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Biographical Prediction of Educational Success

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Abstract

The purpose of the study undertaken here is to determine the extent to which four biographical factors could be used to predict success in Air Force Career Counseling courses. The biographical factors are (1) age, (2) amount of education, (3) number of years in the Air Force and (4) number of years since the individual last attended school. The criteria used to measure the success are the test score results obtained in the Air Force Career Counseling Course taught at the University of Denver during 1952.

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Master of Arts

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Gerald Melvin Simmerman

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CHAPTER I

STATEMENT OF THE PROBLEM

The purpose of the study undertaken here is to determine the extent to which four biographical factors could be used to predict success in Air Force Career Counseling Courses. The biographical factors are (1) age, (2) amount of education, (3) number of years in the Air Force and (4) number of years since the individual last attended school. The criteria used to measure the success are the test score results obtained in the Air Force Career Counseling Course taught at the University of Denver during 1952.

Due to the increasing complexity of activity in the armed services at the present time, there will undoubtedly be a need for more college courses to be taught in the services, whether they be of a contract nature or administered and taught by the services themselves. In either case some criteria will have to be established regarding the selection of the students. This problem faced the selection board who screened the students applying for the Air Force Career Counseling Course. They had certain standards by which they selected or eliminated the students; but they did not have the advantage of knowing the results of this study. Therefore, this study was made to satisfy the real need existing in the armed services today for a more scientific basis for selection of students in college level courses.

Since this was definitely a college course, it is felt that

the findings can be applied to most service schools which are on the same academic level. Generality could therefore be claimed for that situation. However, one cannot claim generality for any college course even though the findings might have some value in that context.

This particular course was unique because it was the first of its kind and there have been none like it since. There are undoubtedly similar courses in the Air Force Career Guidance field. However, "Career Guidance" is not the same as "Career Counseling". The former deals only with "career" men and officers in the Air Force and the latter with "new" enlisted men. In any case, to the author's knowledge, there have been no other studies similar to the present one concerning armed services personnel. The only ones coming anywhere close to the scope of this study will be reported in Chapter II.

The literature is full of studies reporting attempted prediction of college success. Since this Air Force course was on the same academic level with college courses, it was thought that a report of the studies made in the college area would be helpful in understanding the problem at hand. Here, again, there has been no work done exactly similar to the present attempt. Many articles quote predictions made from the results of different standardized test scores, certain single variables such as are in this study and from other biographical factors than those included here.

Once during the course of instruction, a less comprehensive investigation was made on a few subjects to see if there was a difference in the final results of individuals with different backgrounds, using the same factors utilized in this study. At that time, there

were no differences reflected by the presence or absence of the factors. It is the hypothesis of this study that the biographical factors mentioned are of little use in predicting success in the Career Counseling Training Courses and other similar college level courses.

Therefore the problem of this study is to define, delineate and test criteria involved in prognosis of success in college level armed services schools. This is accomplished by correlating the total and phasic test scores with the biographical factors. By analyzing the results, some suggestions as to efficient "cut-off" points for selection purposes are also made.

CHAPTER II

REVIEW OF THE LITERATURE

As implied before, the literature contains few articles exactly pertaining to this problem. Nevertheless, what there is seems to divide itself naturally into those studies involving military personnel and those using civilian subjects. Closest to the scope of this study is one done by Zachert and Levine (35) which is an example of similar work done in other areas of the Air Force. They found that knowing how much education an airman has adds little validity to the prediction of success in aircrew training. Before arriving at this conclusion, the authors determined the predictive validity of the "Airmen Classification Battery" (ACB) tests. Then they determined the predictive coefficient of validity through knowing the amount of education each individual had. From this, they were able to compute how much the latter coefficient of validity added to the ACB predictive coefficient of validity which in no case was more than .05. This was statistically negligible and they concluded that the amount of education need not be used as a predictor for success in this kind of training.

As an illustration of studies done with other parts of the armed services, French, Tucker, Newman and Bobbitt (10) administered mathematical and reading ability, verbal and spatial reasoning tests to Coast Guard cadets in an attempt to glean some prognostic value from the tests. The correlations between the tests and

success at the academy ranged from .01 to .49. A similar study was made on West Point cadets by Comrey (3).

The studies utilizing civilian subjects, or in other words, those involved in the prediction of college success are of the following types; prediction from (1) high school averages; (2) standardized test scores; (3) I.Q. scores; (4) age; (5) number of years out of school; (6) amount of education; and (7) undergraduate averages.

It is evident that some of the variables mentioned above have little connection with the problem of this study, so only a passing comment will be made concerning them. Regarding the value of the high school average, many authors claim it is the best single measure of prediction of college success. Such studies as Wagner's (32) found a median "r" of .67 between high school averages and college grades. Segel (25), Salley and Weintraub (24), and Line (19), among others, found similar results.

Several nationwide standardized tests have been used to predict college success, most important among these has been the American Council on Education Psychological Examination (ACE) and the Ohio State University Psychological Examination (OSU). Correlations as high as .64 have been found between the ACE and college success by such authors as Lanigan (17), Line (19), Salley and Weintraub (24), and Traxler (31). Hartson and Sprow (11), using the OSU, found correlations up to .50 between the test scores and later college success. Other tests have also been used. Segel (25) and Durflinger (6), used the General Achievement Tests. Lanigan (17)

used the Minnesota Speed of Reading Tests. The General Educational Development (GED) tests have been used for predictive purposes by many, among whom is Dixon (5). Salley and Weintraub (24) have used regent's examinations for prediction. The results of all the above mentioned devices are varied, but most of them show statistical significance and should therefore not be eliminated from the problem.

Using highly select groups, Kinney (15), Segel (25), Durflinger (6) and Lanigan (17) have all correlated I.Q.'s with success in college. Their results range from .19 to .54 indicating some significance. It must be remembered here that with highly selected groups, the range of intelligence is greatly restricted, therefore cutting down the correlations.

Studies correlating age with success in college are greater in number than the other categories. Lange (16) reports that younger college men have higher grades. The results are statistically significant, although no figures were quoted. Dwyer (7) correlated age of college entrance with scholarship and found it to be negative up to twenty-one years and positive after that. College entrants of even fifteen to seventeen years showed excellent progress. Asher and Gray (1) found the low but negative correlation of -.27 between success in college and chronological age. Shoemaker and Rohrer (26) obtained similar results predicting success in medical school. Silverman and Jones (28), reported the younger college

student to have an advantage over the older ones. In a comprehensive examination given to over four thousand students between the ages of eighteen and twenty-six covering all topics usually included in a university curriculum, the eighteen-year-olds led all the rest on final scores. Odell (22), as well as Ferguson (9), studied a group of students that entered college between the ages of sixteen and twenty-one and found that the younger students were not at any disadvantage because of their age. Phillips (23) ran a study indicating that the earlier a student went to college the better the results were, both in terms of grades and success in later life.

Only two studies were found accounting for the number of years an individual is out of school. Hurd (14) discovered that if students had a good foundation before they left college (for one reason or another), they were able to succeed when they returned. But if their first attempt at college was not long enough or successful enough, they had more trouble upon returning after an interval during which they had no school experience. No specific number of years were mentioned in the study. Feder (8) discovered that the number of years an individual is out of school is definitely a factor in his success when he comes back. His findings revealed that those students coming directly from high school to college were well prepared and they met with success. Those who were out of school from one-half to three years did increasingly less well than the first group. Those individuals out of school over three

and one-half years did much better and even surpasses the group coming directly into college. A possible reason is by that time, their motivation was definitely settled. They knew what they wanted and desired to make the best of their time.

A report by Shuey (27) indicates that as the education increases in amount, the individual's ability to do college work (or his scholastic aptitude) also improves as shown in an increase in points on the ACE. Between the freshmen and senior years, an increase of eleven points was found on the total scale; fifteen points on the "Q" scale; and thirteen points on the "L" scale. These findings were statistically significant at the one per cent level of confidence. Persistent but insignificant differences were found between students in different fields, with those in the social sciences ranking lowest.

As would be expected, as the number of years of education increases, the ability to succeed also improves as shown in the following studies. Clark's (2) correlations between the number of years of schooling and success in college ranged from .26 to .46. When both age and the number of years of school were combined and correlated with success, an "r" of .65 was found. Age alone yielded an "r" of .50. None of the correlations were held to be statistically significant, yet they are clearly too high to have been the result of chance.

Correlations ranging as high as .77 were found by Webb (33) between undergraduate averages and tests used as entrance requirements of the graduate colleges of several universities.

The tests used were the English Coop Test and the General Culture Test. This indicates that success in undergraduate work is as good a predicter of further college success as the tests used were. The above results were found in all university departments except biology and education. Weber, Brink and Gilliland (34) found a correlation of .61 between undergraduate and graduate success. Smith (20) found correlations ranging between .63 and .70 indicating the relationship between previous semesters work and later success.

The articles mentioned above involving age, amount of education and the number of years out of school bear directly on the current problem. The factor of the number of years in the Air Force, or for that matter in the armed forces anywhere, was not found in the literature as connected with the problems at hand. The results quoted in these studies strengthen the findings of this thesis. All the correlations and figures point in the same direction. Many of the correlations in this work are practically the same as those found by others. However, it must be remembered that two different populations are being used. The one military study directly connected with this problem seemed to be somewhat contradictory. But here again is an instance of the utilization of two different populations. Zachert and Levine (35) dealt with high school graduates in aircrew training while the present study deals with college men in a more abstract field.

With everything taken into consideration, it appears that the three factors, age, amount of education and time away from school, have some possibilities when used as predictors of success in college courses. But they are not the whole picture, nor are they entirely reliable, as indicated by the relatively low correlations. From these reports in the literature, it is certain that a lot more exacting research needs to be done in the field before these and similar factors can be called valid predictors of success.

CHAPTER III

METHOD

In order that the reader might better understand the background of this study, it would be well to consider first, descriptions of the course, the tests and the population, followed by a description of statistical methods used in handling the data.

DESCRIPTION OF THE COURSE

The United States Air Force Career Counseling Course # 73000A was taught by the University of Denver, under contract, between February and December 1952. A total of 330 men, women and officers were enrolled in ten classes of from thirty-two to thirty-four persons each. The first class came in February and was followed approximately every four weeks by another class. The length of the course was eleven weeks divided into three phases. Phase One lasted three weeks; Phases Two and Three lasted four weeks each. The usual instructional hours ran from seven to nine o'clock in the morning and from noon to four o'clock in the afternoon. Therefore, the student airmen spent six hours in the classroom and two hours in study each day. There were relatively few interruptions in this plan; usually only an occasional holiday.

According to the Job Description in the Syllabus of Instruction (13, p. iii), "The purpose of this course was to train selected officers and airmen in the principles and procedures of counseling, interviewing, evaluation and classification of Air Force personnel

to serve in the Air Force Career Counseling and Assignment Program." The details of instruction were agreed upon through the joint action of the University of Denver and Headquarters Technical Training Air Force.

A more detailed analysis of the course content and activities will be found in the Syllabus of Instruction (13) and the Instructors Handbook (12) which are available. A shortened description follows.

