words per Minute Typed at Various Time Intervals in Baseline and Video 12, Forced-Pace Typing Programs, by GWPM Typed at Entry

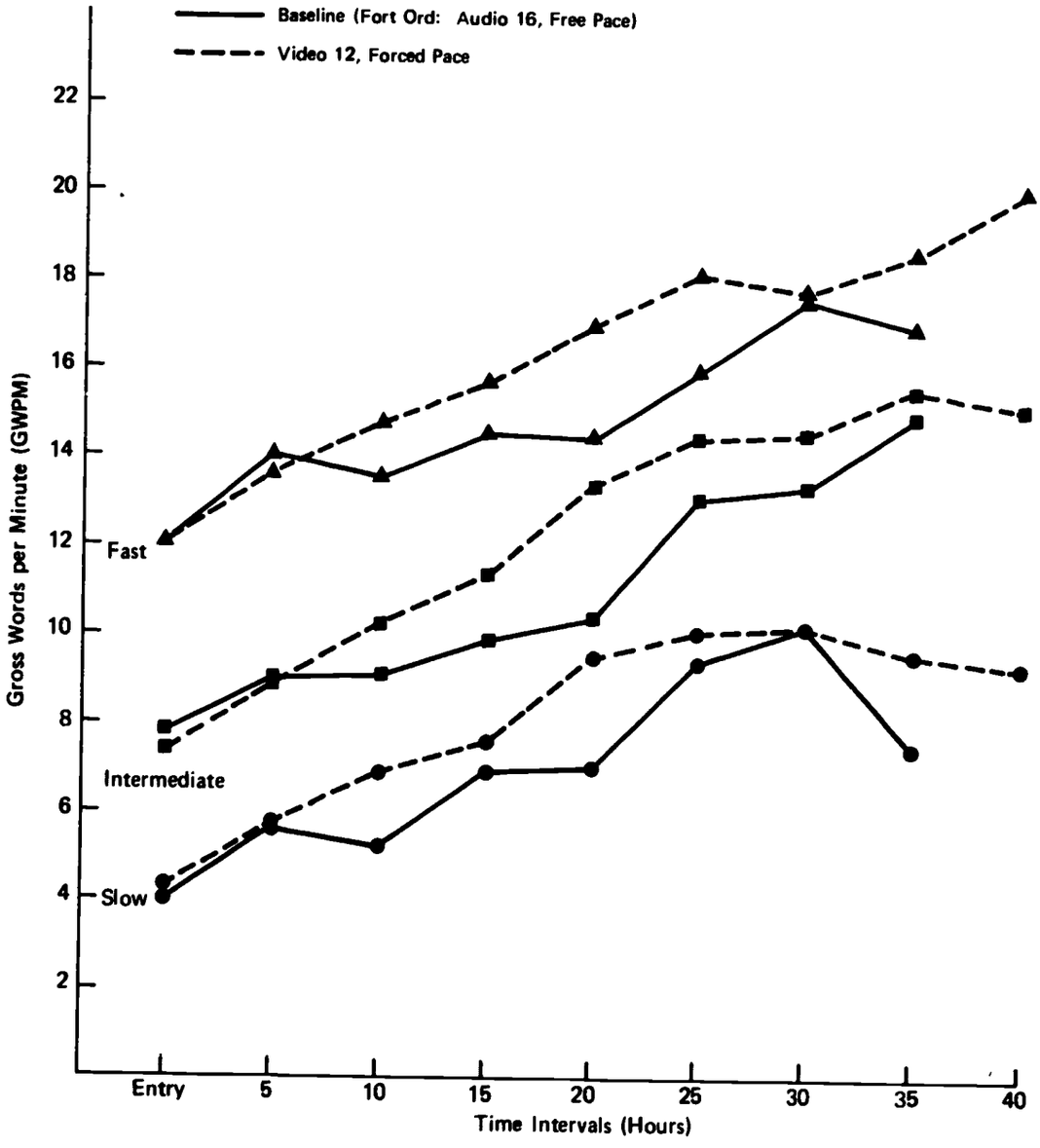


Figure 15

Errors per Five Minutes Typed at Various Time Intervals in Baseline and Video 12, Forced-Pace Typing Programs, by GWPM Typed at Entry

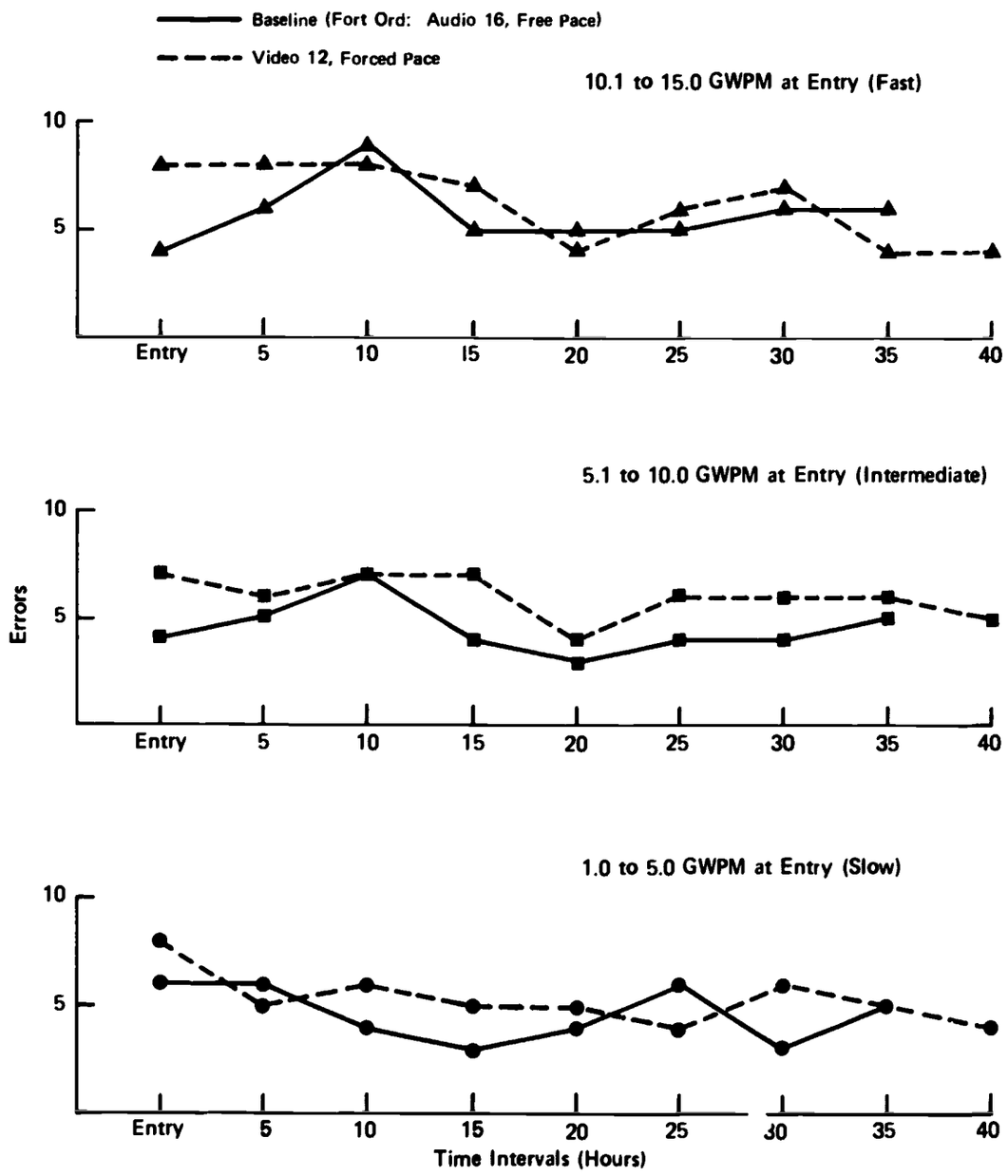


Figure 16

Figures 17 and 18 compare the effectiveness of the baseline program and the Video 6, Forced-Pace program. An examination of the slopes of the GWPM regression lines indicate that the Video 6, Forced-Pace program is significantly superior for intermediate and fast students, but is no better than the baseline program for slow students.

COMPARISON OF ALTERNATIVE TRAINING PROGRAMS

The series of comparisons of the experimental training programs with the baseline program have indicated that the experimental programs are generally more effective for all three groups of students. The next answer to be determined is which of the experimental training programs is the most effective, that is, produces the fastest and most accurate typists at the lowest cost.

GROSS WORDS PER MINUTE AT +20

One standard that can be used is the effectiveness of the program at +20 (after 17 hours of typing practice). In the *distributed* practice programs conducted at Fort Ord, these 17 hours are covered in five training days; in the *massed* practice program conducted at Fort Knox, the hours are covered in three days.

Figure 19 ranks the training programs in terms of GWPM typed at +20 for each of the three groups of students. The data for the fast and intermediate students are consistent. Programs that follow keyboard learning with *self-controlled*, forced-pace typing result in higher GWPM at +20 than do programs that follow keyboard learning with free typing or *externally controlled* (Mind Audio) forced-pace typing. The two most effective programs were those that emphasized the early typing of words and sentences—the Free-Pace, Forced-Pace program and the West: Audio 6, Forced-Pace program.

No such consistency is evident with regard to slow typists—those typing 1.0 to 5.0 GWPM at entry. In part, this may be due to the small number of students involved. The Fort Knox program had no students in this category, and seven of the nine Fort Ord programs contained fewer than 10 such students. The West Audio 6, Forced-Pace program enrolled 11 and the Mind (Audio) program 18 such students.

INCREASE IN THE 5-GWPM TIME VARIABLE

The training programs also can be compared in terms of the speed with which they are able to advance the student to a specified GWPM standard Figure 20 presents these data, with the GWPM standard set at five more GWPM than the upper limit of the student's entry test group. Accordingly, the standard for the slow group is 10.0 GWPM, for the intermediate group 15.0 GWPM, and for the fast group 20.0 GWPM. These standards are *roughly* twice the GWPM that the group typed at entry.

The data are consistent with those presented in Figure 19 in that training programs with a self-controlled, forced-pace component are generally more effective than other programs. Slow students in the Free-Pace, Forced-Pace program reach 10.0 GWPM at +10 with an average of four errors. Students in the Kee: Model 1025 Program reach 10.0 GWPM at +15 with an average of seven errors. Four training programs advance slow students to the 10.0 GWPM standard at +20.

At varying rates of speed, all training programs are able to double the typing speed of both slow and intermediate students. However, only the four programs with a self-controlled, forced-pace component are able to approximately double the typing speed of fast students.

Gross Words per Minute Typed at Various Time Intervals in Baseline and Video 6, Forced-Pace Typing Programs, by GWPM Typed at Entry

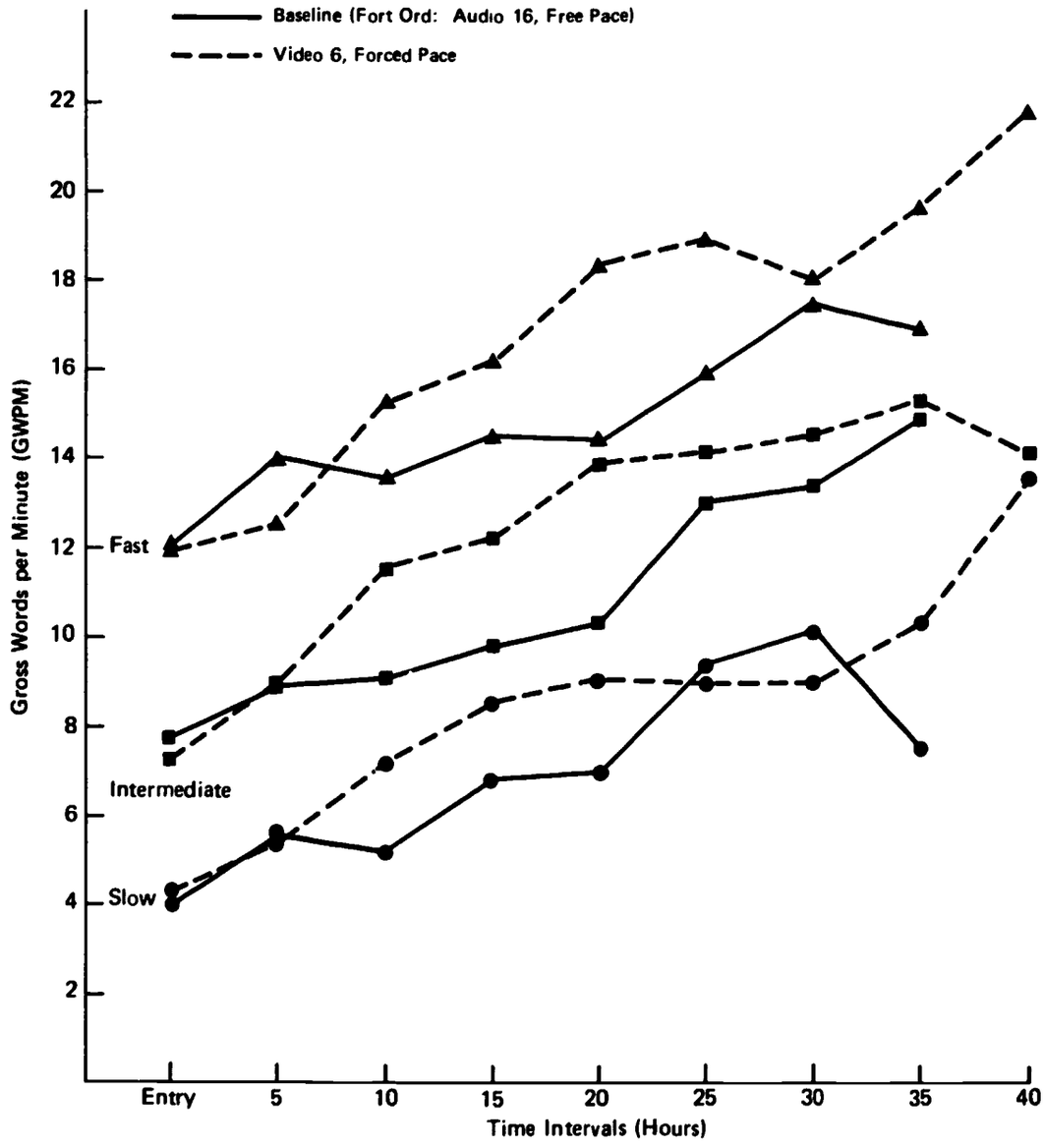


Figure 17

Errors per Five Minutes Typed at Various Time Intervals in Baseline and Video 6, Forced-Pace Typing Programs, by GWPM Typed at Entry

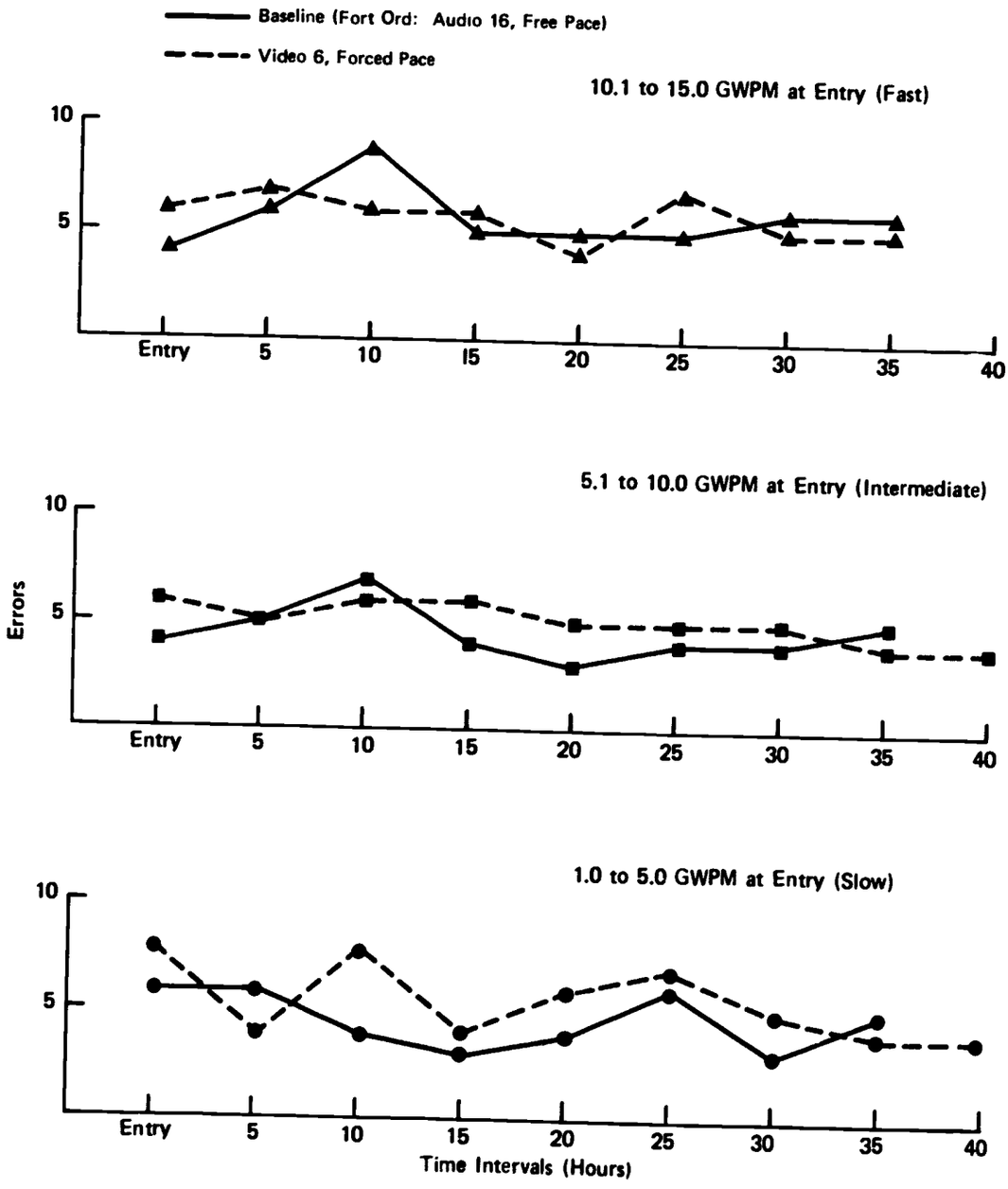
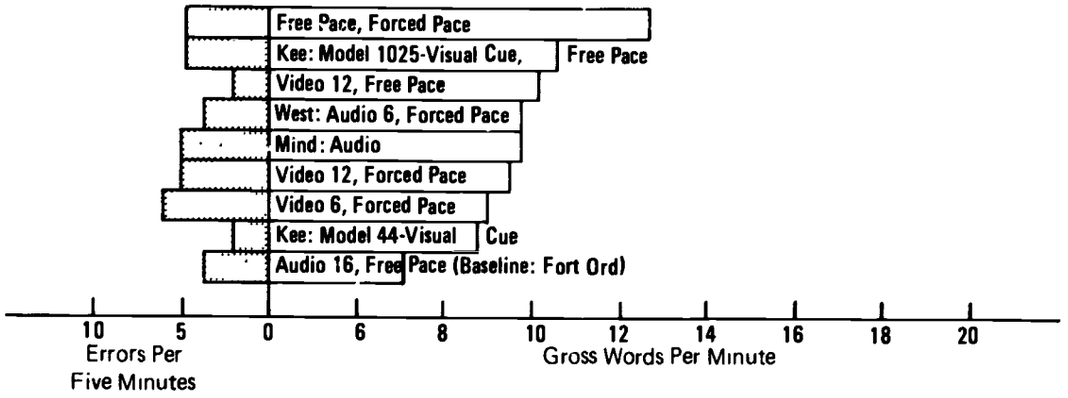


