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THE RELATIONSHIP BETWEEN SCORES ON A BATTERY
OF NURSING TESTS AND SCHOLASTIC ACHIEVEMENT AT
THE END OF THE PRE-CLINICAL PERIOD

By

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A Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of
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CHAPTER I
THE PROBLEM

In September of 1947 the Student Personnel Office at Loyola University initiated a testing service for incoming students at St. Francis and St. Elizabeth hospitals. Each new student was given a battery of five tests, the results of which were to be used for the purpose of future guidance in the curriculum and would in no way affect the student's acceptance in the school of nursing. Plans for the future call for the utilization of similar test results as one means of screening out those prospective students who fail to attain minimum percentile ranks on the tests. It is now generally agreed that psychological tests furnish an objective evaluation of a person that could be otherwise obtained only after a long period of observation. Test results can be utilized to good advantage in the selection and placement of students if the tests used are carefully chosen and intelligently interpreted. Tests do have certain limitations and are best used in conjunction with the student's past academic record and an oral interview. It would seem an unwise procedure to accept or reject a student on any one of these criteria alone. Tests may be used profitably for discovering weak points in the backgrounds of individual students, for comparing various entering classes and for dealing with problem students. The present study is an attempt to discover the degree of correlation existing between each test and scholastic average as determined by the final pre-clinical grades.

The number of student nurses who drop training each year is exceedingly high. In 1934 the New York State Education Department released a study concerned with nursing education in that state.¹ According to this study 15,398 students were admitted to 105 nursing schools between December 1932 and February 1939. Of this number 5,688 students, or approximately 37 percent of the entire group were eliminated before completing their course. Of those eliminated, 3,555, or about 63 percent, had left by the end of the pre-clinical period, while 4,975, or slightly more than 84 percent of all eliminated had left the schools by the end of the first year. There is no reason to suppose that conditions in New York State are especially different from that in any other state.

In view of the fact that student nurses do not return to the hospital during the first year of their course enough hours of work to repay the outlay necessary for maintaining and educating them, the expense to the hospital is admittedly heavy. According to this same study the estimated cost to the hospital for each hour of work done by the pre-clinical students, was \$1.01, as against an average of 39.4 cents for all students and as against 29 cents per hour for seniors. All of this is indicative of the economic waste connected with admission of students who do not have at least a reasonable chance of success. A second argument for better pre-selection among nursing applicants is the effect upon those who are admitted into schools and are dropped within a few months because of inability to succeed. The emotional

1 Harlan H. Horner, "Nursing Education and Practice in New York State with Suggested Remedial Measures," University of The State of New York Press, Albany, 1934, p. 38.

effects of failing in such an endeavor are apt to be far-reaching, long lasting, and decidedly injurious. A final reason is the effect that failing students have on the remainder of classmates. Most teachers feel that once a girl is accepted she has ability as such for the work at hand. When the inferior student begins to have difficulties the instructor will, in many cases, spend a disproportionate amount of time on them, neglecting the remainder of the class. It is believed that a battery of tests will be the means for improving pre-selection of students.

CHAPTER II

REVIEW OF RELATED LITERATURE

Many studies have been made of the prediction of success in the field of nursing. Nursing, unlike many other professions, involves a successful combination of both theoretical and practical work. In the past, the relative importance of these two aspects have varied from hospital to hospital. Studies carried out from fifteen to twenty-five years ago indicated with varying degrees of emphasis that intelligence, as measured by such tests as the Binet, Army Alpha, or the A.C.E. Psychological Examination, was not related to success in nursing. Mary G. Earl's ¹ article on the use of testing procedures in schools of nursing appears to be expressive of the general attitude toward testing in previous years. With regard to the use of such tests she said:

In other words, intelligence testing cannot be made at this time to take the place of all other criteria and where a student thoroughly satisfies from several standpoints no test of intelligence should be used to her prejudice. We cannot as yet, measure zeal, nor enthusiasm, nor fervor, and these qualities may loom large in a few people of only average intelligence.²

1 M.G. Earl, "Intelligence Testing of Probationers," American Journal of Nursing, 23:866-69, 1923.

2 Ibid., pp. 866-67.

Habbe³ conducted a study on the importance of intelligence as an aid to success in nursing. He attempted to find the degree of relationship existing between the student's intelligence quotient and her success in academic work as measured by the average of all academic grades. The value of rho found between these two variables was $.18 \pm .15$. On the basis of this finding Habbe concluded that, "Intelligence within the range of I.Q. 86 to I.Q. 129 is not an important factor statistically in success in nursing training."⁴

Hyman and Dreyfuss⁵ administered the Thurstone Cycle Omnibus Test and the Otis Group Intelligence Scale to 128 probationers. They found that a very wide range of ability existed within the group, percentile ranks ranging from the fifth to the ninety-fifth. On the basis of this they concluded:

If this is at all true of student nurses in general, it certainly suggests that the differences in intelligence, above the minimum standard already assumed as a requisite for graduation from high school, do not form an important factor in the qualifications for success in nursing, and that individuals considerably below the general adult norm in intelligence are not only capable of passing the nurses training course, but that this is quite a usual occurrence. So that, while it may be assumed that intelligence undoubtedly is a factor in nursing qualifications, it is one whose importance is difficult to single out and measure.⁶

3 S. Habbe, "The Selection of Student Nurses," Journal of Applied Psychology, 17:564-80, 1933.

4 Ibid., p. 579.

5 A. Hyman, R. Dreyfuss, "How Intelligent Should Our Nurses Be?" American Journal of Nursing, 30:490-94, 1930.

6 Ibid., pp. 493-94.

Rhinehart⁷ administered a battery of psychological tests to forty-eight first year nursing students. The tests given were the Stanford Revision of Binet-Simon Intelligence Test, A.C.E. Group Intelligence Test, Moss Social Intelligence Test, Moss Nursing Aptitude Test and the Bernreuter Personality Inventory. Statistical treatment of the data consisted primarily of correlating scores made on the tests with grades in theory and practice of nursing.

Theory grade here is the average of the first semester's theoretical work which consisted of such courses as anatomy, physiology, chemistry and dietetics. The practice grade consisted of an estimation of the student's performance on the floor. The A.C.E. Psychological Examination yielded an "r" of $.62 \pm .06$ with theory grades. The Nursing Aptitude Test correlated $.62 \pm .06$ with theory grades. The author divided the group into three smaller groups on the basis of the results of the Stanford-Binet Test. Further investigation revealed that those girls in the lower third of the class, the "subnormals", had done equally as well in theory work and practice as had those in the middle or "normal" group. On the basis of these findings Rhinehart concluded:

In this study the I.Q. but little influences success in nursing when success is measured by grades in theoretical and practical work. "Normal" I.Q. students rate .6 higher in theory and 1.7 less in practice than "below normals." Under present conditions in nursing, a high I.Q. does not seem to be essential to success in nursing."⁸

7 Jesse B. Rhinehart, "An Attempt to Predict The Success of Student Nurses By The Use of A Battery of Tests," Journal of Applied Psychology, 17:277-93, 1933.

8 Ibid., p. 293.

Metcalf⁹ obtained ratings on twelve such factors as anatomy, physiology, chemistry etc., for 331 nurses. She found a coefficient of correlation of $.40 \pm .01$ between theory ratings and the Army Alpha Intelligence Test. A correlation of $.83 \pm .01$ was found between theory ratings and practice ratings, indicating that a nurse with a high rating in theoretical work has a very good chance of also ranking high in the practical side of nursing. The author concludes that the Army Alpha does not measure the total nursing ability of the individual but merely gives an indication of the general intelligence of the nurse, and that tests are needed which will measure the nursing ability of the nurse.

The studies to follow have been completed in the last ten or twelve years and indicate that intelligence tests do bear some relationship to success in schools of nursing. Entrance and classroom standards in most nursing schools have been raised appreciably during the last twenty years. This new emphasis on the quality of classroom work may be due in part to the fact that many of the more progressive hospitals are now affiliated with colleges and universities. As a direct result of this increased emphasis, success in nursing is being measured currently as much by achievement in the classroom as by the previously important practical work in the hospital ward.

Brooks¹⁰ found a correlation of $.54$ between the A.C.E. Psychological Examination and classroom grades. She also found that the Willoughby Test

- 9 R.L. Metcalf, "Achievements of Nurses in Relation To Intelligence Test Ratings," Proceedings, National League of Nursing Education, 174-74, 1928.
- 10 E. Brooks, "The Value of Psychological Testing," American Journal of Nursing, 37:885-90, 1937.

of Emotional Maturity correlated with ward rating scales .50. She concluded:

Students of greater mental ability, generally speaking, do better in both theory and practice than those of lesser ability, the difference between the two groups being greater in the case of theory. Students of greater maturity do better in both theory and practice than those who are immature, the difference between the two groups being the greater in the case of ward practice. Psychological tests can be used to the best advantage in elimination and prediction when they are employed in conjunction with a well-planned, selective preliminary period, with careful supervision and a program of guidance.¹¹

In 1938 Garrison¹² administered the Bernreuter Personality Inventory, Otis Self-Administering Test of Mental Ability, Iowa Reading Tests and the Detroit Mechanical Aptitude Test For Girls to a group of student nurses. The results from these tests were studied in relation to grades on anatomy, physiology and chemistry, grades secured on practical work and the student nurses efficiency record. A comparison was made between the test scores and average grades of the ten highest and ten lowest students in the class. In terms of correlations the results were negligible inasmuch as the highest correlation achieved, with the Otis Self-Administering Test of Mental Ability, was .48. This study serves to illustrate further the well known fact that students who fall at or near the top of their group in terms of test scores will generally be in a similar position in terms of academic success.