The First Phase was comprised of ninety academic hours. The entire first day of instruction was taken up with the "Orientation". The instructors previewed the entire course and prescribed the objectives. This took six hours.

The units to follow took place a few hours each day throughout the rest of the phase. "Basic Psychology"was the second unit, taking up sixteen hours. The title is self-explanatory in that the unit covered a general over-view of some of the basic tenets of psychology. A twelve hour unit entitled "Applications of Psychology to Counseling" covered the applied aspects of psychology. Fourteen hours of "Introduction to Statistics in Counseling" gave the student some preparation for the statistical problems which he will use again later in the second phase. "Development of Personality" took up fifteen hours. This unit covered the genetic aspect of psychology as well as touching on personality per se. A twenty-four hour unit, "Personnel Administration", covered such topics as management-labor and employer-employee relationships. The First Phase ended with the administration of a three-hour quiz.

The Second Phase included 120 academic hours, the first twenty-four of which covered the subject "Problems in Personality Adjustment". This unit continued where the First Phase left off, but with a different accent, the difference being that in the Second Phase more emphasis was placed on abnormal psychology. The second unit of this phase was called "School and Community Resources for Vocational Guidance" and covered sixteen hours. In this unit, discussions were held regarding the various counseling and guidance services available in the community. Two hours of the time were spent in a field trip to the Colorado State Employment Service to observe activities there. Twenty-six hours were taken up in "Job Information and Job Analysis Techniques". This title is self-explanatory, but the reader should also know that much of the time was spent in field trips to various occupational situations throughout the city. This unit was the first in which the student was required to hand in written work, (a "job analysis") and upon which he was graded. This will be explained in greater detail later. The unit, "The Nature of Individual Differences" (ten hours), along with the next unit, "Sample Standardized Tests of Intelligence, Aptitude, Achievement, Interest and Personality" (fourteen hours), were taught by the same instructor. The content of these two sections overlapped to some extent. The student was given a chance to analyse certain tests and to criticize them. The next unit was "Test Administration and Scoring Procedures". During this seven hours, the airmen were given a chance to actually administer and score a test. "Statistical

Interpretation of Test Results by Counselors", a unit of nineteen hours, was a detailed follow-up of the statistics section in the First Phase. The class was divided into two smaller groups so that the amount of individual help could be increased. The quiz for Phase Two took four hours.

The Third and last Phase also covered 120 hours. In all units of this phase, except one which will be noted, the class was again divided into two parts as each unit was more like a "discussion-seminar" class and a great deal more value could be realized for the individual student in this way. One section was even divided into three parts. This will be explained later. The first unit was "Group Guidance Techniques" and covered twenty hours. Basic teaching techniques and methods of handling different groups of people were discussed. A field trip to Lowry Air Base was included in order to give the students in the class some experience in arranging such events. "Interviewing Techniques" (twenty hours) covered the types and purposes of interviews as well as some actual experiences trying out the different techniques. The unit, during which the class was not divided, was "Job Requirements and Occupational Trends". The nature of this class was not quite like a "seminar" even though individual and group reports were made throughout. The content centered around occupational information and vocational guidance. The twenty hours of "Counseling Techniques" were similar to the interviewing section in that actual practice in counseling situations was provided and the students discussed the techniques and essentials of

this method. During sixteen hours of "The Use of Records and Tests in Counseling" the student was given a thorough preview of this important area. Experience with and discussion about actual tests was provided as the student learned their proper use. For the "Practicum and Seminar" (twenty hours), the class was split three ways to allow for even freer discussion. This represented a "summing up" period which attempted to integrate everything that the student had learned. The examination over this phase took two hours which was followed by a two hour graduation ceremony. In each of the sections of this last phase, the students were given individual ratings on their performance which included class participation and required written work.

After the tests for each phase had been corrected and scored, the students were allowed to review their exam copies so that they might know in which areas they were deficient and in which they excelled. An item analysis of each quiz was completed and made available to the instructors and those concerned.

During each phase, the individual student was loaned a set of text books for use in that phase. A bibliography listing these books is available in the Syllabus of Instruction (13) and the Instructors Handbook (12). Also, certain other reference books were available to the airmen as well as the full facilities of the university library.

TESTS USED IN THE COURSE

Sample copies of the tests are available in the Instructors

Handbook (12). A brief description of the phasic tests follows. Each instructor was requested to hand in a certain number of multiple-choice items covering his unit. The number of items was determined in proportion to the number of hours the unit covered. All the questions were then combined into a single test which was administered to the classes. All the tests were composed of these multiple-choice items except for fifteen true-false items at the end of Quiz Three. The content of the tests changed very little during the course of instruction. What few changes did occur were at the request of the instructors involved, who desired to change or substitute items. The total number of changes was so slight that there was little chance of this being a variable that affected the results of this study. Another aspect discounting this possibility was the fact that fairly good consistency was obtained from one administration of the test to the next. Therefore, the tests can be considered virtually constant. To prevent the students from noticing that the individual items were practically the same from class to class the order of presentation was changed periodically.

Quiz One, covering Phase One, contained 110 multiple-choice items. A possible score of 140 on Phase Two was a combination of 130 multiple-choice items and ten points from the Instructor Rating. The Job Analysis Instructor was provided with a five-point scale to rate each individual in the class, with "five" representing the best performance. When these ratings were turned in they were doubled.

making the possible ten points. Fifty points of Quiz Three was determined in the same way. The "Job Analysis" rating in the Third Phase was not doubled, thereby making a total possible of fifty-five points from the ratings in the last Phase. Quiz Three contained sixty-five multiple-choice and fifteen true-false items. This made a grand total from all three quizzes of 385 points including the ratings. Because of minor changes once in a while, some quizzes did not have the same total number as the others. In these cases a constant was added to equate the scores.

THE POPULATION

Before the actual population of this study is discussed, it might be well to review the Job Description of the "Career Counselor". As taken from the Syllabus of Instruction (13, p. iii), his duties and tasks are "to interview military personnel to obtain adequate information which can be evaluated in the final determination of the airman's assignment; to inform airmen of the Airman Career program; to meet with groups of basic airmen to provide counseling and occupational information, to intensely interview exceptional airmen, helping to determine their disposition; to adhere to correct counseling procedures; to develop professionally in the counseling field; to interpret test data and other duties as they might be specified". The Career Counselor must have the following training and/or experience: (1) completion of the Air Force Career Counseling School; (2) formal college training in all aspects of psychology as included in this

course; (3) formal training in the Air Force Classification System and Career Development Program; (4) considerable work experience as a counselor, either in military or civilian life. He must have a Technician Speciality Aptitude Index of seven or higher.

As mentioned before, enlisted men, enlisted women (WAFs), warrant officers and commissioned officers, (both male and female), were selected to take the Career Counseling Course. Most of those who took the course applied for it and were screened and selected by an evaluation board of officers. Besides taking into account the aforementioned requirements, training, and/or experience, the applicants were also evaluated on the following personal-social assets, as extracted from the Rating Sheet used by the Board Members (36):

1. APPEARANCE. An airman with superior appearance is well-coordinated, clean-cut, attractive and neat.
2. FACIAL EXPRESSION. An airman with superior facial expression is appealing, interested, animated and cheerful.
3. MANNERISMS. Desirable mannerisms encompass dignity, earnestness, pleasantness, attentiveness, consideration and tact.
4. COMPOSURE. Superior composure is demonstrated by relaxed, confident and well-poised adjustment without anxiety.
5. VOCAL CLARITY. A clear voice is one that is well modulated, distinct and well accented.
6. VOCAL TONE OR PITCH. A superior voice is one that is deep, resonant, commanding and melodious.
7. SPEECH TEMPO. Well-timed speech is relaxed without being either too slow or too fast.
8. WORD SELECTION. Superior word selection is indicated by resourcefulness, color, exactness and simplicity of description.
9. LANGUAGE ORGANIZATION. Well organized language is fluent, expressive, direct, thorough, unstilted and grammatically perfect.

Some of those who were selected came from other specialties in the Air Force than counseling. However, most of them had

been engaged in the Counseling Program prior to taking the course. Not all of them returned to counseling work.

Of the entire group, 255 were enlisted personnel and forty-two were commissioned officers. There were 321 males and nine females. Three of the women were officers; the remainder were of enlisted rank. Of the thirty-nine male officers, three were warrant officers.

In order to make the population free from variables which could not be controlled, it was decided to eliminate the cases which introduced non-controllable factors. The entire first class was excluded because it was thought that the methods used with this class and the results obtained were more of an experimental nature than anything else. None of the instructors had complete nor final plans until the second class. Many of the textbooks were not in the students' hands until weeks after they were to be used. Everything was on a trial basis. Because of the tentative nature of these plans, many changes were made in time for class two, and by the time it came, many of the problems had been ironed out and everything was more stabilized.

So that any sex differences present might be controlled the remaining eight women were rejected. They could not be retained as a comparison group because their number was too small.

To account for any racial differences that might have existed, four negroes, one Indian and one Spanish-American were excluded.

The remaining thirty-seven officers were large enough in

number to make up a small but separate group for comparison. There were now 246 enlisted men making up the larger group.

The age distribution of both the officers and enlisted men were markedly negatively skewed favoring the twenty to twenty-three-year-old-group. However, the range extended from eighteen to fifty-one. It was thought that with the older men, age might be a factor in their performance; so it was decided to reject all those over forty years of age. This brought the final population of enlisted men down to 240 with twenty-nine officers in the other group.

The factor of intelligence is held constant by reason of the fact that all those in the course had to have a Technician Specialty Aptitude Score of at least seven. According to an extract from Research Report No. 12 of the 3309th Research and Development Squadron, Lackland Air Force Base, Texas (30), a Technician Specialty score of seven correlates with an Army General Classification Test (AGCT) intelligence quotient of above 110. Eighty-one per cent of the population had Technician Specialty scores of nine; thus they had intelligence quotients of at least 124. The range of intelligence was not great, so it can safely be held as a constant.

The distributions for the number of years away from school, and the number of years in the Air Force were practically identical, thus suggesting that the same factor is being measured in both. The shape of the distribution is again markedly negatively skewed, favoring those who had just been out of school and those who had not been in the Air Force very long. The range for both ran from three months

up to twenty-six years. The distribution showing the number of years of education was bimodal. The two modes were at twelve years (high school graduates) and at sixteen years with the latter one indicating the Bachelor's degree being the highest.

Other factors in the students' background not accounted for in this study reveal a varied but rich cultural mixture. Approximately ten per cent had foreign born parents. Only two individuals were foreign born themselves. Another thirty per cent with only high school educations had supplemented their knowledge with some kind of trade or business school. About forty per cent admitted talents in the arts, either musical or theatrical. At least fifty per cent signified more than a passing interest in all kinds of sports, most of them indicating that they participate in them when the opportunity presents itself. Only about thirty per cent reported that they had established themselves in civilian occupations before joining the service. This is easy to explain because of the low average age of the group. Most of them did not have a chance to get civilian jobs before joining up. About seventy-five per cent listed hobbies to include photography, radio, flying or automobiles.