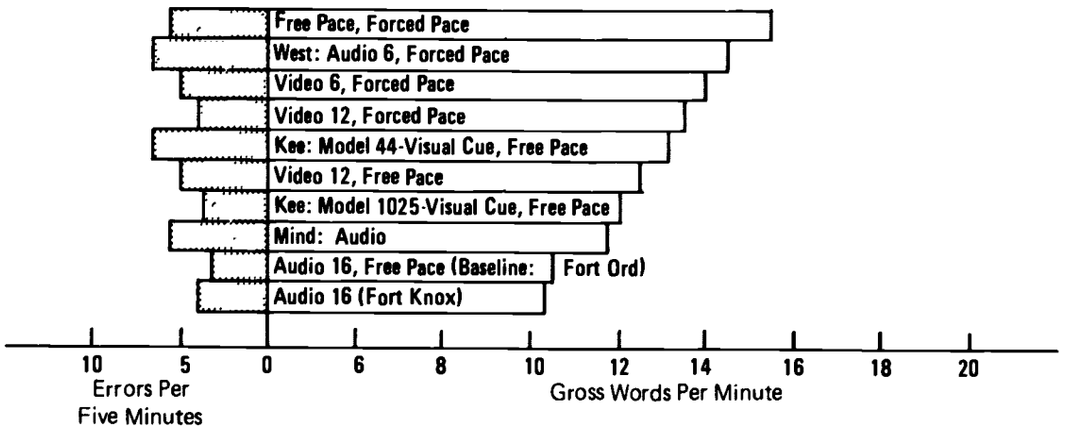
Figure 18

Gross Words per Minute and Errors per Five Minutes Typed at +20, by Typing Program and GWPM Typed at Entry

A – 1.0 to 5.0 GWPM at Entry



B – 5.1 to 10.0 GWPM at Entry



C – 10.1 to 15.0 GWPM at Entry

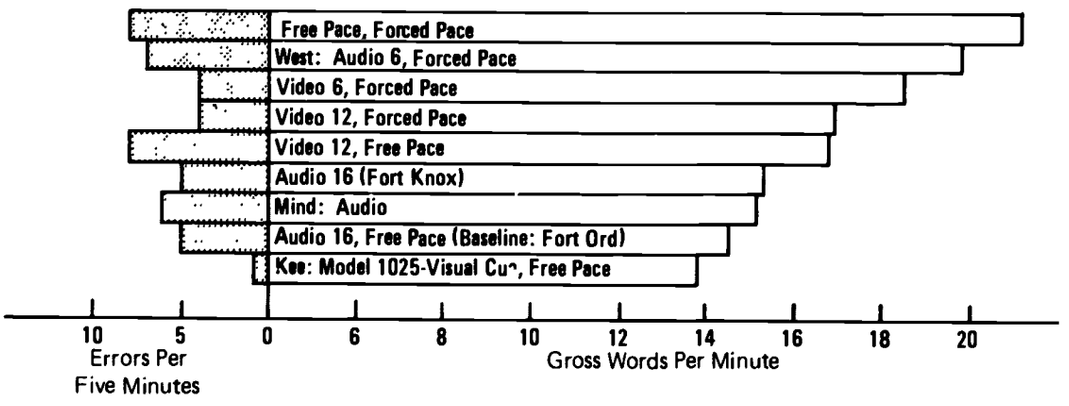


Figure 19

Earliest Time Interval When Students Reach Specified Gross Words per Minute Standard, by Typing Program and GWPM Typed at Entry

Program	Time Interval (hours)								Standard Not Reached While Student in Group IV Status
	5	10	15	20	25	30	35	40	
1.0 to 5.0 GWPM at Entry Standard: 10.0 GWPM									
Audio 16 (Fort Knox)	Data not available								
Audio 16, Free Pace (baseline)						3		ND	
Kee: Model 1025, Visual Cue			7						
Kee: Model 44, Visual Cue							3		
Mind: Audio				5					
Video 12, Free Pace				2					
Video 12, Forced Pace				5					
Video 6, Forced Pace							4		
West Audio 6, Forced Pace				4					
Free Pace, Forced Pace		4							
5.1 to 10.0 GWPM at Entry Standard: 15.0 GWPM									
Audio 16 (Fort Knox)									Not attained
Audio 16, Free Pace (baseline)							5	ND	
Kee: Model 1025, Visual Cue							2		
Kee: Model 44, Visual Cue					5				
Mind: Audio						6			
Video 12, Free Pace							5		
Video 12, Forced Pace						6			
Video 6, Forced Pace						5			
West Audio 6, Forced Pace					6				
Free Pace, Forced Pace				6					
10.1 to 15.0 GWPM at Entry Standard: 20.0 GWPM									
Audio 16 (Fort Knox)									Not attained
Audio 16, Free Pace (baseline)								ND	Not attained
Kee: Model 1025, Visual Cue								ND	Not attained
Kee: Model 44, Visual Cue	Data not available								
Mind: Audio									Not attained
Video 12, Free Pace									Not attained
Video 12, Forced Pace								4	
Video 6, Forced Pace							5		
West Audio 6, Forced Pace				7					
Free Pace, Forced Pace				8					

NOTE: | | | | 3 | Indicates time interval in which students reached specified standards; number indicates number of errors in that interval. ND indicates no data for that interval.

Figure 20

TEN NET WORDS PER MINUTE TIME VARIABLE

The Army Subject Schedule (1) stipulates that when a student can type 10 net words per minute (NWPM), he shall be assigned to Group III. This net score is derived by deducting five words from gross words per minute for every error, a rather severe penalty. Thus a student who makes three errors while typing 60 words in five minutes has a score of 12 GWPM and 9 NWPM. (See Appendix N for a conversion table.)

Figure 21 compares the 10 training programs in terms of how soon their students reach the 10 NWPM standard. Only two of the programs enable slow typists to reach 10 NWPM. Students in the Free-Pace, Forced-Pace program reach 10 NWPM at +35, and students in the Video 6, Forced-Pace program reach 10 NWPM at +40, but it should be noted that the number of slow students in both programs is very small. All but one of the programs bring intermediate typists to the 10 NWPM standard, and all programs bring fast typists to the 10 NWPM standard.

While the Kee: Model 44 program appears to work well with intermediate students, it should be remembered that the N was limited to two students—too few to warrant a final judgment on its effectiveness.

There are some differences between the results presented in Figure 21 and the results presented in Figures 19 and 20. For example, the Video 12, Free-Pace program does as well, if not better than the Video 12, Forced-Pace program when errors are taken into consideration as they are in Figure 21. This indicates that forced-pace programs result in a somewhat higher error rate.

As can be seen in the earlier figures comparing the baseline program with the experimental programs, students are generally able to double their typing speed (GWPM), while the error rate remains fairly stable. For example, over the two-week period, intermediate students in the West program increase their GWPM from 7.4 to 16.0, while their error rate (ignoring intervening fluctuations) remains constant, five errors per five minutes.

The above discussion is included in order to provide a frame of reference when determining the relative importance of speed versus accuracy in setting standards. West devotes considerable space to discussing the error problem, and states that stroking errors should be given "very little weight in measuring straight copy skill," and that "quite lenient standards of accuracy" should be set during accuracy practice (4, p. 294). Later, in outlining a training program, he indicates that two errors per minute is an acceptable standard of accuracy (4, p. 302). Because both the control and the experimental programs meet this standard, we are inclined to prefer those programs which result in the greatest gain in speed, even if they also result in somewhat more errors.

PREDICTED SCORES AT +20 AND +40

The programs also can be compared in terms of the gross words per minute and errors per five minutes that can be predicted from their regression lines. Speed and accuracy predictions at +20 (after 17 hours) and at +40 (after 32 hours) are shown in Table 4.[16] The best of the experimental programs increases the typing speed of slow and intermediate students between two and three GWPM,[17] and the typing speed of fast

[16]The Fort Knox predictions at +40 are based on the extension of its regression lines to that point.

[17]The Free-Pace, Forced-Pace program for the slow group, which involved only eight students, is disregarded.

Earliest Time Interval When Students Reach the Goal of 10 Net Words per Minute, by Typing Program and GWPM Typed at Entry

Program	Time Interval (hours)								Standard Not Reached While Student in Group IV Status
	5	10	15	20	25	30	35	40	
1.0 to 5.0 GWPM at Entry									
Audio 16 (Fort Knox)	Data not available								
Audio 16, Free Pace (baseline)								ND	Not attained
Kee: Model 1025, Visual Cue									Not attained
Kee: Model 44, Visual Cue									Not attained
Mind: Audio									Not attained
Video 12, Free Pace									Not attained
Video 12, Forced Pace									Not attained
Video 6, Forced Pace								10	
West Audio 6, Forced Pace									Not attained
Free Pace, Forced Pace							10		
5.1 to 10.0 GWPM at Entry									
Audio 16 (Fort Knox)									Not attained
Audio 16, Free Pace (baseline)							10	ND	
Kee: Model 1025, Visual Cue						11			
Kee: Model 44, Visual Cue			11						
Mind: Audio					10				
Video 12, Free Pace					10				
Video 12, Forced Pace							10		
Video 6, Forced Pace						10			
West Audio 6, Forced Pace							10		
Free Pace, Forced Pace					11				
10.1 to 15.0 GWPM at Entry									
Audio 16 (Fort Knox)				10					
Audio 16, Free Pace (baseline)			10					ND	
Kee: Model 1025, Visual Cue			11					ND	
Kee: Model 44, Visual Cue	Data not available								
Mind: Audio					10				
Video 12, Free Pace			10						
Video 12, Forced Pace				13					
Video 6, Forced Pace			10						
West Audio 6, Forced Pace	10								
Free Pace, Forced Pace	10								

NOTE: | | | | 3 | Indicates time interval in which students reached specified standards; number indicates number of errors in that interval. ND indicates no data for that interval.

Figure 21

students between four and six GWPM, with only a slight increase in errors. The somewhat lower error rate for the slower programs is due, in part, to the fact that students in these programs type less, consequently have fewer opportunities to make errors.

Table 4

Predicted Gross Words per Minute and Errors per Five Minutes at +20 and +40 for 10 Typing Programs, by GWPM Typed at Entry[a]

Typing Program and Entry Speed	+20 (17 hours)		+40 (32 hours)	
	GWPM	EP5M	GWPM	EP5M
1.0 to 5.0 GWPM at Entry				
Free Pace, Forced Pace	11.2	4.3	16.2	4.7
Kee: Model 1025, Visual Cue, Free Pace	9.8	5.7	14.8	4.7
Mind: Audio	9.0	5.1	13.4	3.8
Video 6, Forced Pace	8.4	5.6	11.8	4.5
Video 12, Forced Pace	8.3	5.5	11.4	6.6
West Audio 6, Forced Pace	7.9	5.3	12.5	5.4
Video 12, Free Pace	7.8	4.3	11.4	6.6
Kee: Model 44, Visual Cue, Free Pace	7.7	2.2	11.4	2.1
Audio 16, Free Pace (baseline)	7.7	4.4	11.3	3.3
5.1 to 10.0 GWPM at Entry				
Free Pace, Forced Pace	13.5	5.3	17.9	5.3
Kee: Model 44, Visual Cue, Free Pace	13.3	3.5	18.1	4.9
West Audio 6, Forced Pace	13.1	5.9	17.4	6.0
Video 6, Forced Pace	12.8	5.2	17.0	4.3
Video 12, Forced Pace	12.4	6.3	16.9	7.0
Mind: Audio	12.1	6.0	17.4	4.3
Video 12, Free Pace	12.0	6.0	15.8	8.2
Kee: Model 1025, Visual Cue, Free Pace	11.6	5.0	15.8	6.7
Audio 16, Free Pace (baseline)	11.4	4.3	15.2	3.7
Audio 16 (Fort Knox)	10.5	5.4	13.3	6.2
10.1 to 15.0 GWPM at Entry				
Free Pace, Forced Pace	19.1	5.7	24.0	5.9
West Audio 6, Forced Pace	18.5	6.1	23.4	7.1
Video 6, Forced Pace	17.1	5.3	21.7	4.4
Video 12, Forced Pace	16.5	6.3	20.2	8.4
Video 12, Free Pace	15.8	6.1	18.2	7.0
Audio 16 (Fort Knox)	15.6	5.6	18.8	6.4
Audio 16, Free Pace (baseline)	15.3	5.8	18.2	5.9
Mind: Audio	14.9	6.3	18.2	6.4
Kee: Model 1025, Visual Cue, Free Pace	14.1	8.3	16.3	11.2

[a]GWPM, gross words per minute; EP5M, errors per five minutes.

Chapter 4

PREDICTING TYPING PERFORMANCE

At the present time, the only prerequisite for entrance into the Clerk or Clerk-Typist training program is a minimum CL Aptitude Area score of 100.[1] The CL score is presumed to be a good predictor of overall performance in the Clerk and Clerk-Typist training programs.

Because of concern with the typing component of the training program, an attempt was made to determine how effective the CL Aptitude Area score and other possible predictors were in specifically predicting performance in the typing component of the training program. It should be noted that the prerequisite of 100 on the CL Aptitude Area restricts the range of scores on this test and related tests, and consequently tends to lower the size of the correlation coefficient.

Table 5 shows the intercorrelation of four possible predictors and typing performance at +20 and +40. It is apparent that the best predictor of typing performance at both +20 and +40 is typing performance at entry.[2] It is about 12 times more effective than any of the three pencil-and-paper aptitude test scores (AFQT, GT, CL).

Table 5

Intercorrelations Between AFQT, GT, and CL Scores and Gross Words per Five Minutes on Third Trial— At Entry, +20, and +40[a] (Ns = 150 to 157)

Possible Predictors	Gross Words Typed		
	Entry	+20	+40
AFQT	.23	.26	.26
GT Score	.23	.25	.27
CL Score	.23	.22	.28
Gross Words Typed At Entry		.70	.69

[a]In the West Audio 6 Forced Pace program.

[1] Of the students studied at Fort Ord and Fort Knox during the spring and summer of 1971, 8% had CL score under 100.

[2] A "tapping test" requiring the use of special equipment (but not the typewriter) has been developed to predict typing performance. This test was administered to two groups of 10 classes each. The average correlation between the "tapping test" scores and *net words per minute* was .39. The average correlation between the "tapping test" scores and *final grade* at the end of the first semester for the second group of 10 classes was .44. Correlations with intelligence test scores were similar to those shown in Table 5 for AFQT, GT, and CL. See *Manual for the Tapping Test* (7).

Chapter 5

PRODUCTION-COPY TYPING

BACKGROUND

The beginning typist first learns to type letters, then words, and finally complete sentences and paragraphs. During these stages, the copy (text) to be typed by the student is presented to him in either typed or machine-printed form. He simply copies the typed or machine-printed text, letter for letter and space for space. He seldom, if ever, is required to make decisions regarding such things as centering, vertical spacing, line endings, or margins. This kind of typing is commonly known as straight-copy typing.

The typist on the job, however, seldom does straight-copy typing. The text he is to type is generally presented to him orally or in hand-printed or hand-written form. He frequently must make decisions regarding centering, vertical spacing, line endings, and margins. This kind of typing is commonly known as *production-copy* typing.[1]

Beginning typists in the Army, those who type 10 or less net words per minute, are classified as Group IV typists. All of their typing instruction and typing practice time is spent on straight-copy material. When they demonstrate that they can type approximately 11 net words per minute, they are classified as Group III typists. As Group III typists, they spend a major portion of their typing time typing production-copy material.

METHOD

In order to determine whether the "11 net words-per-minute" standard for advancement to production-copy typing was valid, a special study was conducted to determine the relationship between straight-copy typing skill and production-copy typing skill. Three groups of Army typists served as subjects for this study:

(1) Beginning typists (Group IV)—45 men who on entry tests had typed 10 or less words per minute and who, at the time of the study had completed approximately 40 hours of typing instruction and practice.

