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Practical nurse students: correlation of test scores

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PRACTICAL NURSE STUDENTS: CORRELATION OF TEST SCORES

BY

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CHAPTER I

INTRODUCTION

"Every educational unit in nursing is faced with a need for adopting procedures it will follow in selecting students for admission."¹ A school of practical nursing therefore, is advised to have an admissions committee to determine the admission requirements and the selection of the student. "Admission requirements should be based on careful study of the characteristics necessary for successful completion of the program and for performance after graduation."² Some of the procedures currently used by admissions committees are review of high school record, personal interview, physical examination, and the administration of standardized tests.

The school of practical nursing selected for the study currently has admitted its tenth class. The admissions requirements include a review of the high school record, personal interview, health evaluation, and the administration of standardized tests. The Division of Employment Security General Aptitude Test Battery is required when the National League for Nursing Prenursing and Guidance Examination

¹"Let's Examine--How to Choose Pre-Admission Tests," Nursing Outlook, August 1961, p. 494.

²Ibid.

has not been taken. Upon completion of the fifteen month program, the graduates are eligible to take the state board examinations for licensure determined by the official Board of Registration in Nursing of the state.

The purpose of this study was to determine the relationship between scores achieved on pre-entrance tests and scores achieved on state board examinations by graduates of a selected school of practical nursing. The National League Test Services states: In selecting which standardized test to use, the school must evaluate the significance of the test, singly or in combination, in predicting success in the program.¹ In this study, the performance of the graduate on the state board examinations represented success in the program. Since the selected school utilizes two pre-entrance tests, this study will demonstrate the value of the National League for Nursing Prenursing and Guidance Examination and the General Aptitude Test Battery as a predictor of state board performance. The values of the three tests will be expressed in scores as reported by the National League for Nursing, the Division of Employment Security, and the Board of Registration in Nursing respectively. The three tests will be described in detail later in the study.

The school has been utilizing these two pre-entrance tests for several years and it would be valuable for the Admissions Committee to know the extent to which each of the tests predict success in the

¹Ibid.

program. Recommendations based on the findings of this study could be made to the Admissions Committee of this school. The relationship between performance on each of the pre-entrance tests and state board examinations will be determined by statistical methods.

The sample consisted of sixty graduates of the selected school from the period 1959-1962. These graduates have taken either the General Aptitude Test Battery or the National League for Nursing Prenursing and Guidance Examination and have taken the state board examination for licensure. The findings of this study are applicable to the selected school and cannot be generalized because of the small sample and immeasurable environmental factors inherent in the school.

Preview of Methodology

The data for this study were obtained from records of the graduates in the office of the School of Practical Nursing at the selected hospital. Statistical methods were employed in the analysis of the data.

Sequence of Presentation

Chapter II presents a review of the pertinent literature. Chapter III presents a description of the study group and the tests taken by the sample. It also includes a description of the statistical method used in analyzing the data. Chapter IV is the analysis of the data and presentation of the findings. Chapter V presents the summary of the study and the conclusions and recommendations drawn from it.

CHAPTER II

THEORETICAL FRAMEWORK OF THE STUDY

The use of objective tests to provide information concerning individuals has a long history. Dating back to the time of Christ, there are references to civil service tests used as routine procedures in China.¹ During the nineteenth century, the use of statewide written examinations to determine the achievement of high school students was initiated in the United States. The Regents examination of New York State were well established by the 1860's.

About the year 1880, Sir Francis Galton established a laboratory to provide for the administration of a series of physical and mental tests to a number of individuals. He is regarded as "the father of mental testing."²

In 1890, a report on a series of tests developed and tried in the hope of finding a way to appraise the abilities of an individual in order to predict college success, was reported by J. M. Cattell. In later years, C. L. Wissler compared the results of these tests with college grades without finding any

¹John T. Dailey and Marion F. Shaycoft, Types of Tests in Project Talent U. S. Department of Health, Education, and Welfare Monograph No. 9 (Washington: U. S. Government Printing Office, 1961), p. 5.

²Ibid.

significant relationships.¹

In 1905, the first intelligence scale by Albert Binet appeared. These were quickly recognized as significant and subsequently were used in this country as well as abroad. The Stanford revision of the Binet scale was published in 1916 by L. M. Terman and today the Stanford-Binet remains the most widely used individual intelligence test. It was recently revised in 1960.