Potts,¹³ in a study of 436 students graduated from a group of nursing

11 Ibid., p. 889.

12 K.C. Garrison, "The Use of Psychological Tests In The Selection of Student Nurses," Journal of Applied Psychology, 23:461-72, 1939.

13 E.M. Potts, "Testing Prospective Nurses," Occupations, 23:328-34, 1945.

schools, found a correlation of .41 between tests of scholastic aptitude and average class grades during the three year training period. In this study Potts, by means of facts and figures based on 666 students, concludes that failure in classwork accounts for more dismissals and withdrawals from nursing schools than any other single factor. She also points out that such failures occur during the first semester of the training period in ninety percent of the cases. No indication is given as to which tests of scholastic aptitude were administered in this particular study.

In 1942 Sartain¹⁴ used eighty-one subjects in an attempt to determine the extent to which success in a school of nursing could be determined from the high school averages of students and also from the scores on the Revised Alpha Examination, Form 8, Columbia Vocabulary Test, Mc Quarrie Test for Mechanical Ability, Bernreuter Personality Inventory and the Potts-Bennett Test For Nursing Aptitude. These students were admitted to the school regardless of the scores made on the tests. The criterion of success was the average grade earned by the student in all courses at the end of six months of training, or at the time the girl left the school of nursing if she was not in training six months later. At the end of the six months period sixty-nine students were left. Nearly all of the girls who left did so because of failing grades. This study serves further to point out the pre-clinical period as the most important and crucial time in a nurses training program. The correlation between the Potts-Bennett Test and school of nursing average was found to be .677. Addition of the other tests to the Potts-Bennett

14 A.Q. Sartain, "Predicting Success In A School of Nursing," Journal of Applied Psychology, 30:234-40, 1946.

raised the correlation to .680, a negligible amount. The Potts-Bennett and the high school average yielded a multiple correlation of .702. This nursing aptitude test alone was found to be almost as effective in prediction of success as any combination studied. The fact that nursing aptitude tests in many studies correlate more highly with academic success than other related variables might indicate the need for utilization of a different nursing aptitude test in the battery given by Loyola at the present time.

In a study by Berg¹⁵ psychological test and other data were analyzed for 110 student nurses admitted to a school of nursing during 1943-45. They were given the A.C.E. Psychological Examination, Form 1940, (Hunt) Aptitude Test For Nursing, (Hunt) Arithmetic Test For Prospective Nurses, (Hunt) Reading Comprehension Test For Prospective Nurses, The Kuder Preference Record, Form 1942 BM, and the Multiple Choice Test. Comparisons were made of successful nurses in training with those who were dropped for poor scholarship and those who quit for other reasons. Of the 110 students who started, thirty-six or 32.7 percent had been dropped or had quit at the end of nineteen months of training. Fifteen of the thirty-six had been dropped for poor scholarship. Data from the test battery revealed that this poor scholarship group performed significantly lower on tests of scholastic and nursing aptitude. Seven students quit because they disliked training. There was some evidence that these nurses had interests different from the group of seventy-four successful nurses and that they had an unrealistic notion of what the

15 I.A. Berg, "A Study of Success And Failure Among Student Nurses," Journal of Applied Psychology, 31:389-95, 1947.

duties of nurses were. Little information was found to set apart the group who dropped for "other reasons" from the successful group.

In an attempt to find out in what ways successful nurses differed from unsuccessful nurses Douglass and Merrill¹⁶ selected comparable data from the records of 250 nurses, 125 of whom were successful graduates, the remaining 125 having been dropped (54%) or withdrawn voluntarily (46%). Comparisons made involved items of personal history and high school performance. They found that nurses professed a liking for high school science courses, that successful nurses chose chemistry as an elective whereas the unsuccessful nurses chose home economics. Surprisingly enough, they found the high school principal's rating of personal qualifications to be the most discriminative index of success in the school of nursing. The value of such an instrument as the rating scale would depend primarily on how well acquainted the principal was with each student in the class. In a large class it is doubtful that a scale like this would be of much value. In general, the successful graduate rated higher than the eliminants in study habits, health, and other personal characteristics. It was found that the greatest amount of elimination (50%) took place during the first quarter. This serves to bear out the contention held by many authors, namely, that a large percentage of nursing students drop out during or shortly after completion of the pre-clinical period. These facts led the authors to the conclusion that a battery of

16 H.R. Douglass, R.A. Merrill, "Prediction of Success In Schools of Nursing," University Minnesota Studies in Prediction of Scholastic Achievement, 2:17-31, 1942.

tests and measures correlating well with first and second year achievement should identify a large number of potential failures and withdrawals. The authors investigated the records of four other groups of nurses ranging in size from sixty-six to 180 subjects. They ran single and multiple coefficients of correlation between as many as thirteen variables and academic achievement. Academic achievement, as used in this study, consisted of, (1) a combination of scientific and clinical marks for the first year and (2) the one and two year honor point ratio system. Highest single correlations, using both standards for academic achievement, were found with the Moss Nursing Aptitude Test. Correlations ranged from .54 to .62. When academic achievement was not considered the best four-factor combination of measures was high school percentile rank and scores on the Moss Nursing Aptitude Test, The Cooperative General Science Test, Part I, and the Douglass-Gordon Fraction Test, which yielded a correlation of .77. The Moss Nursing Aptitude Test also correlated high (.75) when used with the high school percentile rank instead of academic achievement. This study brings out the definite value and place of the high school record in any attempt to predict academic success.