METHOD OF HANDLING THE DATA

A scatter diagram between each of the biographical factors and each set of phasic and total scores was constructed. A Pearson Product Moment Coefficient of Correlation was obtained for each one of these diagrams. The standard error of each correlation was found along with the levels of confidence. Graphs were then

constructed for each pair of distributions to facilitate making suggestions for "cut-off" points in future selection problems. These graphs were constructed on the basis of the mean performance of each interval of the biographical factors, e.g., each year of schooling represented an interval as did the eighteen month intervals in age, time away from school and amount of time spent in the Air Force.

This entire procedure was repeated between officer's scores and their background factors with the exception of making the graphs. This was not done because the correlations were not high enough to warrant the utility of determining "cut-off" points.

CHAPTER IV

RESULTS

Enlisted Men. The correlations computed between the biographical factors and the test scores are listed in Table I. All are significant at the one per cent level of confidence. However, there were no significant differences between the individual correlations. All of the correlations were relatively low when considered in the light of what per cent of improvement over chance they represent. None of them represents more than a thirty per cent improvement and fourteen of the sixteen correlations are less than thirteen per cent improvement over a "best guess". However, even though the figures are low, they represent actual trends; consequently, the null hypothesis can be rejected.

Some of the subsidiary findings are well worth noting. The highest correlations are found in the two aspects which might be measures of the same factor. These are "time in the Air Force" and "time away from school". Correlations of -.59 and -.69, respectively, were found between these two factors and the scores on Quiz One. This is another way of saying those airmen just out of school and in the Air Force only a short time made markedly better scores on Quiz One, than did the older, and more Air-Force-seasoned fellow students. This difference was less pronounced on Quizzes Two and Three, which leads to some interesting conjectures.

Phase One was almost exclusively academic and theoretical; whereas Phase Three was more "practical" in the sense that it was

TABLE I

CORRELATIONS BETWEEN TEST SCORES

AND BIOGRAPHICAL FACTORS

FOR ENLISTED MEN

Biographical Factors	Quiz One	σ_r	Quiz Two	σ_r	Quiz Three	σ_r	TOTAL SCORE	σ_r
Age	-.45	.051	-.18	.062	-.28	.060	-.26	.060
Amount of Education	.42	.053	.44	.052	.39	.055	.46	.051
Number of Years in the Air Force	-.59	.042	-.31	.058	-.38	.055	-.41	.054
Number of Years Since Last Attended School	-.69	.034	-.25	.059	-.49	.049	-.26	.060

N = 240

Note: All of the obtained correlations equal or exceed the one per cent level of confidence.

oriented in the direction of the counseling that the students would be doing for the Air Force, and included considerable field work and practicums. Phase Two was a blending of the theoretical with the applied. Possibly the men who had been out of school (and, in many cases, in the Air Force) longer inclined more toward the "practical" and away from the theoretical. Possibly also, they may have experienced a slow recovery of some of their long-forgotten study skills and techniques. Had there been three more phases to the course, it is not improbable to assume that these more seasoned airmen might have caught up with -- and conceivably have passed by -- their less experienced colleagues.

The above logic can also be used to explain the correlations involving the amount of education. Those with a higher education seem to be able to "hold their own" throughout the Second Phase, but even so, their performance slowly, but insignificantly tapered off. However, these figures are so close, one could say that their performance was rather consistent throughout. It is interesting to note, that the correlation between total performance and amount of schooling is higher than for any other factor, indicating that the longer schooled possibly have a real advantage over the less educated airmen.

By looking over the graphs, some other relationships can be observed. First, considering Figure I, which illustrates the mean performance on the total score at various ages, one observes the incidence of multimodality. The best performance occured at

age twenty-three, following a steady rise from the eighteen-year-old's scores. The means then "see-saw" back and forth, steadily decreasing with increasing age. The plateau at the right end of the distribution might be misleading. At this end of the scale, the number of cases drops sharply, and there are no cases for age thirty-eight. One case might represent a particular age interval.

Even though they were low, the twenty-six-year-olds did better than those of eighteen years of age. The thirty-five-year-olds did the poorest of any age group. The "poor performers" seemed to come in five year cycles. There does not seem to be any explanation for this particular pattern. The age groups representing the other "peaks" on the graph, after the first high one, were the twenty-seven-year-olds and those between thirty-six and forty. It is interesting to note that the individuals at the extremes had the same mean scores; also that the forty-year-olds did as well as the eighteen-year-olds. There is no apparent explanation for this multimodal picture unless it can be blamed on the peculiarities of the sampling and the operation of chance factors.

In Figure II, which shows the relationship between Quiz One and age, the eighteen-year-olds "out performed" all other age-groups by a great deal. The twenty-three and the thirty-six-year-olds were next, but they were not much better than the other groups. The decrease in the twenty-year-olds' scores is unusual in that their other scores are at least average. The thirty-five and the forty-year-old groups were low.

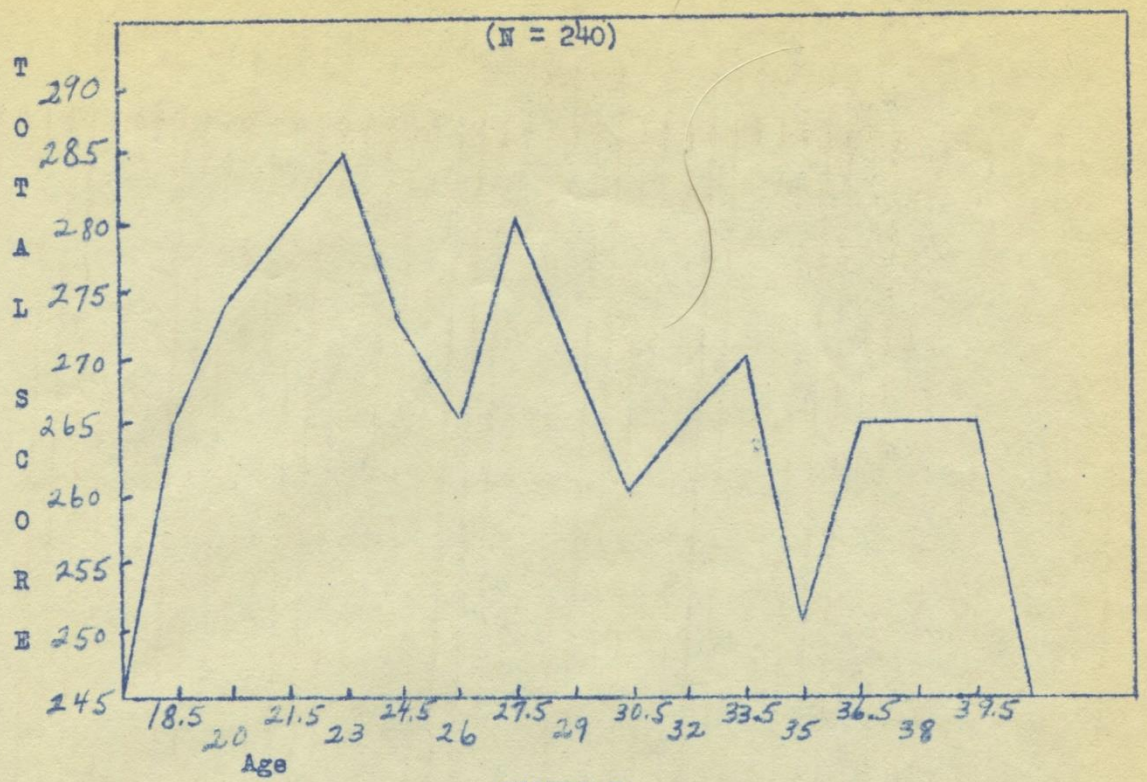

FIGURE I
MEAN PERFORMANCE ON TOTAL SCORES OF AIRMEN OF DIFFERENT AGES

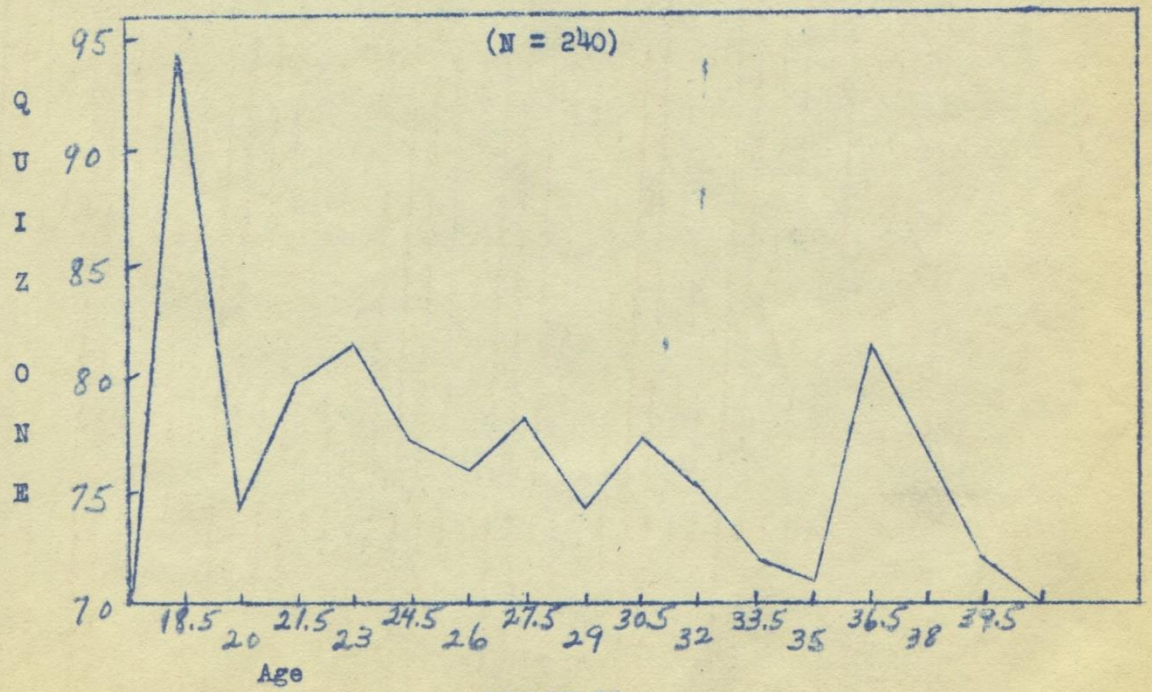

FIGURE II
MEAN PERFORMANCE ON QUIZ ONE OF AIRMEN OF DIFFERENT AGES

Figure III is where the eighteen-year-olds really "fell down", being lowest on the graph. A possible reason for this is over-confidence. They did so well on Quiz One that they possibly thought Quiz Two would also be easy; hence, did not study. On the other hand, both the twenty-year-olds and the forty-year-olds came up to where they stood previously. They possibly were surprised when they did so poorly on the first examination, so studied harder for the second one. The highest group was the twenty-seven-year-old group, who showed some improvement after Quiz One.

The three highest groups on Figure IV, relating Quiz Three with age, are the twenty-seven, the twenty-three and the thirty-three-year-old groups. This is consistent for the first two groups mentioned, but the thirty-three-old group was "up and down". The eighteen-year-olds were again low, supposedly still recovering from the poor performance on the quiz before.