World War I gave great impetus to the mental-test movement. During the war, psychologists were delegated to design intelligence tests for screening of Army recruits. These tests were both verbal and non-verbal. The Army Alpha was the examination for recruits who could read and write. This test was designed for general use. The Army Beta was the non-verbal examination intended for those persons who could neither read nor write the English language.

After World War I, the types of items used in the Army Alpha tests were incorporated into other intelligence tests. About the same time, the United States Employment Service Occupational Analysis Division initiated research on specific occupational aptitude tests.²

¹Ibid, citing C. L. Wissler, "The Correlation of Mental and Physical Tests," Psychological Review Monograph Supplement, 1901, Vol. 3, No. 6.

²B. J. Dvorak, "The New U. S. E. S. General Aptitude Test Battery," Journal of Applied Psychology, 1947, p. 372.

During World War II, the multiple-aptitude test batteries were developed to screen and classify military personnel. The psychologists sorted the tests into groups of specific-aptitude tests. The specific-aptitudes were combined into composite scores, each of which would predict success in occupational assignment.

During the post-war period, the Armed Forces maintained continuing programs to relate their aptitude tests to occupational adjustment and job performances.

One of the largest testing programs today is the examination administered for college entrance. These programs usually consist of either a test of intellectual aptitude or intensive measures of achievement in various areas or both. The college entrance tests are taken each year by over a million high school students and play an important role in the admissions standards of colleges and universities.¹

In nursing, the National League for Nursing Test Services offers course-end achievement tests; selection tests for basic professional, practical, and graduate nurse programs; and licensure tests for professional and practical nursing. Data are being collected for a validation study of the Prenursing and Guidance examination. The study will continue until 1965. Data are also being collected to enable comparison among prenursing, achievement, and licensure test results,

¹John T. Dailey and Marion F. Shaycoft, Types of Tests in Project Talent U. S. Department of Health, Education, and Welfare Monograph No. 9 (Washington: U. S. Government Printing Office, 1961), p. 8.

and performance within schools of nursing.¹

The Federal Government has a number of well-developed testing programs for the selection, classification, and assignment of its own personnel. It also maintains an occupational counseling program within the United States Employment Service and the affiliate offices throughout the country.

This author has been unable to locate any research directly relating to the use of the General Aptitude Test Battery or the Prenursing and Guidance examination as a predictor of success in a School of Practical Nursing.

Currently, however, the performance of practical nursing students on the prenursing test used by schools of professional nursing will be analyzed. This study will be carried out by the National League for Nursing Test Services in cooperation with the National League Department of Practical Nursing Programs.²

In 1950, Monroe stated, "Numerous studies have demonstrated that a combination of several factors may be considerably more valuable in predicting general scholarship than any single factor alone."³ He further stated that studies reveal that a combination of measures, particularly (a) high school scholarship, (b) score on a general scholastic aptitude test, and (c) score on an objective test of high school

¹"Let's Examine--The Outlook in Test Services," Nursing Outlook, January 1963, p. 70.

²Op. cit., p. 70.

³Walter S. Monroe, Encyclopedia of Educational Research, (Revised Edition, MacMillan Co. 1950), p. 874.

achievement, provides the best basis for prediction of achievement in college.¹

A summary of findings by various research groups regarding the essential facts concerning the use of tests for counseling and selection in professional colleges has been prepared by the Committee on Student Personnel Work of the American Council on Education.² These studies were concerned with predicting success in completing professional training in the fields of engineering, law, medicine, dentistry, music, agriculture, teaching, and nursing. The researchers found that no one index was so closely related to achievement that it alone could be relied upon as a basis for prediction of individual success. The committee found, "there is no simple answer to the question of what constitutes a minimum level of aptitude for success in a professional school."³ The reason for this problem was the variation in standards, curricula, and student populations. In reference to nursing, consideration of previous scholastic record, tests of general scholastic aptitude, special aptitude tests, proficiency in natural sciences, mathematics, verbal ability and English, and/or reading test scores should be appraised in order to predict the probable performance of an individual in a school of nursing.

In 1954, Sr. Rose Evelyn Mann, S. S. J. reported

¹Ibid.