(2) Advanced typists (Groups I, II and III)—45.

(3) Job Incumbents (Clerk-Typists, MOS 71B20)—49 men who had been on the job between three and six months and reported that they did some typing at least one or two days a week as part of their job.

The three groups of subjects were tested separately on both straight-copy and production-copy material. The straight-copy tests consisted of three five-minute timed writings. In the first, the subject was to emphasize speed; in the second, he was to emphasize accuracy; and in the third, he was to emphasize both speed and accuracy. The copy, which was different for each timed writing, consisted of commercially prepared material with an average syllabic intensity of 1.51. This is generally considered to be fairly difficult copy. The typed copy was scored for both quantity and quality, using the Army's scoring system.

The production-copy tests consisted of five production-copy problems—a military letter, a nonmilitary letter, a Disposition Form (DA Form 2496), a Summarized Record of Proceedings Under Article #15 (DA Form 2627), and an Allotment Document (DA

[1] West recommends that practice on production copy be initiated when the student has attained a *gross* typing speed of 25 words per minute on 5-minute trials, using new material.

Form 1341-1). Each problem consisted of a typed model and a hand-printed draft; the content of each was different. The subjects were instructed to type the draft, using the model as a guide, and to strive for typed copy that would meet a commanding officer's standards. If they made an error, they were told that they could erase it or start again on a fresh sheet of paper, but they were informed that the time to complete the five problems was one of the scores to be derived from this study.

When the subject completed all five problems to his own satisfaction, he gave them to the test monitor who noted the time required to finish. Typing-stroke errors were scored using the Army's error-scoring system, with one error added for each failure to follow proper format with regard to margins, spacing, or capitalization. Three production-copy scores were computed, gross time in minutes to complete the five exercises, total number of errors, and net time to complete the five exercises. The net-time score consisted of the gross-time score plus one minute for each stroke or format error.

Subjects differed in their familiarity with the five types of production copy. Beginning typists (Group IV) had received no instruction on any of the five types of production copy. Intermediate typists (Groups I, II, and III) had received some instruction on the preparation of military letters, nonmilitary letters, and Disposition Forms, but no instruction on the preparation of DA Forms 2627 or 1341-1. Job incumbents probably had received the same training as intermediate typists, but it is unlikely that while on the job they routinely prepared all five types of production copy.

RESULTS

COMPARISON OF BEGINNING TYPISTS, ADVANCED TYPISTS, AND JOB INCUMBENTS

The three groups of subjects are compared in Table 6 in terms of their aptitude scores, and straight-copy and production-copy typing performance. An analysis of variance revealed that there were significant differences between groups on all eight variables.

While beginning typists had significantly lower aptitude test scores than either advanced typists or job incumbents, the latter two groups did not differ significantly from one another on two of three aptitude measures.

As was to be expected, the three groups differed significantly from one another on gross words per minute typed on the straight-copy test. Beginning typists type the fewest words and job incumbents type the most words. Somewhat surprisingly, the pattern is similar for straight-copy errors, job incumbents making the most errors and beginning typists the fewest. In part, this is a function of the greater typing speed of the job incumbents, who, as a consequence of their greater speed, have more opportunity to make errors.

The pattern for production-copy typing speed is similar to that found for straight-copy typing in that the three groups are significantly different from one another. Job incumbents are the fastest typists and beginning typists the slowest. The error pattern, however, is very different. While the incidence of errors for advanced typists and job incumbents is not significantly different, beginning typists make significantly more errors than either of the other two groups. The answer lies in the nature of the errors made. In straight-copy typing, errors are primarily due to hitting the wrong key. In production-copy typing, an important component of errors is using incorrect format or style.

The relatively poor performance of beginning typists on production copy reflects the fact that they worked under three handicaps. They had the slowest straight-copy typing

Table 6

Comparison of Beginning Typists, Advanced Typists, and Job Incumbents on Aptitude Scores and Performance on Straight-Copy and Production-Copy Typing

Measure	Beginning Typists	Advanced Typists	Job Incumbents
Aptitude Scores	(N=44)	(N=33-43)	(N=46-49)
AFQT		NS[a]	
Mean	47.8	66.1	67.7
SD	24.1	22.3	22.6
CL			
Mean	113.6	128.8	123.0
SD	14.3	10.7	11.0
GT		NS	
Mean	103.8	122.7	119.3
S D	18.7	15.0	16.2
Straight-Copy Typing[b]	(N=44)	(N=45)	(N=49)
Gross Words Per Minute			
Mean	15.9	35.4	40.9
SD	5.0	8.7	10.5
Errors Per Five Minutes	NS	NS	
Mean	5.7	8.7	10.9
SD	4.9	5.4	10.2
Production-Copy Typing	(N=44)	(N=45)	(N=49)
Gross Time (Minutes)			
Mean	98.6	59.6	41.4
SD	22.8	15.3	8.4
Errors		NS	
Mean	32.8	13.4	9.6
SD	25.2	11.1	6.6
Net Time (Minutes)			
Mean	131.2	72.8	50.9
SD	36.7	18.6	10.8

[a]Not statistically significant.
[b]Speed and accuracy trial.

speed and were the least familiar with the format of the letters and DA forms used in the five production-copy problems. To some extent, their lower aptitude scores also may have contributed to their poor performance. On all three counts, the advantage lay with the job incumbents.

Differences between advanced typists and job incumbents are also noteworthy. Although job incumbents type only 5 GWPM more than advanced typists on straight-copy material, they complete the production-copy problems about 20 minutes sooner than advanced typists. It would appear that their advantage lies not in their greater straight-copy typing speed but in their greater familiarity with production-copy material.

INTERCORRELATION OF APTITUDE, STRAIGHT-COPY TYPING, AND PRODUCTION-COPY TYPING SCORES

Table 7 shows the intercorrelations of the aptitude, straight-copy, and production-copy typing scores for each group of subjects. The best predictor of production-copy typing speed for all groups is straight-copy typing speed. Aptitude is a predictor of production-copy errors for beginning typists but not for advanced typists or job incumbents. This may indicate that the more able beginning typists used their intelligence to solve format problems, while the less able beginning typists made format errors. Familiarity with production-copy material would probably outweigh aptitude as a factor in the production-copy typing performance of advanced typists and job incumbents.

Table 7

Intercorrelations Between Aptitude Scores, Straight-Copy Typing Scores, and Production-Copy Typing Scores by Subject Group

Measure	N	Production-Copy Typing[a]		
		Gross Time	Errors	Net Time
Beginning Typists				
Aptitude Scores				
AFQT	44	−.297	−.441*	−.482*
CL	44	−.059	−.461*	−.346
GT	44	−.271	−.540*	−.539*
Straight-Copy Typing[b]				
Gross Words Per Minute	44	−.473*	−.530*	−.661*
Errors Per Five Minutes	44	.016	−.134	−.077
Advanced Typists				
Aptitude Scores				
AFQT	33	−.163	−.429*	−.402
CL	43	−.077	−.345	−.259
GT	43	−.204	−.374	−.365
Straight-Copy Typing[b]				
Gross Words Per Minute	45	−.447*	−.234	−.505*
Errors Per Five Minutes	45	−.307	.271	−.099
Job Incumbents				
Aptitude Scores				
AFQT	46	.114	−.321	−.135
CL	49	−.214	−.265	−.334
GT	49	−.111	−.332	−.298
Straight-Copy Typing[b]				
Gross Words Per Minute	49	−.372*	−.371*	−.523*
Errors Per Five Minutes	49	.244	.203	.313

[a]* Significant at .05 level.

[b]Speed and accuracy trial.

DISCUSSION

The objective of the production-copy study was to determine the best time to introduce production-copy typing. The results indicated that advanced typists and job incumbents do not significantly differ in either their straight-copy or production-copy errors; however, advanced typists and job incumbents do differ in their straight-copy and production-copy speed. The differences appear to be greater for production copy than for straight copy; in both instances, job incumbents demonstrate greater speed. Apparently job experience leads to increased skill in production-copy typing but has little effect on straight-copy typing skill. This may be the result of the job incumbent's greater familiarity or experience with production-copy material and job standards.

Chapter 6

DISCUSSION AND SUGGESTIONS

In this chapter, a system for training Group IV typists is suggested. For some training procedures, few, if any, changes in current practices would be necessary. For others, significant departures from current practices are proposed.

CLASSIFICATION OF STUDENTS FOR TRAINING

The present system of using entry-typing tests to classify students into Group IV and non-IV should be expanded to include all students, even those who say that they have never typed before. Including nontypists makes it possible to tailor training to their particular needs and to monitor their progress more carefully. All students, and particularly nontypists, would be given about one hour of instruction in the use of the typewriter before taking entry-typing tests. This instruction should include correct fingering, capitalization, and carriage return.

Careful attention should be given to the conduct of the entry-typing tests. It is suggested that (a) students be given about 15 minutes of practice before taking the tests; (b) they be given three carefully timed 5-minute test trials, each trial on different copy; (c) the copy for all three trials have a syllabic intensity of approximately 1.35[1]; (d) the average of these three trials constitute the entry test score.

The TYPETRAIN staff sees no reason to alter the current standards of under 11 NWPM for assignment to Group IV, but it suggests that format errors (spacing after punctuation, paragraph indention, etc.) be ignored on entry tests.

TRAINING

On the basis of the data cited earlier, there are a number of training programs that would be more effective than the baseline (Audio 16, Free-Pace) program specified by the Army Subject Schedule.

ALTERNATIVE TRAINING PROGRAMS

Alternative A: If space and staff limitations make it impossible to group students on the basis of their entry-test score, use of either the West Audio 6, Forced-Pace program or the Video 6, Forced-Pace program is suggested. These two programs are about equally effective with the bulk of students who make up Group IV—those who type between 5.0 and 15.0 GWPM at entry. While the Free-Pace, Forced-Pace program was recorded as somewhat more effective, we hesitate to suggest it for a heterogenous group because the

[1] The SI of the copy was set at 1.35 rather than 1.50 because some typing experts consider this to be "normal" copy and because it is more readily available in the typing texts currently in use in Army training centers. To insist on copy with an SI of 1.50 would require the purchase of new material. See 8.

data on its effectiveness with the slow group (1.0 to 5.0 GWPM at entry) are limited to eight students. These students, as well as intermediate students, may suffer from the program's lack of instruction on correct fingering. Although the Free-Pace, Forced-Pace program was effective over the two-week period for which data are available, the suspected failure to use proper typing form may prevent the students from developing typing speeds of 30 to 40 words per minute.

The Audio 6 and the Video 6 programs have their particular strengths and weaknesses. The Video 6 program presents instruction both orally and visually, but it does not include instruction in the shift key nor does it include the use of keyboard mock-ups. Its remote source makes it less flexible in rescheduling tapes for the students who missed training than the Audio 6 program, which is under the direct control of the instructor. Audio 6 also includes instruction in the use of the shift key and has a keyboard mock-up that aids students in locating keys, during the early training stages. Unlike the Video 6 program, however, it uses only one medium to present instruction. There is little difference between the programs in the demands made upon the instructors.

Alternative B: If space and staff allow the students to be grouped on the basis of their entry test score, it is suggested that the fast students (10.1 to 15.0 GWPM at entry) be trained by the Free-Pace, Forced-Pace program and all other students (1.0 to 10.0 GWPM at entry) be trained by either the Audio 6, Forced-Pace or the Video 6, Forced-Pace program. This arrangement would free the fast students from the tedious and repetitive instruction on current fingering.

FORCED-PACE VERSUS FREE-PACE TYPING

Both alternatives incorporate forced-pace typing. As noted earlier in the description of the training programs, forced-pace typing requires the use of special materials and careful monitoring on the part of the instructor in order to ensure that the materials are used properly. Although none of these problems is encountered in free-pace typing, the TYPETRAIN staff prefers forced-pace typing to free-pace typing.

This preference is based upon three factors. First, the data suggest that forced pace is more effective than free pace in increasing the student's typing speed. Second, practice typing is highly repetitive and boring, and it is essential to maintain student interest. Observation of student behavior indicates that they show greater interest in and less boredom with forced-pace typing. Apparently, the challenge of having a specific goal to strive for, immediate knowledge of results, trying to "beat the tape," and having a visible record of one's progress increase the student interest. Third, the forced-pace system gives the instructor greater opportunity to enhance student interest. For example, one instructor took the role of a gambling casino croupier and publicly announced the names of students who had reached their goal.[2]

TRAINING SLOW TYPISTS

Training slow typists, those whose entry typing speed is 5 or less GWPM, poses a special problem. Three programs consistently showed limited effectiveness with this group: Mind; Kee: Model 1025; and Free Pace, Forced Pace. Conclusions about the

[2] If the forced-pace component is adopted, the staff recommends using the format used in the Free-Pace, Forced-Pace program rather than the format used in the West Audio 6, Forced-Pace program.

effectiveness of Free Pace, Forced Pace and Kee are vitiated by the small number of slow students trained in these programs. Moreover, it is questionable whether the cost of purchasing or leasing Kee equipment warrants the limited gain to be expected.

One alternative is to train slow students in the Mind program. The staff hesitates to recommend this because the cost of the equipment does not appear to warrant the limited gain that could be expected.

Another alternative that should be considered is to reassign these students to another MOS. They are few in number and reassignment should cause no problems of consequence in the assignment system.

A third alternative is to train these men in a system that is only marginally effective with them, but works well for the more able students. The Video 6, Forced-Pace and the West Audio 6, Forced-Pace programs meet these criteria.

VIDEO TAPES

As had been noted earlier, the video tapes used in the experimental training programs were designed for the teletypewriter rather than the typewriter. Since the keyboard on a teletypewriter is somewhat different from that found on a typewriter, the use of these video tapes places an unnecessary burden on both the instructor and the student. It is recommended that a new set of video tapes, specifically designed to teach typing, be prepared.

COPY FOR PRACTICE

The forced-pace phase of the recommended training programs made use of copy found in *Sustained Timed Writing* (5), a text available at Fort Ord. Training centers that do not have this typing text may use other typing texts. The only criteria in selecting a text are that the copy be readily scorable and have a syllabic intensity of about 1.35 (i.e., approximately the difficulty of the copy used for testing). If another typing text is used for the forced phase of the training, the Skill Building Booklet will have to be modified to reflect differences in page numbering.

EVALUATION OF TRAINING

The present system of early and frequent evaluation of student progress in order to facilitate reassignment to Group III should be continued. These progress tests should be started as soon as the student completes the six audio tapes, six video tapes, or four key exercises. These progress tests should be administered daily, preferably at a time when the student is alert, should consist of three 5-minute trials, each on different copy, and should be preceded by about 15 minutes of typing practice. The copy should have a syllabic intensity of about 1.35, similar to that used for practice and on the entry tests. The student's score should be the average of his scores on the three trials. Again, there seems to be no reason to change the standard of 11 NWPM for reassignment to Group III.

Consideration should be given to using easier copy on the End of Course typing tests. At present, two alternative versions of this test have syllabic intensities of 1.63 and 1.82, far more difficult than the copy used during practice (average syllabic intensity of 1.31). We estimate that having students practice on copy with an SI of 1.31 and testing them on copy with an SI of 1.82 reduces their test score 3 GWPM (Table 8). If at all possible, test copy should be no more difficult than practice copy.

Table 8

Relation Between Syllabic Intensity of Material and Speed and Accuracy Scores[a]

Copy Difficulty	Syllabic Intensity	N	GWPM	Errors Per Five Minutes
Classes 41 and 43				
Fairly Easy to Normal[b]	1.32[c]	51	19.3	6.6
Fairly Hard to Hard[b]	1.51[d]	51	17.8	6.8
Difference			1.5	.2
Classes 42 and 44				
Fairly Easy to Normal	1.32	46	18.2	3.8
Fairly Hard to Hard	1.51	46	16.6	4.4
Difference			1.6	.6

[a]Typed at +40 (after 32 hours of practice) in the Free-Pace, Forced-Pace typing program.
[b]As defined on the basis of syllabic intensity in 9.
[c]Copy from 6.
[d]Copy prepared by Golden Gate Publishing Company, Incorporated.

EVALUATION OF MATERIAL AND TECHNIQUES

COPY FOR TESTS

The control and experimental training programs were evaluated on copy prepared by the Golden Gate Publishing Co. For purposes of comparison, it would be desirable to use this same copy in the operational setting, but this is not essential. This extra cost can be eliminated by selecting copy from typing texts currently available in the training centers. The only criterion in selecting the copy should be that it have a syllabic intensity of about 1.35, that is, equal in difficulty to the copy used during practice.

MASSED VERSUS DISTRIBUTED PRACTICE

Research on the acquisition of motor skills generally indicates that distributed practice is more effective than massed practice.[3] The only direct evidence the TYPE-TRAIN staff has on this issue is the comparison of the Audio 16 training program using massed practice, at Fort Knox, and the Audio 16 phase of the Audio 16, Free-Pace program using distributed practice, at Fort Ord. There is little difference between the two learning curves.

Indirect evidence of the superiority of distributed over massed practice is found in the fact that all the recommended training programs used distributed practice. On the basis of research on the acquisition of other motor skills and our own indirect evidence on the acquisition of typing skill, the staff feels that distributed practice is the preferred procedure. (See Appendix I for suggested training schedule.)

[3]For a detailed summary of past research on the effect of massed versus distributed practice, see 9, *The Psychology of Learning*, pp. 363-377.

INCENTIVE SYSTEM

It requires practice to develop proficiency in any motor skill. This is particularly applicable for typing, because the highly confining and repetitive nature of the task tends to lower the student's motivation to persist. The forced-pace phase of the recommended programs tend to provide a certain amount of incentive in that the student is continually challenged to reach a word or word-and-error goal and he has immediate knowledge of results. Nevertheless, even with these built-in incentives, student interest lags.

