

STANDARDIZED TEST SCORES AS PREDICTORS OF SUCCESS ON THE
DENTAL HYGIENE NATIONAL BOARD EXAMINATION

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To the Provost of the Graduate School:

I am submitting herewith a thesis written by Bonita Bunny Ann Vitasek entitled "STANDARDIZED TEST SCORES AS PREDICTORS OF SUCCESS ON THE DENTAL HYGIENE NATIONAL BOARD EXAMINATION." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Health Sciences Instruction.

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DEDICATION

To my beloved grandfather, "TATA." His unyielding faith and confidence inspired me to pursue my education. TATA, I love you and miss you dearly.

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STANDARDIZED TEST SCORES AS PREDICTORS OF SUCCESS
ON THE NATIONAL BOARD EXAMINATION FOR DENTAL
HYGIENE WITHIN A SELECT BACCALAUREATE
DENTAL HYGIENE PROGRAM

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The purpose of this study was to determine the predictive ability of the American College Test (ACT) and Dental Hygiene Aptitude Test (DHAT) with respect to success on the National Board Dental Hygiene Examination (NBDHE) and which standardized test was a better predictor of success. Research questions included whether the scores of ACT or DHAT of baccalaureate dental hygiene students were predictive of success on the NBDHE. The strength of predictability of ACT verses DHAT was examined.

Records of 209 dental hygiene students from the 1975-1984 graduates of Baylor College of Dentistry were used in the retrospective study. The mean, standard deviation, frequencies, and stepwise multiple regression were computed at the .05 significance level.

The ACT scores were found to be predictive of success on the NBDHE in 6 of 10 years and the DHAT in 7 out of 10. Neither test made a significant difference in predicting success.

TABLE OF CONTENTS

| | |
|---|-------|
| DEDICATION | iii |
| ACKNOWLEDGEMENTS | iv |
| ABSTRACT | v |
| LIST OF FIGURES | .viii |
| LIST OF TABLES | ix |
| Chapter | |
| I. THE PROBLEM AND ITS BACKGROUND. | 1 |
| Statement of Problem. | 1 |
| Statement of Purposes | 1 |
| Research Questions. | 2 |
| Definition of Terms | 2 |
| Assumptions | 3 |
| Limitations | 3 |
| Significance of Study | 3 |
| II. REVIEW OF LITERATURE. | 5 |
| American College Testing Program Assessment | 5 |
| General Description of ACT. | 5 |
| Assessment Content of ACT | 6 |
| Scoring of Assessment of ACT. | 7 |
| Reliability and Validity of ACT | 8 |
| General Usage of the ACT Assessment | 10 |
| Summary of ACT. | 10 |
| Dental Hygiene Aptitude Assessment. | 10 |
| General Description of DHAT | 10 |
| Test Content of DHAT. | 12 |
| Scoring of DHAT | 14 |
| Reliability and Validity of DHAT. | 14 |
| Usage of DHAT Assessment. | 15 |
| Summary of DHAT | 17 |
| National Board Dental Hygiene Examination | 17 |
| General Description of NBDHE. | 17 |
| Test Content of NBDHE | 21 |
| Scoring of NBDHE. | 23 |

Chapter

| | |
|---|----|
| Reliability of NBDHE. | 25 |
| Validity of NBDHE | 26 |
| Usage of NBDHE. | 27 |
| Summary of NBDHE. | 28 |
| III. METHODOLOGY | 29 |
| Setting | 29 |
| Population and Sample | 29 |
| Protection of Human Subjects. | 30 |
| Instrument. | 30 |
| Data Collection | 30 |
| Data Treatment. | 31 |
| IV. FINDINGS. | 32 |
| Description of Participants | 32 |
| Demographics. | 32 |
| Findings by Research Questions. | 34 |
| Summary | 36 |
| V. SUMMARY, CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS | 38 |
| Summary | 38 |
| Conclusions | 39 |
| Discussion. | 39 |
| Recommendations | 41 |
| REFERENCES | 43 |
| BIBLIOGRAPHY | 44 |
| APPENDIXES | |
| A. Information Recorder Sheet. | 47 |
| B. Permission Letter to Obtain Data from Dean at Baylor College of Dentistry | 49 |

LIST OF FIGURES

| | |
|---|----|
| 1. Predictive ability of ACT, DHAT, and ACT/DHAT | 37 |
|---|----|

LIST OF TABLES

| | |
|--|----|
| 1. Mean, Standard Deviation, and Frequency of DHAT, ACT, and NBDHE. | 33 |
| 2. Coefficients of ACT Scores as Compared to NBDHE by Year | 34 |
| 3. Coefficients of DHAT Scores as Compared to NBDHE by Year | 35 |
| 4. Coefficients of ACT/DHAT Scores as Compared to NBDHE by Year | 36 |

CHAPTER I

THE PROBLEM AND ITS BACKGROUND

There are various standardized tests used in selecting applicants for a dental hygiene program. In this chapter, the problem, purpose, and research questions of this study are presented. Definition of terms, assumptions and limitations are included to acquaint the reader with background information of the study. This chapter concludes with the significance of the study.

The Problem

The primary problem of this study was to establish the predictive ability of the standardized American College Test (ACT) and Dental Hygiene Aptitude Test (DHAT) with respect to success on the National Board Dental Hygiene Examination (NBDHE). A secondary problem of this study was to discover whether the ACT is a better predictor of success on the NBDHE than the DHAT.

Statement of Purposes

The primary purpose of this study was to determine the predictive ability of the ACT and DHAT with respect to success on the NBDHE. An additional purpose in this study was to determine which of the standardized tests was a better predictor of success on the NBDHE.

Research Questions

The research questions of this study were:

1. Are the ACT scores of baccalaureate dental hygiene students predictive of success on the NBDHE?
2. Are the DHAT scores of baccalaureate dental hygiene students predictive of success on the NBDHE?
3. Are the ACT scores of baccalaureate dental hygiene students statistically better predictors of success on the NBDHE than the DHAT scores?