²Committee on Student Personnel Work of the American Council on Education, Predicting Success in Professional Schools.

³Ibid.

at Catholic University that entrance tests properly used were valid and reliable as one tool for selection of students.¹ She found in her study as did Michael, Jones, and Haney² that a battery of tests can be successful in reducing the incidence of academic failure, but there was a need to investigate other factors involved in the selection of students for schools of nursing.

A study by Meyer³ in 1959 found that by correlating the results of the Prenursing and Guidance examination with the results of the State Board Test Pool examination, one could isolate the very outstanding and the typically unacceptable applicants for admission to schools of nursing. Borderline cases presented a problem and needed additional and supportive data for judgment concerning admission to a school of nursing.

In 1962, Martin⁴ in his study recommended that test scores alone should not be used as a predictor of achievement. Minimal scores for acceptance into

¹Sr. Rose Evelyn Mann, S. S. J., "A Study of the Relationships Between Pre-Entrance Examination Scores in Science, Reading and Arithmetic, and the State Board Performance of 82 Graduates of A Selected Three Year School of Nursing" (unpublished Master's thesis, Catholic University).

²W. B. Michael, R. A. Jones, R. Haney, "The Development and Validation of A Test Battery for Selection of Student Nurses," Educational and Psychological Measurement, Vol. XXII, 1962, p. 641.

³B. Meyer, "An Analysis of the Results of Pre-Nursing and Guidance, Achievement, and State Board Test Pool Examinations." Nursing Outlook, September 1959, pp. 538-541.

⁴J. R. Martin, "The Correlation Between Pre-Admission Tests and Graduation from Nursing School," The Journal of Nursing Education, Vol. 1, Number 4, (December 1962), p. 23.

the school of nursing should be defined. Other factors, such as motivation, play a definite role and were difficult to measure.

This study was done to correlate the scores achieved on the two pre-entrance examinations with the scores achieved on the State Board Test Pool examination. The hypothesis was that either the General Aptitude Test Battery of the Prenursing and Guidance examination could be used as a predictor of success in a school of practical nursing.

CHAPTER III

METHODOLOGY

The school of practical nursing selected for this study admitted its first class in 1957. The program is approved by the Board of Registration in Nursing of the Commonwealth of Massachusetts. It is under the control of a general hospital which serves the city and the surrounding communities. The hospital is accredited by the Joint Commission for Accreditation of Hospitals in the United States and Canada. It has accommodations for three hundred patients. Services provided in this hospital include medical and surgical, intensive care, surgery and recovery room, obstetrics, pediatrics, and a very active out-patient department.

The students enrolled in the school include those from the area who commute daily and those from other sections of the state or other states who are in residence for the fifteen months. Presently, there are residence facilities for thirty-seven students. Because the number of applications received for each class exceeds the number of students that the school can accommodate and also because of a high attrition rate, it is necessary to evaluate pre-admission policies. As a former member of the admissions committee of this school, the author attempted to determine if either the General Aptitude Test Battery or the National League for Nursing Prenursing and Guidance examination can serve as a predictor of success in the program.

To enable the use of statistical analysis, success in the program was represented by the scores achieved on the state board examination.

The sample consisted of the graduates of this school from 1959 through 1962 who fulfilled two requirements. First, the graduate must have taken either the General Aptitude Test Battery or the Prenursing and Guidance Examination prior to acceptance into the program. Second, the graduate must have taken the state board examination for licensure. The group studied totalled sixty graduates.

The data, which were the test scores, were collected from the records of the graduates. The records are maintained in the office of the School of Practical Nursing of the selected hospital. The General Aptitude Test Battery scores were sent to the school by the Division of Employment Security. The Prenursing and Guidance examination results are sent to the school by the National League for Nursing. The state board results are forwarded to the school by the Board of Registration in Nursing. The data were collected by the author in April 1963 in order that those individuals who took the state board examinations in January 1963 could be included in the study.

The General Aptitude Test Battery was developed by the United States Employment Service for use in its occupational counseling program. It is used by state employment services to assist individuals in obtaining a suitable job. Ten scores are obtained which can be compared against a large number of occupational aptitude patterns. The ten test scores are: intelligence, verbal aptitude, clerical aptitude, spatial aptitude, form perception, clerical perception, aiming or eye-hand

co-ordination, motor speed, finger dexterity, and manual dexterity. These scores were standardized and an aptitude score of 100 is average for the general working population. The General Aptitude Test Battery has been analyzed to determine its usefulness with professional and practical nurses as well as other occupations.

