THE VALIDITY OF THE CLERICAL APTITUDE RATING AS A FACTOR IN THE CLASSIFICATION OF WAFS IN THE STENOGRAPHIC SCHOOL

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PREFACE

As an instructor in the Stenographic School for Women in the Air Force (WAF) at Oklahoma Agricultural and Mechanical College, the writer was intensely interested to learn if the clerical aptitude rating as revealed by the Airman Classification Battery Test given the WAFS during their basic training was a valid factor in determining the class placement of each WAF in the Stenographic School.

In appreciation for the essential assistance necessary for the completion of her study, the writer wishes to express acknowledgment to Dr. Lloyd L. Garrison, under whose supervision the study was made. Dr. Garrison has been generous with his encouragement, guidance, and time. Heartfelt thanks is also extended to the directors and staff of the Air Force Stenographic School, without whose records and aid this study could not have been made.

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INTRODUCTION

Historical Background

A recruit of the Women's Air Force (WAF) begins her basic training at Lackland Air Force Base, San Antonio, Texas. During the six weeks' basic training period, each WAF is given a series of intensive classroom courses and an aptitude rating as determined by the Airman Classification Battery test to determine the interests and abilities of the "airman." The aptitude tests are administered in a standard order and processed by carefully selected, assigned, and trained airmen who in turn are supervised by experienced non-commissioned officers and professional psychologists, both military and civilian. Controlled conditions of test administration and processing are carefully maintained by a method of exhaustive checking, statistical control, auditing for reasonableness, and review. The Air Force Indoctrination Wing and its career-guidance counseling maintain close liaison.

> The Airman Classification Battery was developed upon the rationale of differential classification, which implies that each job or group of jobs requires a different pattern of aptitudes. The prediction of success in each of these jobs or groups of jobs requires the use of many tests which can be combined into weighted composites, depending upon their intercorrelations and correlations with the criteria of success on the job. The most efficient classification occurs when the separate tests, each as pure as possible, measure different aptitudes, or correlate low with one another and high with the criterion. The differentiation possible by use of such weighted composites depends on their validity for differential prediction,

which, as indicated above, is a function of differences in validity coefficients and the size of intercorrelations of tests.[1]

The Airman Classification Battery makes it possible for an individual to qualify for technical school training in any one of eight aptitude indices--mechanical, clerical, equipment operator, radio operator, technician specialty, services, craftsman, and electronics technician. A large portion, from 75 to 90 per cent, of the basic airmen who attain an aptitude index of 5 or higher are sent to technical schools after the completion of basic training.[2] The aptitude scores range from 1 to 9, with 1 being low and 9 high. Others are assigned without further training to their recommended career fields. All of the WAFS assigned to the Stenographic School at Oklahoma A. & M. College had clerical aptitudes of 5 to 9.

Technical training schools are in operation on many of the Air Force Bases and on college campuses. The technical training school from which data for this study were gathered is the Air Force Stenographic School at Oklahoma A. & M. College.

The first twenty-five of two hundred seventy-five women in the Air Force (WAFS) to be trained as stenographers on the Oklahoma A. & M. campus began their classes on July 9, 1951. For the next ten consecutive weeks, a new flight of twenty-five women began their training.

The organization of the Air Force Stenographic School at Oklahoma A. & M. College was realized by Contract No. AF 33 (038)-29271, entered

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[1]Donald B. Gragg and Mary Agnes Gordon, "Validity of the Airman Classification Battery AC-1," Air Training Command Human Resources Research Center Research Bulletin 50-3, Second Edition, (September, 1951), xix.

[2]Ibid., p. 9.

into as of 13 June 1951 under the provisions of Section 2 (c) (1) of the Armed Services Procurement Act of 1947 (Public Law 413, 80th Congress).

The Training Outline for Stenographers under the contract[3] reads:

1. PURPOSE: To train airmen to be proficient in taking dictation of correspondence, staff notes, informal hearings and proceedings, and reports through the use of Gregg Shorthand; and thereafter transcribe them by using a standard typewriter. To perform related stenographic duties, such as the maintenance of files, safeguarding classified information, and other routine office duties. To give airmen sufficient training to permit them, through on-the-job training and experience, to become efficient in taking and transcribing legal proceedings, such as courts, boards, and investigations, and other highly technical matters.

2. DURATION: Twenty-six (26) weeks (seven hundred eighty (780) academic hours.)

3. OUTLINE:

	Academic Hours
a. Typewriting	190
(1) Progressive typing designed to develop speed and accuracy in transcribing Gregg shorthand notes and to develop speed and accuracy in military typing at a sustained speed in excess of 50 words per minute.	(175)
(2) Evaluation.	(15)
b. Military Correspondence	60
(1) Military letters, indorsements, inclosure notations, and channels of communication.	(54)
(2) Evaluation.	(6)
c. English	70
(1) Sentence structure and punctuation as applied to written expression.	(45)
(2) Spelling, use of the dictionary, and syllabication.	(18)
(3) Evaluation.	(7)

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[3]United States Government Contract No. AF 33 (038)-29271, June 31, 1951.

d. Publication and Filing 60

(1) Alphabetical, numberical, chronological, and decimal filing systems. (40)

(2) Air Force standard and technical publications. (15)

(3) Evaluation. (5)

e. Gregg Shorthand 400

(1) Basic Principles of Gregg Shorthand--Introduction to Gregg Shorthand theory, consonants, consonant combinations, and blended consonants; vowels and their joinings; o-hook and o-hook modified; prefixes and suffixes; brief forms for common words; phrasing principles; and reading and dictation practice. (84)

(2) Application of Gregg Shorthand Principles--The oo-hook and oo-hook modified; the diphthongs and other vowel combinations; omission of u and ow; the final t and final d; the jent-d, pent-d, tive, ten-den, tem-dem, blends; compound words and irregular compounds; days and months; units of measure; and reading dictation, and transcription practice. Dictation at progressive speeds. (150)

(3) Dictation and Transcription of Military Correspondence--Most frequently used Air Force terms; intensive dictation and transcription of military letters; indorsements, inter-office memorandums and non-military letters; safeguarding classified information taken in dictation. (82)

(4) Legal Dictation and Transcription--Most commonly used legal terms; dictation and transcription of certificates, affidavits, court testimony, and board proceedings. (57)

(5) Miscellaneous Secretarial Duties--Routine office practice, work habits and receptionist duties and courtesies, normal secretarial files, such as personal, correspondence, diaries, and journals; taking telephone conversations and their transcriptions. (6)

(6) Evaluation. (21)

Total Academic Hours 780

Classes meeting six hours a day, five days a week for six months were set up as the training period. To follow the Training Outline, shorthand classes met for three hours a day. Typewriting classes met for two hours a day the first twelve weeks and then for one hour the remainder of the program. Military correspondence classes were conducted for one hour beginning the thirteenth week and ending the twenty-fourth week. English classes met for one hour the first fourteen weeks and publication and filing classes met for one hour the last twelve weeks.

Upon the recommendation of the School of Commerce, the Oklahoma A. & M. College Council voted to grant college credit for the work done by the WAFS, up to a maximum of 18 semester hours for each WAF. By March 31, 1952, 762 semester hours of English, 1809 semester hours of shorthand, and 716 semester hours of typewriting had been granted to 252 WAFS.

Statement and Purpose of the Study

The study was made from the compilation of data on 238 WAFS, trainees in the USAF Stenographic School for Women (Airmen) at Oklahoma A. & M. College, Stillwater, Oklahoma, between July 3, 1951 and March 31, 1952.

A method of assigning the WAFS to the class where they would make the most progress was needed. The purpose of this study is to determine the degree of correlation between the clerical aptitude ratings as revealed by the Airman Classification Battery Test of the WAFS and their final grades as an indication of the validity of the clerical aptitude rating in the classification of the WAFS in the Stenographic School.

The final shorthand grade as correlated with the clerical aptitude rating is based on the average of the weekly shorthand grades.

The final typewriting grade as correlated with the clerical aptitude rating is based on the best five-minute timed writing with five or less errors, taken in the last twelve weeks of the typewriting course.

The final English grade as correlated with the clerical aptitude rating is based on the average of the twelve weekly grades.

The final composite grade as correlated with the clerical aptitude rating is based on the final grades of all courses completed--typewriting, 20 per cent; military correspondence, 10 per cent; English, 10 per cent; military publication and filing, 10 per cent; and shorthand, 50 per cent. The final percentage grades were converted between 1.0 and 5.0, with 99 per cent equal to 5.0 and 55 per cent or below equal to 1.0.

To determine the degree of correlation between clerical aptitudes and final shorthand, typewriting, English, and composite grades, the WAFS were classified into three groups. Those WAFS with no previous training in shorthand and typewriting were classed as Beginners in Shorthand and Typewriting. If a WAF had no previous shorthand training but could stroke 30 CWPM on a 5-minute timed writing, she was classed in the group designated as Beginners in Shorthand and Advanced in Typewriting. The third group, Advanced in Shorthand and Typewriting, consisted of those WAFS with any previous shorthand training and who could stroke 30 CWPM on a 5-minute timed writing. This classification included 238 of the 275 WAFS assigned to the Stenographic School.