Definition of Terms

For the purpose of the study, the following terms were defined:
American College Test (ACT). A standardized test that provides student assessment information to colleges and institutions to predict the likelihood of success in college.

Baccalaureate Dental Hygiene Program. A program of study for dental hygiene students culminating in a bachelor of science degree.

Dental Hygiene Aptitude Test (DHAT). A standardized test given to prospective dental hygiene students to predict the likelihood of academic success in a dental hygiene program.

National Board Dental Hygiene Examination (NBDHE). A national standard licensing test for dental hygienists.

Predictive. The process of using parameters (ACT and DHAT) as indicators of future success.

Success. The passing of the NBDHE with a score of 75 or above.

Assumptions

In this study, it was assumed that the documented data of the ACT, DHAT, and NBDHE were recorded correctly. The final assumption made was that the ACT and DHAT would predict success on the NBDHE.

Limitations

Several limitations were established for this study. They were:

1. Associate dental hygiene programs were not included in the study.
2. Scholastic Aptitude Test Scores were not included in the study.
3. Only the baccalaureate dental hygiene program at Baylor College of Dentistry, Caruth School of Dental Hygiene was studied.
4. Data collected and analyzed only included graduation dates from 1975-1984.

Significance of the Study

The significance of this study was that it determined if the ACT and/or DHAT test scores were predictive of success on the NBDHE for the population studied. It also examined which test (ACT or DHAT) was a statistically better predictor of success on the NBDHE. This information may be useful to the study school in determining which test to use for selection in the admission process. Finally, the methodology of this study may be used by other baccalaureate dental hygiene programs

or associate dental hygiene programs throughout Texas to replicate this study.

CHAPTER II

REVIEW OF LITERATURE

American College Testing Program

General Description

The American College Testing Program was founded in 1959 as an independent, non-profit, national educational organization. According to the Highlights of the ACT Technical Report (The American College Testing Program, 1973), the original purpose of the test (ACT) was to provide student assessment services to the nation's institutions for counseling, placement, and admission purposes. The original design of the 1959 assessment included four tests: English Usage, Mathematics Usage, Social Studies Reading, and Natural Sciences Reading. The English Usage Test measures the student's ability to understand and use basic elements in effective and correct writing such as phraseology, usage, style, and organization. The Mathematics Usage Test calculates the mathematics reasoning ability of the student. The Social Studies Reading Test determines the student's interpretation in reasoning, reading, and problem-solving skills that are required in social studies. Finally, the Natural Sciences Reading Test measures the problem-solving skills and critical reasoning necessary in the natural sciences.

Highlights of the ACT Technical Report (The American College Testing Program, 1973) states that the objectives of the ACT program are:

To conduct and administer research programs, and measurement and evaluative programs in all types and kinds of educational endeavor, and to develop any and all means of service or materials necessary or related to such activity; to develop methods, measures, techniques, equipment, and data to promote and advance the interpretation and dissemination of information resulting from such programs. (p. 29)

To identify the needs associated with the broader objective, the ACT Assessment Program expanded to include the Predictive Research Services in 1961, the Student Profile Section in 1965, and the High School Profile Service in 1968.

The Highlights of the ACT Technical Report (The American College Testing Program, 1973) states that the ACT program's primary function is to forward information to students and colleges during the student's transition from high school to college. This function is achieved through the ACT Assessment Program and its key instrument, the ACT Assessment. The ACT Assessment is comprised of the Student Profile Section and the battery of four tests of educational development. The Highlights of the ACT Technical Report (The American College Testing Program, 1973) states that the ACT Assessment Program is used by approximately 20,000 educational institutions and over one million students.

Assessment Content

According to the Highlights of the ACT Technical Report (The American College Testing Program, 1973), a wide range of information through the administration of the ACT Assessment has been collected and standardized on a national basis. From the data collected on academic

achievements, several common areas of interest to institutions of higher learning are evaluated and described. The areas include the status report on Student Educational Information for Student Placement, Base Line Data on Students for Institutional Research, and Prediction of Academic Performance. According to the Report, the Status Report provides highly useful information on the educational development of high school students in English, mathematics, social studies and natural sciences. The Common Information on Educational Status area is designed to assist admissions personnel with appropriate student acceptance. The Educational Information for Student Placement area provides assistance to college advisors for appropriate course placement levels for individual students. The Base Line Data on Students for Institutional Research area provides information about the characteristics of the institutions' student body as related to base line entry data.

Scoring of the Assessment

According to the Highlights of the ACT Technical Report (The American College Testing Program, 1973), the ACT Assessment obtains student information using the format of an examination-questionnaire. The Highlights of the ACT Technical Report (The American College Testing Program, 1973) states that "the ACT Assessment derives meaning not only through statistical relationships with other important variables but also through the educational importance of its content" (p. 5). According to Assessing Students on the Way to College (The American College Testing Program, 1973), the scoring for the four tests of the

ACT Assessment is based on a standard score scale system. The English Usage test has a total number of 75 items; the Mathematics Usage test has 40 items; while the Social Studies and Natural Sciences Reading tests each contain 52 items. In scoring, the total number of correct responses is determined. From this total, an individual's raw score is determined. Raw scores are equated to a standard score scale from 1 (low) to 36 (high). This scale is used for all four ACT tests.

Referring to College Student Profiles (The American College Testing Program, 1983), a "student's true score was usually within two points of the ACT composite score" (p. 1). According to Assessing Students on the Way to College (The American College Testing Program, 1973), "the ACT Composite Standard Score of 16 is the approximate median score of national samples of high school seniors" (p. 51). These score norms are reported in percentile ranks. College Student Profiles (The American College Testing Program, 1983) states that percentile ranks are "a method of indicating the rank of a given score relative to the scores of a group of people" (p.3). For example, a standard score of 20 would be the 75th percentile and a standard score of 11 would represent the 25th percentile. The standard deviation of each test ranges from 5 to 6.