Consideration should be given to instituting an incentive system during the forced-pace phase of the training. The data from this study provide information about the average rate of progress to be expected of students with different entry level speeds.[4] For example, in order to provide incentive, the students could be informed of this average rate and told that those who exceed the rate will be excused from some typing classes, while the students who fail to meet the rate will be required to attend some extra typing classes in the evening.

PRODUCTION-COPY TYPING

The bulk of the research effort conducted in Work Unit TYPETRAIN was directed toward improving acquisition of straight-copy typing skill. On the job, however, the beginning typist will do very little straight-copy typing; the major portion of his time probably will be spent on production copy. Our limited effort to study production-copy typing suggests that production-copy typing skill is more a function of *experience* with production copy than skill in straight-copy typing.

We recommend that some production-copy typing be given to Group IV students as soon as they have been exposed to all of the keys on the keyboard. One alternative is to spend about one hour per day typing military letters. Following the procedure described earlier, the student could be given a typed or printed model and required to reproduce it in typed form. His typescript should then be critiqued with emphasis on correct format rather than correct key strokes.

[4] If an incentive system is introduced using these data on rate of progress as a bench mark for excusing men from training or requiring extra training, the tests used to measure progress must be similar in difficulty to those used in this study.

LITERATURE CITED
AND
APPENDICES

LITERATURE CITED

1. *MOS Technical Training of Clerk MOS70A10*, Army Subject Schedule, 12-70A10 (PI 12-24), 9 April 1970.

2. Mind Inc. *Power Typing*, Stamford, Connecticut.

3. Patten, Alfreda N. *Skill Typewriting*, Sir Isaac Pitman & Sons, London, 1967.

4. West, Leonard. *The Acquisition of Typewriting Skills*, Pitman, New York, 1967.

5. Grubbs, Robert L., and White, James L. *Sustained Timed Writing*, (2d ed.), Gregg Division, McGraw-Hill, New York, 1968.

6. Thorndike, Edward I., and Lorge, Irving. *The Teacher's Word Book of 30,000 Words*, Bureau of Publications, Teacher's College, Columbia University, New York, 1944.

7. Flanagan, John C. *Manual for the Tapping Test*, Psychometric Techniques Associates, Pittsburgh, 1963.

8. Rowe, John L., Lloyd, Allan C., and Winger, Fred E. *Gregg, General Typing I*, Gregg Division, McGraw-Hill, New York, 1963.

9. Hall, John F. *The Psychology of Learning*, J.B. Lippincott, Philadelphia, 1966.

Appendix A

MEANS, STANDARD DEVIATIONS, AND Ns OF GROSS WORDS PER MINUTE AND ERRORS PER FIVE MINUTES FOR CONTROL AND EXPERIMENTAL TRAINING PROGRAMS AT VARIOUS TIME INTERVALS, BY GROSS WORDS PER MINUTE TYPED AT ENTRY

Table A-1

Fort Ord Audio 16, Free-Pace Typing Program

Time Interval	Gross Words per Minute Typed at Entry														
	1.0 to 5.0					5.1 to 10.0					10.1 to 15.0				
	Words		Errors		N	Words		Errors		N	Words		Errors		N
	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Entry	4.0	.7	6	5	4	7.8	1.3	4	3.3	99	12.1	1.3	4	3.5	63
+5	5.6	.8	6	1.7	4	9.0	2.0	5	4.6	85	14.1	3.1	6	5.2	61
+10	5.2	1.5	4	1.5	3	9.1	2.5	7	4.4	83	13.6	4.0	9	8.5	55
+15	6.9	.5	3	1.2	4	9.9	2.5	4	3.6	82	14.6	3.9	5	5.1	55
+20	7.0	1.6	4	.6	3	10.4	2.5	3	2.8	77	14.5	4.6	5	5.3	48
+25	9.4	1.2	6	2.9	4	13.1	4.1	4	4.9	72	16.0	5.4	5	5.5	40
+30	10.2	2.1	3	0.0	4	13.4	3.6	4	4.6	59	17.6	4.1	6	5.7	29
+35	7.5	0.0	5	0.0	1	15.0	4.6	5	5.8	19	17.0	5.5	6	4.6	15

Table A-2

Fort Knox Audio 16 Typing Program

Time Interval	Gross Words per Minute Typed at Entry														
	1.0 to 5.0[a]					5.1 to 10.0					10.1 to 15.0				
	Words		Errors		N	Words		Errors		N	Words		Errors		N
	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Entry						7.6	1.4	5	1.9	44	12.4	1.3	5	2.3	12
+5						8.4	2.0	5	2.7	44	13.0	2.3	5	3.2	12
+10						9.3	2.2	6	3.1	44	14.1	2.6	7	4.3	12
+15						10.0	2.2	5	3.3	44	15.0	3.1	7	5.2	12
+20						10.3	2.2	4	2.6	44	15.4	2.9	5	3.1	12
+25															
+30															
+35															
+40															

[a]There are no data because there were no slow typists at Fort Knox.

Table A-3

Mind: Audio Typing Program

Time Interval	Gross Words per Minute Typed at Entry														
	1.0 to 5.0					5.1 to 10.0					10.1 to 15.0				
	Words		Errors		N	Words		Errors		N	Words		Errors		N
	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Entry	3.7	1.0	6	4.7	21	7.3	1.3	8	5.2	22	12.4	1.9	7	2.3	6
+5	5.4	1.7	6	2.3	21	7.6	1.9	10	7.7	21	8.8	3.3	10	2.6	6
+10	7.0	2.9	7	3.1	20	9.1	2.2	9	6.4	21	9.8	3.1	10	6.2	5
+15	8.4	3.3	5	3.9	20	11.0	2.6	6	4.2	19	12.6	3.7	9	9.2	6
+20	9.9	3.3	5	5.1	18	11.6	2.6	6	3.9	19	15.2	5.1	6	2.5	6
+25	10.3	4.1	5	5.4	19	14.0	3.1	4	3.3	17	15.2	4.9	5	3.4	6
+30	11.6	3.2	4	2.7	19	15.6	3.6	6	3.2	18	15.1	4.8	5	3.4	5
+35	12.5	3.7	4	2.5	18	16.1	3.4	6	4.8	17	16.2	4.5	11	7.7	6
+40	12.2	3.7	4	3.7	20	16.7	4.0	7	4.4	16	18.9	5.0	6	5.4	6

Table A-4

Kee: Model 1025-Visual-Cue, Free-Pace Typing Program

Time Interval	Gross Words per Minute Typed at Entry														
	1.0 to 5.0					5.1 to 10.0					10.1 to 15.0				
	Words		Errors		N	Words		Errors		N	Words		Errors		N
	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Entry	3.7	.7	7	3.7	9	7.0	1.2	5	3.8	14	12.2	1.5	8	3.4	8
+5	5.5	1.1	6	3.9	9	8.4	2.1	7	5.8	13	11.2	3.6	9	5.0	7
+10	7.7	.9	6	4.3	8	9.6	2.5	6	3.1	12	12.9	2.7	11	7.6	8
+15	9.8	2.3	7	4.4	9	11.4	2.7	6	5.8	14	14.6	2.1	4	2.5	8
+20	10.6	2.1	5	2.9	8	11.9	3.5	4	2.6	9	13.9	0.0	1	0.0	1
+25	11.5	2.5	4	3.3	9	12.7	3.2	4	1.3	8	16.2	3.3	8	1.2	3
+30	12.2	2.3	6	5.5	9	14.1	3.9	3	1.8	9	15.8	4.6	6	2.7	3
+35	14.2	2.7	5	3.8	8	15.9	2.3	2	2.3	8	13.5	2.2	3	2.9	3
+40	13.3	2.7	5	6.0	9	14.3	4.2	4	2.4	9					

Table A-5

Kee: Model 44-Visual-Cue, Free-Pace Typing Program

Time Interval	Gross Words per Minute Typed at Entry													
	1.0 to 5.0					5.1 to 10.0					10.1 to 15.0[a]				
	Words		Errors		N	Words		Errors		N	Words		Errors		N
	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Entry	2.8	0	3	0	1	6.9	.3	5	0.0	2					
+5	3.7	0	2	0	1	9.4	2.5	4	.7	2					
+10	7.4	0	2	0	1	11.4	4.7	7	2.8	2					
+15	8.3	0	2	0	1	13.0	5.3	2	.7	2					
+20	8.8	0	2	0	1	12.9	7.1	7	1.4	2					
+25	9.3	0	1	0	1	15 8	4.8	5	0.0	2					
+30	8.5	0	4	0	1	16.9	5	1	1.4	2					
+35	10.8	0	3	0	1	17.7	3.3	1	0.0	2					
+40	10.4	0	1	0	1	15 4	8.3	4	2.1	2					

[a]No students qualified at this level.

Table A-6

West: Audio 6, Forced-Pace Typing Program

Time Interval	Gross Words per Minute Typed at Entry														
	1.0 to 5.0					5.1 to 10.0					10.1 to 15.0				
	Words		Errors		N	Words		Errors		N	Words		Errors		N
	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Entry	4.2	.6	6	2.4	11	7.4	1.3	5	2.7	104	11.8	1.4	4	2.2	41
+5	5.4	.9	4	3.2	11	9.2	2.0	5	2.8	104	14.2	2.9	4	3.4	41
+10	7.0	1.5	6	3.0	11	11.6	2.7	6	3.7	104	16.5	3.3	7	4.1	41
+15	9.0	2.7	5	2.6	11	13.2	2.9	7	4.1	104	18.6	3.8	7	4.5	41
+20	9.9	2.7	4	3.4	11	14.4	3.3	7	4.3	104	19.8	4.0	7	5.0	41
+25	10.2	2.2	6	3.3	11	15.0	3.3	6	3.8	104	20.6	4.2	8	6.3	41
+30	11.2	3.4	7	4.2	11	15.4	3.2	6	4.4	104	21.0	4.1	8	4.9	41
+35	11.1	3.2	6	4.3	11	16.1	3.1	6	3.8	104	22.2	5.1	8	6.5	41
+40	11.1	2.6	4	3.1	11	16.0	3.5	5	4.0	104	21.6	3.8	6	4.2	41

Table A-7

Free-Pace, Forced-Pace Typing Program

Time Interval	Gross Words per Minute Typed at Entry														
	1.0 to 5.0					5.1 to 10.0					10.1 to 15.0				
	Words		Errors		N	Words		Errors		N	Words		Errors		N
	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Entry	4.6	.5	4	2.2	8	7.5	1.3	5	3.2	73	11.7	1.5	7	4.0	24
+5	6.9	1.0	3	1.8	8	9.4	2.1	5	3.1	73	14.9	2.8	5	4.1	24
+10	9.8	1.9	4	1.7	8	12.5	2.3	6	3.7	73	17.9	2.7	7	3.6	24
+15	10.3	1.8	5	3.2	8	13.3	2.5	6	3.9	73	19.0	3.5	7	3.2	24
+20	12.7	1.8	5	3.4	8	15.3	2.5	6	4.7	73	21.2	4.0	8	5.4	24
+25	13.2	2.0	5	3.5	8	15.6	2.3	5	4.4	73	21.0	4.1	6	3.2	24
+30	13.0	1.7	5	2.4	8	15.6	2.7	6	4.3	73	21.3	3.8	8	4.5	24
+35	14.5	2.6	4	2.5	8	16.3	2.3	5	3.7	73	22.2	3.7	7	4.8	24
+40	15.5	1.8	4	4.8	8	16.4	2.5	5	4.5	73	22.4	4.4	6	4.8	24

Table A-8

Video 12, Free-Pace Typing Program

Time Interval	Gross Words per Minute Typed at Entry														
	1.0 to 5.0					5.1 to 10.0					10.1 to 15.0				
	Words		Errors		N	Words		Errors		N	Words		Errors		N
	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Entry	4.5	.6	8	1.7	3	7.7	1.2	8	3.7	40	12.6	2.4	7	4.1	8
+5	5.3	1.6	5	1.2	3	9.1	1.6	7	4.3	40	13.8	1.9	6	3.2	8
+10	7.2	.9	4	3.1	3	10.8	2.1	8	4.5	40	15.0	3.7	7	4.8	7
+15	8.3	.8	4	1.0	3	11.0	2.3	6	3.8	40	15.4	4.7	5	3.1	7
+20	10.1	1.8	2	.6	3	12.4	2.4	5	3.6	39	16.8	4.5	8	4.3	7
+25	10.8	3.0	4	2.0	3	13.7	2.2	4	3.2	34	16.9	5.2	5	3.7	7
+30	10.3	2.7	4	0.0	2	14.2	2.6	4	3.6	31	17.2	3.8	7	4.6	6
+35	11.0	3.1	2	0.0	2	14.6	2.3	5	3.3	31	16.1	3.4	4	2.3	5
+40	10.8	4.8	2	0.0	2	14.8	2.5	4	2.8	28	17.2	0.0	4	0.0	1

Table A-9

Video 12, Forced-Pace Typing Program

Time Interval	Gross Words per Minute Typed at Entry														
	1.0 to 5.0					5.1 to 10.0					10.1 to 15.0				
	Words		Errors		N	Words		Errors		N	Words		Errors		N
	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Entry	4.3	.6	8	1.9	6	7.4	1.3	7	2.5	37	12.1	1.9	8	3.8	14
+5	5.7	.7	5	3.0	6	8.9	1.7	6	3.0	37	13.7	2.5	8	5.5	14
+10	6.9	1.3	6	2.5	6	10.3	1.9	7	3.8	33	14.8	2.7	8	5.9	14
+15	7.6	1.2	5	2.8	6	11.4	2.2	7	3.1	33	15.7	3.5	7	5.0	14
+20	9.5	1.9	5	2.3	6	13.4	2.0	4	3.7	33	17.0	4.1	4	3.7	14
+25	10.1	1.1	4	2.0	6	14.5	2.3	6	3.9	32	18.2	4.1	6	4.0	14
+30	10.2	1.1	6	3.7	6	14.6	2.2	6	3.4	32	17.8	4.3	7	4.5	14
+35	9.6	1.4	5	1.1	5	15.6	2.2	6	4.6	31	18.7	4.0	4	4.8	14
+40	9.3	1.3	4	0.0	2	15.2	2.8	5	3.5	17	20.1	5.9	4	2.5	7

Table A-10

Video 6, Forced-Pace Typing Program

Time Interval	Gross Words per Minute Typed at Entry														
	1.0 to 5.0					5.1 to 10.0					10.1 to 15.0				
	Words		Errors		N	Words		Errors		N	Words		Errors		N
	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Entry	4.3	1.3	8	3.4	4	7.3	1.3	6	2.9	31	12.0	1.7	6	2.1	14
+5	5.4	1.3	4	2.1	4	8.9	1.5	5	2.9	31	12.6	3.5	7	4.6	14
+10	7.2	2.0	8	2.5	4	11.6	2.3	6	3.2	31	15.3	4.1	6	4.5	14
+15	8.6	2.0	4	1.4	4	12.3	2.5	6	4.3	31	16.3	4.2	6	2.8	14
+20	9.1	3.0	6	3.7	4	14.0	2.4	5	3.5	31	18.5	4.7	4	3.2	14
+25	9.0	2.7	7	5.7	4	14.2	2.7	5	4.4	30	19.0	4.5	7	5.0	14
+30	9.0	1.9	5	2.7	4	14.6	3.3	5	3.0	25	18.1	5.2	5	4.8	14
+35	10.4	3.3	4	4.0	3	15.4	2.3	4	3.0	17	19.8	4.7	5	4.2	12
+40	13.6	0.0	4	0.0	1	14.2	1.8	4	2.1	9	21.9	3.4	4	1.6	6

Appendix B

SLOPES OF REGRESSION LINES FOR FORT ORD AND FORT KNOX TRAINING PROGRAMS

Table B-1

Slopes of Regression Lines on Hours of Training (0-20) for Fort Ord and Fort Knox Training Programs With Students at Two Different Levels of Skill[a]

Training Program	GWPM Typed at Entry			
	5.1 to 10.0	p[b]	10.1 to 15.0	p
Slopes of regression of GWPM				
Audio 16, Free Pace (Fort Ord)	.124	<.05	.110	<.05
Audio 16 (Fort Knox)	.140		.160	
Slopes of regression of errors per five minutes				
Audio 16, Free Pace (Fort Ord)	−.036	NS[c]	−.013	NS[c]
Audio 16 (Fort Knox)	−.040		.040	

[a]Test of equality of slopes of regression taken from Bernard Ostle, *Statistics in Research*, Iowa State University Press, Ames, Iowa, 1963.

[b]Difference between slopes is statistically significant.

[c]NS, not significant.

Appendix C

SLOPES OF REGRESSION LINES FOR BASELINE AND EXPERIMENTAL TRAINING PROGRAMS

Table C-1

Slopes of Regression Lines on Hours of Training (0-40) for Nine Training Programs and Students With Three Different Initial Levels of Skill[a]

Training Program	GWPM Typed at Entry					
	1.0 to 5.0	p[b]	5.1 to 10.0	p[b]	10.1 to 15.0	p[b]
Slopes of regression of GWPM						
Audio 16, Free Pace[c]	.179		.190		.143	
Mind: Audio	.222		.264		.165	
Kee: M1025-Visual Cue, Free Pace	.250		.209		.109	
Kee: M44-Visual Cue, Free Pace	.183	<.05	.242	<.05		<.05
West: Audio 6, Forced Pace	.181		.215		.247	
Free Pace, Forced Pace	.252		.216		.245	
Video 12, Free Pace	.179		.183		.122	
Video 12, Forced Pace	.157		.222		.185	
Video 6, Forced Pace	.171		.213		.231	
Slopes of regression of errors per five minutes						
Audio 16, Free Pace[c]	−.055		−.031		−.008	
Mind: Audio	−.066		−.085		.005	
Kee: M1025-Visual Cue, Free Pace	−.047		−.086		−.144	
Kee: M44-Visual Cue, Free Pace	−.007	<.05	−.073	<.05	–	<.05
West: Audio 6, Forced Pace	.003		.007		.077	
Free Pace, Forced Pace	−.017		−.003		.010	
Video 12, Free Pace	−.115		−.110		−.044	
Video 12, Forced Pace	−.055		−.035		−.102	
Video 6, Forced Pace	−.057		−.041		−.045	

[a]Test of equality of slopes of regression taken from Bernard Ostle, *Statistics in Research*, Iowa State University Press, Ames, Iowa, 1963.