Four of the WAFS were not considered in the study, because they did not fit into one of the three classifications. These four WAFS had previous shorthand training, but they could not stroke 30 CWPM on a 5-minute timed writing. Ten of the WAFS not considered in the study were graduated as Clerk-Typists, due to their limited clerical abilities.

Twenty-three of the WAFS assigned to the Stenographic School were eliminated from the school for various reasons.

The relationships of the clerical aptitude ratings to the following factors were computed:

1. Final shorthand grade upon graduation
    a. Beginners in shorthand and typewriting
    b. Beginners in shorthand, advanced in typewriting
    c. Advanced in shorthand and typewriting
    d. Combination of all classifications
2. Final typewriting grade upon graduation
    a. Beginners in shorthand and typewriting
    b. Beginners in shorthand, advanced in typewriting
    c. Advanced in shorthand and typewriting
    d. Combination of all classifications
3. Final English grade upon graduation
    a. Beginners in shorthand and typewriting
    b. Beginners in shorthand, advanced in typewriting
    c. Advanced in shorthand and typewriting
    d. Combination of all classifications
4. Final composite grade upon graduation
    a. Beginners in shorthand and typewriting
    b. Beginners in shorthand, advanced in typewriting
    c. Advanced in shorthand and typewriting
    d. Combination of all classifications

Need for Study

A need to know the reliability of the clerical aptitude ratings of the WAFS as a factor in assigning the WAFS to their classes is felt by the directors and staff of the Stenographic School.

After the WAFS have been in the Stenographic School for a few weeks, the flights are regrouped. A WAF with advanced clerical training is assigned to one of the first flights to begin training. The girls who are beginning clerical training for the first time are grouped with the last flights to begin training.

With only one flight of 25 coming in each week, a tedious task arises as to how to group the students in more homogenous classes. Within each flight, there is a wide range of clerical training, education, and aptitudes. However, as each flight begins at the beginning of each course, the question is if those WAFS with the higher clerical aptitude ratings who have had training in typewriting would learn more readily, thus being grouped with the shorthand students who can already take dictation up to the rate of 60 words per minute. Is the clerical aptitude rating of any significance in the grouping of the WAFS once they have been assigned to the Stenographic School?

The contract between the Government and Oklahoma A. & M. College stipulates that the government pay the College $1.10 per academic hour per WAF. For this sum each WAF should have individualized consideration. She should be in the class commensurate with her abilities. How are the directors of the Stenographic School to judge where to place each student?

The training each WAF receives at Oklahoma A. & M. College will reflect the academic standard of the college. Oklahoma A. & M. needs to check every possible means of improving its WAF training program in order to reflect a high standard for the college through giving individualized consideration. The directors of the Stenographic School anxiously await suggestions to improve the quality of instruction.

Limitations

1. This study is limited to the 238 WAFS who completed the Stenographic Course at Oklahoma A. & M. College, July 9, 1951 to March 31, 1952.
2. This study is limited to the correlation between clerical aptitude and the final shorthand, typewriting, English, and composite grades.

3. The study is further limited in that only airmen with a clerical aptitude rating of 5 or better are assigned to stenographic training.

Definitions

Correlation--The relationship of one ability to another.

Coefficient of Correlation--

> Correlation is the extent to which an individual tends to be in the same relative position in each of two series. Perfect correlation, denoted by the figure 1.00, means that there is exact correspondence. No correlation at all, denoted by .00, means that, if you know what a pupil's score on one test is, you have no basis for estimating his score on the other test. Negative coefficients indicate relationship between the two series, but an inverse one.[4]

PE_r--The probable error of a coefficient of correlation means that the chances are even (50 in 100) that the "true" r falls within the calculated "r" plus or minus the PE.

CWPM--Gross strokes ÷ 5 = Gross words - Errors = Correct words ÷ Time

Beginning shorthand student--A student with no previous shorthand training upon entrance in the Stenographic School.

Beginning typewriting student--A student who cannot stroke 30 CWPM on a 5-minute timed writing upon entrance in the Stenographic School.

Beginning shorthand and advanced typewriting student--A student with no previous shorthand training, but who can stroke 30 CWPM on a 5-minute timed writing upon entrance in the Stenographic School.

Advanced shorthand student--A student with any previous training or knowledge of shorthand upon entrance in the Stenographic School.

Advanced typewriting student--A student who can stroke at least 30 CWPM on a 5-minute timed writing upon entrance in the Stenographic School.

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[4]Carter V. Good, A. S. Barr, and Douglas E. Scates, The Methodology of Educational Research (New York: 1941), p. 606.

Final Composite Grade--The final grade of each course is weighted as follows: typewriting, 20 per cent; military correspondence, 10 per cent; English, 10 per cent; military publication and filing, 10 per cent; Gregg shorthand, 50 per cent to obtain the final composite grade.

Final Shorthand Grade--Based on the average of the twenty-four weekly grades.

Final Typewriting Grade--Based on the best 5-minute timed writing with five or less errors taken in the last twelve weeks of the course.

Final English Grade--Based on the average of the twelve weekly grades.

Related Literature

Due, possibly, to the recency of the program, no correlation study of this kind has been made.

In an article by G. Samuells,[5] mention is made of the aptitude tests to determine the interests and abilities of the "airmen" before assignment out of basic training.

In the May 1, 1951 issue of Higher Education,[6] the Commission on Accreditation of Service Experiences, recommends that credit for formal service school training continue to be granted. The Commission states that credit should be limited to educational programs and experiences which can be reported in terms of measurable academic standards.

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[5]G. Samuells, "Its Hup, 2, 3, 4, and Yes, Ma'am," New York Times Magazine, (September 3, 1950), 10-11.

[6]American Council of Education Commission on Accreditation of Service Experiences, "Accreditation of Service Experiences," Higher Education, (May 1, 1951), pp. 199-200.

In the Air Training Command Research Bulletin,[7] "Validity of the Airman Classification Battery AC-1," the basic principle of the battery is stated that each airman specialty requires a different combination of specific aptitudes. Accordingly, there are eight aptitude indices, each representing an aptitude cluster and each composed of a different combination of differentially weighted tests. Because the aptitude index determines a man's eligibility for technical school training, its validity is of prime importance.

The criterion in the study was the final average grade in the Stenographic School at Frances E. Warren Air Force Base and Lowry Air Force Base (May 1947-November 1948). A correlation with the final average grades was made of each of the variables in the Airman Classification Battery test--arithmetic reasoning; dial and table reading; numerical operations; aviation information; background for current affairs; electrical information; mechanical principles; general mechanics; tool functions; speed of identification; memory for landmarks; reading comprehension; numberical operations; army general classification test; army general classification test 3, arithmetic computation; army general classification test 3, arithmetic reasoning; army general classification test, pattern analysis; army general classification test, reading vocabulary; adjutant general mechanical aptitude test, form 2; ages in years; education in years. All correlations were positive, ranging from .00-.42.

The authors of the Research Bulletin 50-3 feel that as the efficiency of the Airman Classification Battery test is improved, it will result in further substantial savings by means of more effective utilization of talents available to the Air Force.

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[7]Gragg and Gordon, "Validity of the Airman Classification Battery AC-1," p. 3.

Sources of Data

A data card was prepared for each of the 238 cases used for the study. Data were collected for these cards from the registration cards filled out by each WAF and which are on file in the Registrar's Office at Oklahoma A. & M. College. The registration cards contain the following information: name, birth date, birthplace, education, permanent address, college credit received.

The clerical aptitude ratings were taken from records in the office of the Air Force Stenographic School. From the cumulative grade record sheets in the Stenographic School Office, the final composite grade and the final shorthand, English, and typewriting grades were recorded on each data card. The degree of typewriting skill of each WAF when she entered training was obtained from the cumulative grade record sheet in the Stenographic School Office.

Through a brief interview with each shorthand instructor, the beginning shorthand skill upon entrance of each WAF was obtained from the shorthand instructor who had her the first weeks she was in school. Because the Stenographic School Office kept no record of beginning shorthand skills, this method of determining the beginning shorthand skill of each WAF was used. If the WAF had no previous shorthand training, she was classified as a beginner. Any amount of shorthand training placed the student in the advanced shorthand classification.

Method of Approach

The scientific method was employed in this study.

The data were grouped as to the final shorthand, typewriting, and English grades, and final composite grades of 238 WAFS who completed the

stenographic training. In addition, these groups were subdivided into three classifications based upon entrance skill--21 beginners in shorthand and typewriting, 82 beginners in shorthand and advanced in typewriting, and 135 advanced in shorthand and typewriting. The aptitudes of these WAFS ranged from 5 to 9.