In February of 1928 a testing program¹⁷ was set up at the Rhode Island Hospital training school for nurses. A study of comparative data available at the time indicated that, in terms of general intelligence, probationers and other students in this training school compared very favorably with corresponding groups in similar institutions. In order to discover whether or

17 A.H. Mc Phail, "Psychological Tests Applied to Nurses in Training at the Rhode Island Hospital," American Journal of Nursing, 29:203-206, 1929.

not scores on the Brown University Psychological Examination possessed any predictive value, a careful study was made of the records of thirty-five probationers, using grades from twelve theoretical courses. An "r" of .76 was found between scores on this examination and the average academic grade during the probationary period. A study of the average grades of thirty-two juniors showed that predictive significance of psychological scores may be expected to extend beyond the probationary period. For this group a correlation of .50 was found. In this group no student below the average for the group on the psychological test had an academic average as high as 85%. Conversely, no one above average on the test had an academic average below 75%. The correlation between the psychological examination and academic average in the case of the probationers is by far the highest single "r" found in available literature. There is nothing in the makeup of the Brown University Psychological Examination to set it apart from other similar tests. It is essentially a language test with some work in simple arithmetic reasoning and computation. The small number of subjects used in each case should be kept in mind in any interpretation of results.

Mc Phail and Bernard,¹⁸ using data based on records of 1500 probationers, found coefficients of correlation between the Brown University Psychological Examination and average preliminary grades ranging from .42 to .60. These authors also found:

It is quite obvious that there is a definite positive relationship between the chances of survival to graduate and the level or quality of the psychological test score, although

18 A.H. Mc Phail, W. Bernard, "Ten Years of Intelligence Testing," Educational And Psychological Measurement, 3:157-65, 1943.

there is considerable variation in these chances from school to school.¹⁹

Rainier, Rehfeld and Madigan²⁰ investigated the relationships existing between high school averages, psychological ratings, reading tests and academic achievements at the end of the first semester in the school of nursing. Data were obtained from the records of eighty students. Subjects covered by the first semester's work included microbiology, chemistry, anatomy and physiology, drugs and solutions and hygiene. The authors found a correlation of $.43 \pm .06$ between the first semester's average and the high school average, and a correlation of $.42 \pm .06$ between the same scholastic average and the A.C.E. Psychological Examination.

We may conclude from the foregoing studies that:

1. Single and multiple correlations between academic average and test scores tend to be well within the range of .40 to .76.
2. The primary reason for elimination in nursing schools may be attributed to academic failure.
3. The pre-clinical period is undoubtedly the most crucial period in the three year program.
4. Studies completed in the last ten or twelve years indicate that intelligence test scores do have or bear a definite relationship to success in nursing.
5. The high school average and percentile rank are of definite value as indices of probable success in the nursing curriculum and for purposes of future guidance.
6. Students who do exceptionally well in entrance tests tend to do equally as well in theoretical work within their class.

19 Ibid., p. 160.

20 R.N. Rainier, F.W. Rehfeld, M.E. Madigan, "The Use of Tests in Guiding Student Nurses," American Journal of Nursing, 42:679-81, 1942.

7. Nursing aptitude tests tend to be of equal, if not more, value with other psychological tests in regard to prediction of success in nursing schools.

CHAPTER III

SOURCES, TREATMENT OF DATA AND METHODS OF PROCEDURE

The data used in this study consists of the results of a battery of five psychological tests and the average of all final grades received by each of the ninety-five student nurses at the completion of their pre-clinical work. The five tests used were the American Council On Education Psychological Examination, Form 1946, the Kuder Preference Record, Form BM, (Hunt) Arithmetic Test For Prospective Nurses, (Hunt) General Science Test For Prospective Nurses, and (Hunt) Aptitude Test For Nursing.