The twenty-year-olds had trouble maintaining an average. The forty-year-olds improved to where they were before, having suffered just one departure from their average. The thirty as well as the thirty-five-year-old groups were down, consistent with their general trend.

The consistently high groups were first, the twenty-seven-year-olds, with the twenty-three and the thirty-three-year-olds following in that order.

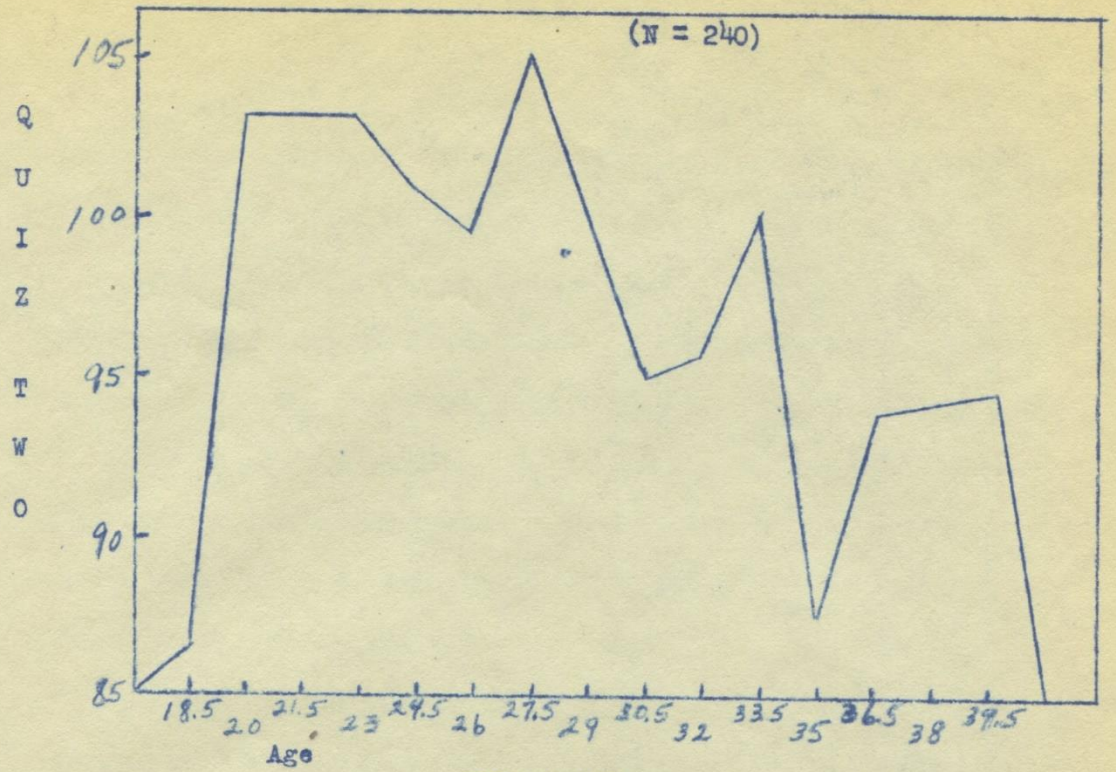

FIGURE III
MEAN PERFORMANCE ON QUIZ TWO OF AIRMEN OF DIFFERENT AGES

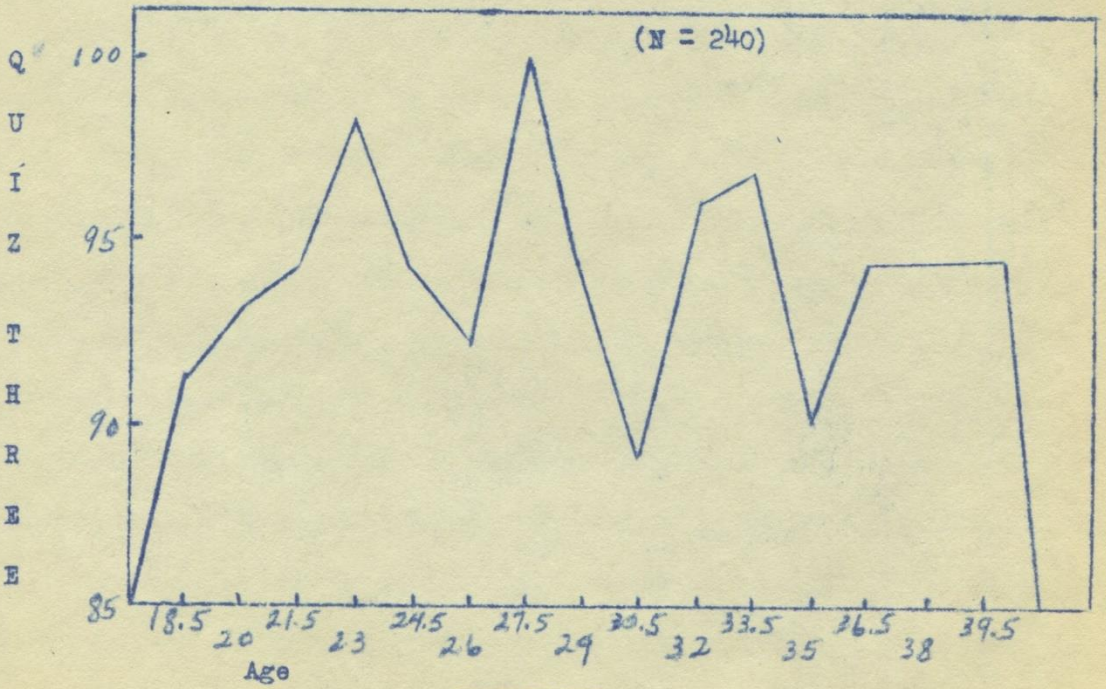

FIGURE IV
MEAN PERFORMANCE ON QUIZ THREE OF AIRMEN OF DIFFERENT AGES

Figures V through VIII illustrate the mean performance on the tests of students with differing amounts of schooling. This set of graphs is much more revealing than the former set. A definite cut-off point can immediately be seen on Figure V. There is a plateau in performance up to twelve years of schooling. After that, there is a sharp steadily increasing rise in performance as the amount of schooling increases. This indicates that those who have not gone beyond high school probably should not be selected for college type training in the Air Force.

The same trend is seen in Figure VI (Quiz One). There is a sudden rise at eight years of schooling, but this can probably be attributed to chance factors. The plateau up to the twelve year mark is not so pronounced as in Figure V. However, it can still be seen. After twelve years, there is a sudden rise, followed by practically the same steady increases as seen on the previous figure. Here again, as with the other graphs, there is only one case representing the last interval on the right. It is interesting to note that the sharpest increases come after twelve years, fourteen years and sixteen years. These seem to be dividing places in a person's education. After finishing high school, one is confronted with the first experiences of college. After two years of university work, the individual begins to specialize and his education takes on a different "slant". After one attains the Bachelors degree, graduate study is different and more challenging than anything that has come before.