The grouped data of aptitudes, grades of each subdivision and the combination of all classifications were recorded on scattergrams. From the scattergrams, the information was transferred to the tables for the purpose of determining the relationships through the method of the coefficient of correlation. The coefficient, expressed by the letter "r," is obtained through the Pearson product-moment method.

> Perfect correlation, denoted by the figure 1.00, means that there is exact correspondence. No correlation at all, denoted by .00, means that, if you know what a pupil's score on one test is, you have no basis for estimating his score on the other test. Negative coefficients indicate a relationship between the two series, but an inverse one.[8]

The tables used enable the computation of two standard deviations simultaneously, one on the X axis and one on the Y axis.

The totals for the bottom lines of the tables x', fx', fx'^2, Sy', $Sx'y'$, give the X standard deviation. The totals on the right, y', fy', fy'^2, Sx', $Sx'y'$, supply the Y standard deviation.

The sums of fx', fx'^2, Sy', $Sx'y'$, for the X axis are given as are the sums of fy', fy'^2, Sx', $Sx'y'$, for the Y axis. In checking the correctness of these totals, the Sy' must equal the sum of fy'; fx' must equal Sx'; and the $Sx'y'$ of the X axis must equal the sum of the $Sx'y'$ of the Y axis.

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[8]Good, Barr, and Scates, The Methodology of Education Research, p. 606.

The means of the sums are found by dividing Sfy' by the total number of the sample and by dividing Sfx' by the same number.

The probable error of the obtained "r" was computed. The probable error of a coefficient of correlation depends upon the size of the obtained "r" and upon "N." If "N" is a representative number, the PE means that the chances are even (50 in 100) that the "true" r falls within the calculated "r" plus or minus the PE. The true "r" is the correlation normally expected to be found between the aptitude ratings and the final grades. The "r" should be four times its PE to be reasonably sure that at least some degree of correlation greater than zero is present. A low "r" should be five or six times its PE to be certain of at least a small degree of correlation.[9]

$$\sigma_y = \sqrt{\frac{Sfy'^2}{N} - c^2_y} \times i \qquad \sigma_x = \sqrt{\frac{Sfx'^2}{N} - c^2_x} \times i$$

$$r = \frac{\frac{Sx'y'}{N} - (c_y \times c_x)}{\sqrt{\frac{fy'^2}{N} - c^2_y}\sqrt{\frac{fx'^2}{N} - c^2_x}} \qquad PE_r = \frac{.6745\,(1 - r^2)}{\sqrt{N}}$$

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[9]Henry E. Garrett, Statistics in Psychology and Education, (New York, 1947), p. 281.

CHAPTER II.

CORRELATION BETWEEN CLERICAL APTITUDE AND FINAL SHORTHAND GRADE

Beginners in Shorthand and Typewriting

The final shorthand grades for the 21 beginners in shorthand and typewriting ranged from 70 to 94. It can be noted from Table I, page 16, that 11 or 52 per cent of the 21 had final shorthand grades between 80 and 84. Of this number, 3 had a clerical aptitude rating of 8, 5 had a clerical aptitude rating of 7, and 3 had a clerical aptitude rating of 6. Four or 19 per cent made a final shorthand grade above 84, and 6 or 29 per cent made a shorthand grade less than 80. Two students, each with clerical aptitude ratings of 8, made the lowest and highest final shorthand grades. There were no beginners in shorthand and typewriting with a clerical aptitude rating of 9.

The coefficient of correlation between the final shorthand grade of the 21 WAFS and the clerical aptitude ratings of these trainees and the probable error of this coefficient of correlation is also shown on page 16. The coefficient of correlation, r, was found to be .05, with a PE_r of $\pm$ .15.

Beginners in Shorthand, Advanced in Typewriting

Table II, page 18, reveals that the final shorthand grades ranged from 70-99 for the 82 beginners in shorthand and advanced in typewriting students. Twenty-eight or 34 per cent of the 82 had final shorthand grades between 80-84. Of this number, 1 had an aptitude rating of 9, 9 had an aptitude rating of 8, 8 had an aptitude rating of 7, and 10 had an

TABLE I - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL SHORTHAND GRADES OF BEGINNERS IN SHORTHAND AND TYPEWRITING

x = Final Shorthand Grades

Clerical Aptitudes	70-74	75-79	80-84	85-89	90-94	f_y	y'	fy'	fy'^2	$Sx'y'$ ✓	$Sx'y'$ -	Sx'	$Sx'y'$
	(-2)	(-1)	(0)	(1)	(2)								
8	1 -2	2 -2	3 0	1 1	1 2	8	1	8	8	3	4	-1	-1
7		(0) 1 0	(0) 5 0	(0) 2 0		8	0					1	0
6		(1) 2 2	(0) 3 0			5	-1	-5	5	2		-2	2
f_x	1	5	11	3	1	21		3	13	5 - 4 (1)		-2	1
x'	-2	-1	0	1	2								
fx'	-2	-5		3	2 = -2								
fx'^2	4	5		3	4 = 16								
Sy'	1	0	0	1	1 = 3								
$Sx'y'$	-2	0	0	1	2 = 1								

$c_y = \frac{3}{21} = .143$ $\quad c^2_y = .0205$ $\quad c_x = \frac{-2}{21} = -.095$ $\quad c^2_x = .009$

$\sigma_y = \sqrt{\frac{13}{21} - .0205} \times 1 = .7736 \times 1 = .7736$

$\sigma_x = \sqrt{\frac{16}{21} - .009} \times 5 = .867 \times 5 = 4.335$

$r = \frac{\frac{1}{21} - (.143 \times (-.095))}{.7736 \times .867} = .05$

$PE_r = \frac{.6745 (1 - .05^2)}{\sqrt{21}} = .15$

aptitude rating of 6. Forty-one or 50 per cent of the 82 had final shorthand grades above 84, and 13 or 16 per cent had final shorthand grades below 80.

There were no students with aptitude ratings of 9 with shorthand grades below 80. The 4 students with aptitude ratings of 9 made shorthand grades between 80-99. A shorthand grade of 95-99 was not made by anyone with an aptitude rating of 6.

The coefficient of correlation between the final shorthand grades of the 82 WAFS and the clerical aptitude ratings of these students, r, was found to be .16, with a PE_r of $\pm$ .06.

Advanced in Shorthand and Typewriting

For the 135 advanced in shorthand and typewriting, the final shorthand grades tabulated on Table III, page 20, show the grades ranged from 75-99. Twenty-six or 19 per cent of the 135 students had final shorthand grades between 80-84. Of this number, 6 had clerical aptitude ratings of 8; 9 had clerical aptitude ratings of 7; 10 had clerical aptitude ratings of 6; and 1 had a clerical aptitude rating of 5. One hundred six or 79 per cent of the advanced students in shorthand and typewriting made a final shorthand grade better than 84; 3 or 2 per cent made a lower shorthand grade than 80.

While no student with a clerical aptitude of 9 made a grade below 85 and no student with a clerical aptitude of 8 made a grade below 80, there were students in all clerical aptitude classifications who made final shorthand grades between 95-99.

The coefficient of correlation between the final shorthand grades of the 135 WAFS and their clerical aptitude ratings and the probable

TABLE II - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL SHORTHAND GRADES OF BEGINNERS IN SHORTHAND AND ADVANCED IN TYPEWRITING

x = Final Shorthand Grades

Clerical Aptitudes	70-74	75-79	80-84	85-89	90-94	95-99	f_y	y'	fy'	fy'^2	$Sx'y'$	Sx'	$Sx'y'$
9			(0) 1 0	(2) 1 2	(4) 1 4	(6) 1 6	4	2	8	16	12	6	12
8	(-2) 1 -2	(-1) 2 -2	(0) 9 0	(1) 3 3	(2) 6 12	(3) 1 3	22	1	22	22	18 4	14	14
7		(0) 6 0	(0) 8 0	(0) 10 0	(0) 6 0	(0) 1 0	31	0				19	0
6	(2) 1 2	(1) 3 3	(0) 10 0	(-1) 7 -7	(-2) 4 -8		25	-1	-25	25	5 15	10	-10
f_x	2	11	28	21	17	3	82		5	63	35-19 (16)	49	16
x'	-2	-1	0	1	2	3							
fx'	-4	-11		21	34	9 =	49						
fx'^2	8	11		21	68	27 =	135						
Sy'	0	-1	1	-2	4	3 =	5		$c_y = \frac{5}{82} = .0607$			$c_x = \frac{49}{82} = .597$	
$Sx'y'$	0	1	0	-2	8	9 =	16		$c^2_y = .0037$			$c^2_x = .3564$	

$$\sigma_y = \sqrt{\frac{63}{82} - .0037} \times 1 = .8744 \times 1 = .8744$$

$$\sigma_x = \sqrt{\frac{135}{82} - .3564} = 1.136 \times 5 = 5.68$$

$$r = \frac{\frac{16}{82} - (.0607 \times .597)}{.8744 \times 1.136} \qquad r = .16$$

$$PE_r = \frac{.6745\,(1 - .16^2)}{\sqrt{82}} = .06$$

error of this coefficient of correlation is shown on page 20. The coefficient of correlation, r, was found to be .29, with a PE_r of $\pm$ .06.