American Council On Education Psychological Examination, Form 1946

This nationally used test is perhaps best characterized as a measure of academic aptitude or the ability to profit from schooling beyond the high school level. Two sub-scores and a total are given. The Quantitative sub-score, indicative of Quantitative Reasoning ability, is derived from the sections of the test which deal with simple arithmetic computation, number series, and figure analogies. Individuals who score low in this section of the test may have difficulty in reasoning with quantitative concepts. The Linguistic sub-score, indicative of Linguistic Reasoning ability, is derived from the sections of the test which deal with vocabulary, word meaning, and verbal analogies. Individuals who score low in this section of the test may have difficulty in reasoning with verbal materials, such as deriving meaning from printed material and so on. The Total or Gross score is based on both

the Quantitative and Linguistic scores, and since a minimum of each of these abilities is necessary for successful schooling the score is designated the Academic Aptitude Score. The first form was published in 1929 and annually thereafter. For the nursing curricula the correlations of this test with academic success are approximately in line with correlations quoted for the Hunt Aptitude Test For Nursing, zero order correlations clustering around sixty-five and multiple correlations with other tests approximating seventy-five. Data available on the reliability of the scores on this test indicate that they cluster around .95. Comprehensive norms for each annual edition are published in the April edition of the Educational Record. The total testing time involved in administration is one hour.

The Kuder Preference Record, Form BM

The Kuder Preference Record was included in this test battery because of its value in determining whether or not the student may be high in those interest areas which supposedly are desirable in nursing. It is a truism that regardless of the ability a person possesses she is not likely to be successful in a field like nursing, which is demanding of personal sacrifice, unless she has a vital interest in the field. Experienced counsellors of nurses know that the scores on an interest inventory, examined after a student has failed or withdrawn from the nursing curriculum may be the only instruments on which the scores deviate from the usual pattern of scores made by the successful student nurse. Therefore, data on scholastic aptitude and achievement are not enough when counselling with those students contemplating entering the nursing curriculum.

The Preference Record is intended as a means of making a systematic approach to narrowing a field of vocational choice for young people. Specific uses of this test are: "(1) To point out vocations with which the student may not be familiar but which involve activities of the type for which he has expressed preference. (2) To check on whether a person's choice of an occupation is consistent with the type of thing he ordinarily prefers to do."¹ Scores on the Preference Record are found to be as reliable as is usually considered necessary for use in a counseling program serving individuals. Studies reported in the 1944 edition of the manual show reliability coefficients on the revised edition to vary from .83 to .98 with a median of .91. Intercorrelations of part scores on this test are found to be low, indicating that the scores are not measuring the same thing. The items in the test sample, broadly, types of experiences which bear on the crystallization of interests in a specific occupation or career rather than being closely related to specific vocationally related activities. The 1944 manual of the Preference Record gives intercorrelations between general scholastic ability and achievement in various subject matter as measured by standardized tests and scores of the Preference Record. The validity of this test has now been fairly well established.

Mean profiles for the occupational groups studied to date are given in Tables 2 and 3 on pages 10-13. The results indicate in

1 G. F. Kuder, Revised Manual For The Kuder Preference Record, Science Research Associates, 1946, p. 3.

general that the names assigned to the various scales are appropriate in terms of the activity for which the scale is scored. Chemists are found to be particularly high on the scientific scale, writers on the literary scale, musicians on the musical scale, accountants on the computational scale, and so on.²

Percentile norms furnished are based on groups of college students segregated by sex. This test may be scored for occupations falling in the following types of activities: Mechanical, Computational, Scientific, Persuasive, Artistic, Literary, Musical, Social Service and Clerical.

The Hunt Nursing Tests, Aptitude, Arithmetic and General Science.

These three tests were selected from the battery which Dr. Thelma Hunt designed for and standardized on applicants for nursing schools. Only three of Hunt's tests were used because the others overlapped with other tests in the battery. The experimental work in the development of these tests was carried out in the District of Columbia where over 500 students a year were tested for a period of eight years. According to the author, the tests have an established validity in terms of relationship between ratings and performance in training courses and ward work, and in terms of usefulness in guiding and counseling individual students who present special problems.

Aptitude Test For Nursing, Form II

This is a general test, patterned somewhat after the old Moss-Hunt Test published in 1931. It contains parts measuring (1) judgment in nursing situations, (2) memory of an anatomical diagram and descriptions studied during the test, (3) information on general subjects somewhat related to nursing interest, (4) scientific vocabulary, and (5) ability to understand and follow directions with reference to filling in a typical nurses

report form. The whole test might be considered of the nature of a specialized intelligence test for prospective nurses. In addition to measuring general intelligence, the test probably also measures interest in nursing and specialized information and vocabulary likely to be acquired through the general experience and previous schooling by the person looking forward to nursing.³

There is a good deal of statistical evidence to indicate the extent of relationship between Form I and success in nursing courses. So far as this evidence is concerned, success in nursing courses can be predicted about equally as well by this test and an achievement test in science and arithmetic as by American Council On Education Psychological Examination. The zero order correlations seem to cluster around sixty-five and multiple correlations with other tests, such as a general science test, and an arithmetic test approximately seventy-five. From the extent of the revision of this test there is no reason to think that the correlations would be lower than they were for Form I.⁴

With regard to the relationship of test scores to class work the authors say:

If a girl falls in the highest tenth of Aptitude Test scores the chances are fifty-two out of a hundred that she will do superior classroom work, and eighty-two out of a hundred that she will do average or better. Contrast this with the lowest tenth where the chances are zero that she will do even passing work. If a girl falls in the upper half of Aptitude Test scores the chances are twenty-six out of a hundred of her doing superior work and seventy-one out of a hundred of her doing average or better; while if she falls in the lower half the chances are only one out of a hundred of her doing superior work, and only twenty out of a hundred of doing average or better.⁵

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- 3 T. Hunt, E. Healy, A Study of Three Tests Used In The Selection Of Applicants For Nurses Training Schools, Center For Psychological Service, George Washington University, 1941, p. 1.
- 4 F. O. Triggs, Personnel Work In Schools Of Nursing, W. B. Saunders Company, 1945, pp. 158-59.
- 5 T. Hunt, E. Healy, op. cit., p. 2.