[b]Difference between slopes is statistically significant.

[c]Program ends at +35.

Appendix D

RANKING AND CLUSTERING OF TRAINING PROGRAMS IN TERMS OF SPEED AND ACCURACY

Table D-1

Training Programs Ranked by Slope of Gross Words per Minute on Time Regression Line and Clustered by Significance Level, by GWPM Typed at Entry

Ranking
1.0 to 5.0 GWPM at Entry
Free Pace, Forced Pace
Kee: Model 1025-Visual Cue, Free Pace
Mind: Audio
Kee: Model 44-Visual Cue, Free Pace
Kee: Model 44-Visual Cue, Free Pace
West: Audio 6, Forced Pace
Video 12, Free Pace
Audio 16, Free Pace (baseline)
Video 6, Forced Pace
Video 12, Forced Pace
5.1 to 10.0 GWPM at Entry
Mind: Audio
Kee: Model 44-Visual Cue, Free Pace
Kee: Model 44-Visual Cue, Free Pace
Video 12, Forced Pace
Free Pace, Forced Pace
West: Audio 6, Forced Pace
Video 6, Forced Pace
Kee: Model 1025-Visual Cue, Free Pace
Kee: Model 1025-Visual Cue, Free Pace
Audio 16, Free Pace (baseline)
Audio 16, Free Pace (baseline)
Video 12, Free Pace
10.1 to 15.0 GWPM at Entry
West: Audio 6, Forced Pace
Free Pace, Forced Pace
Video 6, Forced Pace
Video 12, Forced Pace
Mind: Audio
Mind: Audio
Audio 16, Free Pace (baseline)
Audio 16, Free Pace (baseline)
Video 12, Free Pace
Video 12, Free Pace
Kee: Model 1025-Visual Cue, Free Pace

Table D-2

Training Programs From Least to Most Errors Ranked by Slope of Errors per Five Minutes on Time Regression Line and Clustered by Significance Level, by GWPM Typed at Entry

Ranking
1.0 to 5.0 GWPM at Entry
Video 12, Free Pace
Mind: Audio
Mind: Audio Video 6, Forced Pace Video 12, Forced Pace Audio 16, Free Pace (baseline)
Video 6, Forced Pace Video 12, Forced Pace Audio 16, Free Pace (baseline) Kee: Model 1025-Visual Cue, Free Pace Kee: Model 44-Visual Cue, Free Pace
Kee: Model 44-Visual Cue, Free Pace West: Audio 6, Forced Pace Free Pace, Forced Pace
5.1 to 10.0 GWPM at Entry
Video 12, Free Pace
Kee: Model 1025-Visual Cue, Free Pace Mind: Audio Kee: Model 44-Visual Cue, Free Pace
Kee: Model 55-Visual Cue, Free Pace Video 6, Forced Pace
Video 6, Forced Pace Video 12, Forced Pace Audio 16, Free Pace (baseline)
Free Pace, Forced Pace
West: Audio 6, Forced Pace
10.1 to 15.0 GWPM at Entry
Kee: Model 1025-Visual Cue, Free Pace Video 12, Forced Pace
Video 6, Forced Pace Video 12, Free Pace
Mind: Audio Audio 16, Free Pace (baseline) Free Pace, Forced Pace
West: Audio 6, Forced Pace

Appendix E

SKILL BUILDING PROGRESS BOOKLET: USED IN WEST TRAINING PROGRAM (Pages 1, 2)

Name_____ Date_____ Class #_____
Last First

1. For your remaining time as a Group IV typist, you will do all of your typing from copy in *Sustained Timed Writing* by Grubb and White. Each page in this book is a separate typing exercise.
2. All of your practice typing will be done in 5 minute blocks, called trials.
3. Begin each trial at the top of the specified page in *Sustained Timed Writing*. Do not type the title of the exercise. Type the copy exactly as it appears on the page.
4. When you type for speed, ignore errors completely. If you do not make many errors on a speed trial, you are not typing fast enough.
5. When you type for accuracy, slow down a bit, and try to avoid making errors. If you make more than 10 errors, slow down a bit more on the next accuracy trial.
6. Record your scores (words or errors) after every trial in the appropriate Speed Trial Box or Accuracy Trial Box.
7. Repeat each exercise starting each time at the top of the page, until you meet or exceed the indicated speed or accuracy goal. Make sure that you meet or exceed each indicated goal before you move on to the next step.
8. When you reach your goal (type more words or make fewer errors than are required), you may go on to the next step.
9. Type three or four exercises on the same sheet of paper.
10. Do not lose this booklet. Keep it with you for your entire two weeks in this typing program. It is a record of your progress.
11. Read all instructions on the following pages before you start to type. If you have any questions, raise your hand and an instructor will help you.
12. From now on, you will be trying to build-up your typing skill. The Skill Building Exercises that follow are designed to build-up your skill.
13. For all Skill Building Exercises, set your typewriter as follows:
    a. Left margin stop at 13.
    b. Right margin stop at 88.
    c. Line space lever for single space.
    d. Paper guide at 0.

Step 1 FOR STUDENTS WHO TYPE 0 to 9 WORDS IN 5 MINUTES: INCREASE SPEED
Turn to page 3. Your goal is to type 10 words in 5 minutes. Keep repeating the 5 minute exercise on page 3 until you reach your goal. Record your word count for each speed trial in the Speed Trial Boxes below. When you reach your goal, move on to step 2.

Word Count on Speed Trials Page 3

WC													
WC													

Step 2 FOR STUDENTS WHO TYPE 10 to 19 WORDS IN 5 MINUTES: INCREASE SPEED
Turn to page 4. Your goal is to type 20 words in 5 minutes. Keep repeating the 5 minute exercise on page 4 until you reach your goal. Record your word count for each speed trial in the Speed Trial Boxes below. When you reach your goal, move on to step 3.

Word Count on Speed Trials Page 4

WC													
WC													

Step 3 FOR STUDENTS WHO TYPE 20 to 29 WORDS IN 5 MINUTES: INCREASE SPEED
Turn to page 5. Your goal is to type 30 words in 5 minutes. Keep repeating the 5 minute exercise on page 5 until you reach your goal. Record your word count for each speed trial in the Speed Trial. Boxes below. When you reach your goal, move on to step 4.

Word Count on Speed Trials Page 5

WC													
WC													

Step 4 FOR STUDENTS WHO TYPE 30 to 39 WORDS IN 5 MINUTES: REDUCE SPEED
Turn back to page 4. Your goal is to type no less than 20 words while making no more than 10 errors. To do this, type a little slower than you did in Step 3. If you make 11 or more errors, reduce your speed a little more. Keep repeating the 5 minute exercise on page 4 until you reach your goal. Record your word count and your error count for each trial in the Accuracy Trial Exam below. When you reach your goal, move on to step 5.

Word and Error Count on Accuracy Trials Page 4

WC													
EC													

Appendix F

RULES FOR COUNTING WORDS

Whole Line Scale
Words

Many people think that all the machines we see in offices all over the world were invented in America. That is not the case, for more than three hundred years ago, a Frenchman by the name of Pascal first invented the calculating machine, and many others, too.

13
25
38
51
52

> IF YOU FINISH TYPING AT THE END OF A LINE, use the Whole Line Scale to find how many words you typed.
>
> Example: If the last word you typed was name, you typed 38 words.
>
> Example: If the last word you typed was too, you typed 52 words.

64
77
89
101
114
126

wealthy and eminent. Father and son had much in common, and Pascal's dad taught him several languages and philosophy.

138
150

> IF YOU FINISHED TYPING IN THE MIDDLE OF A LINE, use both the Whole Line Scale and the Part Line Scale to find how many words you typed.
>
> First, use the Whole Line Scale to find how many words you typed in whole lines.
>
> Second, use the Part Line Scale to find how many words you typed in part of a line. You have to estimate this. It will not be exact.
>
> Third, add the Whole Line Scale number to the Part Line Scale number.
>
> Example: If the last word you typed was discoveries, you typed about 319 words. (314 + 5)
>
> Example: If the last word you typed was practical, you typed about 340 words. (327 + 13)

164
176
190
203
216
228
234
247
260
274
287
301
314 +
327 +

he applied his discoveries to practical ends. His study of fluids and of the various aspects of air pressure brought about practical uses for this basic knowledge. He designed the hydraulic press and invented the wheelbarrow in its present form.

341
354
362

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14

Part Line Scale

WORD COUNTING EXERCISE

Name _____ Date _____ Class # _____
Last First

	Words
When I was very young, I had the good fortune to attend a	12
school of the old type. We had a class in politeness, and I can	25
remember many of the things we were taught there. The rules [were]	38
simple. Because of that they were impressive, and we were all	50
able to [remember] them and apply them in our daily lives. We	63
learned from the wise teacher that composure is a jewel of untold	76
worth, that good manners help smooth an otherwise rough path.	88
Like it or not, this world must be used by a great many people.	101
That being the case, there must be good manners or there will	114
be fights. There will be trouble in the home and in the community	127
and ultimately this [bickering] will lead us to more serious difficulties.	142
It is the part of good manners to create and maintain a serene life.	156
This does not mean that we must sit down and sedately stay seated	169
with an everlasting grin. A serene life is much deeper than that—	183
it is essential to peace and [order.]	190
One reason why manners are so important is the fact that they	202
are the measure of an individual's sympathy and imagination. You	216
will find that they exist in the ratio in which one is capable of	229

HOW MANY WORDS DID YOU TYPE--

1. If the last word you typed was <u>were</u>? _____words
2. If the last word you typed was <u>remember</u>? _____words
3. If the last word you typed was <u>bicker</u>? _____words
4. If the last word you typed was <u>order</u>. _____words

tions constantly. He had been encouraged to exhibit his ego; and	242
in doing so, he was just making a nuisance of himself. No doubt	253
he will go through life in the same rude way because his mother	265
believed that any training in manners would make him unnatural.	277

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14

Appendix G

RULES FOR FINDING AND COUNTING ERRORS

1. This page is designed to teach you how to score a typewritten page for errors. Read it carefully, and when you are finished, you will be an expert on finding and counting errors in a typewritten page.

2. The reverse side of this page describes the rules for finding and counting typing errors.

3. After you have finished studying the rules, do the Error Scoring Exercise which you have been given.

   a. Circle each error that you find.

   b. Count the total number of errors that you find, following the rules for counting errors.

   c. Write the total number of errors you found in the space provided at the bottom of the Error Scoring Exercise.

4. The errors have been circled and counted on the reverse side of the Error Scoring Exercise. Do not look at that side of the page until you have completed the Error Scoring Exercise.

KINDS OF ERRORS

Capitals	Capitals that are above or below the regular line of type	Should type: Type appears	M J U I M J i
Spelling	Includes regular misspellings, transposition, improper punctuation and omitted letters	Should type: Type appears	bug James bite dub james biet
Spacing	One space: Between words, after commas and semicolons	Should type: Type appears	mat, key; knob mat, key; knob
	Two spaces: after periods, colons and question marks	Should type: Type appears	end. boy: who? do end. boy: who? do
	Five spaces: for paragraph indentation		
Omission	Omission of a word or words. Each word omitted = 1 error	Should type: Type appears	red dog ran fast red fast
Addition	Insertion of an extra word or words. Each word added = 1 error	Should type: Type appears	long rug long blue rug
Substitution	Substitution of a similar word. Each word substituted = 1 error	Should type: Type appears	the happy boy the sad boy
Margins	Uneven left margin due to the improper use of the typewriter rather than to a faulty typewriter		

RULES FOR COUNTING ERRORS

RULE 1. The punctuation following a word is considered as a part of that word.

RULE 2. The spacing following a word is considered as a part of that word.

RULE 3. If there are several errors within a word including the spacing or punctuation after it) there is, nevertheless, only one error counted for the entire word.

RULE 4. Circle all words which contain the above errors.

EXCEPTIONS: Do not count the following as errors.

1. Light copy which may be due to a worn ribbon
2. Uneven left margin which may be due to a defective typewriter
3. Uneven lines
4. Hyphenation
5. Right margin irregularities

ERROR SCORING EXERCISE

Name_____ Date_____ Class #_____
Last First

COPY WITHOUT ERRORS

If you have decided that you want to leave the shores of this country for a vacation, you will have to apply to the State Department for a passport. A branch of the Department, known as the Passport Office, has the authority to issue passports to citizens of the United States. It has offices in many of our larger cities.

The first thing to do is to write to the State Department or call at one of the local offices and tell the clerk that you want a passport. You will receive an application form that you will have to fill out. When you have completed the application form, you mail it and two pictures of yourself to the Department of State. One of the photos will be clipped to the

COPY WITH ERRORS

Read the copy below and compare it with the copy above. Circle each error that you find. Then count the errors.

If you have desided that you want to leave the shores of this country for a vacatıon, you will have to applyto the State Department for a passport. A branch of the department, known as the Passport Office, has the authority to issue passports to all citizens of the United States. It has offices in many larger cities.

The first thing to do is to right to the State Department or call at one of the local offices and tell the cl rk that you want a passport. You will receive an application form that you you will have to fill out. When you have completed the application form; you mail it and two pictures of yourself to the Deparmeny of State. One of The photos will be cliped to the

How many errors did you find? _____errors

COPY WITH ERRORS CIRCLED AND COUNTED

If you have desided that you want to leave the shores of this country for a vacatoon, you will have to apply to the State Department for a passport. A branch of the department, known as the Passport Office, has the authority to issue passports to all citizens of the United States. It has offices in many larger cities.

The first thing to do is to right to the State Department or call at one of the local offices and tell the cl rk that you want a passport. You will receive an application form that you you will have to fill out. When you have completed the application form; you mail it and two pictures of yourself to the Deparmeny of State. One of The photos will be cliped to the

1. spelling error
2. strike-over
3. spacing error
4. flying capital
5. failure to capitalize
6. spacing error
7. word added
8. word omitted
9. word omitted
10. indentation error
11. incorrect wo' !
12. extra space
13. spacing error
14. word repeated
15. indentation error
16. punctuation error
17. spelling error
18. capitalization error
19. spelling error

Appendix H

ENTERING FIRST WORD COUNT FOR SKILL BUILDING

Recording the First Skill Building Score
(Used in the West Audio 6, Forced-Pace program)

1. Have students type page 39 in *Sustained Timed Writing* for SPEED. (5 minute trial)

2. Have students count the number of words that they typed, using the two scales on page 39.

3. Have students record their word count as follows:

If they typed between	They should record their score in
0 and 9 words	Step 1
10 and 19 words	Step 2
20 and 29 words	Step 5
30 and 39 words	Step 6
40 and 49 words	Step 9
50 and 59 words	Step 10
60 and 69 words	Step 13
70 and 79 words	Step 14
80 and 89 words	Step 17
90 and 99 words	Step 18

Recording the First Skill Building Score
(Used in the Free-Pace, Forced-Pace; Video 12, Forced-Pace: and Video 6, Forced-Pace programs)

1. Have students type page 39 in *Sustained Timed Writing* for SPEED. (5 minute trial)

2. Have students count the number of words that they typed, using the two scales on page 39.

3. Have students record their word count as follows:

If they typed between	They should record their score in
Under 24 words	Step 1
25 to 29 words	2
30 to 34 words	5
35 to 39 words	6
40 to 44 words	9
45 to 49 words	10
50 to 54 words	13
55 to 59 words	14
60 to 64 words	17
65 to 69 words	18
70 to 74 words	21
75 to 79 words	22
80 to 84 words	25
85 to 89 words	26
90 to 94 words	29
95 to 99 words	30

Appendix I

TRAINING SCHEDULE USED FOR WEST: AUDIO 6, FORCED-PACE PROGRAM AND VIDEO 6, FORCED-PACE PROGRAM

Ten-Day Typing Schedule for Group IV: West, Audio 6, Forced Pace

	Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday	Wednesday	Thursday	Friday	Monday
0800	Orientation	KD-3	KD-6	SB	SB +15 Test	SB +20 Test	SB +2E Test	SB +30 Test	SB +35 Test	SB +40 Test
0900	Organize Class	KD-4	Company Time	SB	SB	SB	SB	SB	SB	Typing Make-up
1000	Basic Operations	PI	Introd. to SB	PI	PI	PI	PI	PI	PI	PI
1100	Entry Test	PI	Introd. to SB	SB	SB	SB	SB	SB	SB	Typing Make-up
1300	KD-1	+5 Test PI	SB	SB	SB	SB	SB	SB	SB	
1400	KD-2	PI	PI	Company Time	SB	SB	PI	PI	PI	
1500	Company Time	KD-5	SB +10 Test	Company Time	Company Time	Company Time	SB	SB	SB	
1600										

KD = Key Drill; SB = Skill Building; PI = Programmed Instruction.