The National League for Nursing Prenursing and Guidance examination is used by many of the approved schools of professional nursing. It comprises five tests from which eight test scores and a composite score are obtained. The five tests are: test of academic aptitude which yields three scores: the verbal, the quantitative, and the total; the reading comprehension test which yields two scores: the speed and level of comprehension; the mathematics test; the natural science achievement test; and the social studies achievement test. The composite score is based on the total performance of the applicant. The test is administered at specific testing centers several times a year. The tests are scored and a report of the performance of each prospective student is sent to the school of her choice. The results are reported as both raw scores and percentiles.

Although the Prenursing and Guidance examination is for applicants to a school of professional nursing, the school utilized in this study receives many referrals from professional schools. The National League for Nursing Test Services in co-operation with the National League for Nursing Department of Practical Nursing Programs will analyze "the performance of practical nursing students on the prenursing test used by schools of professional nursing. It is hoped that the

results of this investigation will provide information that will prove to be helpful to schools of professional and practical nursing in selecting and referring applicants."¹ The author of this study will correlate the scores achieved on the pre-entrance examination to the scores received on state board examinations. This will be helpful to the school involved in this study.

Performance on state licensing examinations was interpreted in this study as success in the program. The National League for Nursing State Board Test Pool for Practical Nurses is used in this state. The test is administered several times a year in a designated area by the Board of Registration in Nursing. The test results are reported to the school from which the individual graduated. The scores are standardized nationally. The score at the mean is equal to 500, and the standard deviation is equal to 100. The passing score in Massachusetts is 350.

Analysis of the data consisted of determining correlation coefficients on the following:

1. The four General Aptitude Test Battery scores versus the State Board Test Pool for Practical Nurses examination scores.
2. The four National League for Nursing Pre-nursing and Guidance examination scores versus the State Board Test Pool examinations.

The four General Aptitude Test Battery scores

¹"Let's Examine--The Outlook in Test Services," Nursing Outlook, January 1963, p. 70.

used are those recommended by the United States Employment Service for the selection of students for schools of practical nursing. The scores represent intelligence, clerical perception, motor co-ordination, and manual dexterity.

The four Prenursing and Guidance examination scores are those utilized by the school involved in the study in selecting its students for admission. The scores represent the composite, the speed and level of reading comprehension, and the mathematics tests.

The coefficient of correlation may be defined as an index of relationship between two variables. Perfect relationship is assigned a value of 1. A coefficient of correlation measures both the amount and kind of relationship. The amount is represented by the size of the coefficient which ranges from zero to 1.00. Kind is represented by the sign of the coefficient. A positive correlation is indicated by a positive (+) sign, usually omitted. A negative correlation is indicated by a negative (-) sign. The Pearson product-moment method was used in the data analysis. The formula for which is:¹

$$r = \frac{N\sum XY - \sum X \sum Y}{\sqrt{N\sum X^2 - (\sum X)^2} \sqrt{N\sum Y^2 - (\sum Y)^2}}$$

Substituting in the formula, x equalled the scores of the State Board Test Pool examination for Practical Nurses and y equalled each of the other test scores.

¹M. J. Nelson, E. C. Denny, A. P. Coladarci, Statistics for Teachers, (New York: Holt, Rinehart and Winston, 1956), p. 97.

CHAPTER IV

ANALYSIS OF DATA

The scores of the graduates on the State Board Test Pool examination for Practical Nurses and their scores on the General Aptitude Test Battery were tabulated. (Table 1) The records of seven graduates showed that the General Aptitude Test Battery scores were incomplete. The only available scores for these graduates were the general achievement and the manual dexterity scores. The coefficients of correlation were computed according to the Pearson product-moment method previously described.