These figures are based on the performance in classwork of 956 students falling in various tenths of the Aptitude Test scores. This test has a time limit of one hour.

Arithmetic Test For Prospective Nurses

This is a twenty minute test on fundamentals of arithmetic. The test includes short problems in decimals, percentage, and fractions, with one problem on translation of measures from one system to another when a table of equivalents is given. This test was included in the group because of the importance of arithmetic accuracy in certain work, such as that dealing with calculations of drug dosages. The authors state that the relationship between this test and classwork is not quite as high as that of the Aptitude Test.

It has been the opinion of some who have used the test that the lower relationship of Arithmetic Test scores to classroom work may be due to lesser importance of arithmetical ability than verbal ability in most training courses, although in a few courses, such as those involving drug calculations, its importance is great.⁶

General Science Test For Prospective Nurses

This test is a multiple-choice test covering high school science. It includes questions from all the different sciences found in the high school curricula, with an emphasis, however, upon those most closely related to medicine and nursing. This test has been developed to meet the needs of the nursing schools for a measure of this aspect of the background of the applicant or new student. Since so much of the work of the pre-clinical

⁶ T. Hunt, E. Healy, loc. cit.

period involves some knowledge of basic science, such a measure is invaluable. It is not necessary that the person tested have had formal courses in science. An adequate performance on the test would be possible on the basis of outside reading and experience.

Scholastic achievement was determined by taking the average grade for each student in chemistry, anatomy and physiology, pharmacology, microbiology, and nursing arts. Reports from individual instructors and nursing school supervisors indicate that grades were based on from two to five written examinations, classroom recitations and some outside assignments.

Frequency distributions were made in order to find the mean and standard deviations on each test and on the scholastic average. The student's raw score on each test was converted into a T-Score by means of a standard formula, a sample of which may be found in Lindquist's A First Course In Statistics.⁷ The coefficient of correlation between each test and scholastic average was computed by means of the Pearson product-moment method as outlined by Lindquist's correlation chart. After securing single correlations, test intercorrelations were computed by the same method mentioned previously with a view to utilizing them in deriving the multiple correlations. Statistical methods employed in the computation of these multiple correlations may be found in Garrett's Statistics In Education And Psychology.⁸

7 E. F. Lindquist, A First Course In Statistics, Revised Edition, 1942, p.149.

8 H. E. Garrett, Statistics In Education And Psychology, Second Edition, 1939, Chapter 14, pp. 409-463.

CHAPTER IV

FINDINGS AND CONCLUSIONS

The single and multiple correlations, means and standard deviations of the different variables will be found listed in Table I. These correlations when treated singly, as will be shown subsequently, approximate the findings in other studies. When taken as a battery the tests correlate rather highly with academic averages, the correlations ranging from .60 to .80, depending on the number of variables utilized.

Multiple correlation is especially useful when one wishes to determine the influence of a group of factors (e.g. a battery of tests) upon some final result (scholastic average). The calculation of successive correlations as tests are added to the group enables one to estimate the relative contribution of each factor. In the present study it was found that a combination of the Hunt Arithmetic Test and the Hunt General Science Test correlated $.60 \pm .05$ with scholastic average. The addition of the A.C.E. Psychological Examination to the battery raised the correlation to $.71 \pm .04$. Finally, addition of the Hunt Aptitude Test increased the correlation to $.80 \pm .03$.

The correlations, probable errors, means, standard deviations and percentiles on each of the nine scales of the Kuder Preference Record will be found listed in Table II. Each of the scales in this test was correlated separately with the scholastic average. The resulting correlations appear to

indicate clearly that in this particular study the Preference Record is of little or no value in prediction of success in a school of nursing. All correlations were negative with the exception of the following three; Computational $.10\pm.07$, Scientific $.13\pm.06$, and Literary $.07\pm.07$. In view of the fact that the majority of work during the pre-clinical period is of an academic nature, heavily weighted with science courses, it is not surprising that the correlations in these three areas are positive. Obviously, these three correlations are of little or no value for predictive purposes.

The means and standard deviations of the various scales are quite similar to those found by Berg,¹ Triggs,² and those given by Kuder.³ These findings are listed in Table III. Research⁴ shows that nurses are significantly higher in Scientific and Social Service, principally, and in Artistic and Musical interests when compared to women in general. Conversely, nurses tend to be lower in Computational, Persuasive, Literary and Clerical interests than women in general.