Reliability and Validity

The Highlights of the ACT Technical Report (The American College Testing Program, 1973) describes the reliability and validity evaluation which are used for the assessment. Three internal forms of reliability are used, namely the Split-half correlation, Kuder-

Richardson Formula 20 (K-R 20), and coefficient alpha index. According to the Report, when 10 forms of the ACT Assessment were used from the years 1967 to 1971, the median split-half reliabilities ranged from .85 to .90 with a median of the ACT Composite score of .96. These estimates were based on random samples of approximately 1,000 students. The report further states that the Kuder-Richardson 20 reliabilities were based on 12 forms of the ACT Assessment between the years of 1968 to 1972. The median K-R 20 estimates for the subtests ranged from .84 to .91, while the median for the ACT Composite score was .91 based on random samples from approximately 1,000 to 3,000 students. Finally, the coefficient alpha estimates were based on the subtests of the ACT Assessment and the range, .73 to .77, was taken from the years 1967 to 1972. The median of the ACT Composite score was .85. The Highlights of the ACT Technical Report (The American College Testing Program, 1973) states that, with the estimates of the reliabilities used, the ACT tests are highly reliable.

Predictive validity as related to college activities and accomplishments is a major concern for the individuals who use the data from the ACT Assessment. According to the Highlights of the ACT Technical Report (The American College Testing Program, 1973), 419 colleges participated in the ACT Standard Research Service in the years 1968, 1969, or 1970. Based on 297,980 students' high school grades and the correlation with ACT scores, a median multiple correlation of .465 and .512 was found. According to the Report, these estimates indicate

that the ACT test scores and high school grades are good predictors of overall college grade point averages, and are reasonably valid for use in the area of college academic success.

General Usage of the ACT Assessment

According to the Highlights of the ACT Technical Report (The American College Testing Program, 1973), the ACT Assessment provides the student with information on career placement, prediction of success in certain college courses, and the overall prediction of academic success in college. Colleges provide counseling and guidance using the information provided on socio-economic background of the students taking the assessment. Further, institutions use the assessment for prediction of academic success, admission decision-making and course placement.

Summary

This review presents a general description of the American College Testing Program. Topics mentioned include the content of the ACT Assessment and the scoring procedure for the ACT Assessment. Reliability and validity are also presented in relation to the ACT Assessment. In conclusion, the general usage of the ACT Assessment by colleges and institutions is discussed.

Dental Hygiene Aptitude Test

General Description

Dental hygiene educational programs in institutions of higher education use different mechanisms of admissions criteria such as high school and college grade point averages, interviews, and scores of

standardized tests. One of the ways to obtain different mechanisms for admissions is to establish a test battery that will help dental hygiene program directors, selection committees, and admission officers in selecting individuals to enter dental hygiene programs. In 1957, the Dental Hygiene Aptitude Test (DHAT) was established by the American Dental Hygienists' Association. According to the Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976), several revisions have been made on the DHAT since 1957 to secure the relevancy of the DHAT to dental hygiene programs. Since the Guide states that the number of applicants exceed the amount of spaces open in a dental hygiene program, careful selection of applicants is necessary to ensure that the individual will not drop out after beginning. The Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976) states that the DHAT is designed to accommodate the selection process by recognizing areas of achievement of the applicant's abilities and aptitudes that are indicative of success in the field of dental hygiene. The Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976) states that the DHAT is administered three times a year in January, April and November at testing centers throughout the country. The institution administering the one-half day DHAT tests are allowed to choose the time and day of the examination. According to the Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental

Hygienists' Association, 1976), if an individual lives 120 miles outside of the original testing center, a special request can be made for another site. The fee of the DHAT is \$13.00 and the scores are sent to three dental hygiene schools 4 to 6 weeks after the test. If a score is sent to an additional school, a charge of \$1.00 is assessed for each.

Test Content

According to the Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976), the 1973 revision of the DHAT accomplished several goals:

1. The tests in Science, Reading Comprehension and Mathematics were completely reworked, resulting in parallel tests, with entirely new items.
2. The general information test was removed from the battery, as it was felt that this test was concentrated in an area of knowledge that could be discriminatory against individuals not having a specific socio-economic background. Additionally, the material covered in the test was of questionable relationship to either dental hygiene education or those skills that are necessary for success in dental hygiene education.
3. A new test on verbal usage was added to the battery.
4. A new test on perception was added to the battery. (p. 4)

The battery of tests that are included in the DHAT are Science, Reading-Comprehension, Mathematics, Verbal and Perception. The Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976) states that the Science section contains 90 items that cover areas of biology, chemistry, physics and earth sciences. The Reading-Comprehension part is composed of 42 items that measure recall of fact and synthesis of fact and deduction.

According to the Report of the Testing Division for the DHAT (American Dental Hygienists' Association, 1979), the Reading-Comprehension was changed in 1979 to allow the applicants to refer back to the reading passage while answering the items. This change resulted in an improvement in the reliability concerning this section of the DHAT. The Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976) states that the Mathematics test has 60 items which measure the applicants ability to deal with quantitative material. The Verbal section is designed to measure the ability of the applicant to deal with vocabulary and its usage.

The last battery test on Perception requires an individual to make decisions about the relationships of lines and forms. This section remained in the battery of tests for four years. According to the Report of the Testing Division for the DHAT (American Dental Hygienists' Association, 1979), the Perception test was removed from the DHAT because the results did not project successful performance in dental hygiene programs. As of this date, the DHAT has maintained four areas of battery tests. The Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976) states that each of the four battery of tests are designed to measure the applicant's ability to relate to subject matters at a level that is normally expected of entering dental hygiene students.

Scoring of the DHAT

According to the Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976), two sets of scores are issued for each individual. One set of scores determines the relationship of the applicant's scores to other applicants' scores with similar backgrounds of education (education level standardization). The second set recognizes the applicants performance as compared to other applicants regardless of the level of education received (whole group standardization). The Guide (1976) states that the DHAT is composed of an eleven point scale. This scale ranges from a low of -1 to a high of 9 with the mean score of 4. The scoring of the DHAT is determined by converting the raw scores to standard scores for each subtest.