Combination of All Classifications

Seventy to 99 was the range of the final shorthand grades of the 238 stenographic graduates shown on Table IV, page 21. Eighty-seven or 37 per cent of the students had an aptitude rating of 7. Of these 87, 9 or 10 per cent had a final shorthand grade between 75-79; 22 or 25 per cent had a final shorthand grade between 80-84; 27 or 31 per cent had a final shorthand grade between 85-89; 22 or 25 per cent had a final shorthand grade between 90-94; and 7 or 9 per cent had a final shorthand grade between 95-99.

The coefficient of correlation between the final shorthand grades of the 238 WAFS and the clerical aptitude ratings of these students, r, was found to be .25, with a PE_r of $\pm$ .04.

TABLE III - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL SHORTHAND GRADES OF ADVANCED IN SHORTHAND AND TYPEWRITING

x = Final Shorthand Grades

Clerical Aptitudes	75-79	80-84	85-89	90-94	95-99	f_y	y'	fy'	fy'^2	$Sx'y'$	Sx'	$Sx'y'$
9			(0) 2 0	(2) 9 18	(4) 2 8	13	2	26	52	26	13	26
8		(-1) 6 -6	(0) 12 0	(1) 14 14	(2) 11 22	43	1	43	43	36 6	30	30
7	(0) 2 0	(0) 9 0	(0) 15 0	(0) 16 0	(0) 6 0	48	0				15	0
6	(2) 1 2	(1) 10 10	(0) 6 0	(-1) 11 -11	(-2) 2 -4	30	-1	-30	30	12 15	3	-3
5		(2) 1 2				1	-2	-2	4	2	-1	2
f_x	3	26	35	50	21	135		37	129	76-21 (55)	60	55
x'	-2	-1	0	1	2							
fx'	-6	-26		50	42 =	60						
fx'^2	12	26		50	84 =	172						
Sy'	-1	-6	10	21	13 =	37		$\sigma_y = \frac{37}{135} = .274$			$\sigma_x = \frac{60}{135} = .444$	
$Sx'y'$	2	6	0	21	26 =	55		$\sigma^2_y = .075$			$\sigma^2_x = .197$	

$\sigma_y = \sqrt{\frac{129}{135} - .075} \times 1$ = .9386 x 1 = .9386

$\sigma_x = \sqrt{\frac{172}{135} - .197} \times 5$ = 1.0378 x 5 = 5.189

$r = \frac{\frac{55}{135} - (.274 \times .444)}{.9386 \times 1.0378}$ r = .29

$PE_r = \frac{.6745 (1 - .29^2)}{\sqrt{135}}$ = .06

TABLE IV - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL SHORTHAND GRADES OF COMBINATION OF ALL CLASSIFICATIONS

x = Final Shorthand Grades

Clerical Aptitudes	70-74	75-79	80-84	85-89	90-94	95-99	f_y	y'	fy'	fy'^2	Sx' ✓	y' -	Sx'	$Sx'y'$
9			(-2) 1 -2	(0) 3 0	(2) 10 20	(4) 3 12	17	2	34	68	32	2	15	30
8	(-3) 2 -6	(-2) 4 -8	(-1) 18 -18	(0) 16 0	(1) 21 21	(2) 12 24	73	1	73	73	45	32	13	13
7		(0) 9 0	(0) 22 0	(0) 27 0	(0) 22 0	(0) 7 0	87	0					-4	0
6	(3) 1 3	(2) 6 12	(1) 23 23	(0) 13 0	(-1) 15 -15	(-2) 2 -4	60	-1	-60	60	38	19	-19	19
5			(2) 1 2				1	-2	-2	4	2		-1	2
f_x	3	19	65	59	68	24	238		45	205	117-53 (64)		4	64
x'	-3	-2	-1	0	1	2								
fx'	-9	-38	-65		68	48 =	4							
fx'^2	27	76	65		68	96 =	332							
Sy'	1	-2	-5	9	26	16 =	45		$c_y = \frac{45}{238} = .189$				$c_x = \frac{4}{238} = .017$	
$Sx'y'$	-3	4	5	0	26	32 =	64		$c^2_y = .0357$				$c^2_x = .0003$	

$$\sigma_y = \sqrt{\frac{205}{238} - .0357} \times 1 = .9086 \times 1 = .9086$$

$$\sigma_x = \sqrt{\frac{332}{238} - .0003} \times 5 = 1.18 \times 5 = 5.9$$

$$r = \frac{\frac{64}{238} - (.189 \times .017)}{.9086 \times 1.18} \qquad r = .25$$

$$PE_r = \frac{.6745\,(1 - .25^2)}{\sqrt{238}} = .04$$

CHAPTER III.

CORRELATION BETWEEN CLERICAL APTITUDE AND FINAL TYPEWRITING GRADE

Beginners in Shorthand and Typewriting

The final typewriting grades of the 21 beginners in shorthand typewriting ranged from 35-70 CWPM. It is revealed from Table V, page 23, that there was no positive correlation between clerical aptitude and final typewriting grades. Four students with clerical aptitudes of 8 made final typewriting grades between 35-49 CWPM, and 4 with the same clerical aptitude rating made between 55-70 CWPM.

The coefficient of correlation between the final typewriting grades of the 21 WAFS and the clerical aptitude ratings of these students and the probable error of this coefficient of correlation is shown on page 23. The coefficient of correlation, r, was found to be .00, with a PE_r of $\pm$ .15.

Beginners in Shorthand, Advanced in Typewriting

Table VI, page 24, shows the final typewriting grades of the 82 beginners in shorthand and advanced in typewriting ranged from 45-90 CWPM. There was little positive relationship in this correlation. Those students with clerical aptitude ratings of 9 made final typewriting grades between 50-80 CWPM, as did those students with clerical aptitude ratings of 6.

The coefficient of correlation between the final typewriting grades of the 82 WAFS and the clerical aptitude ratings of these trainees, r, was found to be .17, with a PE_r of $\pm$ .07. Table VI also shows the probable error of the coefficient of correlation.

TABLE V - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL TYPEWRITING GRADES OF BEGINNERS IN SHORTHAND AND TYPEWRITING

x = Final Typewriting Grades

Clerical Aptitudes	35-39	40-44	45-49	50-54	55-59	60-64	65-69	f_y	y'	fy'	fy'^2	Sx' / y'	Sx'	$Sx'y'$
8	(-3) 1 -3	(-2) 1 -2	(-1) 2 -2		(1) 2 2	(2) 1 2	1 3	8	1	8	8	7 / 7	0	0
7		(0) 1 0	(0) 2 0	(0) 1 0	(0) 2 0	(0) 2 0		8	0				2	0
6			(1) 3 3		(-1) 1 -1	(-2) 1 -2		5	-1	-5	5	3 / 3	0	0
f_x	1	2	7	1	5	4	1	21		3	13	10-10 (0)	2	0
x'	-3	-2	-1	0	1	2	3							
fx'	-3	-4	-7		5	8	3 =	2						
fx'^2	9	8	7		5	16	9 =	54						
Sy'	1	1	-1	0	1	0	1 =	3						
$Sx'y'$	-3	-2	1	0	1	0	3 =	0						

$c_y = \frac{3}{21} = .14$ $\qquad$ $c_x = \frac{2}{21} = .095$

$c^2_y = .0196$ $\qquad$ $c^2_x = .009$

$$\sigma_y = \sqrt{\frac{13}{21} - .0196} \times 1 \qquad \sigma_x = \sqrt{\frac{54}{21} - .009} \times 5$$

$$r = \frac{\frac{0}{21} - (.14 \times .095)}{}$$

$r = .00$

$$PE_r = \frac{.6745\,(1 - 0^2)}{\sqrt{21}}$$

$= .15$

TABLE VI - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL

TYPEWRITING GRADES OF BEGINNERS IN SHORTHAND AND ADVANCED IN TYPEWRITING

x = Final Typewriting Grades

Clerical Aptitudes	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	f_y	y'	fy'	fy'^2	$Sx'y'$	Sy'	Sx'	$Sx'y'$
9		1 (-6) -6		1 (-2) -2	1 (0) 0		1 (4) 4			4	2	8	16	4	8	-2	-4
8	1 (-4) -4	1 (-3) -3	1 (-2) -2	4 (-1) -4	5 (0) 0	2 (1) 2	4 (2) 8	2 (3) 6	2 (4) 8	22	1	22	22	24	13	11	11
7	1 (0) 0	3 (0) 0	3 (0) 0	8 (0) 0	5 (0) 0	8 (0) 0	2 (0) 0	1 (0) 0		31	0					-12	0
6		2 (3) 6	4 (2) 8	8 (1) 8	6 (0) 0	3 (-1) -3	2 (-2) -4			25	-1	-25	25	22	7	-15	15
f_x	2	7	8	21	17	13	9	3	2	82		5	63	50-28 (22)		-18	22
x'	-4	-3	-2	-1	0	1	2	3	4								
fx'	-8	-21	-16	-21		13	18	9	8 = -18								
fx'^2	32	63	32	21		13	36	27	32 = 256								
Sy'	1	1	-3	-2	1	-1	4	2	2 = 5								
$Sx'y'$	-4	-3	6	2	0	-1	8	6	8 = 22								