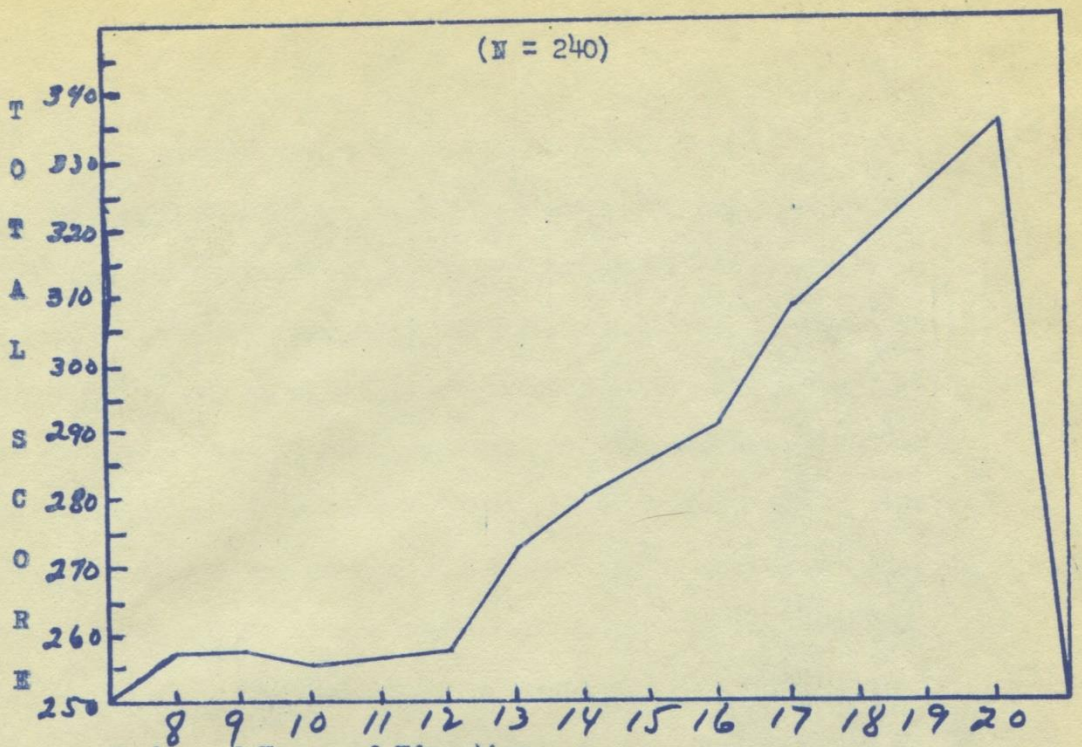

FIGURE V - MEAN PERFORMANCE ON TOTAL SCORES
OF AIRMEN WITH DIFFERENT AMOUNTS OF EDUCATION

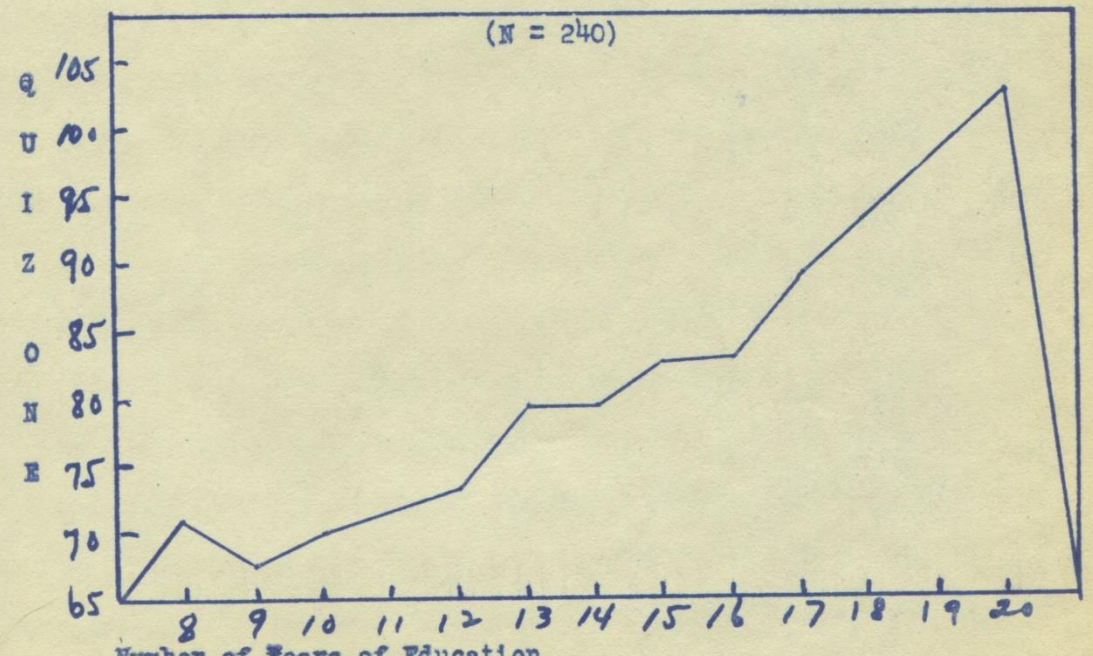

FIGURE VI - MEAN PERFORMANCE ON QUIZ ONE
OF AIRMEN WITH DIFFERENT AMOUNTS OF EDUCATION

The picture seems to change in the next graph (Figure VII). The general trend though, is still there. The place on the graph where the steady increase occurs has not changed its position. The only different aspects are the sudden rise at ten years and the tapering off at twenty years instead of the usual increase. If the rise at ten is smoothed over with the decline at twelve, the plateau once more appears. The decrease at twenty is explained by the fact that the student was absent during almost the entire Second Phase due to an emergency furlough. When he returned, he decided to take the test anyway and he still did better than all the groups except one. If he had been given the advantage of the instruction during the Second Phase, his score probably would have been up where he was before. So, even though this graph looks different from the others, it really is not. The chance factors operating could well have produced the sudden increase at ten years. One of these chance factors could have been the conglomerate subject matter of this phase, as mentioned before.

The graph depicting Quiz Three (Figure VIII) is practically identical with the others. The differences are the increases at nine and fifteen years. This does not negate the formerly mentioned cut-off point at twelve years, however. If the first part of the graph is smoothed out as suggested before, there is still an increase arising from this plateau. The sharp rise at fifteen suggests that in this more practical phase, only the graduate and senior year students do exceptionally well, due to the fact that

they have had more time and experience to apply the knowledge they have gained.

The next two sets of graphs, Figures IX through XVI might be considered together, since it has been suggested before that these two factors are basically the same. That might be true, but the graphs show two different and consistent patterns.

For instance, Figure IX (between total score and time spent in the Air Force) is essentially bimodal with the extremes being the modes. The middle interval dips very low. A possible explanation for this is three-fold. First of all, the students who have just been in the Air Force, say, up to a year-and-a-half are relatively fresh from school studies and can perform well without much effort. However, as the years wear on in the Air Force, motivation for studying is considerably lessened. Then in the second place, when the airman has about ten years of service behind him, he is at somewhat of a "crossroads". He cannot make up his mind whether to go ahead and make the service his career or to get out then, while there is still some chance of becoming established in civilian life. The result of this mixed emotional affect is lowered motivation and likewise, low grades. Thirdly, after he makes up his mind to stay in the service, he wants to make the best of it so that his record will show a find performance. By the time he has been in nineteen or twenty years, his motivation is on a high level and he is able to succeed.

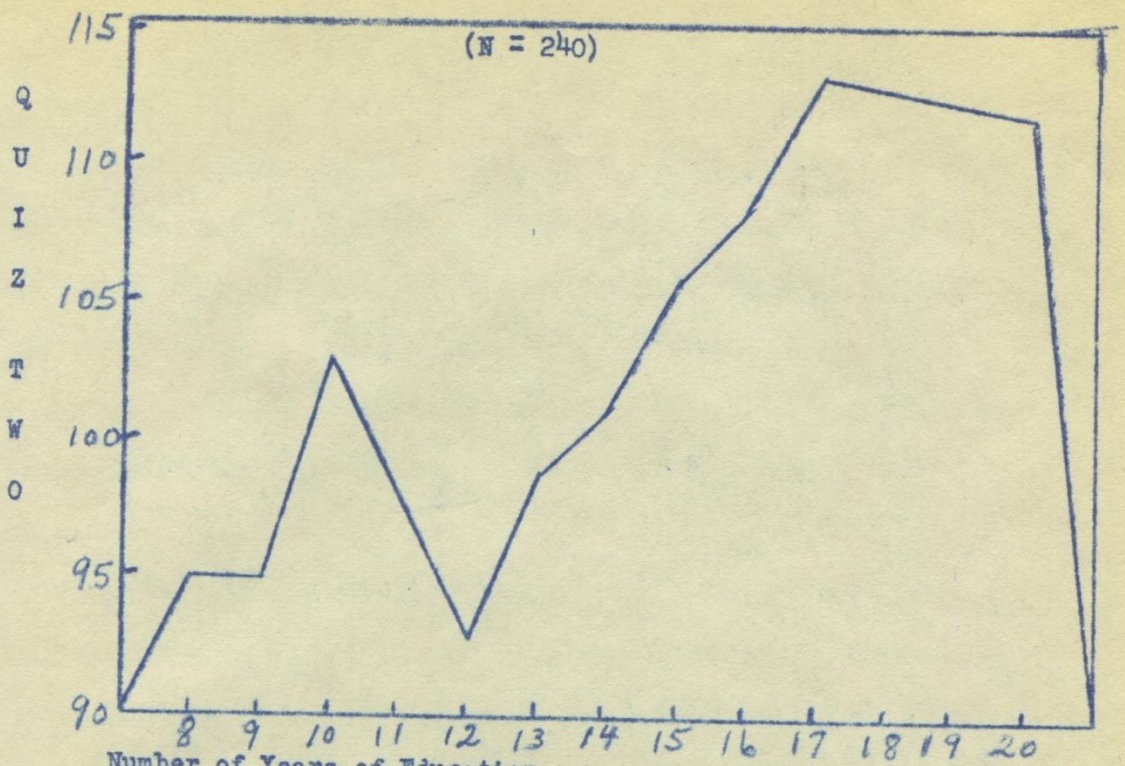

FIGURE VII - MEAN PERFORMANCE ON QUIZ TWO OF AIRMEN WITH DIFFERENT AMOUNTS OF EDUCATION

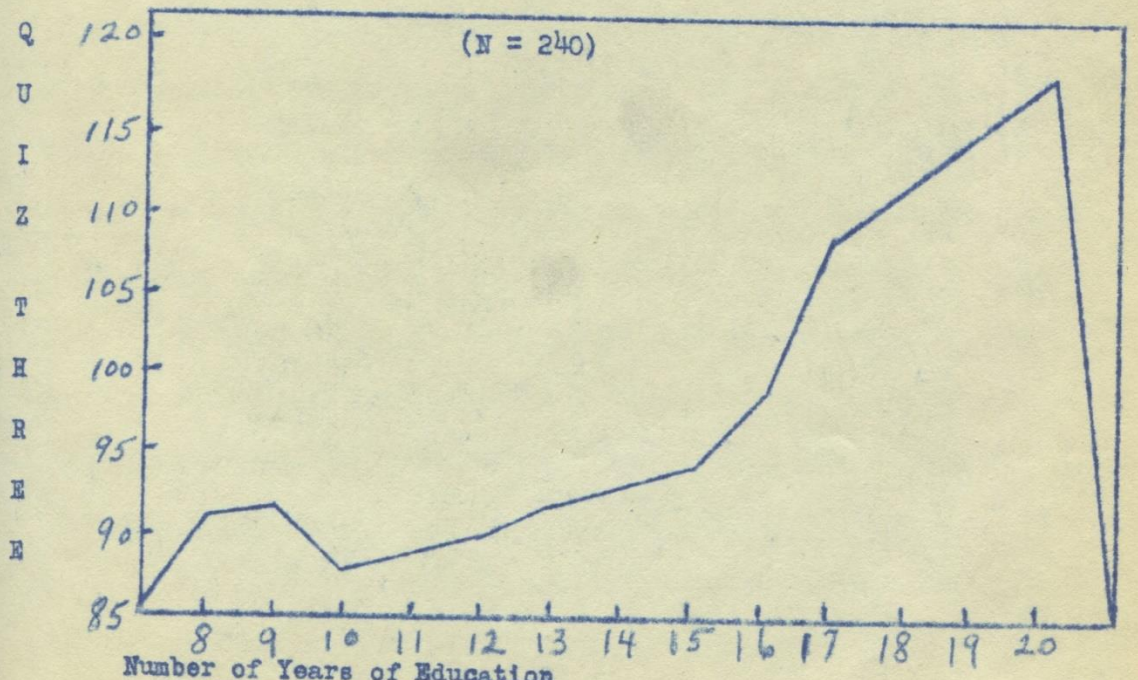

FIGURE VIII - MEAN PERFORMANCE ON QUIZ THREE OF AIRMEN WITH DIFFERENT AMOUNTS OF EDUCATION

The results of Quiz One of Figure X shows that those in the service a short time did a little better than the "oldtimers". The older men were a little slower in getting started; therefore, the younger students were able to "out-do" them. Also, the younger students have done consistently better on the First Phase because it is more academic, and that is the kind of studying they were accustomed to.

The shape of Figure XI again reveals the results of the different instructional methods used in Phase Two. The newer airmen again "out-performed" the other groups, but the older men gradually increased their scores. Throughout this set of graphs, there has been a consistent improvement in test score results somewhere in between seven and nine years, varying from quiz to quiz. This might be due to chance factors, but there might also be a real reason for it. During these years the airman is either ending his second enlistment or beginning his third one. Either case might be reason enough for increased motivation. He might want to make a good showing as he completes his career in the service; he might want to perform well in order to be in line for promotions or desirable assignments in the next enlistment; or, he has just started out for another four years and sometimes a new start enlivens a person's motivation.