The coefficient of correlation between the State Board Test Pool examination scores and the general achievement test of the General Aptitude Test Battery was 0.10 which was very low. This score was too low for predictive purposes. It was interesting to note that the graduate with the top State Board Test Pool score also scored among the top three on the general achievement test. Another factor evident from the table was the appearance of two identical State Board Test Pool examination scores of 455. Both these graduates had also received the same score (94) on the general achievement test. An identical score of 452 was achieved on the State Board examination by the graduates who had scored within one point of each other on the general achievement test. This same factor appeared when two graduates scored 438 on the State Board Test Pool examination. This would suggest that despite the poor correlation of the total group, there was some correlation of individual scores.

TABLE 1.--Scores on State Board Test Pool Examinations and General Aptitude Test Battery by Graduates of X School of Practical Nursing from 1959-1962.

State Board	General Aptitude Test Battery			
	General Achievement	Clerical Perception	Motor Co-ordination	Manual Dexterity
694	119	...	...	102
684	99	101	97	87
649	123	100	89	96
642	105	115	89	118
627	120	128	109	95
607	92	104	97	94
600	87	133	84	87
596	99	117	111	100
587	108	132	134	110
583	101	108	126	123
578	117	125	103	90
576	94	114	89	83
536	98	85	109	106
533	94	103	101	112
529	108	104	103	96
519	96	113	118	86
515	86	...	...	94
512	91	133	109	117
511	111	116	97	126
510	81	81	105	75
507	98	122	128	113
501	104	108	95	101
487	98	119	118	111
487	92	113	120	116
487	76	...	...	101
484	86	105	109	100
483	101	103	109	110
477	113	128	128	140
475	102	104	99	99
471	115	103	101	110
455	94	...	...	81
452	88	100	128	122
452	87	...	...	126
446	92	135	132	132
438	101	119	132	124
438	100	118	93	109
426	104	106	122	106
417	90	...	...	122
413	118	110	118	120
396	84	115	120	162
370	113	113	120	115
362	101	128	118	154
362	96	127	130	108
345	68	101	107	107

Between the State Board Test Pool examination score and the clerical perception score on the General Aptitude Test Battery, the coefficient of correlation was 0.014 which is insignificant. This indicates considerable variability in performance in the two tests. This variability was noted in the table. The graduate scoring 345 on the State Board examination and the graduate scoring 684 on the State Board examination both scored 101 on the clerical perception test. The graduate who scored the highest (135) on the clerical perception test scored 446 on the State Board examination. The lowest score of 81 on the clerical perception test was received by the graduate who scored 510 on the State Board examination. According to the United States Employment Service, a score of approximately 90 was considered useful in determining aptitude for practical nursing.

The coefficient of correlation between the score on the State Board Test Pool examination and the motor co-ordination score of the General Aptitude Test Battery was -0.61 which is satisfactory for correlation purposes but, unsatisfactory for prediction. A negative correlation indicated that a change in one variable was associated with a change in another variable in the opposite direction. Therefore, the State Board Test Pool examination score was high while the motor co-ordination score was low. It was noted that several of the lowest scores in the motor co-ordination test were received by graduates achieving the highest scores on the State Board Test Pool examinations.

Between the State Board Test Pool examination score and the manual dexterity test of the General Aptitude Test Battery, the coefficient of correlation

was 0.10. This coefficient of correlation was too low for any predictive purposes. The highest score (162) in the manual dexterity test was received by the graduate scoring 396 on the State Board examination. The lowest score (75) in the manual dexterity test was received by the graduate scoring 510 on the State Board examination. This demonstrated the variability indicated by the low coefficient of correlation.

The scores of the graduates on the State Board Test Pool examination and the National League for Nursing Prenursing and Guidance examination were also tabulated. (Table 2) Fifteen graduates had taken the Prenursing and Guidance examination prior to admission to the school. The coefficients of correlation were also computed according to the Pearson product-moment method.

The coefficient of correlation between the State Board Test Pool examination score and the composite score of the National League for Nursing Prenursing and Guidance examination was 0.52 which was too low for predictive purposes. This indicated variability in performance in the two tests.

In correlating the State Board Test Pool examination and the reading test, the coefficient of correlation for reading speed was 0.06 and for level of comprehension was 0.01. Both these scores were below the level of significance.

The coefficient of correlation between the State Board Test Pool examination and the mathematics score of the Prenursing and Guidance examination was 0.32 which was also too low for predictive purposes.