$\sigma_y = \frac{5}{82} = .0607$ $\sigma_x = \frac{-18}{82} = .2195$

$\sigma^2_y = .0037$ $\sigma^2_x = .0482$

$$\sigma_y = \sqrt{\frac{63}{82} - .0037} \times 1 = .8744 \times 1 = .8744$$

$$\sigma_x = \sqrt{\frac{256}{82} - .0482} \times 5 = 1.7532 \times 5 = 8.766$$

$$r = \frac{\frac{22}{82} - (.0607 \times (-.2195))}{.8744 \times 1.7532} \qquad r = .17$$

$$PE_r = \frac{.6745\,(1 - .17^2)}{\sqrt{82}} = .07$$

Advanced in Shorthand and Typewriting

For the 135 students advanced in shorthand and typewriting, the final typewriting grades ranged from 45-95 CWPM. From Table VII, page 26, it can be recognized that while no student with a clerical aptitude rating of 9 had a final typewriting grade better than 90 CWPM, neither did any with this rating have a final grade below 55 CWPM. Of the 13 students with clerical aptitude ratings of 9, 9 had final grades above 75 CWPM.

The coefficient of correlation between the final typewriting grades of the 135 WAFS and the clerical aptitude ratings of these trainees and the probable error of this coefficient of correlation is also shown on page 26. The coefficient of correlation, r, was found to be .13, with a PE_r of $\pm$ .06.

Combination of All Classifications

Thirty-five to 95 CWPM was the range of the typewriting grades made by the stenographic graduates as shown on Table VIII, page 27. With the exception of the group with clerical aptitudes of 6, it can be noted that the percentage of those making final grades below 55 in each clerical aptitude classification increased as the clerical aptitude rating decreased.

The percentage of those making final grades above 75 in each clerical aptitude classification increased as the clerical aptitude rating increased.

The coefficient of correlation between the final typewriting grades of the 238 WAFS and the clerical aptitude ratings of these trainees, r, was found to be .19, with a PE_r of $\pm$ .04.

TABLE VII - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL TYPEWRITING GRADES OF ADVANCED IN SHORTHAND AND TYPEWRITING

x = Final Typewriting Grades

Clerical Aptitudes

	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	f_y	y'	fy'	fy'^2	$Sx'y'$	Sx'	$Sx'y'$
9			(-6) 1 -6	(-4) 1 -4	(-2) 1 -2	(0) 1 0	(2) 5 10	(4) 2 8	(6) 2 12		13	2	26	52	30 / 12 -	9	18
8		(-4) 1 -4	(-3) 3 -9	(-2) 9 -18	(-1) 6 -6	(0) 9 0	(1) 5 5	(2) 5 10	(3) 3 9	(4) 2 8	43	1	43	43	32 37	-5	-5
7	(0) 1 0	(0) 2 0	(0) 4 0	(0) 5 0	(0) 11 0	(0) 7 0	(0) 9 0	(0) 4 0	(0) 3 0	(0) 2 0	48	0				-12	0
6		(4) 1 4	(3) 3 9	(2) 7 14	(1) 6 6	(0) 6 0	(-1) 6 -6	(-2) 1 -2			30	-1	-30	30	33 8	-25	25
5					(2) 1 2						1	-2	-2	4	2	-1	2
f_x	1	4	11	22	25	23	25	12	8	4	135		37	129	97-57 (40)	34	40
x'	-5	-4	-3	-2	-1	0	1	2	3	4							
fx'	-5	-16	-33	-44	-25		25	24	24	16 =	34						
fx'^2	25	64	99	88	25		25	48	72	64 =	510						
Sy'	0	0	2	4	0	5	9	8	7	2 =	37		$\sigma_y = \frac{37}{135} = .274$			$\sigma_x = \frac{34}{135} = .252$	
$Sx'y'$	0	0	-6	-8	0	0	9	16	21	8 =	40		$\sigma^2_y = .075$			$\sigma^2_x = .0635$	

$$\sigma_y = \sqrt{\frac{129}{135} - .075} \times 1 = .9386 \times 1 = .9386$$

$$\sigma_x = \sqrt{\frac{510}{135} - .0635} \times 5 = 1.927 \times 5 = 9.635$$

$$r = \frac{\frac{40}{135} - (.274 \times .252)}{.9386 \times 1.927} = .13$$

$$PE_r = \frac{.6745\,(1 - .13^2)}{\sqrt{135}} = .06$$

TABLE VIII - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL TYPEWRITING GRADES OF COMBINATION OF ALL CLASSIFICATIONS

x = Final Typewriting Grades

Clerical Aptitudes	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	f_y	y'	fy'	fy'^2	$Sx'y'$	Sx'	$Sx'y'$
9				(-6) 1 -6	(-4) 1 -4	(-2) 2 -4	(0) 2 0	(2) 1 2	(4) 6 24	(6) 2 12	(8) 2 16		17	2	34	68	54 14	20	40
8	(-6) 1 -6	(-5) 1 -5	(-4) 3 -12	(-3) 2 -6	(-2) 6 -12	(-1) 14 -14	(0) 12 0	(1) 11 11	(2) 9 18	(3) 7 21	(4) 5 20	(5) 2 10	73	1	73	73	80 55	25	25
7		(0) 1 0	(0) 4 0	(0) 6 0	(0) 9 0	(0) 15 0	(0) 16 0	(0) 15 0	(0) 11 0	(0) 5 0	(0) 3 0	(0) 2 0	87	0				2	0
6			(4) 3 12	(3) 3 9	(2) 8 16	(1) 16 16	(0) 12 0	(-1) 9 -9	(-2) 8 -16	(-3) 1 -3			60	-1	-60	60	53 28	-25	25
5							(0) 1 0						1	-2	-2	4	0 0	0	0
f_x	1	2	10	12	24	47	43	36	34	15	10	4	238		45	205	187-97 (90)	22	90
x'	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5							
fx'	-6	-10	-40	-36	-48	-47		36	68	45	40	20 =	22						
fx'^2	36	50	160	108	96	47		36	136	135	160	100 =	1064						
Sy'	1	1	0	1	0	2	2	4	13	10	9	2 =	45						
$Sx'y'$	-6	-5	0	-3	0	-2	0	4	26	30	36	10 =	90						

$\sigma_y = \frac{45}{238} = .189$ $\sigma_x = \frac{22}{238} = .092$

$\sigma^2_y = .0357$ $\sigma^2_x = .0085$

$$\sigma_y = \sqrt{\frac{205}{238} - .0357} \times 1 = .9086 \times 1 = .9086$$

$$\sigma_x = \sqrt{\frac{1064}{238} - .0085} \times 5 = 2.112 \times 5 = 10.56$$

$$r = \frac{\frac{90}{238} - (.189 \times .092)}{.9086 \times 2.112} = .19$$

$$PE_r = \frac{.6745\,(1 - .19^2)}{\sqrt{238}} = .04$$

CHAPTER IV.

CORRELATION BETWEEN CLERICAL APTITUDE AND FINAL ENGLISH GRADE

Beginners in Shorthand and Typewriting

It is shown in Table IX, page 29, that all 5 students with clerical aptitudes of 6 made between 80-85 as their final English grade, while the final English grades of the 8 students with clerical aptitude ratings of 8 ranged from 70-100.

The coefficient of correlation between the final English grades of the 21 WAFS and the clerical aptitude ratings of these trainees, r, was found to be .25, with a PE_r of $\pm .14$.

Beginners in Shorthand, Advanced in Typewriting

The final English grades of the 82 beginners in shorthand and advanced in typewriting ranged from 70-100. Table X, page 30, discloses that all 4 of those students with clerical aptitude ratings of 9 scored above 90 on their final English grade. Of 22 with clerical aptitude ratings of 8, only 5 scored less than 85. No student with a clerical aptitude rating of 6 scored above 95.

The coefficient of correlation between the final English grades of the 82 WAFS and the clerical aptitude ratings of these trainees and the probable error of this coefficient of correlation is shown on page 30. The coefficient of correlation, r, was found to be .44, with a PE_r of $\pm .06$.