Reliability and Validity

The Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976) states that the reliability of the DHAT is used to determine the consistency of test results. High reliability coefficients show that the DHAT results would be the same if a group was retested which indicates the results were not achieved by chance. According to the Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976), the reliability coefficients for 1973 and 1975 are as follows:

| | <u>1973</u> | <u>1975</u> |
|-----------------------|-------------|-------------|
| Science | .74 | .79 |
| Reading-Comprehension | .64 | .68 |
| Numerical | .79 | .82 |
| Verbal | .83 | .90 |
| Perception | .44 | .77 (p. 11) |

The Report of the Testing Division for the Dental Hygiene Aptitude Testing Program (American Dental Hygienists' Association, 1979) states that the reliability coefficients increased as follows:

| | <u>1979</u> |
|-----------------------|-------------|
| Reading-Comprehension | .90 |
| Mathematics | .82 |
| Verbal | .87 |
| Science | .79 (p. 1) |

Although improvement in the Reading-Comprehension and Verbal test for reliability has increased, the Testing Division for the DHAT accepts that in the areas of Mathematics and Science, the reliability must be improved.

According to the Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976), the validity of the DHAT determines how well the test itself measures predictability of success of students in dental hygiene programs. However, no specific or valid data are presented in the Guide.

Usage of the DHAT Assessment

According to the Dental Hygiene Aptitude Test as Admissions Criterion (American Dental Hygienists Association, 1983), approximately 60% of the dental hygiene schools use the DHAT as a criterion in making

admissions decisions. Forty-six percent of the schools require the DHAT for admission. The Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976) states that the DHAT should be used with other information, such as previous education, personal interviews, references and motivation as a part of the admission procedure process. As the Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976) mentions, the American Dental Hygienists' Association recommends that admission committees inspect all individual test scores rather than the composite score of the DHAT. Within each of the tests of the DHAT, a measurement of identifiable skills and body of knowledge is obtained and should be evaluated separately by admission committees.

According to the Dental Hygiene Aptitude Test as Admissions Criterion (American Dental Hygienists' Association, 1983), 15% of the dental hygiene programs require a minimum score on the DHAT for admissions. Twenty-nine percent require the DHAT for admission purposes but do not require a minimum score. The Guide for Admissions Officers and Dental Hygiene Program Directors (American Dental Hygienists' Association, 1976) states that the American Dental Hygienists' Association recommends that there be no cut-off scores for the DHAT applicants that are being considered for admission. Individuals with low scores on one or more parts of the DHAT have been accepted into dental hygiene programs and successfully completed the program. However, when individuals with known deficiencies are admitted into

a dental hygiene program, remediation should be provided in the difficult areas.

Summary

This assessment represents a general description of the Dental Hygiene Aptitude Test. Areas included in the DHAT assessment are the test content and scoring of the DHAT. Other topics that are presented are the reliability and validity of the DHAT along with usage of the DHAT assessment.

National Board Dental Hygiene Examination

General Description

The establishment of the National Board Dental Hygiene Examination (NBDHE) began its groundwork in the early 1960s. According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), the Council on National Board Examinations was directed by the American Dental Association (ADA) Board of Trustees to develop a written examination for dental hygiene licensure. After this action, the Council on National Board Examinations took the ADA House of Delegates request one step further and developed a permanent Committee on Dental Hygiene within the Council to provide continuous input from the American Dental Hygienists' Association (ADHA) for the NBDHE. From the groundwork of this committee emerged the development of the NBDHE to be used by respective state boards of dentistry for dental hygiene licensure.

The first dental hygiene national board examination was given in

the spring of 1962. According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), the purpose of the NBDHE is:

To assist state boards of dentistry in assessing whether a candidate possess, what in the judgment of experts, are the cognitive skills essential for the competent practice of dental hygiene. These cognitive skills include not only the ability to recall important information from basic biomedical and dental sciences, but also the ability to apply such information in a problem-solving context. (p.1)

According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), other factors important to the development of the NBDHE made by the Council on National Board Examinations and Committee on Dental Hygiene are:

1. National Board dental hygiene examinations would be administered at least twice each calendar year with the first administration in the spring of 1962.
2. Test item files and information developed for the ADHA achievement testing program would be made available for use in the National Board dental hygiene examination program.
3. The ADHA would assist in publicizing and promoting National Board dental hygiene examinations.
4. The ADA would advance funds to cover developmental costs for the National Board dental hygiene examination program. (p.3)

The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) also states that the Committee on Dental Hygiene is composed of seven members. There is one member from each of the following organizations: The American Dental Association (ADA), the American Association of Dental Examiners (AADE), and the American Association of Dental Schools (AADS). The other four

members are selected by the ADHA. Two of these four members represent dental hygiene education and the remaining two members are from the general membership of ADHA. In 1975, the Committee also added a dental hygiene student consultant to be an ex-officio committee member. This student consultant is to be appointed by the junior membership of ADHA. The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) states that the duties of the Committee on Dental Hygiene for the NBDHE involve developing the specifications of the examination, developing rules and regulations for the examination, selecting individuals to work as test constructors, and reporting significant data from the examination program. The actual writing of the examination is not done by the committee but delegated to subject matter specialists that are selected by the Committee on Dental Hygiene.

According to the Information Sheet for the National Board Dental Hygiene Examination Program (Joint Commission on National Dental Examinations, 1984), evaluating the competency of candidates for dental hygiene licensure belongs to the dental licensing board of the states, districts or dependencies to which the dental hygienists are applying. To meet this responsibility, the use of educational requirements, written examinations and clinical examinations are utilized to measure competency. The Information Sheet for the National Board Dental Hygiene Examination Program (Joint Commission on National Dental Examinations, 1984) states that 51 of 53 dental licensing jurisdictions recognize the NBDHE results as a major part of their written examination requirement.