TABLE 2.--Scores on State Board Test Pool Examination and Prenursing and Guidance Examination by Graduates of X School of Practical Nursing from 1959-1962

State Board	National League Prenursing and Guidance Examination			
	Composite	Reading Speed	Level	Mathematics
596	24	14	19	12
583	22	04	19	18
571	14	34	27	04
540	46	55	40	53
511	30	26	06	35
487	27	48	38	17
477	18	25	20	38
473	09	03	07	19
466	12	09	15	13
462	14	06	10	37
452	04	09	15	07
448	34	40	60	26
434	22	44	44	25
417	04	12	20	13
345	10	20	13	26

There was poor correlation between the State Board Test Pool examination and the National League for Nursing Prenursing and Guidance Test. The Prenursing and Guidance test is designed for applicants to schools of professional nursing. It was not prepared to determine the ability to succeed in a school of practical nursing. Many students who were not qualified for professional nursing may have been referred to a school of practical nursing. The scores of these applicants were low in comparison to professional applicants, but were adequate for completion of a practical nurse program. Because of the low scores received on the National League for Nursing Prenursing and Guidance test, poor correlation with the State Board Test Pool examination for Practical nurses might have been predicted.

The correlation between the General Aptitude Test Battery and the State Board Test Pool examination

was lower than the correlation between the Prenursing and Guidance test and the State Board Test Pool examination. The coefficient of correlation decreases as the sample increases in size. A small value for the coefficient of correlation based on a large sample may indicate a higher degree of correlation than a higher coefficient based on a small sample. The General Aptitude Test Battery and the Prenursing and Guidance examination were not significant in predicting success in the selected school of practical nursing.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study was done to correlate each of the pre-entrance tests used in a selected school with the State Board Test Pool examination for Practical nurses. The investigator expected to prove the hypothesis that either the Employment Security General Aptitude Test Battery or the National League for Nursing Prenursing and Guidance examination could serve as a predictor of success in a selected school of practical nursing. For purposes of statistical analysis, success in the program was represented by the scores achieved on the State Board Test Pool examination for Practical nurses. A review of the literature revealed that tests could serve as predictors of success in an educational program. Tests, however, should not be the only criterion for admission into an educational program.

Using the Pearson product-moment method of determining coefficients of correlation, the findings of this study were:

1. The correlation between the State Board Test Pool examination and the general achievement test of the General Aptitude Test Battery yielded a 0.10 coefficient. Some correlation between individual scores was evident from the table. Correlation of the total group was insignificant.
2. The correlation between the State Board Test Pool examination and the clerical perception test of the General Aptitude Test

Battery yielded a 0.014 coefficient. This indicated variability in performance in the two tests. This was noted in the table.

3. The correlation between the State Board Test Pool examination and the moter co-ordination test of the General Aptitude Test Battery yielded a -0.61 coefficient. This was satisfactory for correlation purposes but unsatisfactory for prediction.
4. The correlation between the State Board Test Pool examination and the manual dexterity test of the General Aptitude Test Battery yielded a 0.10 coefficient. This was too low for any predictive purposes.
5. The correlation between the State Board Test Pool examination and the composite score of the Prenursing and Guidance examination yielded a coefficient of 0.52. This indicated a variability in performance on the two tests.
6. The correlation between the State Board Test Pool examination and the reading test of the Prenursing and Guidance examination yielded a coefficient of 0.06 for speed and 0.01 for level of comprehension. Both coefficients were below the level of significance.
7. The correlation between the State Board Test Pool examination and the mathematics test of the Prenursing and Guidance examination yielded a coefficient of 0.32. This was too low for any prediction.

The hypothesis was disproved. The General Aptitude Test Battery and the Prenursing and Guidance examination cannot serve as predictors of success in the selected school.

Recommendations

On the basis of this study, the following recommendations were made:

1. The Admissions Committee of the selected school might consider the utilization of another pre-entrance test or tests.
2. A study should be done on the predictive value of the selected test or tests.
3. The current National League for Nursing study of the performance of practical nurse students on the Prenursing and Guidance examination should be reviewed when available. The conclusions and recommendations of this study should be considered by this school when reviewing the admission policies.
4. Because the General Aptitude Test Battery and the Prenursing and Guidance examination have little predictive value, other factors should be appraised when considering an applicant for admission.
5. That this study be repeated in other schools and with the same and other pre-entrance tests.

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