TABLE IX - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL ENGLISH GRADES OF BEGINNERS IN SHORTHAND AND TYPEWRITING

x = Final English Grades

Clerical Aptitudes	70-74	75-79	80-84	85-89	90-94	95-99	f_y	y'	fy'	fy'^2	$Sx'y'$ ✓	$Sx'y'$ −	Sx'	$Sx'y'$
8	(-3) 1 -3		(-1) 1 -1	(0) 2 0	(1) 3 3	(2) 1 2	8	1	8	8	5	4	1	1
7		(0) 2 0	(0) 1 0	(0) 2 0	(0) 2 0	(0) 1 0	8	0					-1	0
6			(1) 5 5				5	-1	-5	5	5		-5	5
f_x	1	2	7	4	5	2	21		3	13	10 − 4 (6)		-5	6
x'	-3	-2	-1	0	1	2								
fx'	-3	-4	-7		5	4 =	-5							
fx'^2	9	8	7		5	8 =	37							
Sy'	1	0	-4	2	3	1 =	3		$c_y = \frac{3}{21} = .143$				$c_x = \frac{-5}{21} = -.238$	
$Sx'y'$	-3	0	4	0	3	2 =	6		$c^2_y = .0205$				$c^2_x = .0566$	

$$\sigma_y = \sqrt{\frac{13}{21} - .0205} \times 1 = .7736 \times 1 = .7736$$

$$\sigma_x = \sqrt{\frac{37}{21} - .0566} \times 5 = 1.3058 \times 5 = 6.529$$

$$r = \frac{\frac{6}{21} - (.14 \times (-.238))}{.7736 \times 1.3058} \qquad r = .25$$

$$PE_r = \frac{.6745\,(1 - .25^2)}{\sqrt{21}} = .14$$

TABLE X - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL

ENGLISH GRADES OF BEGINNERS IN SHORTHAND AND ADVANCED IN TYPEWRITING

x = Final English Grades

Clerical Aptitudes	70-74	75-79	80-84	85-89	90-94	95-99	f_y	y'	fy'	fy'^2	$Sx'y'$	Sx'	$Sx'y'$
9					(2) 1 2	(4) 3 12	4	2	8	16	14	7	14
8		(-2) 1 -2	(-1) 4 -4	(0) 7 0	(1) 4 4	(2) 6 12	22	1	22	22	16 6	10	10
7	(0) 1 0	(0) 3 0	(0) 7 0	(0) 6 0	(0) 7 0	(0) 7 0	31	0				5	0
6	(3) 1 3	(2) 8 16	(1) 7 7	(0) 4 0	(-1) 5 -5		25	-1	-25	25	26 5	-21	21
f_x	2	12	18	17	17	16	82		5	63	56-11 (45)	1	45
x'	-3	-2	-1	0	1	2							
fx'	-6	-24	-18		17	32 =	1						
fx'^2	18	48	18		17	64 =	165						
Sy'	-1	-7	-3	3	1	12 =	5		$c_y = \frac{5}{82} = .0607$			$c_x = \frac{1}{82} = .0122$	
$Sx'y'$	3	14	3	0	1	24 =	45		$c^2_y = .0037$			$c^2_x = .000149$	

$\sigma_y = \sqrt{\frac{63}{82} - .0037} \times 1$ $\quad = .8744 \times 1 = .8744$

$\sigma_x = \sqrt{\frac{165}{82} - .000149} \times 5$ $\quad = 1.418 \times 5 = 7.09$

$r = \frac{\frac{45}{82} - (.0607 \times .0122)}{.8744 \times 1.418}$ $\quad r = .44$

$PE_r = \frac{.6745\,(1 - .44^2)}{\sqrt{82}}$ $\quad = .06$

Advanced in Shorthand and Typewriting

For the 135 students advanced in shorthand and typewriting, the final English grades ranged from 70-100. Table XI, page 32, reveals that 6, or 46 per cent of the 13 students with clerical aptitude ratings of 9 made final English grades between 95-99. None of the 13 made an English final grade below 80. Of the 30 students with clerical aptitude ratings of 6, none made a final English grade above 94, and 30 per cent made grades below 80.

The coefficient of correlation between the final English grades of the 135 WAFS and the clerical aptitude ratings of these students and the probable error of this coefficient of correlation is also shown on page 32. The coefficient of correlation, r, was found to be .47, with a PE_r of $\pm$ .05.

Combination of All Classifications

Table XII, page 33, reveals that 100 per cent of the 17 students with clerical aptitude ratings of 9 made final English grades above 80; 70 or 96 per cent of the 73 students with clerical aptitude ratings of 8 made final English grades above 80; 76 or 87 per cent of the 87 students with clerical aptitude ratings of 7 made grades above 80; and 41 or 68 per cent of the 60 students with clerical aptitude ratings of 6 made grades above 90. These percentages indicate a positive correlation between clerical aptitude ratings and final English grades.

The coefficient of correlation between the final English grades of the 238 WAFS and the clerical aptitude ratings of these trainees, r, was found to be .46, with a PE_r of $\pm$ .04.

TABLE XI - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL ENGLISH GRADES OF ADVANCED IN SHORTHAND AND TYPEWRITING

x = Final English Grades

Clerical Aptitude	70-74	75-79	80-84	85-89	90-94	95-99	f_y	y'	fy'	fy'^2	$Sx'y'$ ↑	y' −	Sx'	$Sx'y'$
9			(-2) 1 -2	(0) 2 0	(2) 4 8	(4) 6 24	13	2	26	52	32	2	15	30
8		(-2) 1 -2	(-1) 7 -7	(0) 8 0	(1) 14 14	(2) 13 26	43	1	43	43	40	9	31	31
7	(0) 1 0	(0) 4 0	(0) 14 0	(0) 13 0	(0) 9 0	(0) 7 0	48	0					-2	0
6	(3) 2 6	(2) 7 14	(1) 8 8	(0) 9 0	(-1) 4 -4		30	-1	-30	30	28	4	-24	24
5				(0) 1 0			1	-2	-2	4			0	0
f_x	3	12	30	33	31	26	135		37	129	100-15 (85)		20	85
x'	-3	-2	-1	0	1	2								
fx'	-9	-24	-30		31	52 =	20							
fx'^2	27	48	30		31	104 =	240							
Sy'	-2	-6	1	1	18	25 =	37							
$Sx'y'$	6	12	-1	0	18	50 =	85							

$\sigma_y = \frac{37}{135} = .274$ $\sigma_x = \frac{20}{135} = .148$

$\sigma^2_y = .075$ $\sigma^2_x = .0219$

$\sigma_y = \sqrt{\frac{129}{135} - .075} \times 1$

$= .9386 \times 1 = .9386$

$\sigma_x = \sqrt{\frac{240}{135} - .0219} \times 5$

$= 1.325 \times 5 = 6.625$

$r = \frac{\frac{85}{135} - (.274 \times .148)}{.9386 \times 1.325}$

$r = .47$

$PE_r = \frac{.6745\,(1 - .47^2)}{\sqrt{135}}$

$= .05$

TABLE XII - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL ENGLISH GRADES OF COMBINATION OF ALL CLASSIFICATIONS

x = Final English Grades

Clerical Aptitudes	70-74	75-79	80-84	85-89	90-94	95-99	f_y	y'	fy'	fy'^2	$Sx'y'$ ✓	$Sx'y'$ −	Sx'	$Sx'y'$
9			(-2) 1 -2	(0) 2 0	(2) 5 10	(4) 9 36	17	2	34	68	46	2	22	44
8	(-3) 1 -3	(-2) 2 -4	(-1) 12 -12	(0) 17 0	(1) 21 21	(2) 20 40	73	1	73	73	61	19	42	42
7	(0) 2 0	(0) 9 0	(0) 22 0	(0) 21 0	(0) 18 0	(0) 15 0	87	0					2	0
6	(3) 3 9	(2) 15 30	(1) 20 20	(0) 13 0	(-1) 9 -9		60	-1	-60	60	59	9	-50	50
5				(0) 1 0			1	-2	-2	4			0	0
f_x	6	26	55	54	53	44	238		45	205	166-30 (136)		16	136
x'	-3	-2	-1	0	1	2								
fx'	-18	-52	-55		53	88 =	16							
fx'^2	54	84	55		53	176 =	422							
Sy'	-2	-13	-6	6	22	38 =	45							
$Sx'y'$	6	26	6	0	22	76 =	136							

$c_y = \frac{45}{238} = .189$ $\quad c_x = \frac{16}{238} = .067$

$c^2_y = .0357$ $\quad c^2_x = .0045$

$\sigma_y = \sqrt{\frac{205}{238} - .0357} \times 1 = .9086 \times 1 = .9086$

$\sigma_x = \sqrt{\frac{422}{238} - .0045} \times 5 = 1.33 \times 5 = 6.65$

$r = \frac{\frac{136}{238} - (.189 \times .067)}{.9086 \times 1.33}$ $\quad r = .46$

$PE_r = \frac{.6745 (1 - .46^2)}{\sqrt{238}}$ $\quad = .04$

CHAPTER V.