Ten-Day Typing Schedule for Group IV: Free Pace, Forced Pace

	Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday	Wednesday	Thursday	Friday	Monday
0800	Orientation	Two Syllable Words	SB	SB	SB +15 Test	SB +20 Test	SB +25 Test	SB +30 Test	SB +35 Test	SB +40 Test
0900	Organize Class	Three-Four Syllable Words	Company Time	SB	SB	SB	SB	SB	SB	Typing Make-up
1000	Basic Operations	PI	SB	PI	PI	PI	PI	PI	PI	PI
1100	Entry Test	PI	SB	SB	SB	SB	SB	SB	SB	Typing Make-up
1300	Patterned Keys	+5 Test Introd. to Skill Build.	SB +10 Test	SB	SB	SB	SB	SB	SB	
1400	One Syllable Words	Introd. to Skill Build.	PI	Company Time	SB	SB	PI	PI	PI	
1500	Company Time	SB	PI	Company Time	Company Time	Company Time	SB	SB	SB	
1600										

SB = Skill Building; PI = Programmed Instruction.

Ten-Day Typing Schedule for Group IV: Video 6, Followed by Force Typing

	Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday	Wednesday	Thursday	Friday	Monday
0810	Orientation	TV 106	Introd. to SB	SB	SB +15 Test	SB +20 Test	SB +25 Test	SB +30 Test	SB +35 Test	SB +40 Test
0910	Organize Class	TV 108	Company Time	SB	SB	SB	SB	SB	SB	Typing Make-up
1010	Basic Operations	PI	Introd. to SB	PI	PI	PI	PI	PI	PI	Typing Make-up
1110	Entry Test	+5 Test	SB	SB	SB	SB	SB	SB	SB	Typing Make-up
1300	TV 102	TV 110	SB	SB	SB	SB	SB	SB	SB	
1400	TV 104	PI	SB +10 Test	Company Time	SB	SB	SB	SB	SB	
1500	Company Time	TV 112		Company Time	Company Time	Company Time	PI	PI	PI	
1600										

SB = Skill Building; PI = Programmed Instruction

Appendix J

KEY EXERCISES USED FREE-PACE, FORCED-PACE PROGRAM

Letters in Patterned Order

1. q w e r t y u i o p a s d f g h j k l ; z x c v b n m , . /
2. Q w E r T y U i O p A s D f G h J k L ; Z x C v B n M , . /
3. / . , m n b v c x z ; l k j h g f d s a p o i u y t r e w q
4. ? . , m N b V c X z : l K j H g F d S a P o I u Y t R e W q
5. q a z w s x e d c r f v t g b y h n u j m i k , o l . p ; /
6. q A z W s X e D c R f V t G b Y h N u J m I k , o L . P ; ?
7. / ; p . l o , k i m j u n h y b g t v f r o d e x s w z a q
8. / : p . l O , K i M j U n H y B g T v F r C d E x S w Z a Q
9. a d g j l s f h k ; q e t u o w r y i p z c b m . x v n , /
10. a D g J l S f H k ; q E t U o W r Y i P z C b M . X v N , ?
11. ; k h f s l j g d a p i y r w o u t e q / , n v x . m b c z
12. ; K h F s L j G d A p I y R w O u T e Q / , n V x . m B c Z
13. a ; s l d k f j g h q p w o e i r u t y z / x . c , v m b n
14. a : s L d K f J g H q P w O e I r U t Y z ? x . o , v M c N
15. ; a l s k d j f h g p q o w i e u r y t / z . x , c m v n b
16. ; A l S d K j F h G p Q o W i E u R y T / Z . X , C m V n B
17. g h f j d k s l a ; t y r u e i w o q p b n v m c , x . z /
18. g H f J d K s L a : t Y r U e I w O q P b N v M c , x . z ?
19. h g j f k d l s ; a y t u r i e o w p q n b m v , c . x / z
20. h G j F k D l S ; A y T u R i E o W p Q n B m V , C . X / Z
21. q z a x w s e c d v r f t b g n y h u m j , i k o . l / p ;
22. q Z a X w S e C d V r F t B g N y H u M j , I k O . L / P ;
23. / q . w , e m r n t b y v u c i x o z p a h s j d k f l g ;
24. ? q . W , E m R n T b Y v U c I x O z P a H s J d K f L f :

One-Syllable Words

1. ache back Cage dad egg Fact gas hall Ice jail king Lack man nail.
2. Oak pace quack Race sack tack Up vase wag Yard add bad Calf dame?
3. edge Face gave hang Ill jam kneel Last male name Oar pail quart:
4. Rag stage team Use vine wet Yarn age bat Call date earn Fail /
5. gear has In jar know Lean me near Odd pan queen Red scare than.
6. Vote what year Aid barn can Dark end fed Gain have inch Jug knew?
7. leg Mind neat oil Past queer reap Small tight view Wild yes aim:
8. Bang can den Else fire give Hawk ink jump Keep lip more Need;
9. once pay Quick ride seem Told won yet Air band chair Deer eve /
10. fine Goes hen is June key like Moss nice one Peel quiet ring?
11. Snow track wrap Yolk all beat Cent deed each For goat his It:
12. junk knife Loaf mud nod Ore pig quilt Road shirt tune Waist you /
13. an Bed cell drum Ear five good Hope if just Knot long move Nine.
14. our place Quit rock song Twig weak youth And bent cave Dog eight?
15. flame Grew horn inn Jig kill luck Mitt note out Pole quite rule:
16. Silk tax whip Yell ant best Cat doll elm From grind horse Jcb;
17. kite led Meal now owe Porch rung spell Tear wide young Any beer/
18. case Dime eye frown Glow hog jaw Kind lash mail Nurse owl pray?
19. Ram skip they Wolf your ape Beg cod dish Elf flat grape Hung;
20. join knob List meant next Or punch ripe Sled tire wreck Are bell;
21. cord Ditch flip glide Heal jay knock Lump milk night Off pup roar.
22. Arm bang chew Dive east fur Gas head joke Knock loss moon Noise/
23. ouch peace Rot start tool War art birth Crow due earth Free glad;
24. heel Jerk keen limp Mule none on Pie rest seat Trace weigh ask:
25. brush Cute draw eighth Flew grass hit Joy kiss length Mess neck?

Two-Syllable Words

1. able baby Cabin dairy easy Fairly gallon haircut Icy jacket.
2. kindness Ladder magic napkin Oatmeal package quarter Rabbit?
3. safety tablet Ugly valley wagon Yellow accept became Center/
4. defeat eighty Feather gentle heaven Ideal jelly kettle Likely;
5. measure neither Obey peanut question Reason second temper Uncle:
6. value weaken Yonder admire biscuit Chicken dinner elbow Fifty?
7. giant hidden Income jockey kingdom Lemon miner nickel Ocean/
8. pillow quickly River Shadow thankful Under velvet whisky Afraid;
9. blackboard circus Dollar empty flower Glory hollow itself:
10. Journey kitchen lonely Moment noisy offer Platter rocket silence.
11. Ticket unfair every Wicked yourself ago Body clever dresser?
12. Enjoy follow govern Hunger improve juicy Kitten lumber muddy/
13. Number onion poison Runner slipper today Unfold visit without;
14. Ahead brother cocoa During errand freedom Grandma handle indeed:
15. Junior lying myself Notice open prepare Rumble snapping treasure.
16. unkind women Ahead buggy crazy Damage errand further Grapefruit?
17. heavy invite Joyous lover music Ninety orange public Rotten/
18. someone tunnel Unhurt written airport Bacon curtain defend;
19. Escape fashion golden Highway indoors lizard Mountain neighbor:
20. other Puzzle report spinach Turkey until writing Alarm because?
21. canyon Direct even fever Giving honey inside Lesson mistake/
22. narrow Often protect railroad Station trolley upon Worker among:
23. bitter Ceiling except hurry Insect lazy message Never only upset;
24. Winter angel blanket Champion double explain Finger garage hammer.
25. Island joking language Matter nineteen outdoors Perhaps receive/

Three- and Four-Syllable Words

1. accident bakery Candlestick dangerous electric Factory gasoline.
2. handkerchief Important jellyfish lemonade Magazine neighborhood?
3. October passenger rapidly Saturday tablecloth Umbrella valentine;
4. Waterproof yesterday adventure Banana capital December elephant:
5. Family general however Indian January library manager nevermore/
6. otherwise Peppermint remember schoolmaster Telephone understand.
7. valuable whenever Afternoon battleship carelessness Deposit?
8. eleven faraway Gentlemen happily interested Junior liberty;
9. medicine Newspaper otherwise pineapple September terible:
10. underwear Vegetable wonderful afterwards Buffalo carpenter/
11. difference enemy Favorite godmother happiness interesting?
12. locomotive multiply Nobody overalls pocketbook Settlement;
13. Thanksgiving unfinished Victory woodpecker already Becoming:
14. cereal direction Engineer finally government Hickory impossible/
15. machinery November overcoat policeman Seventeen theatre violet.
16. unfriendly Anyway beginning champion Discover evening furniture?
17. Gracious history overeat Possible several tobacco Unhappy visitor:
18. animal Bicycle chocolate diamond Excited fisherman grasshopper;
19. Holiday overhead potato Strawberry together uniform Another.
20. blackberry Cigarette everday grocery Honeymoon overturn?
21. pussycat Tomorrow unpleasant anything Buttermilk envelope/
22. gunpowder American beautiful cabinet Different everyone February.
23. geography Hospital machinery separate Tomato unwilling watermelon:
24. Automobile bookkeeper calendar Dressmaker exciting fisherman;
25. Grandmother settlement tricycle unusual Grandfather permanent?

Appendix K

SKILL BUILDING PROGRESS BOOKLET: USED IN FREE-PACE, FORCED-PACE PROGRAM (PAGES 1,2)

Name _____ Date _____ Class # _____
Last First

1. For your remaining time as a Group IV typist, you will do all of your typing from copy in *Sustained Timed Writing* by Grubb and White. Each page in this book is a separate typing exercise.
2. All of your practice typing will be done in 5 minute blocks, called trials.
3. Begin each trial at the top of the specified page in *Sustained Timed Writing*. Do not type the title of the exercise. Type the copy exactly as it appears on the page.
4. When you type for speed, ignore errors completely. If you do not make many errors on a speed trial, you are not typing fast enough.
5. When you type for accuracy, slow down a bit, and try to avoid making errors. If you make more than 5 errors, slow down a bit more on the next accuracy trial.
6. Record your scores (words or errors) after every trial in the appropriate Speed Trial Box or Accuracy Trial Box.
7. Repeat each exercise, starting each time at the top of the page, until you meet or exceed the indicated speed or accuracy goal. Make sure that you meet or exceed each indicated goal before you move on to the next step.
8. When you reach your goal (type more words or make fewer errors than are required), you may go on to the next step.
9. Type three or four exercises on the same sheet of paper.
10. Do not lose this booklet. Keep it with you for your entire two weeks in this typing program. It is a record of your progress.
11. Read all instructions on the following pages before you start to type. If you have any questions, raise your hand and an instructor will help you.
12. From now on, you will be trying to build-up your typing skill. The Skill Building Exercises that follow are designed to build-up your skill.
13. For all Skill Building Exercises, set your typewriter as follows:
    a. Left margin stop at 13.
    b. Right margin stop at 88.
    c. Line space lever for single space.
    d. Paper guide at 0.

Step 1 FOR STUDENTS WHO TYPE UNDER 24 WORDS IN 5 MINUTES: INCREASE SPEED
Turn to page 3. Your goal is to type 25 words in 5 minutes. Keep repeating the 5 minute exercise on page 3 until you reach your goal. Record your word count for each speed trial in the Speed Trial Boxes below. When you reach your goal, move on to step 2.

Word Count on Speed Trials Page 3

WC														
WC														

Step 2 FOR STUDENTS WHO TYPE 25 to 29 WORDS IN 5 MINUTES: INCREASE SPEED
Turn to page 4. Your goal is to type 30 words in 5 minutes. Keep repeating the 5 minute exercise on page 4 until you reach your goal. Record your word count for each speed trial in the Speed Trial Boxes below. When you reach your goal, move on to step 3.

Word Count on Speed Trials Page 4

WC														
WC														

Step 3 FOR STUDENTS WHO TYPE 30 to 34 WORDS IN 5 MINUTES: INCREASE SPEED
Turn to page 5. Your goal is to type 35 words in 5 minutes. Keep repeating the 5 minute exercise on page 5 until you reach your goal. Record your word count for each speed trial in the Speed Trial Boxes below. When you reach your goal, move on to step 4.

Word Count on Speed Trials Page 5

WC														
WC														

Step 4 FOR STUDENTS WHO TYPE 35 to 39 WORDS IN 5 MINUTES:: REDUCE SPEED
Turn back to page 4. Your goal is to type no less than 30 words while making no more than 5 errors. To do this, type a little slower than you did in Step 3. If you make 6 or more errors, reduce your speed a little more. Keep repeating the 5 minute exercise on page 4 until you reach your goal. Record your word count and your error count for each trial in the Accuracy Trial Boxes below. When you reach your goal, move on to step 5.

Word and Error Count on Accuracy Trials Page 4

WC														
EC														

Appendix L

VIDEO TAPES USED IN THE VIDEO TAPE TRAINING PROGRAMS[a]

TVR101[b]	(30 Minutes)	Introduction to the Typewriter
TVR102	(36 Minutes)	Finger Exercises, Home Keys 1
TVR103	(35 Minutes)	Finger Exercises, Home Keys 2
TVR104	(35 Minutes)	Finger Exercises, Index Finger, Near Reaches 1
TVR105	(35 Minutes)	Finger Exercises, Index Finger, Near Reaches 2
TVR106	(35 Minutes)	Finger Exercises, Index Finger, Far Reaches 1
TVR107	(40 Minutes)	Finger Exercises, Index Finger, Far Reaches 2
TVR108	(40 Minutes)	Finger Exercises, Middle Finger 1
TVR109	(41 Minutes)	Finger Exercises, Middle Finger 2
TVR110	(41 Minutes)	Finger Exercises, Ring Finger 1
TVR111	(40 Minutes)	Finger Exercises, Ring Finger 2
TVR112	(40 Minutes)	Finger Exercises, Little Finger 1
TVR113	(40 Minutes)	Finger Exercises, Little Finger 2

[a]The 12 video tapes were part of a 20-tape series developed by the Southeastern Signal School to teach radio-teletypewriter operators.

[b]This tape was not used in any of the experimental programs.

Appendix M

COMPARISON OF VIDEO 12, FREE-PACE AND VIDEO 12, FORCED-PACE PROGRAMS

Gross Words per Minute Typed at Various Time Intervals in Video 12, Free-Pace and Video 12, Forced-Pace Typing Programs, by GWPM Typed at Entry

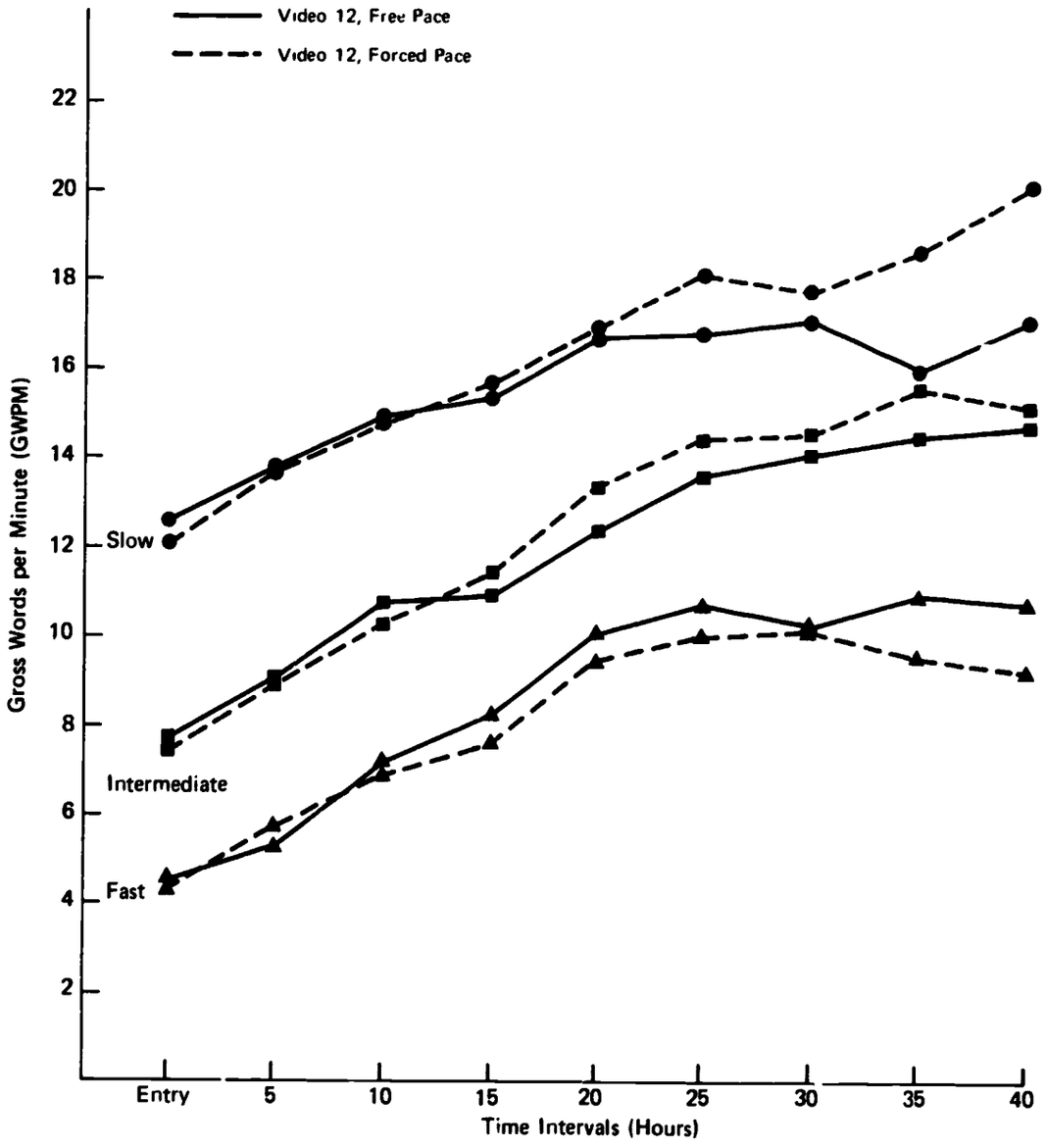


Figure M-1

Errors per Five Minutes Typed at Various Time Intervals in Video 12, Free-Pace and Video 12, Forced-Pace Typing Programs, by GWPM Typed at Entry