According to the Information Sheet for the National Board Dental Hygiene Examination Program (Joint Commission on National Dental Examinations, 1984), eligibility to take the NBDHE falls into certain categories. A student is eligible for examination by a proof of certification from the director or administrator of the dental hygiene program in which the student is prepared. This certification verifies that the student is within four months of receiving a dental hygiene certificate (the dental hygiene program must have been accredited by the Commission on Dental Accreditation of the American Dental Association at the time that the application for National Board dental hygiene examination is filed). According to the Information Sheet for the National Board Dental Hygiene Examination Program (Joint Commission on National Dental Examinations, 1984), a graduate of an accredited dental hygiene program is also eligible for examination following receipt of evidence of graduation (membership in the ADHA at the time of application is acceptable evidence that the candidate was a dental hygienist). A graduate hygienist who is a non-member of ADHA must submit a letter of recommendation from one of the following: secretary of the United States dental licensing board of a jurisdiction in which the hygienist is licensed or eligible for licensure, the director or administrator of the dental hygiene program from which the hygienist graduated, or a current or former employer licensed in the dental profession. A graduate of a non-accredited program is also eligible for the NBDHE upon meeting the criteria established by the Joint Commission on National Dental Examinations.

Test Content

The National Board dental hygiene examination consists of 350 multiple-choice items written in the English language. Test items of the NBDHE describe only those functions which have been delegated as responsibilities of a dental hygienist in the majority of states. According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), the test content of the NBDHE is directed by an examination outline. The Information Sheet for the National Board Dental Hygiene Examination Program (American Dental Association, 1984) states that the outline has nine functional categories with the following assigned weights:

Performing oral inspection (15%), exposing and processing radiographs (13%), providing other diagnostic aids (9%), performing prophylaxis (12%), applying topical and preventive agents (5%), providing individual oral health instruction (including nutrition and plaque control) (16%), providing supportive treatment services (13%), assisting in emergencies (8%), and participating in community health activities (9%). (p. 1)

By the usage of the examination outline, consistent coverage from one edition of the National Board dental hygiene examination to the next can be insured. According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), 60% of the test items on the NBDHE are regarded as background information, and 30% of the remaining test items are classified on method-technique with 10% focusing on armamentarium.

According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), the test construction of

the National Board dental hygiene examination requires three types of activities to be performed. They are a review of the test items that are unsatisfactory, a finalization of the draft examination and preparation of a new draft examination. When reviewing the unsatisfactory test items, the test construction committee begins with the items that did not produce satisfactory statistical characteristics from a recently used NBDHE. The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) states that test items in this category did not contribute enough discrimination to justify a position in the NBDHE. If possible, each unsatisfactory item is reworded or modified to be used at a later date. If the test items are unable to be improved, then they are discarded. The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) states that the second activity of test construction committee is to review a draft that was previously constructed and put that draft into a final form. This process begins with case problems or presentations and is followed by test items coinciding with the function-oriented outline. An overall approval of each test item is necessary before another item was considered. After a draft examination is finalized, the test items are grouped together in a similar format so the correct answers will fall into a random order. At this stage of the final draft, no rewording is permitted.

According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), the last activity of the

committee is the preparation of another draft examination. The committee selects case problems and reviews the material for accuracy and conciseness. After extensive review, test items dealing with the case problems are subtracted from the particular number that is specified in the examination. The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) mentions that the committee also selects items from test question files, constructs items or revises items from previous examinations, and forms an end product that results in a draft examination to be finalized.

Scoring of the NBDHE

According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), the scoring of the NBDHE is based on a raw score that depicts the number of test items that are answered correctly. There is no penalty for answering an item incorrectly. Raw scores (relative standard) are used instead of percentage scores (absolute standards) to guarantee a constant meaning of scores from each administered edition of the NBDHE. According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), most national testing agencies report an individual's performance by the use of a standard score. This standard score represents how an individual's own score relates to the average. The scoring procedure of an individual's reported NBDHE score depends on the following two factors. The first factor, the raw score, is the number of correct answers an individual selected. The second factor is

the distribution of the raw scores of a norming group. The norming group is all candidates who are taking the NBDHE for the first time and are students enrolled in accredited dental hygiene programs. The standard score of 85 is the mean raw score that is always assigned to the norming group. According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), a standard score of 75 is assigned to represent the lowest number an individual can obtain to pass the NBDHE. This score of 75 is 1.5 standard deviations below the mean raw score of 85. All other standard scores are calculated between the relationship of these two scores.

The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) states that to obtain the greatest spread in correct answers, as well as maintain accuracy in the lower scores of the individuals involved, the NBDHE is constructed so that the average number of correct responses will be as close to 65% as possible. This is done to separate the well-prepared candidate from the poorly-prepared candidate by a large number of correct answers. By using the method of standard scoring, the influences of raw score difficulty level and spread in raw scores of each individual, as related to the performance of norming groups could be eliminated. According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), as long as there are no systematic changes in the norming group, standard scores from different NBDHE for dental hygiene would carry the same meaning.

The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) states that if a candidate's score falls below 75, this is considered a failure of the examination. Failure rates can vary, but approximately 6% of first time student candidates fail the NBDHE. According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), when a score below 75 is obtained on the NBDHE, areas of weakness are reported to the individual as opposed to a composite score only. The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) states that scores on the NBDHE for failing candidates are hand-checked to guard against error of the computer in scoring. It is recommended that as an individual prepares for re-examination, emphasis should be placed on the listed areas of weakness, but a review of all areas covered in the NBDHE is necessary.

Reliability

According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), reliability for the NBDHE is calculated using the Kuder-Richardson 21 (K-R 21) formula. Using the K-R 21, an estimate of the internal consistency of the examination can be produced. The reliability coefficient that is generated is an average estimate of the coefficients that would be obtained if a split-half coefficient were calculated on every combination of test items. The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) states that examples of reliability

coefficients from NBDHE from recent years are as follows:

| <u>Month/Year</u> | <u>Reliability Coefficient</u> |
|-------------------|--------------------------------|
| March 1973 | .85 |
| April 1974 | .89 |
| April 1976 | .88 |
| April 1978 | .88 (p. 25) |

According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), after the comprehensive format of the NBDHE was changed in 1973 to a function-oriented examination, the dental hygiene examination has maintained the highest reliability figures of any national board examination.