CORRELATION BETWEEN CLERICAL APTITUDE AND FINAL COMPOSITE GRADE

Beginners in Shorthand and Typewriting

The final composite grades of the 21 beginners in shorthand and typewriting ranged from 2.75 to 3.74. From Table XIII, page 35, it can be seen that 50 per cent of the 8 with clerical aptitude ratings of 8 made final composite grades between 3.25-3.74, while 37.5 per cent of the 8 with clerical aptitude ratings of 7 made final composite grades between 3.25-3.74. No student with a clerical aptitude rating of 6 made a final composite grade better than 3.25.

The coefficient of correlation between the final composite grades of the 21 WAFS and the clerical aptitude ratings of these trainees, r, was found to be .34, with a PE_r of $\pm$ .13.

Beginners in Shorthand, Advanced in Typewriting

Table XIV, page 37, shows the final composite grades of this group of 82 ranged from 2.75-4.74. The percentage of those making final composite grades below 3.50 within each clerical aptitude classification increased as the clerical aptitude rating decreased--9, 25 per cent; 8, 59 per cent; 7, 71 per cent; and 6, 76 per cent.

The percentage of those making final composite grades above 3.50 within each clerical aptitude rating classification increased as the clerical aptitude rating increased--6, 24 per cent; 7, 29 per cent; 8, 41 per cent; and 9, 75 per cent.

TABLE XIII - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL COMPOSITE GRADES OF BEGINNERS IN SHORTHAND AND TYPEWRITING

x = Final Composite Grades

Clerical Aptitudes	2.75-2.99	3.00-3.24	3.25-3.49	3.50-3.74	f_y	y'	fy'	fy'^2	$Sx'y'$ (+ / −)	Sx'	$Sx'y'$
8	(-1) 1 -1	(0) 3 0	(1) 3 3	(2) 1 2	8	1	8	8	5 1	4	4
7	(0) 1 0	(0) 4 0	(0) 1 0	(0) 2 0	8	0				4	0
6	(1) 2 2	(0) 3 0			5	-1	-5	5	2	-2	2
f_x	4	10	4	3	21		3	13	7 - 1 (6)	6	6
x'	-1	0	1	2							
fx'	-4		4	6 =	6						
fx'^2	4		4	12 =	20						
Sy'	-1	0	3	1 =	3						
$Sx'y'$	1	0	3	2 =	6						

$c_y = \frac{3}{21} = .143$ $c_x = \frac{6}{21} = .2857$

$c^2_y = .0205$ $c^2_x = .0816$

$$\sigma_y = \sqrt{\frac{13}{21} - .0205} \times 1 = .7736 \times 1 = .7736$$

$$\sigma_x = \sqrt{\frac{20}{21} - .0816} \times .25 = .933 \times .25 = .2333$$

$$r = \frac{\frac{6}{21} - (.143 \times .2857)}{.7736 \times .933} = .34$$

$$PE_r = \frac{.6745 (1 - .34^2)}{\sqrt{21}} = .13$$

The coefficient of correlation between the final composite grades of the 82 WAFS and the clerical aptitude ratings of these students and the probable error of this coefficient of correlation is shown on page 37. The coefficient of correlation, r, was .37, with a PE_r of $\pm$ .07.

Advanced in Shorthand and Typewriting

Of the 135 students advanced in shorthand and typewriting, the final composite grades ranged from 2.75-4.99. Table XV, page 38, discloses that no student with a clerical aptitude rating of 9 made a final composite grade below 3.50, and no student with a clerical aptitude rating of 8 made below a 3.00. Only one student made a final composite grade between 4.75-4.99, and this student had a clerical aptitude rating of 9. The 30 students with clerical aptitude ratings of 6 made final composite grades between 2.75-4.24.

The coefficient of correlation between the final composite grades of the 135 WAFS and the clerical aptitude ratings of these trainees and the probable error of this coefficient of correlation is shown on page 38. The coefficient of correlation, r, was found to be .42, with a PE_r of $\pm$ .05.

Combination of All Classifications

The final composite grades for the 238 stenographic graduates ranged from 2.75-4.99. Table XVI, page 40, shows that 55 or 23 per cent had final composite grades between 3.25 and 3.49. One of this number had a clerical aptitude rating of 9, 18 had a clerical aptitude rating of 8, 22 had a clerical aptitude rating of 7, and 14 had a clerical aptitude rating of 6.

TABLE XIV - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL

COMPOSITE GRADES OF BEGINNERS IN SHORTHAND AND ADVANCED IN TYPEWRITING

x = Final Composite Grades

Clerical Aptitudes		2.75-2.99	3.00-3.24	3.25-3.49	3.50-3.74	3.75-3.99	4.00-4.24	4.25-4.49	4.50-4.74	f_y	y'	fy'	fy'^2	$Sx'y'$	Sx'	$Sx'y'$
	9			(0) 1 0	(2) 1 2	(4) 1 4	(6) 1 6			4	2	8	16	12	6	12
	8	(-2) 2 -4	(-1) 2 -2	(0) 9 0	(1) 4 4	(2) 2 4	(3) 1 3	(4) 1 4	(5) 1 5	22	1	22	22	20 - 6	14	14
	7	(0) 2 0	(0) 7 0	(0) 13 0	(0) 4 0	(0) 3 0	(0) 2 0			31	0				5	0
	6	(2) 5 10	(1) 10 10	(0) 4 0	(-1) 5 -5	(-2) 1 -2				25	-1	-25	25	20 - 7	-13	13
	f_x	9	19	27	14	7	4	1	1	82		5	63	52-13 (39)	12	39
	x'	-2	-1	0	1	2	3	4	5							
	fx'	-18	-19		14	14	12	4	5 =	12						
	fx'^2	36	19		14	28	36	16	25 =	174						
	Sy'	-3	-8	7	1	3	3	1	1 =	5		$c_y = \frac{5}{82} = .0607$			$c_x = \frac{12}{82} = .1463$	
	$Sx'y'$	6	8	0	1	6	9	4	5 =	39		$c^2_y = .0037$			$c^2_x = .0214$	

$$\sigma_y = \sqrt{\frac{63}{82} - .0037} \times 1 = .8744 \times 1 = .8744$$

$$\sigma_x = \sqrt{\frac{174}{82} - .0214} \times .25 = 1.449 \times .25 = .36225$$

$$r = \frac{\frac{39}{82} - (.0607 \times .1463)}{.8744 \times 1.449} \qquad r = .37$$

$$PE_r = \frac{.6745\,(1 - .37^2)}{\sqrt{82}} = .07$$

TABLE XV - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL COMPOSITE GRADES OF ADVANCED IN SHORTHAND AND TYPEWRITING

x = Final Composite Grades

Clerical Aptitudes	2.75-2.99	3.00-3.24	3.25-3.49	3.50-3.74	3.75-3.99	4.00-4.24	4.25-4.49	4.50-4.74	4.75-4.99	f_y	y'	fy'	fy'^2	Sx' y'	Sx'	Sx' y'
9				(0) 2 0	(2) 1 2	(4) 4 16	(6) 2 12	(8) 3 24	(10) 1 10	13	2	26	52	64	32	64
8		(-2) 5 -10	(-1) 6 -6	(0) 7 0	(1) 12 12	(2) 6 12	(3) 4 12	(4) 3 12		43	1	43	43	32	32	32
7	(0) 2 0	(0) 10 0	(0) 8 0	(0) 9 0	(0) 6 0	(0) 7 0	(0) 4 0	(0) 2 0		48	0				6	0
6	(3) 1 3	(2) 6 12	(1) 10 10	(0) 5 0	(-1) 4 -4	(-2) 4 -8				30	-1	-30	30	25 12	-13	13
5		(4) 1 4								1	-2	-2	4	4	-2	4
f_x	3	22	24	23	23	21	10	8	1	135		37	129	125-12 (113)	55	113
x'	-3	-2	-1	0	1	2	3	4	5							
fx'	-9	-44	-24		23	42	30	32	5 =	55						
fx'^2	27	88	24		23	84	90	128	25 =	489						
Sy'	-1	-3	-4	6	10	10	8	9	2 =	37						
Sx' y'	3	6	4	0	10	20	24	36	10 =	113						

$c_y = \frac{37}{135} = .274$ $\quad c_x = \frac{55}{135} = .4074$

$c^2_y = .075$ $\quad c^2_x = .166$

$$\sigma_y = \sqrt{\frac{129}{135} - .075} \times 1 = .9386 \times 1 = .9386$$

$$\sigma_x = \sqrt{\frac{489}{135} - .166} \times .25 = 1.859 \times .25 = .46475$$

$$r = \frac{\frac{113}{135} - (.274 \times .4074)}{.9386 \times 1.859} \qquad r = .42$$

$$PE_r = \frac{.6745\,(1 - .42^2)}{\sqrt{135}} = .05$$

Seventeen or 7.1 per cent of the students had an aptitude rating of 9; 73 or 30.7 per cent had an aptitude rating of 8; 87 or 36.6 per cent had an aptitude rating of 7; 60 or 25.2 per cent had an aptitude rating of 6; and 1 or .4 per cent had an aptitude rating of 5.

