Research

Predicting National Dental Hygiene Board Examination Success Based on Specific Admission Factors

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Introduction

Applications to dental hygiene programs in the U.S. are at an all–time high.[1] Interest in dental hygiene education has remained strong, with approximately 3.8 times as many applicants as available first–year class positions.[1] Often, selection committees must turn away qualified applicants due to limited class sizes. Therefore, selecting those applicants who are more likely to be successful in the academic program and pass the National Board Dental Hygiene Examination (NBDHE) is critical.

The means of selecting an incoming dental hygiene class varies from school to school. A few schools utilize a waiting list, taking those students in order who have satisfactorily completed the pre–requisite classes. Other dental hygiene programs utilize an admissions rubric to determine which applicants will be offered a position in the program. It is critical that admissions committees carefully decide who is most likely to be successful in the program due to the lockstep nature of the curriculum. While the application process varies greatly among schools, dental hygiene applicants typically submit transcripts of previous course work as well as scores from the ACT or SAT tests.[1] While schools are careful to select those candidates most likely to remain in the program for 2 years, it is also critical to determine if specific factors are more likely to be correlated with success on the national licensing examination.

Historically, dental hygiene program directors have had access to NBDHE scores of each student

Abstract

Purpose: The purpose of this study was to determine if there are specific admissions criteria that are significantly correlated with a student's National Board Dental Hygiene Examination (NBDHE) total score and case–based score. Specifically, the study examined the relation between an individual's reading acuity and their scores on the NBDHE. Because of the competitive nature of most dental hygiene admissions, selecting those applicants who are more likely to be successful in the academic program and pass the NBDHE is critical.

Methods: Total NBDHE scores and case–based scores of 214 students attending Western Kentucky University's Program of Dental Hygiene between 2002 and 2010 were examined to determine if significant correlations existed. Specific factors examined were each student's total NBDHE score, as well as the score on the case–based section of the examination, age, microbiology lecture grade, microbiology lab grade, anatomy and physiology grade, college GPA, English grade, psychology grade, composite ACT score and subcomponent scores of the ACT (math, reading, English and science).

Results: Results revealed that the strongest predictors of total NBDHE scores were the score on the reading portion of the ACT (r=0.715, r2=0.511, p=0.01) and the grades in Microbiology lecture (r=0.644, r2=0.414, p=0.01). Results revealed that the strongest predictors of scores on the case–based portion of the NBDHE were students' scores on the reading portion of the ACT (r=0.673, r2=0.452, p=0.01) and the microbiology lecture grade (r = .637, r2 = .405, p = 0.01).

Conclusion: Traditionally, schools have looked at specific science–based pre–requisite courses as a means of determining admission to schools of dental hygiene. Findings from this study suggest that a broader approach may need to be taken, specifically as it concerns a student's reading aptitude.

Keywords: National Board Dental Hygiene Examination, College Admission Criteria, ACT

This study supports the NDHRA priority area, **Professional Education and Development:** Validate and test measures that evaluate student critical thinking and decision–making skills.

from their respective institutions. However, beginning in 2012, directors will only receive individual scores of those candidates who were not successful

(score of 74 or below) in their attempt. While the policy of the Joint Commission on National Dental Examinations is that exam scores are not meant to be used as a means of assessment for programs of dental hygiene, admissions committees are still tasked with selecting those applicants who will be able to be successful on the NBDHE.

The purpose of the NBDHE is to assist state boards in determining qualifications of dental hygienists who seek licensure to practice dental hygiene. While the NBDHE has undergone several transformations since it was first administered in 1962, the purpose of the examination has always been to assess the ability to understand important information from basic biomedical, dental and dental hygiene sciences, and the ability to apply such information in a problem–solving context.[2] In 1998, the NBDHE was modified to include 150 case–based questions as a significant portion of the exam. Unlike typical stand–alone questions, case–based questions pertain to a presented case. Typically, 9 to 12 questions are asked about each of the 15 specific cases. It is likely that success on this modified NBDHE involves different skills than on the previous exam. The 15 cases that comprise the case–based portion of the NBDHE involve more reading than the older version of the test. Similarly, the 24 community–related questions also involve more reading than the stand alone questions. Existing studies have not examined the correlation between a student's NBDHE score and their reading aptitude.

The purpose of this study was to determine if there are specific pre–admission factors that are significantly related to success on the NBDHE. Much of the literature describes correlations between post–admission factors, such as specific dental hygiene course grades and success on the NBDHE. If it can be shown that there is a correlation between specific pre–admission factors and success on the NBDHE, admissions committees may wish to include additional criteria in admission rubrics.