Validity

The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) states that content validity is a characteristic of the NBDHE. The examination is designed to measure cognitive skills deemed necessary for competent practice that are established by qualified professionals in the field of dental hygiene. The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) states that the test construction committee of the NBDHE guarantees that:

The examination is developed by a representative group of dental and dental hygiene educators and practitioners who are familiar with the most current trends in the dental hygiene profession. (p.26)

From the adequate and consistent coverage of the test construction committee, the NBDHE emerges as an examination that measures appropriate knowledge.

Usage of NBDHE

According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), the NBDHE is primarily used for the licensing process of dental hygienists, but it also provides feedback to dental hygiene directors and faculty with respect to the quality of their dental hygiene program. However, the NBDHE as the only measure of a program's quality can be misleading. The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) states that the motivation of the student and his or her academic ability can influence his or her performance on the NBDHE. The type of student that is accepted in an accredited dental hygiene program also has a bearing on the class average performance on the NBDHE.

According to the Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978), released examinations of past NBDHE are distributed to accredited dental hygiene programs. The intent of doing this is to dispel rumors of examination content, to discourage reproduction of the examination from memory, to promote constructive criticism of the examination, to acquaint candidates with test item format (textbooks and lecture notes should be the primary source of study material), and to provide feedback to dental hygiene directors and faculty. The Manual for Dental Examiners and Dental Hygiene Educators (American Dental Association, 1978) states that the NBDHE should be used in conjunction with other information about the

dental hygiene program to assess the quality of the dental hygiene program.

Summary

A general description is presented of the National Board Dental Hygiene Examination. The review includes test content and scoring. The validity and reliability of the test are included along with a discussion of the tests usage.

CHAPTER III

METHODOLOGY

The research design for this study was descriptive and used the retrospective approach. This method involved the observing, measuring, analyzing and interpreting variables and their relationship to one another when they are impossible to manipulate otherwise. The advantage to using this method lies in making the data available to everyone.

Setting

The setting used in this study was Baylor College of Dentistry, Caruth School of Dental Hygiene. The data were compiled in the Registrar's Office.

Population and Sample

The population chosen for the data analysis was composed of students who graduated from the baccalaureate dental hygiene program during the years of 1975-1984 and who had taken the ACT, DHAT, and NBDHE. From this 10 year span, 300 individual records were reviewed. Records that did not include scores for the DHAT, ACT, and NBDHE were excluded. The review process yielded 209 records for which all scores were available. These 209 records constituted the data base for this study.

Protection of Human Subjects

All data reported in this study were collected on a group basis. The data collected were coded by graduation year only. The mechanism used for data collection was designed to protect the identity of the individuals taking the ACT, DHAT, and NBDHE.

Instrument

The information obtained from the data collection was recorded on the researcher-developed form by graduation year (Appendix A). According to the researcher-developed form (Appendix A), the ACT mean test scores for each student were recorded with 1 as the lowest score and 36 for the highest with 16 being the mean. The individual DHAT test scores ranged from -1 to 9 with 4 being the mean. The instrument also included a column for the DHAT total mean score. The NBDHE test scores were indicated in the final column with 1 as the lowest possible score and 100 being the highest. A score of 75 is considered passing score on the NBDHE.

Data Collection

Permission to collect the data for this study was obtained from the Dean of Baylor College of Dentistry, Caruth School of Dental Hygiene (Appendix B). As a data criterion, only the most recent scores (to the date of admission) of the DHAT and ACT were recorded. Also, only the first score on the NBDHE was recorded on the data collection form. To obtain the information for the data collection, the registrar's office

pulled the files for review according to graduating class. Each file was reviewed to obtain the scores for DHAT, ACT, and NBDHE for each student by year, and this data were recorded only by the researcher on the prescribed form (Appendix A).

Treatment of Data

A total mean score for the DHAT was computed and entered on the researcher-developed form (Appendix A). The mean, standard deviation, and frequency were calculated for each year using statistical techniques. The data were examined using stepwise multiple regression. The DHAT and ACT scores were entered as the independent (predictor) variables and the NBDHE scores were selected as the dependent variable. In this study, the level of significance was set at the 0.05 level.

CHAPTER IV

FINDINGS

This chapter presents a description of the participants in the study. Demographic information is given and findings by research question are presented. The chapter concludes with a summary of all findings.

Description of Participants

Participants selected for the study were students graduating from the Caruth School of Dental Hygiene at Baylor College of Dentistry during the years 1975-1984. To meet the study criteria, a sample was chosen from students having taken the ACT, DHAT and NBDHE during the selected time frame. For this ten year period, 300 records were examined and a sample size of 209 met study requirements.

Demographics

Test taken, sample size, mean, and standard deviation by year of graduation are presented in Table 1. The sample size varied by 1 to 2 individuals in 6 of the 10 years. The mean scores for this time period varied by only 4 points for both the ACT and DHAT. The NBDHE mean test scores were similar in 4 of the 10 years and the standard deviation was less than 4.0.

Table 1

Mean, Standard Deviation, and Sample Size of DHAT, ACT, and NBDHE

| Year | Test | Sample Size | Mean | Standard Deviation |
|------|-------|-------------|-------|--------------------|
| 1975 | DHAT | 22 | 21.27 | 4.00 |
| | ACT | 22 | 22.68 | 3.37 |
| | NBDHE | 22 | 87.27 | 3.73 |
| 1976 | DHAT | 22 | 23.18 | 3.72 |
| | ACT | 22 | 22.50 | 4.00 |
| | NBDHE | 22 | 87.04 | 5.15 |
| 1977 | DHAT | 23 | 22.17 | 4.69 |
| | ACT | 23 | 23.56 | 3.72 |
| | NBDHE | 23 | 87.47 | 5.09 |
| 1978 | DHAT | 22 | 21.68 | 3.52 |
| | ACT | 22 | 21.77 | 4.21 |
| | NBDHE | 22 | 88.77 | 4.51 |
| 1979 | DHAT | 22 | 20.90 | 3.81 |
| | ACT | 22 | 21.22 | 4.33 |
| | NBDHE | 22 | 86.72 | 6.29 |
| 1980 | DHAT | 19 | 19.78 | 3.56 |
| | ACT | 19 | 19.47 | 2.98 |
| | NBDHE | 19 | 89.68 | 3.62 |
| 1981 | DHAT | 18 | 21.66 | 3.42 |
| | ACT | 18 | 22.50 | 3.91 |
| | NBDHE | 18 | 88.66 | 5.40 |
| 1982 | DHAT | 22 | 19.86 | 4.07 |
| | ACT | 22 | 21.09 | 3.44 |
| | NBDHE | 22 | 85.36 | 5.81 |
| 1983 | DHAT | 25 | 19.44 | 2.59 |
| | ACT | 25 | 19.36 | 3.30 |
| | NBDHE | 25 | 87.44 | 3.76 |
| 1984 | DHAT | 14 | 22.00 | 3.16 |
| | ACT | 14 | 19.14 | 2.59 |
| | NBDHE | 14 | 88.28 | 3.79 |