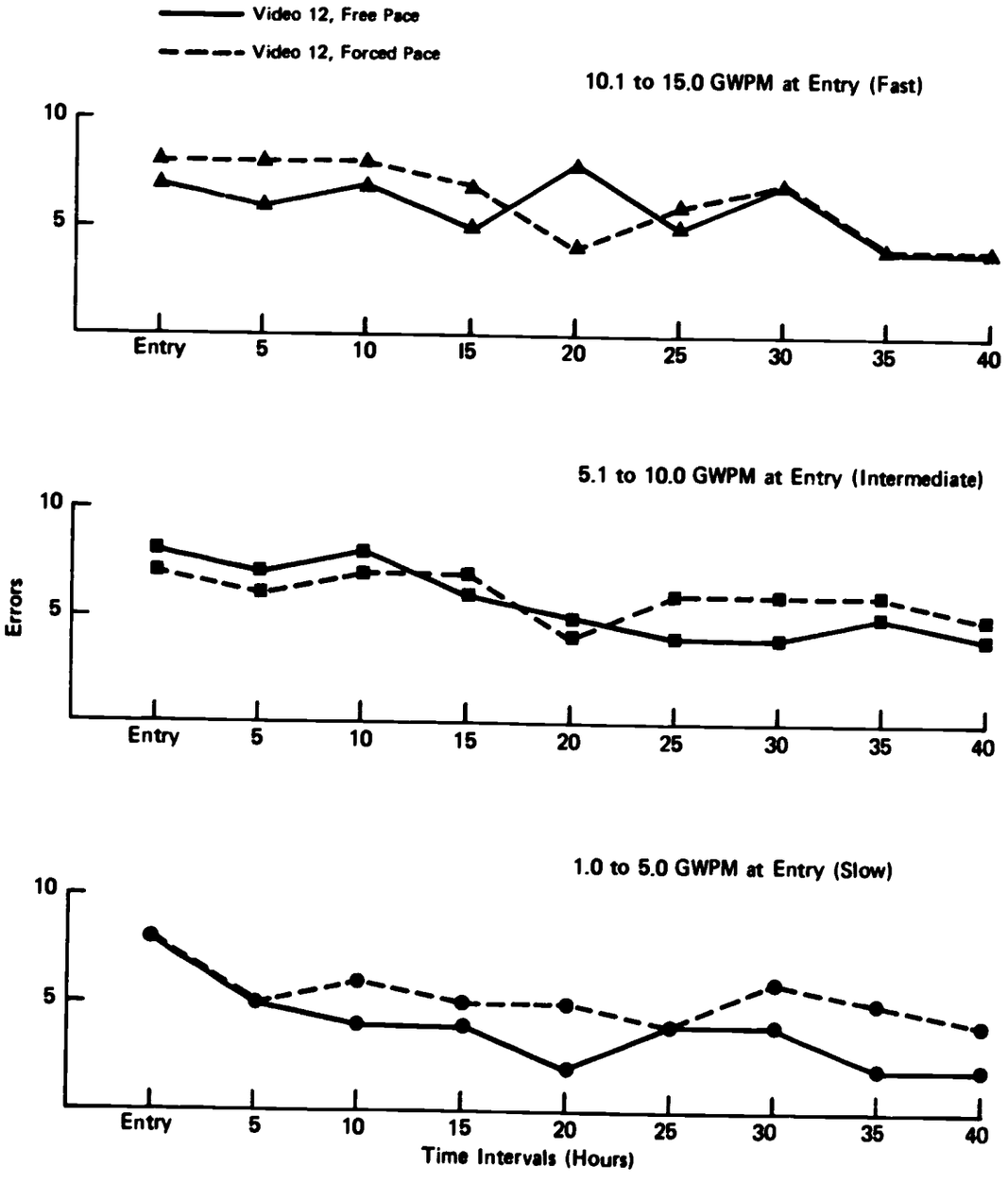


Figure M-2

Appendix N

TABLE FOR CONVERTING GROSS WORDS AND ERRORS TO NET WORDS PER MINUTE

Gross Words in Five Minutes	Total Errors								
	0	1	2	3	4	5	6	7	8
	Net Words Per Minute (after deducting 5 words for each error)								
25	5	4	3	2	1	0			
30	6	5	4	3	2	1	0		
35	7	6	5	4	3	2	1	0	
40	8	7	6	5	4	3	2	1	0
45	9	8	7	6	5	4	3	2	1
50	10	9	8	7	6	5	4	3	2
55	11	10	9	8	7	6	5	4	3
60	12	11	10	9	8	7	6	5	4
65	13	12	11	10	9	8	7	6	5
70	14	13	12	11	10	9	8	7	6
75	15	14	13	12	11	10	9	8	7
80	16	15	14	13	12	11	10	9	8
85	17	16	15	14	13	12	11	10	9
90	18	17	16	15	14	13	12	11	10
95	19	18	17	16	15	14	13	12	11
100	20	19	18	17	16	15	14	13	12

Unclassified

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Human Resources Research Organization (HumRRO) 300 North Washington Street Alexandria, Virginia 22314	2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP

3. REPORT TITLE

AN EVALUATION OF ALTERNATIVE PROGRAMS FOR TRAINING BEGINNING TYPISTS IN THE ARMY

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Technical Report

5. AUTHOR(S) (First name, middle initial, last name)

Morris Showel

6. REPORT DATE November 1972	7a. TOTAL NO. OF PAGES 106	7b. NO OF REFS 10
8a. CONTRACT OR GRANT NO. DAHC 19-73-C-0004 b. PROJECT NO. c. 2Q062107A745 d.	9a. ORIGINATOR'S REPORT NUMBER(S) Technical Report TR-72-33 9b. OTHER REPORT NO.(S) (Any other numbers that may be assigned this report)	

10. DISTRIBUTION STATEMENT

Approved for public release; distribution unlimited.

11. SUPPLEMENTARY NOTES Work Unit TYPETRAIN; research performed by HumRRO, Division No. 3, Presidio of Monterey, California	12. SPONSORING MILITARY ACTIVITY Office, Chief of Research and Development Department of the Army Washington, D.C. 20310

13. ABSTRACT

This report presents the results of research to develop an improved training program for Army typists, and the material needed to implement that program. The research was conducted at Fort Ord and Fort Knox. First, baseline learning curves were determined. Eight experimental programs then were examined, and the results of various modifications in training were compared with the baseline learning curves. The effect of selected training variables and training systems was evaluated, and the relationship between straight-copy typing and production-copy typing was explored. Several alternative revised training programs were field tested, and suggestions for revising the training program now in use were made.

DD FORM 1 NOV 68 1473

Unclassified

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
*Aptitude Tests						
*Army Training						
*Learning Curves						
*Motivation						
*Performance Evaluation						
Audio Tapes						
Program Evaluation						
Typing Skills						
Typing Training						

DISTRIBUTION LIST

2 DIR OASD MANPOWER (PP&GR)
1 CHF DEF NUC AGCY ATTN DOC LIB BR
1 DIR WSEG WASH., D.C. 20305
1 DIR OASD MANPOWER & RESERVE AFFAIRS
1 OFC OF THE ASST SEC OF DEF (MRA) (OAA) ATTN M BIEGEL
2 COMDR FLD COMD DEF NUC AGCY SANDIA BASE ATTN FCTG7
2 NASA SCI & TECH INFO FACILITY COLLEGE PARK MD
1 CINC US EUROPEAN COMD ATTN SUPPORT PLANS BR J3
1 CG US ARMY JAPAN APO 96343 SAN FRAN ATTN G3
10 CG USA FORCES SOUTHERN COMD ATTN SCARCO CZ
2 CG US ARMY EUROPE APO 09403 NY ATTN OPNS DIV
1 CO ARMY TRANS RES COMD FT EUSTIS ATTN TECH LIB
1 CG USA AD COMD ENT AFB ATTN ADGPA COLO
6 CG 1ST ARMY ATTN DCSOT FT MEADE MD
1 CG 3RD ARMY ATTN DCSOT FT MCPHERSON
4 CG SIXTH ARMY PRES OF SAN FRAN ATTN AMAPS-TZ
1 CG EUSA ATTN AG-AC APO 96301 SAN FRAN
1 DIR HEL APG MD
1 CG USA COC EXPERIMENTATION COMD FT ORD
2 ENGNR PSYCHOL LAB PIONEERING RES DIV ARMY NATICK LABS NATICK MASS
4 TECH LIB ARMY NATICK LABS NATICK MASS
2 INST OF LAND CBT ATTN TECH LIB FT BELVOIR VA
1 REDSTONE SCIENTIFIC INFO CTR US ARMY MSL COMD ATTN CHF DOC SEC ALA
1 CO FT HUACHUCA SPT COMD USA ATTN TECH REF LIB
1 SIXTH USA LIB DEPOT BLDG M 13 14 PRES OF SAN FRAN
1 PLNS OFCR PSYCH HDQTRS USACDCEC FT ORD
5 CG FT ORD ATTN G3 TNG DIV
1 CO HQ ARMY ENLISTED EVAL CTR FT BENJ HARRISON
1 LIB DEF SUPPLY AGCY CAMERON STA VA
2 CO USA COC AG AGCY FT BENJ HARRISON IND
1 CO ARMY COC INF AGY FT BENNING
1 CO ARMY COC ARMOR AGY FT KNOX
1 DIR OF INTERN TNG USA LOG MGT CTR FT LEE
3 CO USA TNG CTR (FA) ATTN AKPSITC-TT FT SILL
1 CG USA TNG CTR & FT LEONARD WOOD ATTN ACOFS G3
1 CG USA INF CTR ATTN AJIGT-T FT BENNING
1 CG USA TNG CTR INF ATTN ACOFS G3 FT DIX
1 CG USA TNG CTR ATTN ACOFS G3 FT JACKSON
1 CG USA TNG CTR INF ATTN ACOFS G3 FT LEWIS
1 CG USA TNG CTR INF & FT ORD ATTN ACOFS C3
61 CG USA TNG CTR INF ATTN ACOFS G3 FT POLK
5 CO USA MED TNG CTR ATTN DIR OF TNG FT SAM HOUSTO
20 CG USA AD CTR ATTN G3 FT BLISS
1 CG USA TNG CTR INF ATTN ACOFS G3 FT CAMPBELL
3 LIB ARMY WAR COLL CARLISLE PA
1 COMDT COMD & GEN STAFF CO FT LEAVENWORTH ATTN ARCHIVES
1 DIR OF MILIT PSYCHOL & LDRSHP US MILIT ACAD WEST POINT
1 US MILIT ACAD WEST POINT ATTN LIB
1 COMDT ARMY AVN SCH ATTN DIR OF INSTR FT RUCKER
2 COMDT ARMY SECUR AGY TNG CTR & SCH FT DEVENS ATTN LIB
1 STIMSON LIB MED FLD SERV SCH BROOKE ARMY MED CTR FT SAM HOUSTON
10 COMDT THE ARMOR SCH ATTN DOI FT KNOX
1 COMDT ARMY ARMOR SCH FT KNOX ATTN WEAPONS DEPT
1 LIB USA ARMOR SCH FT KNOX
1 COMDT USA CHAPLAIN SCH ATTN DOI FT HAMILTON
1 COMDT ARMY CHEM CORPS SCH FT MCCLELLAN ATTN EDUC ADV
1 COMDT USA FIN SCH ATTN CHF DUC DEV LIT PLN DIV DOOI FND
1 USA FINANCE SCH FT BENJ HARRISON ATTN EDUC ADV
4 COMDT ADJ GEN SCH FT BENJ HARRISON ATTN EDUC ADV
1 COMDT USAIS ATTN EDUC ADV FT BENNING
1 COMDT USAIS ATTN AJIIS-O-EPRD FT BENNING
1 HQ US ARMY ADJ GEN SCH FT BENJ HARRISON ATT COMDT
1 LIB ARMY QM SCH FT LEE
1 COMDT USA QM SCH FT LEE ATTN EDUC ADV
1 COMDT ARMY TRANS SCH FT EUSTIS ATTN EDUC ADV
1 CO USA SEC AGY TNG CTR & SCH ATTN (ATEV RSCH ADV FT DEVENS
1 COMDT USA MIL POLICE SCH ATTN PLNS &PROG DOOI FT GORDON
2 COMDT US ARMY SOUTHEASTERN SIG SCH ATTN EDUC ADV FT GORDON
1 COMDT USA AD SCH ATTN DOI FT BLISS
1 CO USA ORD CTR & SCH OFC OF OPS ATTN AMBN-O APG MD
5 ASST COMDT ARMY AIR DEF SCH FT BLISS ATTN CLASSF TECH LIB
3 CG USA FLD ARTY CTR & FT SILL ATTN AVN OFCR
1 COMDT DEF INTELL SCH ATTN SIGAS DEPT
1 COMDT ARMED FORCES STAFF COLL NORFOLK
1 COMDT USA SIG CTR & SCH ATTN DOI FT MONMOUTH
1 COMDT JUDGE ADVOCATE GENERALS SCH U OF VA
1 OPTY COMDT USA AVN SCH ELEMENT GA
1 OPTY ASST COMDT USA AVN SCH ELEMENT GA
1 USA AVN SCH ELEMENT OFC OF DIR OF INSTR ATTN EDUC ADV GA
1 EDUC CONSLT ARMY MILIT POLICE SCH FT GORDON
6 COMDT USA ENGR SCH ATTN EDUC ADV AMBBES-EA FT BELVOIR
2 COMDT USA SCH EUROPE ATTN EDUC ADV APO 09172 NY
1 OFC OF DOCTRINE DEV LIT & PLNS USA ARMOR SCH ATTN AMBAAS-OM
1 COMDT ARMY AVN SCH FT RUCKER ATTN EDUC ADV
1 DIR OF INSTR US MIL ACAD WEST POINT NY
1 DIR OF MILIT INSTR US MILIT ACAD WEST POINT
1 USA INST FOR MIL ASSIST ATTN LIB BLDG 1912808 FT BRAGG
1 COMDT DEF MGT SCH FT BELVOIR
2 COMDT USA MSI & RUN CTR & SCH ATTN CHF OFC OF OPS REDSTONE ARSNL
2 COMDT US WAC SCH US WAC CTR ATTN AJMCT FT MCCLELLAN
2 HQ ABERDEEN PG ATTN TECH LIB
1 CO USA INTELL CTR & SCH ATTN DIR OF ACADEMIC OPS FT HUACHUCA
1 CO USA INTELL CTR & SCH ATTN DIR OF DOC & LIT FT HUACHUCA
1 COMDT USA CGGSC OFC OF CHF OF RESIDENT INSTR FT LEAVENWORTH
1 COMDT USA CA SCH ATTN OFC OF DOCTRINE DEVEL LIT & PLNS FT BRAGG
1 COMDT USA CA SCH ATTN DOI FT BRAGG
1 COMDT USA CA SCH ATTN EDUC ADV FT BRAGG
1 COMDT USA CA SCH ATTN LIB FT BRAGG
1 COMDT USA SCH & TNG CTR ATTN ACOFS G3 TNG DIV FT MCCLELLAN
1 COMDT USA SCH & TNG CTR ATTN ACOFS G3 PLNS & OPS DIV FT MCCLELLAN
10 COMDT USA INST FOR MIL ASSIST ATTN DOI FT BRAGG
1 LIBN LSAIS FT BENNING
8 COMDT USA FLD ARTY SCH ATTN DOI FT SILL
1 COMDT USA ARTY SCH ATTN EDUC SERVICES DIV FT SILL
1 COMDT USA ARTY SCH ATTN EDUC ADV FT SILL
1 COMDT USA TRANS SCH ATTN DIR OF DOC & LIT FT EUSTIS
1 COMDT USA TRANS SCH ATTN LIB FT EUSTIS
1 LSA INST FOR MIL ASST ATTN EDUC ADV FT BRAGG
1 C MDT USA CGGSC ATTN ATSCS-DJ (SPWAR)
1 COMDT ARMY QM SCH OFC DIR OF NONRESID ACTVY ATTN TNG MEDIA DIV VA
1 COMDT USA ARTY SCH ATTN LIB FT SILL
1 CG USA SCH & TNG CTR ATTN ACOFS G3 FT GORDON
1 DIR OF GRAD STUD & RSCH ATTN BEHAV SCI REP USACGGSC
1 COMDT USA AD SCH ATTN AKBAAS-DL-EA FT BLISS
1 COMDT USA AD SCH HIGH ALTITUDE MSL DEPT FT BLISS
1 CG USA SIG CTR & SCH ATTN ATSSC-DP-COB FT MONMOUTH
1 SECY OF ARMY, PENTAGON
1 OCS-PERS DA ATTN CHF C&S DIV
1 DIR OF PERS STUDIES & RSCH ODCSPER DA WASH DC
2 ACSFOR DA ATTN CHF TNG DIV WASH DC
1 CHF OF ENGNRS DA ATTN ENGTE-T
1 HQ ARMY MAT COMD R&D DRCTE ATTN AMCRD-RC
1 US ARMY BEHAVIOR & SYS RSCH LAB ATTNCRD-AR ARL VA
1 OPO PERS MGT DEV OFC ATTN MOS SEC (NEW EQUIP) OPOMO
1 PROVOST MARSHAL GEN DA
2 DIR CIVIL AFFAIRS DRCTE ODCSOPS
1 OFC RESERVE COMPON DA
2 CG USA SEC AGCY ARL HALL STA ATTN AC OF S GI VA
12 ADMIN DOC ATTN: TCA (HEALY) CAMERON STA ALEX., VA. 22314
1 CHF OF R&D DA ATTN CHF TECH & INDSTR LIAISON OFC
1 CO USA COC HEO SERV AGCY FT SAM HOUSTON
1 USA BEHAVIOR & SYS RSCH LAB ATTN CRD-AIC ARL VA
2 TNG & DEVEL DIV ODCSPERS
1 CAREER MGT BR ATTN R DETIENNE CAMERON STA ALEX VA
1 USA LIB DIV-TAGO ATTN ASDIRS
1 CG CONARC ATTN COL E M HUDAK ATIT-SA FT MONROE
15 CG CONARC ATTN ATIT-STM FT MONROE
2 CG CONARC ATTN LIB FT MONROE
1 CO ARMY CBT DEVEL COMD MILIT POLICE AGY FT GORDON
1 CHF USA AD HRU FT BLISS
1 CHF USA ARMOR HRU FT KNOX
1 CHF USA AVN HRU FT RUCKER
1 CHF USA INF HRU FT BENNING
1 CHF USA TNG CTR HRU PRES OF MONTEREY
2 CALIF NG 40TH ARMORED DIV LOS ANGELES ATTN AC OF SG3
1 55TH COMD HQ DIV ARMY NG JACKSONVILLE FLA
1 CG HQ 27TH ARMORED DIV NY AIR NG SYRACUSE
1 TEXAS NG 49TH ARMORED DIV DALLAS
3 CG ARMY ARMOR CTR FT KNOX ATTN G3 AIBKGT
1 CG 3RD INF DIV ATTN ACOFS G3 APO NY 09036
1 CG 8TH INF DIV ATTN ACOFS G2 APO NY 09111
3 CG 4TH INF DIV (MECH) & FT CARSON ATTN ACOFS G3
1 DA HQS FT CARSON & HQS 4TH INF DIV (MECH) ATT MAJ HARRIS
3 CG 82ND ABN INF DIV ATTN ACOFS G3 FT BRAGG
1 CG XVIII ABN CORPS ATTN ACOFS G3 FT BRAGG
1 CO 197TH INF BRGD FT BENNING ATTN S3
1 CO 1ST BN (REINF) ATTN S3 FT MYER
1 CO 2ND BN 15TH INF 3RD INF DIV ATTN S3 APO NY 09026
5 CG 1ST INF DIV ATTN ACOFS G3 FT RILEY
1 CO USA PARTIC GP USA TNG DEVICE CTR FLA
2 OA OFC OF ASST CHF OF STAFF FOR COMM-ELCT ATTN CETS-6 WASH
1 CG MILIT DIST OF WASHINGTON
2 OA USA ADV GP (ARNGUS) RALEIGH NC
1 USA RECRUITING COMD HAMPTON VA
1 OIR ARMY LIB PENTAGON
1 CHF OF MILIT HIST DA ATTN GEN REF BR
1 US ARMY GEN EQUIP ATTN TECH LIB FT LEE
10 CG III CORPS & FT HOOD ATTN G3 SEC FT HOOD
30 CO 1ST ARMORED DIV ATTN G3 SEC FT HOOD
30 CG 2D ARMORED DIV ATTN G3 SEC FT HOOD
25 CO 13TH SUPT BDDE ATTN S3 SEC FT HOOD
1 CG USAFAC & FT SILL ATTN AKPSIGT-TNTN
20 CO III CORPS ARTY ATTN G3 SEC FT SILL
15 CO 1ST AIT BDDE ATTN G3 SEC FT BLISS
8 CG USATCI & FT POLK ATTN AKPPD-DCOT
1 RSCH CONTRACTS & GRANTS BR ARD
1 BESD ARO OFC CHF OF R&D WASH DC
1 CHF OF R&D DA ATTN SCI INFO BR RSCH SPT DIV WASH DC
1 CINC US ATLANTIC FLT CODE 312A USN BASE NORFOLK
1 CDR TNG COMMAND US PACIFIC FLT SAN DIEGO
5 TECH LIB PERS LIB BUR OF NAV PERS ARL ANNEX
3 DIR PERS RES DIV BUR OF NAV PERS
1 TECH LIB BUR OF SHIPS CODE 210L NAVY DEPT
1 ENGNR PSYCHOL BR ONR CODE 455 ATTN ASST HEAD WASH DC
3 CO & DIR NAV TNG DEVICE CTR ORLANDO ATTN TECH LIB
1 CO FLT ANTI-AIR WARFARE TNG SAN DIEGO
2 CO FLT TNG CTR NAV BASE NEWPORT
1 CO FLEET TNG CTR US NAV STA SAN DIEGO