Many schools have adopted different approaches to determine the specific criteria of dental hygiene students who have the greatest likelihood of being successful on the NBDHE. Earlier studies have reported the correlation between internal board review courses and NBDHE scores, as well as the relationship between student grades in online and on–campus dental hygiene courses and NBDHE scores.[3,4] While yielding useful data, information is still needed on predictors of student success as part of the admission process. Identifying those variables that have been shown to accurately predict success on the NBDHE before a student has been admitted

would enable selection committees to make more informed choices regarding applicants.

Downey et al conducted a 6 year study to determine which factors were best able to predict success on the NBDHE.[5] Examining records from 134 dental hygiene students at the Medical College of Georgia, the authors found that a student's incoming GPA was the best predictor for success on the NBDHE. Further, the authors reported that dental hygiene GPA was best predicted by both the incoming GPA and the total SAT score. The authors also reported that the GPA in science pre–requisite courses was not significant in predicting NBDHE success.

A study by Bauchmoyer et al examined 173 dental hygiene students who had graduated between 1998 and 2002 from The Ohio State University.[6] Results of this study indicated that the strongest variables in predicting NBDHE scores were a student's dental hygiene coursework GPA and the GPA in the 3 science pre–requisite courses. While a student's GPA in pre–requisite course work would be helpful in the admissions process as a predictor of NBDHE scores, a student's GPA in specific dental hygiene coursework would not be determined until after a student has been admitted.

Methodology for a study conducted by Alzahrani et al included examining the records of students (n=235) enrolled at Old Dominion University between 1998 and 2002 to determine which variables significantly predicted graduation and successful completion on the NBDHE.[7] Unlike the results found by Bauchmoyer et al,[6] but similar to the results found by Downey et al,[5] the researchers found no correlation between GPA in the science pre–requisite courses and success on the NBDHE. The researchers did determine, however, that a significant relation (p=0.0008) existed between the final grade in the oral pathology course and NBDHE success. Since oral pathology is taken after a student has been admitted to a program of dental hygiene, these findings are of limited use in the candidate selection process.

Similarly, a study conducted by Mills et al revealed that the most accurate predictors of NBDHE scores were student grades in dental anatomy and head and neck anatomy.[8] The researchers gathered data on 132 students enrolled in the University of New England Dental Hygiene Program from 2005 to 2007. A pre–requisite course, anatomy and physiology, was not shown to be an accurate predictor of student success on the NBDHE. While poor grades in dental anatomy and head and neck anatomy may alert faculty to the need for student remediation prior to taking the NBDHE, this finding does not as-

sist in determining which applicants are going to be most successful on the NBDHE following completion of the dental hygiene coursework.

Also finding a correlation between NBDHE success and dental hygiene coursework, Ward et al conducted a study to determine if a relationship existed between predicted NBDHE success and GPA at graduation.[9] Findings from their study revealed moderate correlations between probability models and success on the NBDHE. Additionally, the authors found the best predictor of success on the NBDHE was GPA while enrolled in the dental hygiene curriculum. Similar to other studies, the dental hygiene GPA will not aid admissions committees in selection of the applicants most likely to succeed on the NB-DHE.

DeWald et al also examined the effect of GPA and national board review courses on NBDHE scores.[10] Results of their study indicated that there was not a significant difference in national board scores based on whether or not a student had participated in a national board review session. Similarly, the researchers found that a student's GPA was not related to performance on the NBDHE. The researchers did, however, find that those students who did not participate in a review course had a significantly higher GPA (p<0.05) than those who did take the review course.

A review of the literature concerning predictors of student success on the NBDHE reveals different findings. Some researchers found the GPA coursework was the best predictor of NBDHE success.[6,7,9] Other researchers identified specific dental hygiene courses as the best predictor.[7,8] Lacking in the literature are current studies which are capable of assisting admissions committees in the critical selection process, especially as related to non–science pre–requisite variables.

Methods and Materials

Prior to initiation of the study, an exempt status proposal was approved by the Western Kentucky University's Human Subjects' Review Board. As a portion of the admission process to Western Kentucky University's Program of Dental Hygiene, applicants take the following pre–requisite classes: microbiology, anatomy and physiology, English composition and introduction to psychology. Other required materials as part of the admission process include college transcripts and ACT scores.

NBDHE scores of students who were enrolled at Western Kentucky University's Program of Dental Hygiene from 2002 to 2010 (n=234) were exam-ined. Some of these 234 students had not taken the ACT or their scores were not available to the researcher. Exempted from the study were those students whose application did not include an ACT score as well as separate grades for microbiology lecture and lab, leaving a sample of 214 students.