Findings by Research Question

Research Question 1

Research question 1 was: Are the scores on the ACT of baccalaureate dental hygiene students predictive of success on the NBDHE? Table 2 shows the coefficients of test scores for the ACT as compared to the NBDHE in the years 1975-1984. The ACT was found to be predictive of success on NBDHE in 6 of 10 years with the level of significance at .05.

Table 2

Coefficients of ACT Scores as Compared to NBDHE by Year

| Year | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
|-------------|-------------------|-------------------|-------------------|------|-------------------|------|-------------------|------|-------------------|------|
| Coefficient | .625 [*] | .262 [*] | .257 [*] | .050 | .324 [*] | .025 | .624 [*] | .192 | .159 [*] | .034 |

Note. * $p < .05$

Research Question 2

Research Question 2 was: Are the scores on the DHAT of baccalaureate dental hygiene students predictive of success on the NBDHE? The DHAT was found to be predictive of success on the NBDHE. Table 3 shows this predictability in 7 of 10 years with a .05 level of significance.

Table 3

Coefficients of DHAT Scores as Compared to NBDHE by Year

| Year | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
|-------------|-------------------|-------------------|-------------------|------|-------------------|------|-------------------|-------------------|-------------------|------|
| Coefficient | .504 [*] | .166 [*] | .239 [*] | .111 | .219 [*] | .007 | .360 [*] | .265 [*] | .266 [*] | .008 |

Note. ^{*}p<.05

Research Question #3

Research Question 3 was: Are the ACT scores statistically better predictors of success on the NBDHE than the scores on the DHAT? According to this study, there is no statistically significant difference in the predictability of success on the NBDHE between the ACT and DHAT. When the ACT and DHAT mean scores were taken together as shown in Table 4, the comparison coefficients were only slightly higher than when compared separately. However, the compared coefficients were significant in 6 out of 10 years (Table 4).

Table 4

Coefficients of ACT/DHAT Scores as Compared to NBDHE by Year

| Year | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
|-------------|-------------------|------|-------------------|------|-------------------|------|-------------------|-------------------|-------------------|------|
| Coefficient | .644 [*] | .265 | .281 [*] | .111 | .327 [*] | .026 | .627 [*] | .272 [*] | .275 [*] | .036 |

Note. * $p < .05$

Summary

The analysis of data in this study included computing the frequency, mean, and standard deviation, of each test by year of graduation. Stepwise multiple regression was performed to answer each research question posed. Figure 1 graphically presents the coefficients for predictability found in this study. The ACT test scores were found to be predictive of success on the NBDHE in 6 of the 10 years studied (Table 2). The DHAT test scores were predictive of success on the NBDHE in 7 of the 10 years studied (Table 3). The comparison coefficients of the ACT and DHAT mean scores were significant in 6 of the 10 years studied (Table 4). Neither of the tests proved to be statistically better than the other in predicting success on the NBDHE.

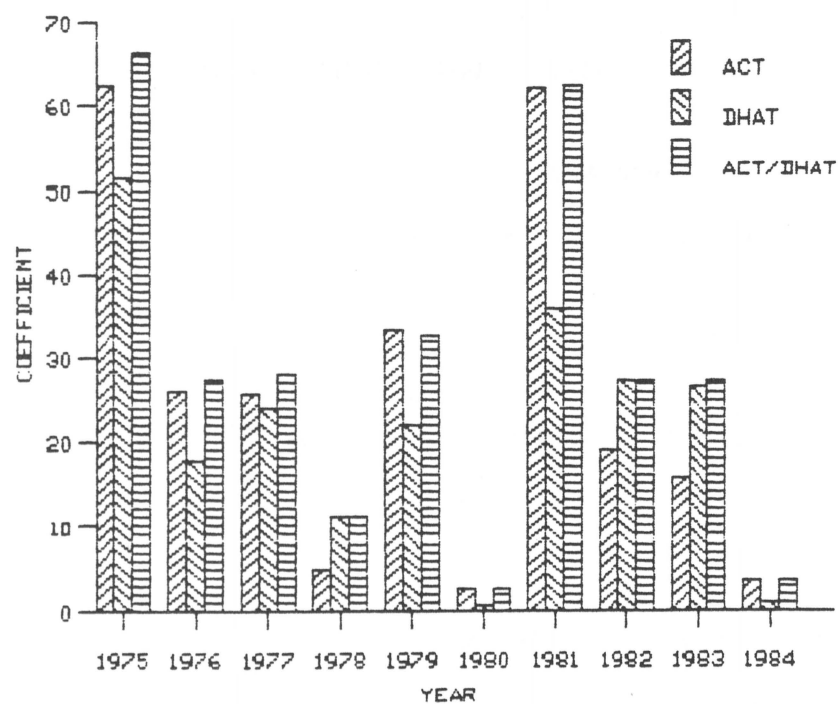


Figure 1. Predictive ability coefficients of ACT, DHAT and ACT/DHAT.