There has also been an increase varying between twelve and thirteen years. This can be explained in terms of the explan-

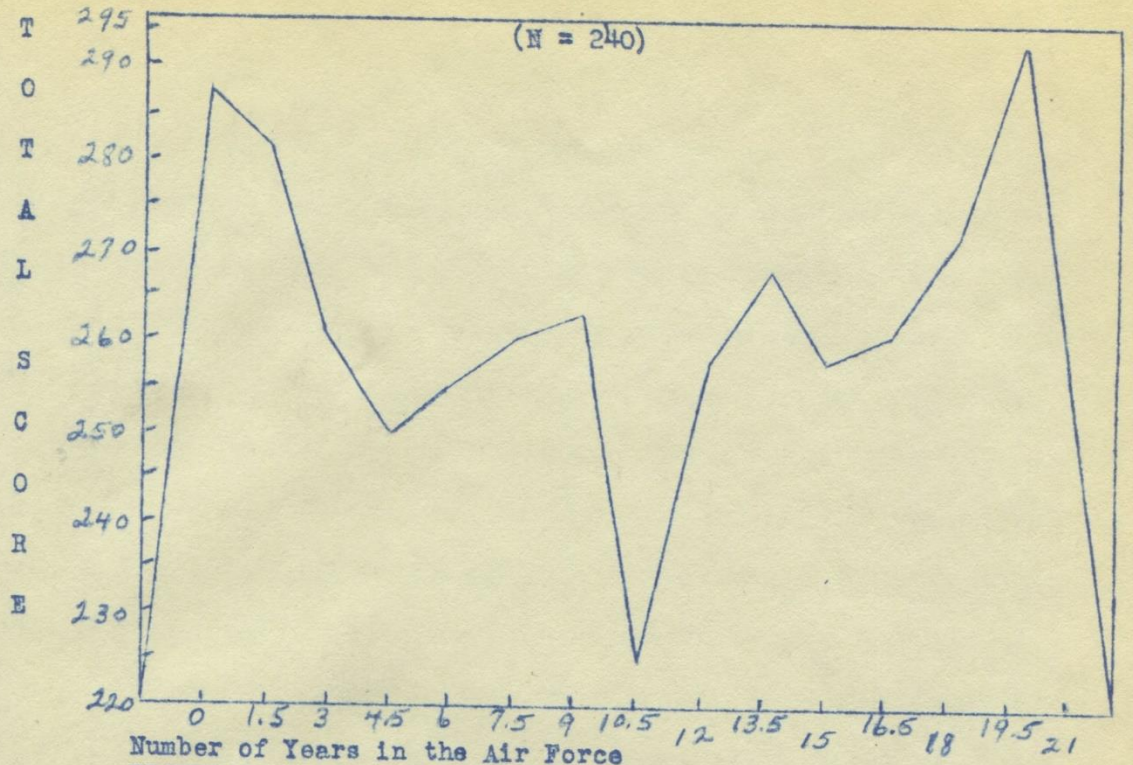

FIGURE IX - MEAN PERFORMANCE ON TOTAL SCORES OF AIRMEN WITH DIFFERENT AMOUNTS OF TIME SPENT IN THE AIR FORCE

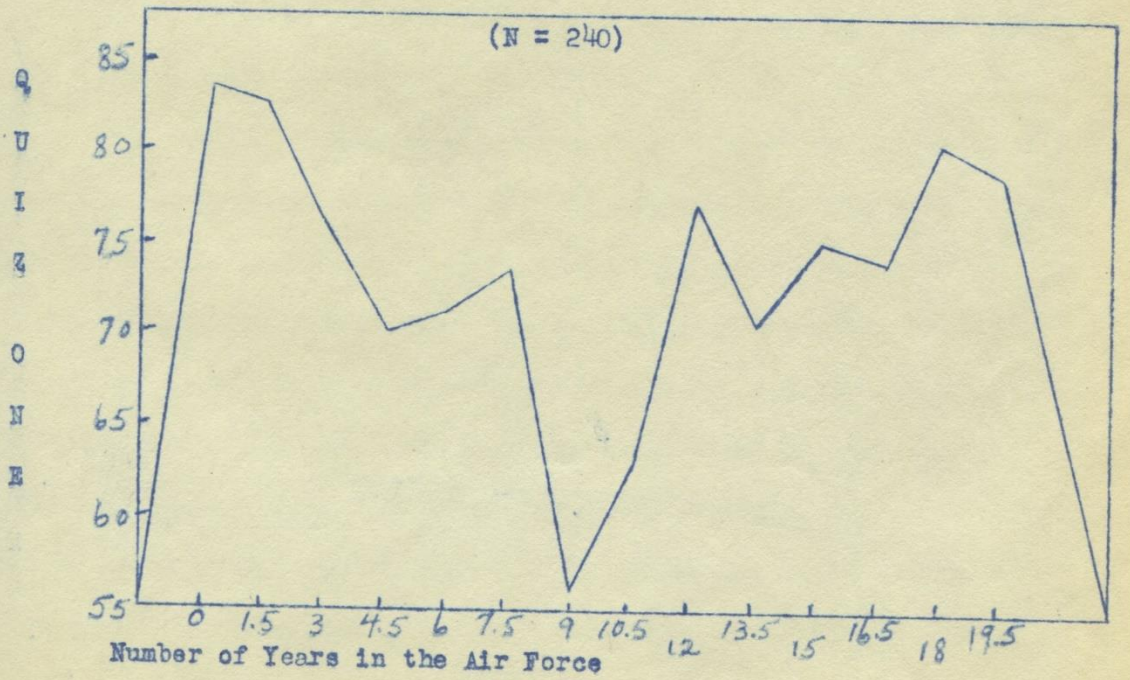

FIGURE X - MEAN PERFORMANCE ON QUIZ ONE OF AIRMEN WITH DIFFERENT AMOUNTS OF TIME SPENT IN THE AIR FORCE

ation of the dip at ten years as mentioned before. If the individual was confused before and has finally made up his mind to stay in the service, a sudden spurt of activity and motivation results from the relief he receives from making this definite decision. So, during his twelfth and thirteenth years, he does well. The individual has been periodically promoted throughout the years and as he approaches twenty years in the service, the "master sergeant's stripes" are almost a certainty if he does not already have them. This final promotion is perhaps enough to increase his motivation at that time.

Something which has been noticed before is seen again in Figure XII (Quiz Three). That is, the airmen who have been in the Air Force the longest are the best performers when it comes to the practical aspects. Some of these individuals have had considerable experience in the actual counseling situations that the younger ones are just learning about in the classroom.

It would be well to suggest at this point that future selection boards question the efficiency of the "middle man", so to speak. The airman who is undecided about whether or not to stay in the service, does not seem to make the best kind of student. It would be better to wait a year or so until he has had a chance to resolve this conflict. The man with from nine-and-a-half to eleven years, in the service is a poor risk in college level courses.

The outlook in Figures XIII to XVI is not quite as consistent as the previous set was. "Time Away from School" as a factor,

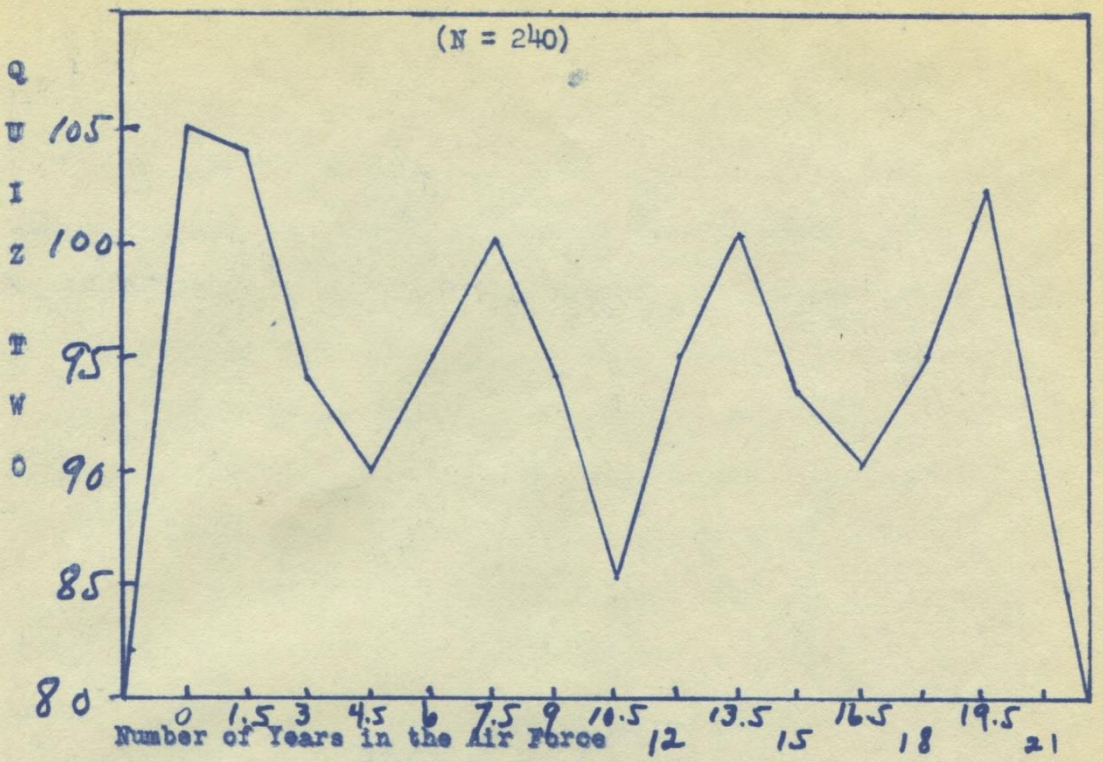

FIGURE XI - MEAN PERFORMANCE ON QUIZ TWO
OF AIRMEN WITH DIFFERENT AMOUNTS OF TIME SPENT IN THE AIR FORCE

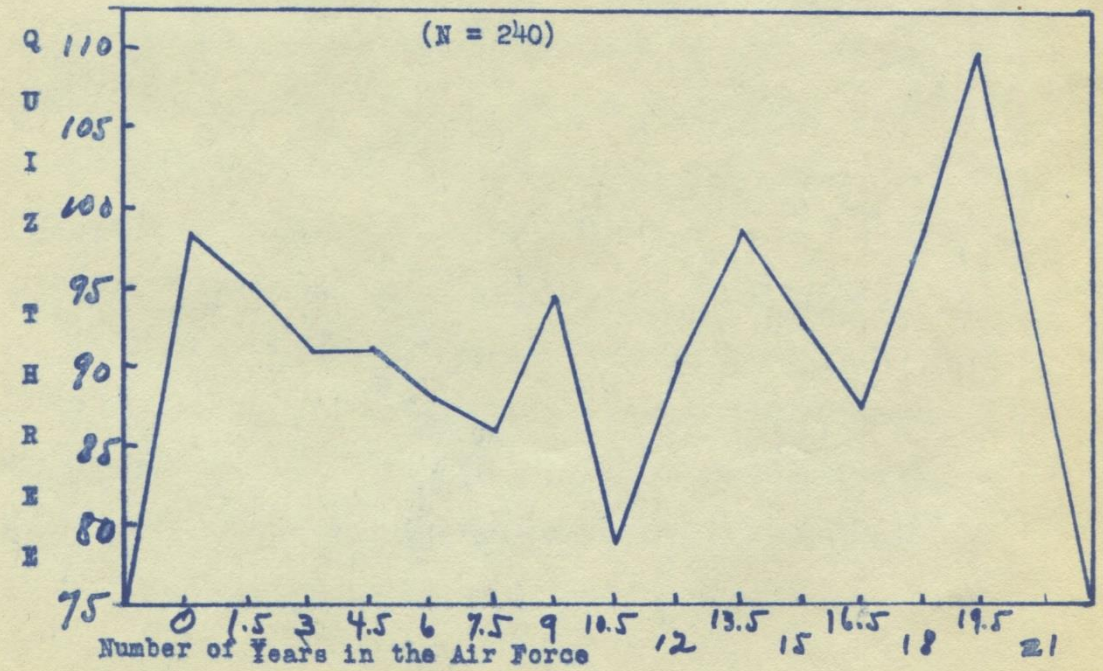

FIGURE XII - MEAN PERFORMANCE ON QUIZ THREE
OF AIRMEN WITH DIFFERENT AMOUNTS OF TIME SPENT IN THE AIR FORCE

seems to vary with each quiz. The total picture as shown on Figure XIII looks somewhat like Figures IX through XII. Here again, the best performance was turned out by those who had been away from school the longest. Not very far behind were those just out of school. This particular pattern reminds one of the previous set of graphs and maybe the same factors are present in both. Three other groups did well in this multimodal picture. They are those away from school nine, fifteen and eighteen years for which no apparent explanation is immediately evident. The poorest performances came from those who had been away from school ten and nineteen years. The explanation for the ten year group is the same as has been mentioned before, but the nineteen-year-old-group presents a new problem.