The mean scores found on the various scales in this study are more closely related to those found by Berg⁵ than those found by Triggs⁶ or Kuder⁷.

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- 1 I. A. Berg, "A Study Of Success And Failure Among Student Nurses," Journal of Applied Psychology, 31:389-95, 1947.
 - 2 F. O. Griggs, "The Measured Interests of Nurses," Journal of Educational Research, 41:25-34, 1947.
 - 3 G. F. Kuder, Revised Manual For The Kuder Preference Record, Science Research Associates, 1946, P. 12.
 - 4 F. O. Triggs, op. cit., pp. 25-34.
 - 5 I. A. Berg, op. cit., pp. 389-95.
 - 6 F. O. Triggs, op. cit., pp. 25-34.
 - 7 G. F. Kuder, op. cit.

In both of the former studies results were based on entering students who may have had an unrealistic idea of the duties involved in nursing while in the latter two studies results are based on data from graduate nurses who are well acquainted with the academic and practical side of the nursing curriculum.

In general, the Kuder Preference Record is a valuable adjunct to the test battery regardless of the lack of correlation between the various scales and scholastic average.

The correlation between the A.C.E. Psychological Examination and theory grades in this study is in keeping with similar studies. The three other studies in which this examination was used reported correlations of $.61\pm.06$, $.42\pm.06$ and $.54\pm.06$. These studies were covered in the review of the literature. The $.41$ correlation found in the present work is also in line with a $.40\pm.01$ found on the Army Alpha by Metcalf⁸ and a $.48$ on the Otis Self-Administering Test of Mental Ability by Garrison.⁹

The correlations on the nursing tests with theory grades while low, appear to be more or less in line with figures given by the author. Unfortunately there is little or nothing in the available literature on these tests that might serve as a basis for comparison. In view of the low correlation of the Aptitude Test with scholastic average, the reported higher correlation of other nursing aptitude tests with scholastic average and the paucity of statistics on the test, it seems advisable to remove this particular test from the battery.

8 R. L. Metcalf, "Achievements Of Nurses In Relation To Intelligence Ratings," Proceedings, National League of Nursing Education, 174-74, 1928.

9 K. C. Garrison, "The Use Of Psychological Tests In The Selection Of Student Nurses," Journal of Applied Psychology, 23:461-72, 1939.

The relationship between scores on the Hunt Nursing tests and success in classwork appears to be, as the authors state, one of moderate degree. This relationship will vary from one training school to another depending on the standards of admission, standards of grading training school work and in respect to customary proportion of students failed or given superior marks. A training school admitting only relatively superior students, say only those in the upper half of test scores, would be likely to present failures in the fourth or fifth decile if any at all were failed. On the other hand, a training school drawing a relatively poorer group might find some of its best students among the fourth and fifth deciles, and therefore, be likely to assign superior grades to these students. Generally speaking, the relationship between test scores and school work is more closely related if considered for each school separately than when considered for a large group of several schools of varying standards and practices. In some cases students with high test scores may fail or do poorly in their classwork. Many times these are students who have the native ability to do the work but factors of an emotional, personal or social nature interfere and seriously hamper their adjustment to the demands of the nursing curriculum. There are also cases where students who did poorly on the tests developed into very successful nurses. In many such cases the student is accepted because of an excellent high school record, evidence of good work habits or because of other qualities particularly conducive to success in the type of training program which the nursing school offers. These students compensate for somewhat low test records by excellence in non-test criteria. General experience seems to be,

however, that most students suffer these same handicaps in the training course, are often equally unable to take training school examinations, and are therefore poor risks as students.

The fact that certain discrepancies exist between test scores and performance in training schools suggests the desirability of considering and of working out better means of measuring and evaluating qualities of emotional, personal and social adjustment likely to affect nursing school work.

CHAPTER V

SUMMARY

The Student Personnel Office at Loyola University undertook a program of testing entering students at two of its affiliated hospitals in September of 1947. Each student was given a battery of five tests, the results of which were to be used for counseling and guidance purposes and would in no way affect the student's acceptance or rejection in the school of nursing.

The tests given were the A.C.E. Psychological Examination, Form 1946, the Kuder Preference Record, Form BM, (Hunt) Arithmetic Test For Prospective Nurses, (Hunt) General Science Test For Prospective Nurses, and (Hunt) Aptitude Test For Nursing.

Scholastic achievement was determined by taking the average of all final grades at the end of the pre-clinical period. After conversion of raw scores into T-Scores coefficients of correlation were computed singly and in multiple form between each test and the academic average.

To summarize the general findings and conclusions:

1. Relationships or correlations between academic average and test scores, taken singly and in multiple form, approximate findings reported in other studies.
2. Single correlations range from .40 to .54. Multiple correlations from .60 to .80.
3. Correlations on the Kuder Preference Record with academic average were negative on all scales except Computational, Scientific and Literary.