The following variables for each student were entered into a spreadsheet: NBDHE score, case–based section score, age of student when admitted to the program, microbiology lecture grade, microbiology lab grade, anatomy and physiology grade, college GPA, English grade, psychology grade, composite ACT score for math, reading, English and science subcomponent scores of the ACT. Data were analyzed using SPSS 17.0. Pearson product–moment correlation coefficient was used to determine the strength of the association between NBDHE scores and specific variables. Further, the square of the correlation coefficient was used to estimate the fraction of the variance in the NBDHE score that is explained by the reading ACT score and the microbiology grade in a linear regression analysis.

Results

Results of this study revealed that the strongest predictors of total NBDHE scores were the scores on the reading portion of the ACT (r=0.715, r^2=0.511, p=0.01) and the grades in microbiology lecture (r=0.644, r^2=0.414, p=0.01). Weaker correlations were found to exist between the anatomy and physiology grade and total NBDHE score (r=0.461, p=0.01), college GPA and total NBDHE score (r=0.445, p=0.01), total ACT score and total NBDHE score (r=0.438, p=0.01), English grade and total NBDHE score (r=0.418, p=0.01) and microbiology lab grade and total NBDHE score (r=0.368, p=0.01). No significant correlations were shown to exist between a student's age and total NBDHE score, psychology grade and total NBDHE score or other subcomponent scores of the ACT and total NBDHE score.

Case–Based Scores

A separate analysis of the above factors and student performance on the case–based portion of the NBDHE was also conducted. Findings from these analyses indicated that the most significant correlations existed between a student's score on the reading ACT (r=0.673, r^2=0.452, p=0.01), the microbiology lecture grade (r=0.637, r^2=0.405, p=0.01) and the case–based score. As with the total score, weaker correlations to the case–based score were shown to exist with total ACT score (r=0.440, p=0.01), college GPA (r=0.417, p=0.01), anatomy and physiology grade (r=0.390, p=0.01), English grade (r=0.334, p=0.01) and microbiology

lab grade (r=0.282, p=0.05). No significant correlations with the case–based scores were shown to exist between a student's age, psychology grade or other subcomponent scores of the ACT.

Discussion

Previous research has examined success on the NBDHE and the grades attained on science–based courses before and as part of the dental hygiene curriculum. Grades on courses that are part of the dental hygiene course sequence, however, cannot be used as part of admissions criteria. Studies concerning grades on pre–admission science–based courses only have yielded conflicting results.[5,6]

Findings from this study suggest that the grade a student attains on the reading portion of the ACT is an important predictor of success on the NBDHE. Also important, however, is a student's grade in microbiology. One possible explanation regarding the correlation between a student's microbiology grade and NBDHE score is that there is a microbiology subsection of the NBDHE. Students who have performed well in Microbiology would, logically, score well on that section of the NBDHE. This finding is consistent with that of Bauchmoyer et al when they found that the GPA in certain pre–requisite courses, including microbiology, were strong predictors of NBDHE scores.[5]

Further, the coefficient of determination indicated that 51% (r^2=0.511) of an individual's total NBDHE score can be explained by an individual's score on the reading portion of the ACT. Similarly, the coefficient of determination indicated that 41% (r^2=0.414) of an individual's NBDHE total score can be explained by an individual's grades in microbiology lecture. Concerning case–based scores, the coefficient of determination indicated that 45% (r^2=0.452) of an individual's score can be explained by their score on the reading portion of the ACT. Similarly, the coefficient of determination indicated that 40.5% (r^2=0.405) of an individual's NBDHE case–based score can be explained by their grades

in microbiology lecture. While knowledge of course material is essential, results of this study suggest that a student's ability to read and assess the meaning of questions is critical.

Results of this study can be used to augment existing admissions rubrics in order to select a dental hygiene class more likely to succeed on the NBDHE. Findings from this study revealed that, of the variables examined, students' scores on the reading portion of the ACT were most strongly correlated with their total score on the NBDHE (r=0.715, p=0.01), as well as their scores on the case–based section (r=0.673, p=0.01). The microbiology lecture also was found to have a strong correlation with total NBDHE scores (r=0.644, p=0.01), as well as case–based scores (r=0.637, p=0.01).

It is recommended that this study be expanded to include other means of assessing a student's reading ability. Examples of other means of assessment may include grades in English literature classes or verbal scores on the SAT examination. Additionally, future studies may wish to examine reasons for the strong correlation between microbiology grades and NBDHE scores.

Conclusion

This study found that scores on the reading portion of the ACT and microbiology lecture grades were strong predictors of NBDHE scores. Applications to dental hygiene schools are likely to continue to experience rapid growth in the coming years. In order to select those students most capable of achieving success on the NBDHE, admissions committees may wish to consider modifying existing admissions rubrics to incorporate a student's reading acuity.

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