Figure XIV, showing Quiz One results, has the same shape as most other Quiz One graphs. Those just out of school did the best, probably because they were not far from, chronologically speaking, former studies. The oldest group were not on "top" but they performed above average. The ten year group was low along with the nineteen year group.

Those just out of school did the best on Figure XV, followed by those at the thirteen and twenty-four year intervals. The ten year group was low, but two other groups were even lower on this quiz. Those were the individuals who had been away from school sixteen and nineteen years. The results with this set of figures seem to be rather inconclusive; but is consistent with

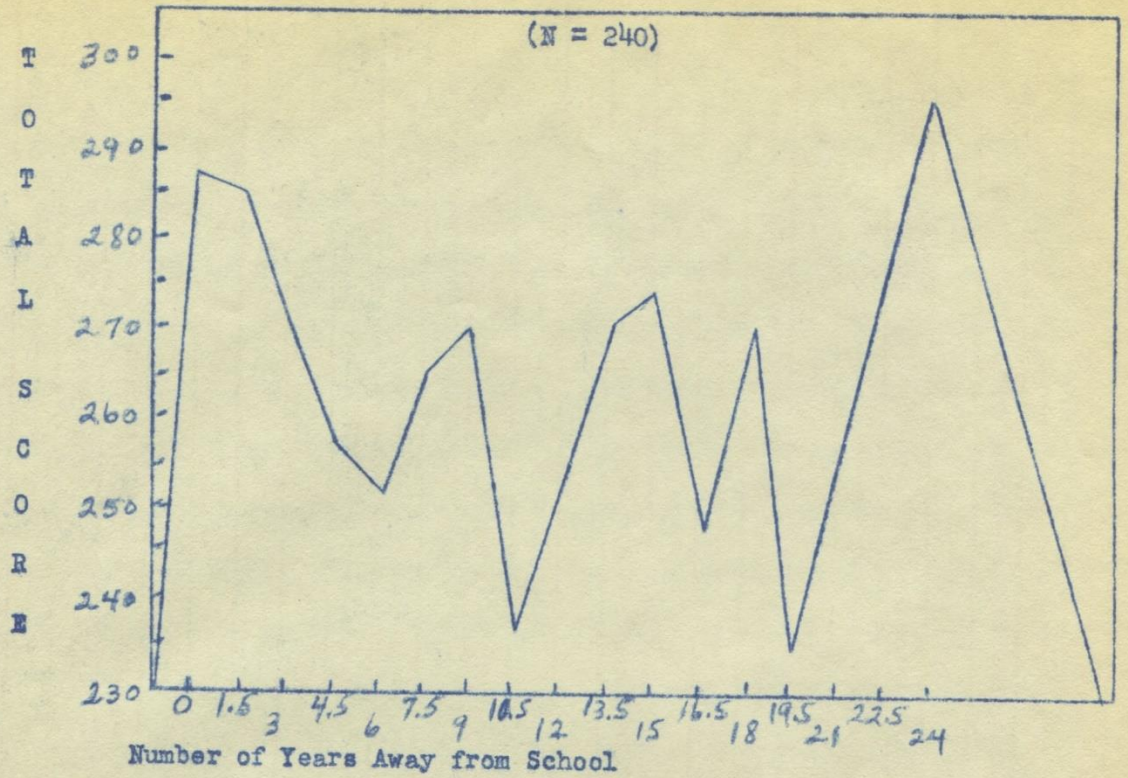

FIGURE XIII - MEAN PERFORMANCE ON TOTAL SCORES
OF AIRMEN WITH DIFFERENT AMOUNTS OF TIME AWAY FROM SCHOOL

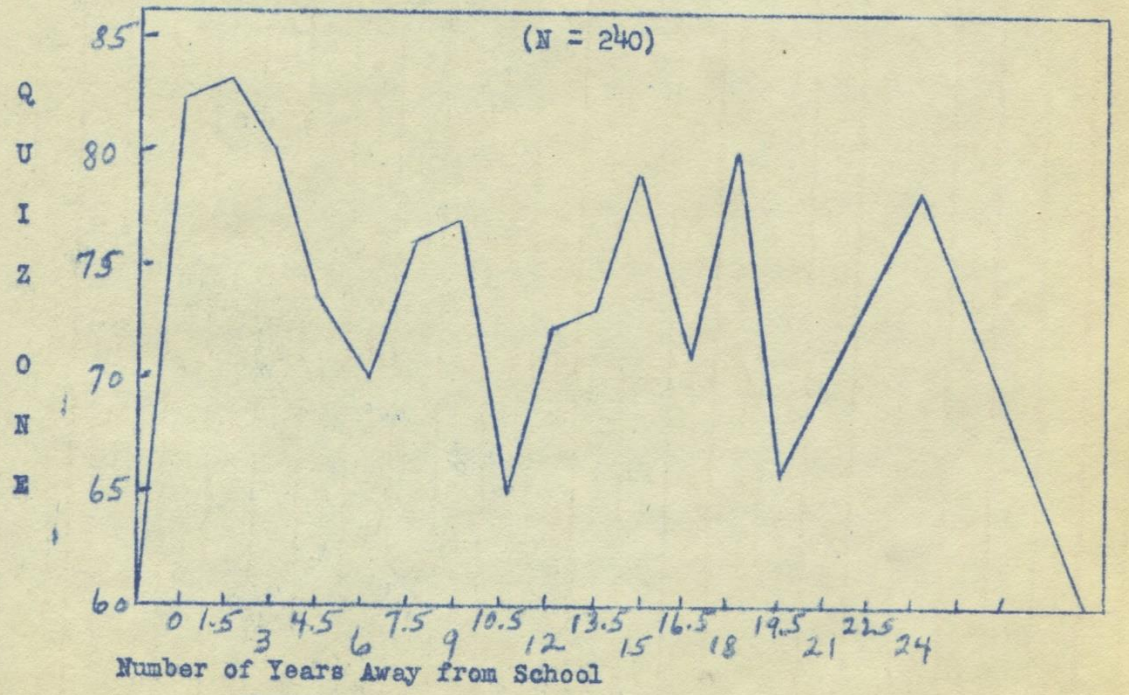

FIGURE XIV - MEAN PERFORMANCE ON QUIZ ONE
OF AIRMEN WITH DIFFERENT AMOUNTS OF TIME AWAY FROM SCHOOL

other Quiz Two graphs. Chance factors might be operating or perhaps some other factor is present which has not been accounted for.

Quiz Three on Figure XVI is consistent with other Phase Three graphs in that the older students do a better job on the more practical part of the course. The group just out of school is not far behind though, as it has been other times. Other groups who performed above average were those away from school nine, thirteen, fifteen and eighteen years. Again, those away from school nineteen years fell "way down" along with the ten year group.

Each figure in this set has the "peaks and valleys" at the same intervals. However, there does not seem to be any explanation for some of these. The groups that are consistently the highest are those just out of school and those out the greatest number of years. This relationship, explained before, suggests further that these groups should be selected in the future for similar training.

Commissioned Officers. As can be seen on Table II, there is hardly any relationship between the performances of officers and their biographical backgrounds. This might be a function of the small population, or it might represent the true picture. The large standard errors make the correlations very unreliable. Only one correlation was significant at the one per cent level of confidence. That was the relationship between Quiz Two scores and age (-.42). The relationship between Quiz Two and amount of time