The coefficient of correlation, r, between the final composite grades of the 238 WAFS and the clerical aptitude ratings of these trainees was .40, with a PE_r of $\pm$ .04.

TABLE XVI - CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL

COMPOSITE GRADES OF COMBINATION OF ALL CLASSIFICATIONS

x = Final Composite Grades

Clerical Aptitudes	2.75-2.99	3.00-3.24	3.25-3.49	3.50-3.74	3.75-3.99	4.00-4.24	4.25-4.49	4.50-4.74	4.75-4.99	f_y	y'	fy'	fy'^2	$Sx'y'$ ↗ -	Sx'	$Sx'y'$
9			(0) 1 0	(2) 3 6	(4) 2 8	(6) 5 30	(8) 2 16	(10) 3 30	(12) 1 12	17	2	34	68	102	51	102
8	(-2) 3 -6	(-1) 10 -10	(0) 18 0	(1) 12 12	(2) 14 28	(3) 7 21	(4) 5 20	(5) 4 20		73	1	73	73	101 16	85	85
7	(0) 5 0	(0) 21 0	(0) 22 0	(0) 15 0	(0) 9 0	(0) 9 0	(0) 4 0	(0) 2 0		87	0				55	0
6	(2) 8 16	(1) 19 19	(0) 14 0	(-1) 10 -10	(-2) 5 -10	(-3) 4 -12				60	-1	-60	60	35 32	-3	3
5		(2) 1 2								1	-2	-2	4	2	-1	2
f_x	16	51	55	40	30	25	11	9	1	238		45	205	240-48 (192)	187	192
x'	-2	-1	0	1	2	3	4	5	6							
fx'	-32	-51		40	60	75	44	45	6 =	187						
fx'^2	64	51		40	120	225	176	225	36 =	937						
Sy'	-5	-11	6	8	13	13	9	10	2 =	45						
$Sx'y'$	10	11	0	8	26	39	36	50	12 =	192						

$c_y = \frac{45}{238} = .189$ $\quad c_x = \frac{187}{238} = .786$

$c^2_y = .0357$ $\quad c^2_x = .6178$

$\sigma_y = \sqrt{\frac{205}{238} - .0357} \times 1$

$= .9086 \times 1 = .9086$

$\sigma_x = \sqrt{\frac{937}{238} - .6178} \times .25$

$= 1.82 \times .25 = .455$

$r = \frac{\frac{192}{238} - (.189 \times .786)}{.9086 \times 1.82}$

$r = .40$

$PE_r = \frac{.6745\,(1 - .40^2)}{\sqrt{238}}$

$= .04$

CHAPTER VI.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to determine the degree of correlation between the clerical aptitude ratings as revealed by the Airman Classification Battery Test of the WAFS and their final grades as an indication of the validity of the clerical aptitude rating in the classification of the WAFS in the Stenographic School. Data were secured for the 238 WAFS who completed their stenographic training at Oklahoma A. & M. Air Force Stenographic School, 1951-52.

After the data were gathered from the registration cards and the records kept in the stenographic school office, the data cards were classified according to:

1. Beginners in shorthand and typewriting--those students who had no previous shorthand training and who could not stroke 30 CWPM on the typewriter.
2. Beginners in shorthand and advanced in typewriting--those students who had no previous shorthand training but who could stroke at least 30 CWPM on the typewriter.
3. Advanced in shorthand and typewriting--those students with any previous shorthand training and who could stroke at least 30 CWPM on the typewriter.
4. Combination of all classifications.

The Pearsonian product-moment method of correlation was used to determine the relationship in each of the classifications between the clerical aptitude ratings of the 238 WAF stenographic students and their final shorthand, typewriting, English, and composite grades.

The highest correlation within the classifications was between the clerical aptitude ratings and the final English grades of the advanced students in shorthand and typewriting. This coefficient of correlation was .47. The relation between the clerical aptitude ratings and the final English grades of the beginners in shorthand and advanced in typewriting ranked second, with a correlation of .44. The third highest correlation was found in the relationship between the clerical aptitude ratings and the final composite grades of the advanced shorthand and typewriting students. This coefficient of correlation was .42. The correlation between the clerical aptitude ratings and the final composite grades of the beginners in shorthand and advanced in typewriting students ranked fourth, with a coefficient of .37.

The correlation between clerical aptitude ratings and the final composite grades of beginners in shorthand and typewriting, fifth in rank, was .34. The coefficient of correlation between clerical aptitudes and final shorthand grades of the advanced students in shorthand and typewriting, sixth in rank, was .29. The correlation between the clerical aptitude ratings and the final English grades of the beginners in shorthand and typewriting, seventh in rank, was .25. Eighth in rank was the correlation between the clerical aptitude ratings and the final typewriting grades of the beginners in shorthand and advanced in typewriting, which was .17.

Ninth in rank, with a coefficient of correlation of .16, was the correlation between the clerical aptitude ratings and the final shorthand grades of the beginners in shorthand and advanced in typewriting. The coefficient of correlation between clerical aptitude ratings and the final typewriting grades of the advanced students in shorthand and typewriting, tenth in rank, was .13. The relation between the clerical

aptitude ratings and the final shorthand grades of the beginners in shorthand and typewriting ranked eleventh with a correlation of .05. Lowest in correlation was the relation between the clerical aptitude ratings and the final typewriting grades of the beginners in shorthand and typewriting, with a correlation of .00.

Of the four grades correlated with the clerical aptitudes of all classifications, the final English grades had the highest correlation with a .46. Second was the clerical aptitude ratings to the final composite grades with .40. The clerical aptitude ratings to the final shorthand grades ranked third with .25. Last was the clerical aptitude rating to the final typewriting grade with .19.

On page 44, there is a summary of coefficients of correlation between clerical aptitudes and final shorthand, typewriting, English, and composite grades for the four classified groups.

Conclusions

O'Dell states that "A coefficient of .30 or .40 is high enough to indicate that there is definite relationship between the two things correlated, but is so low that estimates of one of the traits from the other are scarcely better than mere guesses."[10]

On this basis, the only useful correlation found was between the clerical aptitude ratings and the final English grades of the stenographic graduates (.46). Within the classifications, the useful correlations found were between the clerical aptitude ratings and the final English grades of the advanced students in shorthand and typewriting (.47), the

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[10]Charles W. O'Dell, Statistical Method in Education, (New York, 1935), p. 189.

TABLE XVII

SUMMARY OF COEFFICIENTS OF CORRELATION BETWEEN CLERICAL APTITUDES AND FINAL SHORTHAND, TYPEWRITING, ENGLISH, AND COMPOSITE GRADES FOR THE FOUR CLASSIFIED GROUPS

	Beginners in Shorthand and Typewriting	Beginners in Shorthand and Advanced Typewriting	Advanced in Shorthand and Typewriting	Combination of All Classifications
Final Shorthand Grade	.05	.16	.29	.25
Final Typewriting Grade	.00	.17	.13	.19
Final English Grade	.25	.44	.47	.46
Final Composite Grade	.34	.37	.42	.40

final English grades of the beginners in shorthand and advanced typewriting students (.44), and the final composite grades of the students advanced in shorthand and typewriting (.42).

Since the coefficients of correlation found in this study range from .00, Table V, to .47, Table XI, it is concluded that there is some relation between the clerical aptitude ratings and final shorthand, typewriting, English, and composite grades.

A decided pattern is noted in that the correlation is usually highest between the clerical aptitude ratings and the final grades of those students who are advanced in shorthand and typewriting. From this pattern, it may be construed that previous secretarial training may have a tendency to influence the clerical aptitude rating as determined by the Airman Classification Battery-1 B test.

The author believes that enough conclusive evidence has been revealed to use the clerical aptitude score as a factor in advancing a student with a clerical aptitude rating of 8 or 9. One of the acute problems in the classification of WAFS in the stenographic school was whether to place a student who was advanced in typewriting to a more advanced shorthand class, even though she had no previous shorthand training, on the basis of her clerical aptitude rating. Of the four WAFS in this study with a clerical aptitude of 9 who were beginners in shorthand and advanced in typewriting; all of them made between 80-99 as a final shorthand grade, 90-99 as a final English grade, and between 3.25-4.24 as a final composite grade. Of the twenty-two WAFS in this study with clerical aptitudes of 8 and the above qualifications; 19 or 86 per cent made between 80-99 in shorthand, 17 or 77 per cent made better than 85 in English, 18 or 82 per cent made between 3.25-4.74 as a final composite grade.

Recommendations

It is recommended that:

1. A study be made to attempt to determine the general ability or I. Q. of an average group of college students as compared with a group of WAFS who are studying the same subjects.

2. The validity of the clerical aptitude against the aptitudes for the various other service schools as revealed by the Airman Classification Battery test be studied.

3. The final grades in this study be correlated with the variables in the Airman Classification Battery test to further determine the variables most closely related to success in stenographic training.

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