1 PRES NAV WAR COLL NEWPORT ATTN MAHAN LIB
1 CHF OF NAVL RSCH PERS & TNG BR (CODE 458) ARL VA
1 CHF OF NAV RES ATTN HEAD GP PSYCHOL BR CODE 452
1 DIR US NAV RES LAB ATTN CODE 5120
1 DIR NAVAL RSCH LAB ATTN LIB CODE 2029 WASH DC
1 CHF OF NAV AIR TNG TNG RES DEPT NAV AIR STA PENSACOLA
1 CDR NAV MSL CTR POINT MUGU CALIF ATTN TECH LIB CODE 3022
3 OIC NAV PERS RES ACTVY SAN DIEGO
2 NAVAL MSL CTR (CODE 5342) PT MUGU CALIF
1 DIR PERS RES LAB NAV PERS PROGRAM SUPPORT ACTIVITY WASH NAV YD
1 NAV TNG PERS CTR NAV STA NAV O ANNEX CODE 83 ATTN LIB WASH
5 COMDT MARINE CORPS HQ MARINE CORPS ATTN CODE AO-1B
1 HQ MARINE CORPS ATTN AX
1 DIR MARINE CORPS EDUC CTR MARINE CORPS SCH QUANTICO
1 DIR MARINE CORPS INST ATTN EVAL UNIT
1 US MARINE CORPS HQS HIST REF LIB ATTN MRS JADOT
1 CHF OF NAV OPNS OP-01P1
1 CHF OF NAVL OPS OP-039 WASH DC
1 CHF OF NAV OPNS OP-07TL
2 COMDT HQS 8TH NAV DIST ATTN EDUC ADV NEW ORLEANS
1 CHF OF NAV AIR TECH TNG NAV AIR STA MEMPHIS
1 DIR OPS EVAL GRP OFF OF CHF OF NAV OPS OPO3EG
2 COMDT PTP COAST GUARD HQ
1 CHF OFCR PERS RES & REVIEW BR COAST GUARD HQ
1 CO US COAST GUARD TNG CTR GOVERNORS ISLAND NY
1 CO US COAST GUARD TNG CTR CAPE MAY NJ
1 CO US COAST GUARD TNG CTR & SUP CTR ALAMEDA CALIF
1 CO US COAST GUARD INST OKLA CITY OKLA
1 CO US COAST GUARD RES TNG CTF YORKTOWN VA
1 SUPT US COAST GUARD ACAD NEW LONDON CONN
1 OPNS ANLS OFC HQ STRATEGIC AIR CCMD OFFUTT AFB
1 AIR TNG COMD/XPT RANDOLPH AFB
1 TECH DIR TECH TNG DIV(HRD) AFHRL LOWRY AFB COLO
1 CHF SCI DIV DRCTE SCI & TECH DCS R&D HQ AIR FORCE AFRSTA
1 CHF OF PERS RES BR DRCTE OF CIVILIAN PERS DCS-PERS HQ AIR FORCE
1 CHF ANAL DIV (AFPOPL (R) DIR OF PERSONNEL PLANNING HQS USAF
1 AFHRL/TT ATTN CAPT W S SELLMAN LOWRY AFB
1 HQ SAMSO (SMSIR) AF UNIT POST OFC LA AFS CALIF
2 MILIT TNG CTR OPE LACKLAND AFB
2 AFHRL (HRT) WRIGHT-PATTERSON AFB
1 AMD AMRH BROOKS AFB TEXAS
1 HQS ATC DCS/TECH TNG (ATTNS) RANDOLPH AFB
USAFA DIR OF THE LIB USAF ACAD COLO
1 TECH TNG CTR (LNTC/OP-1-L1) LOWRY AFB
2 CO HUMAN RESOURCES LAB BROOKS AFB
1 COMDT USAF SPEC OP SCH (TAC" EGLIN AFB
1 AFHRL (FT) WILLIAMS AFB ARIZ
1 DIR NATL SECUR AGY FT GEO G MEADE ATTN TDL
1 DIR NATL SECUR AGY FT GEO G MEADE ATTN DIR OF TNG
3 CIA ATTN CRS/ADD STANDARD DIST
1 SYS EVAL DIV RES DIRECTORATE DOD-OCD PENTAGON
1 DEPT OF STATE BUR OF INTEL & RES EXTERNAL RES STAFF
1 SCI INFO EXCH WASHINGTON
2 CHF MGT & GEN TNG DIV TR 200 FAA WASH DC
1 BUR OF RES & ENGR US POST OFC DEPT ATTN CHF HUMAN FACTORS BR
1 EDUC MEDIA BR OE HEW ATTN T D CLEMENS
1 OFC OF INTERNATL TNG PLANNING & EVAL BR AID WASH DC
1 DEPT OF TRANS FAA ACQ SEC HQ 61DA WASH DC
2 ERIC OE WASH DC
1 CONSOL FED LAW ENFORCEMENT TNG CTR WASH DC
2 SYS DEVEL CORP SANTA MONICA ATTN LIB
2 DUNLAP & ASSOC INC DARIEN ATTN LIB
2 RAC ATTN LIB MCLEAN VA
1 RAND CORP WASHINGTON ATTN LIB
2 ELECT PERS RSCH GP U OF SOUTHERN CALIF
1 COLUMBIA U ELEC RES LABS ATTN TECH EDITOR
1 MITRE CORP BEDFORD MASS ATTN LIB
2 SIMULATION ENGR CORP ATTN DIR OF ENGR FAIRFAX VA
2 LEARNING R&D CTR U OF PITTS ATTN DIR
1 HUMAN SCI RES INC MCLEAN VA
2 TECH INFO CTR ENGNR DATA SERV N AMER AVN INC COLUMBUS O
1 RAYTHEON SERV CO ATTN LIBN BURLINGTON MASS
1 GEN DYNAMICS POMONA DIV ATTN LIB DIV CALIF
2 OTIS ELEVATOR CO DIV ATTN LIB STAMFORD CONN
1 MGR BIOTECHNOLOGY AEROSPACE SYS DIV MS 8H-25 BOEING CO SEATTLE
1 IDA RSCH & ENG SUPT DIV ARL VA
1 SCI & TECH DIV IDA ARL VA
1 HUGHES AIRCRAFT COMPANY CULVER CITY CALIF
1 DIR CTR FOR RES ON LEARNING & TEACHING U OF MICH
1 EDITOR TNG RES ABSTR AMER SOC OF ENG DIRS U OF TENN

1 DIR CTR FOR RSCH IN SOCIAL SYS KENSINGTON MD
3 CANADIAN JOINT STAFF OFC OF DEF RES MEMBER WASHINGTON
3 CANADIAN ARMY STAFF WASHINGTON ATTN GSDZ TNG
2 OFC OF ARMED FORCES ATTACHE ROYAL SWEDISH EMBSY DC
3 AUSTRALIAN NAV ATTACHE EMBSY OF AUSTRALIA WASH DC
1 OFC OF AIR ATTACHE AUSTRALIAN EMBSY ATTN: T.A. NAVGN WASH. D.C.
2 AUSTRALIAN ARMY ATTACHE EMBSY OF AUSTRALIA ATTN TECH CLK
2 DR B T DOOD LRNING SYS LTD SURREY ENGLAND
1 MENNINGER FOUNDATION TOPEKA
1 AMER INSTS FOR RSCH SILVER SPRING
1 AMER INSTS FOR RSCH ATTN LIBN PA
1 DIR PRIMATE LAB UNIV OF WIS MADISON
3 MATRIX RSCH CO FALLS CHURCH VA
1 EDUC & TNG CONSLT CO LA CALIF
1 DR GEORGE T HAUTY CHMN DEPT OF PSYCHOL U OF DEL
1 HEAD DEPT OF PSYCHOL UNIV OF SC COLUMBIA
1 TVA PERS STAFF OFCR KNOXVILLE TENN
1 U OF GEORGIA DEPT OF PSYCHOL
1 GE CO WASH D C
1 AMER INST FOR RSCH ATTN LIB PALO ALTO CALIF
1 COLL OF ARTS & SCI U OF MIAMI ATTN L L MCQUITTY
1 ROWLAND & CO HADDONFIELD NJ ATTN PRES
1 SCI RSCH ASSOC INC DIR OF EVAL CHICAGO ILL
2 OREGON STATE U DEPT OF MILIT SCI ATTN ADJ
1 AMER PSYCHOL ASSOC WASHINGTON ATTN PSYCHOL ABSTR
1 NO ILL U HEAD DEPT OF PSYCHOL
1 GEORGIA INST OF TECH DIR SCH OF PSYCHOL
1 ENGNR LIB FAIRCHILD HILLER REPUBLIC AVN DIV FARMINGDALE N Y
1 LIFE SCI INC HURST TEXAS ATTN W G MATHENY
1 AMER BEHAV SCI CALIF
1 COLL OF WM & MARY SCH OF EDUC
1 SO ILLINOIS U DEPT OF PSYCHOL
2 ASSOC DIR CDC TNG PROG ATLANTA GA
2 WASH MILITARY SYS TECH LIB DIV BETHESDA MD
1 NORTHWESTERN U DEPT OF INDSTR ENGNR
1 DR L TWYFORD NY STATE EDUC DEPT ABSTRACT EDITOR AVCR
1 AEROSPACE SAFETY DIV U OF SOUTHERN CALIF LA
1 MR BRANDON B SMITH RES ASSOC U OF MINN
1 DR V ZACHERT RT 1 GOOD HOPE GA
1 J P LYDON DIR JR ROTC SAN ANTONIO TEXAS
1 DR E FOULKE DEPT OF PSYCH UNIV OF LOUISVILLE
2 CHRYSLER CORP DEF ENGR ATTN DR H BERMAN DETROIT
1 DR S ROSCOE ASSOC DIR FOR RSCH INST OF AVN U OF ILL
1 DR C HELM DEPT EDUC PSYCH CITY U OF NY
1 DR E PERKINS PROF OF PSYCH ST CLOUD STATE COLL MINN
1 DR H SHOEMAKER DIR TNG RSCH GP NY
1 U OF MINN DEPT OF INDUST EDUC ATTN R E KUHL
1 VOC-TECH EDUC PROG PLNNG DEV ATTN W STOCK ST PAUL
1 CHF PROCESSING DIV DUKE U LIB
1 U OF CALIF GEN LIB DOCU DEPT
1 FLORIDA STATE U LIB GIFTS & EXCH
1 PSYCHOL LIB HARVARD UNIV CAMBRIDGE
1 U OF ILL LIB SER DEPT
2 U OF KANSAS LIB PERIODICAL DEPT
1 U OF NEBRASKA LIBS ACQ DEPT
1 OHIO STATE U LIBS GIFT & EXCH DIV
1 PENNA STATE U PATTEE LIB DOCU DESK
1 PURDUE U LIBS PERIODICALS CHECKING FILES
1 STANFORD U LIBS DOCU LIB
1 LIBN U OF TEXAS
1 SYRACUSE U LIB SER DIV
1 SERIALS REC UNIV OF MINN MINNEAPOLIS
1 STATE U OF IOWA LIBS SER ACQ
1 NO CAROLINA STATE COLL CH HILL LIB
2 BOSTON U LIBS ACQ DIV
1 U OF MICH LIBS SER DIV
1 BROWN U LIB
1 COLUMBIA U LIBS DOCU ACQ
1 DIR JOINT U LIBS NASHVILLE
2 LIB GEO WASH UNIV ATTN SPEC COLL DEPT WASH DC
2 LIB OF CONGRESS CHF OF EXCH & GIFT DIV
U OF PGH DOCU LIBN
1 CATHOLIC U LIB EDUC & PSYCHOL LIB WASH DC
1 U OF KY MARGARET I KING LIB
1 SO ILL U ATTN LIBN SER DEPT
1 KANSAS STATE U FARREL. LIB
1 BRIGHAM YOUNG U LIB SER SECT
1 U OF LOUISVILLE LIB BELKNAP CAMPUS
1 GEORGETOWN U LIB SER DEPT WASH DC
1 LIBS COLO STATE U ATTN DOC LIBN FT COLLINS

HUMAN RESOURCES RESEARCH ORGANIZATION

300 North Washington Street • Alexandria, Virginia 22314

President	[illegible]
Executive Vice President	[illegible]
Director for Business Affairs and Treasurer	[illegible]
Director for Operations	[illegible]
Director for Program Development	[illegible]
Director for Research Design and Reporting	[illegible]

RESEARCH DIVISIONS

HumRRO Division No. 1 (System Operations) 300 North Washington Street Alexandria, Virginia 22314	[illegible]
HumRRO Division No. 2 Fort Knox, Kentucky 40121	[illegible]
HumRRO Division No. 3 [illegible]	[illegible]
HumRRO Division No. 4 [illegible]	
HumRRO Division No. 5 [illegible]	[illegible]
HumRRO Division No. 6 (Aviation) [illegible]	[illegible]
HumRRO Division No. 7 (Social Science) 300 North Washington Street Alexandria, Virginia 22314	[illegible]