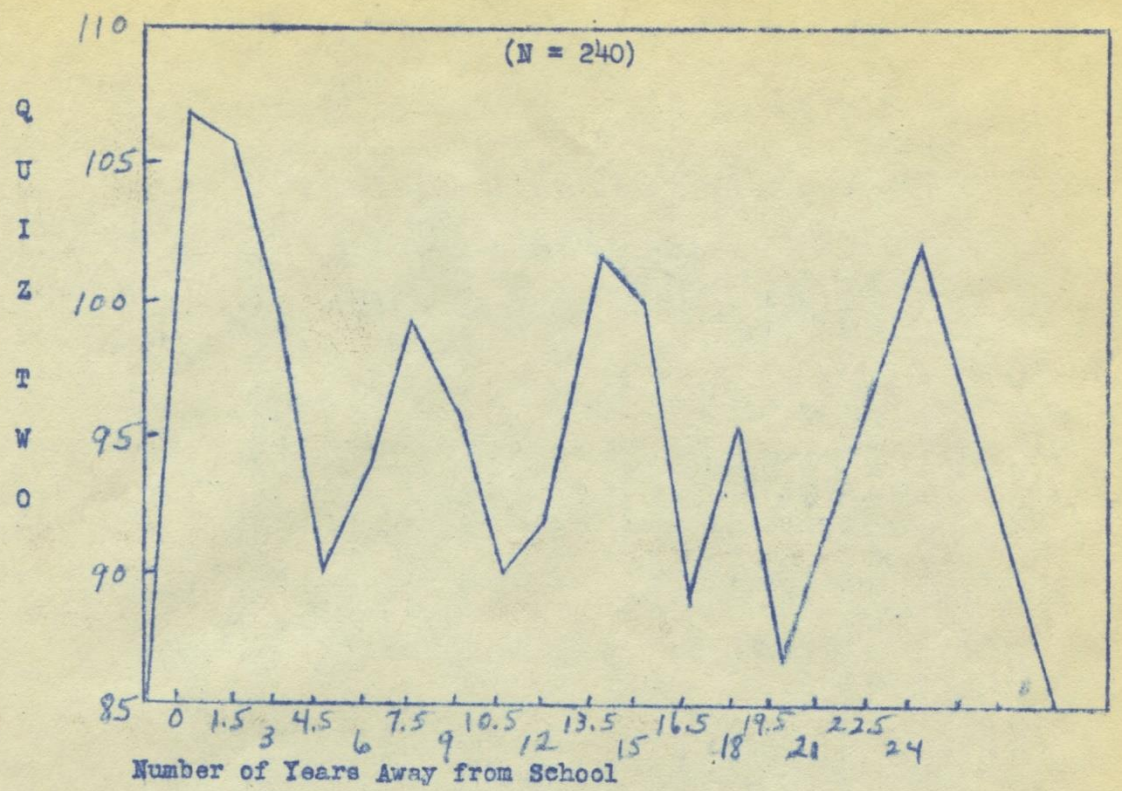

FIGURE XV - MEAN PERFORMANCE ON QUIZ TWO
OF AIRMEN WITH DIFFERENT AMOUNTS OF TIME AWAY FROM SCHOOL

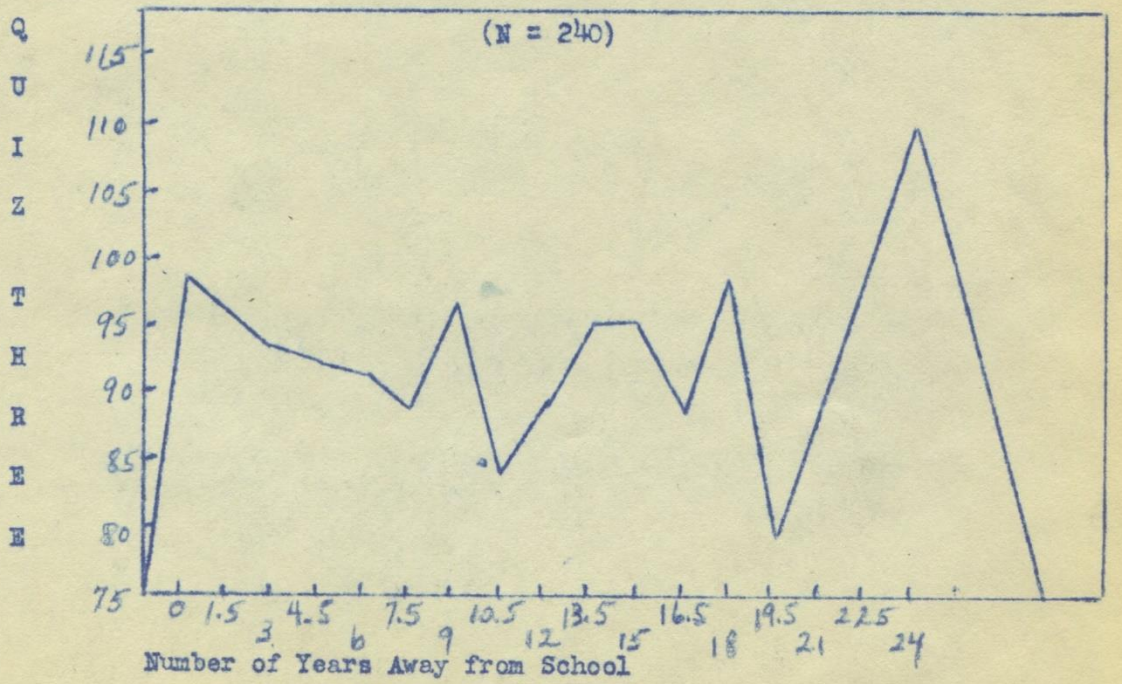

FIGURE XVI - MEAN PERFORMANCE ON QUIZ THREE
OF AIRMEN WITH DIFFERENT AMOUNTS OF TIME AWAY FROM SCHOOL

TABLE II

CORRELATIONS BETWEEN TEST SCORES

AND BIOGRAPHICAL FACTORS

FOR COMMISSIONED OFFICERS

Biographical Factors	Quiz One	σ_r	Quiz Two	σ_r	Quiz Three	σ_r	TOTAL SCORE	σ_r
Age	.06	.185	-.42*	.153	.08	.184	-.08	.184
Amount of Education	-.03	.185	-.02	.186	-.13	.185	-.004	.186
Number of Years in the Air Force	.06	.185	-.19	.179	.004	.186	-.08	.184
Number of Years Since Last Attended School	.05	.185	-.29**	.170	.08	.184	-.04	.185
N = 29								

* - This correlation was found to be significant at the one per cent level of confidence.

** - This correlation was found to be significant at the five per cent level of confidence.

away from school and significant at the five per cent level (-.29). It is interesting that both of these significant correlations were between Quiz Two and either age or a function of age. From this, one could say that the younger officers, conscious of their records, try very hard to keep their performance up. Perhaps they realized from comments of previous classes or from the content of Phase Two that a quiz covering this area would be one of the hardest; so they studied more and came up with better grades.

In general, though, it can be said for the officers that there is no correlation between success in this course and the biographical factors studied, with the exceptions noted above.

As stated before, no graphs were constructed for the officers mean performance because the relationships were so negligible and the total number is so low, that such graphs would be misleading.

CHAPTER V

SUMMARY AND CONCLUSIONS

A real need exists in the armed services today to provide some valid and reliable measure predicting success in college level courses. Those in charge of such programs should have some bases for selecting the right personnel in order to effect the most economical and efficient results. The same problem applies to institutions of higher learning. This study was conducted to determine the predictive value of four biographical factors, namely, age, amount of education, number of years spent in the Air Force, and number of years since the individual last attended school. Test scores, the success criteria, were obtained from students enrolled in an Air Force Career Counseling Course at the University of Denver. These were correlated (both total and phasic) with the biographical factors. Graphs were constructed showing the mean scores at various intervals of the background factors.

The above factors are not claimed to be the only ones that can predict success in college work. These are ones, however, that have not been investigated to any great extent. There are no military studies utilizing these factors. In view of the survey of the literature stemming from university studies bearing on this problem, one finds that (1) time away from school is a factor governing success upon returning to school, depending on the time interval involved; (2) the amount of education definitely affects success

in further education; and (3) age has some relation to success, but evidently not too much, as revealed by the relatively low correlations.

Suggestions for future research would include: (1) to conduct another study, similar to this one, using a larger population including samplings of individuals from all college level courses in the Air Force in order to see if the correlations are any different due to the wider sampling; (2) conduct a study similar in scope to the present one, comparing sex and possibly racial differences; (3) to conduct a study investigating the predictive value of these same factors in virtually all kinds of armed service training, not only college work. All of these suggested studies should utilize, where possible, a comparison group of officers, using a much larger population than was used here.

Conclusions resulting from this study can be made as follows:

1. The ideal age for counselor training seems to be around twenty-seven, even though the correlations regarding age are low.

2. It is certain, both correlation-wise and in terms of selection, that increased education insures better performance, i.e., counseling students should have, at least, some college training, the more the better.

3. Individuals just out of school and only recently in the Air Force, and those who have been in the service (and away from school) about nineteen years perform better in this type of training

than those in the service and away from school approximately only ten years.

4. The correlations found between the biographical factors and test scores for the enlisted men were statistically significant at the one per cent level of confidence, but did not represent more than a thirty per cent improvement over chance.

5. These results can be applied to similar situations in the Air Force and allied problems in the armed forces. However, no generality is claimed for the prediction of college success, even though some of the findings might be applicable.

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36. Note: This was the Rating Sheet used by the Evaluation and Selection Board of Officers to screen applicants for the Air Force Career Counseling Course # 73000A, Lackland Air Force Base, Texas, 1952. No other information available. Mimeographed copy.

APPENDIX

TABLE XII

DISTRIBUTION OF ENLISTED MEN BY AGE

Age Intervals In Years and Months From To	Number
18-6 -- 19-11	1
20-0 -- 21-5	23
21-6 -- 22-11	80
23-0 -- 24-5	73
24-6 -- 25-11	19
26-0 -- 27-5	9
27-6 -- 28-11	2
29-0 -- 30-5	2
30-6 -- 31-11	7
32-0 -- 33-5	7
33-6 -- 34-11	4
35-0 -- 36-5	5
36-6 -- 37-11	6
38-0 -- 39-5	0
39-6 -- 40-11	2
	N = 240

TABLE IV

DISTRIBUTION OF ENLISTED MEN BY AMOUNT OF EDUCATION

Number of Years of Education	N
8	3
9	3
10	1
11	0
12	62
13	20
14	42
15	26
16	68
17	14
18	0
19	0
20	1
	N = 240

TABLE V

DISTRIBUTION OF ENLISTED MEN

BY THE NUMBER OF YEARS SPENT IN THE AIR FORCE

Number of Years In the Air Force (Intervals in Years and Months) From To	N
0-0 -- 1-5	101
1-6 -- 2-11	57
3-0 -- 4-5	27
4-6 -- 5-11	11
6-0 -- 7-5	8
7-6 -- 8-11	7
9-0 -- 10-5	4
10-6 -- 11-11	3
12-0 -- 13-5	4
13-6 -- 14-11	4
15-0 -- 16-5	6
16-6 -- 17-11	3
18-0 -- 19-5	4
19-6 -- 20-11	1
	N = 240

TABLE VI

DISTRIBUTION OF ENLISTED MEN

BY THE NUMBER OF YEARS AWAY FROM SCHOOL

Number of Years Away From School (Intervals in Years and Months) From To	N
0-0 -- 1-5	64
1-6 -- 2-11	78
3-0 -- 4-5	27
4-6 -- 5-11	15
6-0 -- 7-5	9
7-6 -- 8-11	10
9-0 -- 10-5	5
10-6 -- 11-11	4
12-0 -- 13-5	7
13-6 -- 14-11	6
15-0 -- 16-5	4
16-6 -- 17-11	5
18-0 -- 19-5	4
19-6 -- 20-11	1
21-0 -- 22-5	0
22-6 -- 23-11	0
24-0 -- 25-5	1
	N = 240

BIOGRAPHICAL PREDICTION OF EDUCATIONAL SUCCESS

An Abstract of a Thesis

Presented to

The Faculty of the Graduate College

University of Denver

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

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by

Gerald Melvin Simmerman

June, 1953

ABSTRACT

A real need exists in the armed services today to provide some valid and reliable measure predicting success in college level courses. Those in charge of such programs should have some bases for selecting the right personnel in order to effect the most economical and efficient results. The same problem applies to institutions of higher learning. This study was conducted to determine the predictive value of four biographical factors, namely, age, amount of education, number of years spent in the Air Force, and number of years since the individual last attended school. Test scores, the success criteria, were obtained from students enrolled in an Air Force Career Counseling Course at the University of Denver. These were correlated (both total and phasic) with the biographical factors. Graphs were constructed showing the mean scores at various intervals of the background factors.

Suggestions for future research would include: (1) to conduct another study, similar to this one, using a larger population including samplings of individuals from all college level courses in the Air Force in order to see if the correlations are any different due to the wider sampling; (2) conduct a study similar in scope to the present one, comparing sex and possibly racial differences; (3) to conduct a study investigating the predictive value of these same factors in virtually all kinds of armed service training, not only to college work. All of these suggested studies should utilize, where possible, a comparison group of officers, using a much larger

population than was used here.

Conclusions resulting from this study can be made as follows:

1. The ideal age for counselor training seems to be around twenty-seven, even though the correlations regarding age are low.

2. It is certain, both correlation-wise and in terms of selection, that increased education insures better performance, i.e., counseling students should have, at least, some college training, the more the better.

3. Individuals just out of school and only recently in the Air Force, and those who have been in the service (and away from school) about nineteen years perform better in this type of training than those in the service and away from school approximately ten years.

4. The correlations found between the biographical factors and test scores for the enlisted men were statistically significant at the one per cent level of confidence, but did not represent more than a thirty per cent improvement over chance.

5. These results can be applied to similar situations in the Air Force and allied problems of the armed forces. However, no generality is claimed for the prediction of college success, even though some of the findings might be applicable.