CHAPTER V

SUMMARY, CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

Summary

This study was conducted to determine the predictive ability of the standardized test scores of the ACT and DHAT with respect to success on the NBDHE. The study also intended to discover which standardized test, the ACT or DHAT, was a better predictor of success on the NBDHE. Three research questions were established from the problem of the study. They were:

1. Are the scores on the ACT of baccalaureate dental hygiene students predictive of success on the NBDHE?
2. Are are scores on the DHAT predictive of success on the NBDHE?
3. Are the ACT scores from baccalaureate dental hygiene students statistically better predictors of success on the NBDHE than the scores on the DHAT?

The population chosen for this study were all students who had graduated from the Caruth School of Dental Hygiene at Baylor College of Dentistry during the years 1975-1984. The sample size was determined by the students who had taken the ACT, DHAT, and NBDHE during that time frame. This sampling yielded 209 records which were reviewed to constitute the data base for this study. The data were then examined and the mean, standard deviation and frequency were computed. A

stepwise multiple regression was used to measure predictability.

Conclusions

Based on the findings of this study, the following conclusions were made:

1. The ACT scores from the baccalaureate dental hygiene students were predictive of success on the NBDHE in 6 out of 10 years (1975, 1976, 1977, 1979, 1981, and 1983).
2. The DHAT scores from the baccalaureate dental hygiene students were predictive of success on the NBDHE in 7 out of 10 years (1975, 1976, 1977, 1979, 1981, 1982, and 1983).
3. There was no statistical difference between the ACT and DHAT in determining a stronger predictor of success on the NBDHE of baccalaureate dental hygiene students during the years 1975-1984.

Discussion

In this study, with this population, both the ACT and DHAT scores were predictive of success on the NBDHE (See Tables 1 and 2). This occurrence might be explained by the similarity of the ACT and DHAT mean scores and the NBDHE mean scores over the 10 year time frame. This synonymity of scores may also be reflective of the homogeneity of the students that are selected for the baccalaureate degree program at Baylor College of Dentistry.

Another conclusion that was derived from this study and the

population used was that neither the ACT or DHAT scores made a significant difference in the success on the NBDHE. According to the data presented in Tables 2 and 3, each set of comparison coefficients for the ACT and DHAT varied from year to year (in 1975, the ACT score was .625 and the DHAT score was .504; in 1976, the ACT score was .262 and the DHAT score was .166). Therefore, because of the fluctuation in sets of comparison scores, a true statistical significance could not be determined for a stronger predictor of success on the NBDHE.

Based on the data presented in Tables 2 and 3 there seems to be a trend for the DHAT scores to be a stronger predictor of success on the NBDHE in 7 out of the 10 years studied. The amount of predictability for the DHAT scores is slightly higher than the ACT scores, but the difference was not enough to be statistically significant. Considering the review of the literature and this apparent trend, certain similarities were found. It should be noted that the test content for the ACT and DHAT is comparable. Each test covers areas in Reading Comprehension, Mathematics, Science, and Verbal usage. Nevertheless, when comparing the reliability and validity of the two, the ACT test had a higher reliability range and was statistically more valid than its counterpart the DHAT. Educators may wish to examine the use of both tests in their programs.

Since the data presented in Tables 2 and 3 showed that both the ACT and DHAT tests were predictors of success on the NBDHE, what other factors might account for the baccalaureate dental hygiene students at

Baylor College of Dentistry success on the NBDHE? As represented in Table 1, in the years studied, the NBDHE mean scores were at least 12-14 points higher than the passing score of 75. The overall above average success on the NBDHE by this population may be attributed to the teaching methods used at Baylor College of Dentistry. The methods could include the teaching techniques and evaluation strategies that have a tendency to stress content geared towards passing the NBDHE. Other reasons for student success on the NBDHE could be the adaptability of the individual students to adhere to a rigorous curriculum and the strength of the dental hygiene baccalaureate curriculum at Baylor College of Dentistry. For example, in the year 1980 (Table 1) both the ACT and DHAT score means were considerably lower than in any of the years studied. However, the NBDHE score mean for 1980 was the highest of all the years. The baccalaureate dental hygiene students at Baylor College of Dentistry who took the NBDHE in 1980 apparently developed the necessary didactic base for success.

Recommendations

From this study, several recommendations can be made:

1. Baylor College of Dentistry could eliminate both the ACT and DHAT since neither test is a better predictor of success on the NBDHE and therefore reduce student costs.
2. If Baylor College of Dentistry chose to use only one of the two tests, the ACT would be recommended, based on reliability, validity and other available data.

3. Replicate the study with other baccalaureate dental hygiene programs in Texas and throughout the nation.
4. Replicate the study with associate degree dental hygiene programs in Texas and across the nation.
5. Conduct a similar study substituting the Scholastic Aptitude Test (SAT) for the ACT.
6. Conduct a study to determine if the higher mean scores on the ACT and DHAT correlate with higher mean scores on the NBDHE.

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APPENDIXES

APPENDIX A

INFORMATION RECORDER SHEET

[illegible]

APPENDIX B

Baylor
College of
Dentistry



3302 Gaston Avenue • (214) 828-8340 • Dallas, Texas 75246

Caruth School of Dental Hygiene

August 1, 1984

Dr. Richard Bradley
Dean, Baylor College of Dentistry
3302 Gaston
Dallas, TX 75246

Dear Dr. Bradley,

I am a faculty member in the Dental Hygiene program here at Baylor. I am also involved in writing my thesis in Health Sciences Instruction at the Texas Woman's University. My study concerns the predictability of the ACT and DHAT with respect to the National Board Examination for Dental Hygiene.

After discussing the matter with Dr. Goral, Director Caruth School of Dental Hygiene and Mrs. Scott, Registrar, I would like to request your permission to research the dental hygiene student records at Baylor from the years 1974 to 1984. I will be using the DHAT, ACT and National Board Examination scores only. This information will be reported on a group basis and will only be used for educational purposes.

I would appreciate hearing from you at your earliest possible convenience. Thank you for your consideration.

Sincerely,

Bunny Vitasek
Bunny Vitasek
Dental Hygiene
Instructor

BV/ab

cc: Dr. Virginia Goral
Mrs. Betty Scott

*Approved
RB
8-6-84*