4. Mean scores and standard deviations for this group on the various scales of the Preference Record were quite similar to those reported by Kuder and several other investigators.
5. Single and multiple correlations between the tests used and scholastic average indicates that tests results alone cannot be the sole criteria for acceptance or rejection of a prospective nursing student. The tests results are of definite value however, for purposes of guidance and counseling when used in conjunction with the high school record and a personal interview with the student.
6. Psychological tests form a very valuable part of an entrance program but they must be considered as only a part of the total picture when it comes to acceptance or rejection of a particular student in the nursing school or any school situation.

TABLE I
SINGLE CORRELATIONS BETWEEN TESTS USED AND SCHOLASTIC AVERAGE;
MEANS, STANDARD DEVIATIONS AND INTER-CORRELATIONS OF TESTS

Variables	Scholastic Average	Hunt Arith.	Hunt Gen. Science	A.C.E. Psych.	Mean	S.D.
Scholastic Average					85.8	4.38
Hunt Arithmetic	.54 \pm .06				29.4	9.69
Hunt General Science	.43 \pm .06	.34 \pm .10			45.9	10.62
A.C.E. Psychological	.41 \pm .05	.61 \pm .05	.63 \pm .05		93.3	22.96
Hunt Aptitude	.40 \pm .06	.55 \pm .06	.73 \pm .03	.70 \pm .03	153.5	22.23

FINAL MULTIPLE CORRELATIONS

<u>Variables</u>	<u>Results</u>
1. Scholastic Average	"r" 1(23) equals .602 \pm .05
2. Hunt Arithmetic	"r" 1(234) equals .706 \pm .04
3. Hunt General Science	"r" 1(2345) equals .797 \pm .03
4. A.C.E. Psychological	
5. Hunt Aptitude	

TABLE II

CORRELATIONS AND PROBABLE ERRORS BETWEEN SCORES ON THE NINE SCALES OF KUDER PREFERENCE RECORD AND SCHOLASTIC AVERAGE; MEANS, STANDARD DEVIATIONS AND PERCENTILES ON EACH SCALE AS FOUND IN THIS STUDY

Scale	"r"	P.E.	Mean	S.D.	Percentile
1. Mechanical	-.04	.07	51.26	14.8	57
2. Computational	.10	.07	29.75	9.2	57
3. Scientific	.13	.06	67.05	11.7	82
4. Persuasive	-.14	.07	59.72	11.8	35
5. Artistic	-.02	.07	51.23	14.2	52
6. Literary	.07	.07	45.13	13.9	42
7. Musical	-.06	.07	21.14	8.8	41
8. Social Service	-.05	.07	100.52	14.1	87
9. Clerical	-.03	.07	47.44	12.8	16

TABLE III

A COMPARISON OF FINDINGS ON THE KUDER PREFERENCE RECORD
 BETWEEN THIS STUDY AND SIMILAR STUDIES IN TERMS OF
 MEANS, STANDARD DEVIATIONS AND PERCENTILES

Scale		Loyola	Kuder	Berg	Triggs
1. Mechanical	Mean	51.26	53.52	50.0	53.15
	S.D.	15	17.48	14.7	16.33
	%le	57	62	55	62
2. Computational	Mean	29.75	28.53	28.7	29.73
	S.D.	9	9.7	10.6	9.62
	%le	57	50	53	57
3. Scientific	Mean	67.05	60.41	63.0	58.07
	S.D.	12	12.41	14.1	12.41
	%le	83	71	76	67
4. Persuasive	Mean	59.7	52.80	53.4	54.65
	S.D.	12	12.38	12.0	14.39
	%le	35	18	17	22
5. Artistic	Mean	51.2	53.77	48.6	54.35
	S.D.	14	15.37	15.0	14.69
	%le	52	57	46	59
6. Literary	Mean	45.1	50.30	46.0	49.12
	S.D.	14	13.45	12.9	13.64
	%le	42	55	44	53
7. Musical	Mean	21.1	21.93	23.0	22.34
	S.D.	9	9.05	8.82	10.0
	%le	41	45	49	45
8. Social Service	Mean	100.5	93.07	100.2	95.16
	S.D.	14.1	16.82	14.2	17.56
	%le	87	78	87	80
9. Clerical	Mean	47.4	50.02	51.5	52.13
	S.D.	12.8	13.97	13.9	14.55
	%le	16	21	24	25
Number Subjects		95	183	126	826

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APPROVAL SHEET

The thesis submitted by Patrick J. Fitzmaurice, Jr. has been read and approved by three members of the Department of Psychology.

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the thesis is now given final approval with reference to content, form, and mechanical accuracy.

The thesis is therefore accepted in partial fulfillment of the requirements for the Degree of Master of Arts.

Feb. 18, 1949
Date

Frank Hobbs
Signature of Adviser