

# Predictors of Success on the NATABOC Certification Examination

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**Objective:** To determine the degree to which a selected number of variables could predict success on the first attempt at the National Athletic Trainers' Association Board of Certification Examination.

**Design and Setting:** Data were obtained from the student records of subjects who were enrolled in the same undergraduate athletic training education program for a minimum of two years, maintained a minimum GPA of 2.5 on a 4.0 scale, and had taken the National Athletic Trainers' Association Board of Certification Examination. A telephone survey of the subjects was used to supplement these records.

**Subjects:** Fifty-two subjects (38 male, 14 female) who had been enrolled for a mean of seven semesters ( $\pm 2.57$ ) participated in this study. Subjects maintained a mean overall GPA of  $3.27 (\pm 0.39)$ , with an athletic training mean GPA of  $3.34 (\pm 0.43)$  and an academic minor mean GPA of  $2.91 (\pm 0.46)$ . The mean ACT composite score was  $18 (\pm 4.02)$ .

**Measurements:** Subjects sat for the National Athletic Trainers' Association Board of Certification Examination. Examination passing status, rather than subjects' scores on individual sections, was used in the analysis.

**Results:** Analysis using forward multiple linear regression indicated that no single independent variable predicted examination success. However, a strong interrelationship was present between several of the independent variables. Multiple discriminant analysis was used to determine the nature and strength of these interrelationships. A composite set of variables was formed to include overall academic GPA, athletic training GPA, academic minor GPA, ACT composite score, and number of semesters of university enrollment. This composite set explained 42% of the variance in predicting successful completion of the entire examination on the first attempt. The predictive power of the composite set greatly decreased after the first examination attempt.

**Conclusions:** Academic variables are the strongest predictors of first-time success on the overall National Athletic Trainers' Association Board of Certification Examination and its component sections.

**Key Words:** education, achievement, athletic training, undergraduate

Data collected by the National Athletic Trainers' Association Board of Certification, Inc (NATABOC) show that, in 1995, 58% of the candidates from an athletic training education program (ATEP) successfully completed all three sections of the NATABOC Certification on their initial attempt.<sup>1</sup> These data also demonstrate a failure rate of 21% to 41%<sup>1</sup> on the three sections for first-time ATEP student candidates. Statistics for ATEP-trained candidates retaking portions of the examination also show failure rates ranging from 22 to 51% for all three sections.<sup>1</sup>

Research using independent variables to predict success on health care licensing/certification examinations is scarce. Most of the investigations in this area were conducted with students in nursing,<sup>2-5</sup> medicine,<sup>6</sup> and physical therapy programs.<sup>7-9</sup> In these studies, overall grade point average (GPA) (including entrance and exit GPA from the professional program), GPA in professional course work, specific course grades, ACT composite scores, Allied Health Professions Test scores, interview

rating scores, admission test scores, and demographic variables such as age, ethnicity, and sex were investigated as predictors of success on health care licensing/certification examinations.

Only Draper<sup>10</sup> investigated predictors of student success on the certification examination for athletic trainers. This research focused on learning style as it relates to success on the examination. In addition, this study also addressed GPA and clinical experience, expressed as contact hours, as predictors of examination success.<sup>10</sup>

If it were possible to predict from a group of selected variables which candidates taking the NATABOC Certification Examination would pass or fail particular sections, then steps could be taken to address those areas where a significant relationship exists. By making ATEP directors and student athletic trainers aware of significant relationships between certain variables, a candidate's chance of passing the Certification Examination on the initial attempt might be enhanced. The purpose of this study was to investigate ATEP students' success on the NATABOC Certification Examination and its component sections and the degree to which this success was related to selected academic, demographic, and social variables.

## METHODS

### Subjects

Fifty-two athletic training students (38 male, 14 female) who were enrolled in an undergraduate ATEP from 1978 to 1992

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and who had taken the NATABOC Certification Examination participated in this study. All subjects had been enrolled in The University of Southern Mississippi for a minimum of four semesters and had maintained a minimum GPA of 2.5.

We reviewed each subject's student records to determine overall GPA, athletic training GPA, academic minor, academic minor GPA, fraternity or sorority affiliation, ACT composite score, teaching versus nonteaching degree track (18 versus 34 students), and number of semesters of university enrollment. As needed, we supplemented these records through a telephone survey with each subject.

### Survey Instrument

Ten certified athletic trainers involved in the education component of the ATEP at The University of Southern Mississippi reviewed the survey to determine face validity. We determined the number of attempts for successful completion of each section of the NATABOC Certification Examination from the ATEP director's records and supplemented these data with a telephone survey.

### NATABOC Certification Examination

Content validity of the NATABOC Certification Examination is ensured through the *Role Delineation Study*.<sup>11</sup> Reliability of the examination sections has been reported as 0.84 for the written (W), 0.80 for the written simulation (WS), and 0.88–0.91 for the oral/practical (OP) sections.<sup>12</sup> Reliability for the W and WS sections was determined by using the Kuder-Richardson internal consistency formula, and the OP section reliability was determined by inter-rater reliability.<sup>12</sup>

### Statistical Analysis

We used the statistical package SPSS for Windows (v. 6.0, SPSS Inc, Chicago, IL) for data analysis. Multiple linear regression (MLR) identified any of the independent variables

**Table 1. Descriptive Data Representing the Categorical Independent Variables**

Variables	Frequency	%
Academic minor		
Biology-General Science	9	17.3
Social Studies	7	13.5
Physical Education	2	3.8
Physical Education w/ Exercise Science	13	25.0
General Science	8	15.4
Mathematics	1	1.9
Premedicine	1	1.9
None	11	21.2
Sex		
Male	38	73.1
Female	14	26.9
Fraternity or sorority affiliation		
Yes	8	15.4
No	44	84.6
Teaching	18	34.6
Nonteaching	34	65.4

**Table 2. Descriptive Data Representing the Continuous Independent Variables**

Variable	Mean	Standard Deviation
Overall GPA	3.27	.39
Athletic training GPA	3.34	.43
Academic minor GPA	2.91	.46
ACT composite score	18.19	4.02
Number of semesters at the university	7.37	2.37

**Table 3. Criterion Variables of Number of Attempts to Pass the NATABOC Certification Examination**

Variable	Mean	Standard Deviation	Frequency	%
Number of attempts to pass NATABOC Certification Examination	1.14	.929		
1st attempt			21	40.4
2nd attempt			14	27.0
3rd attempt			2	3.8
4th attempt			1	1.9
Have not passed			14	26.9
Number of attempts to pass written section	1.04	.766		
1st attempt			33	63.5
2nd attempt			7	13.5
3rd attempt			1	1.9
4th attempt			1	1.9
Have not passed			10	19.2
Number of attempts to pass oral/practical section	1.54	.460		
1st attempt			40	76.9
2nd attempt			10	19.2
3rd attempt			0	
4th attempt			0	
Have not passed			2	3.9
Number of attempts to pass written simulation section	.752	.825		
1st attempt			22	42.2
2nd attempt			3	5.8
3rd attempt			3	5.8
4th attempt			0	
Have not passed			8	17.4
Did not take*			16	28.8

\* The WS was initiated in 1987 and 16 of the subjects did not take this part of the examination.

that could predict success on the NATABOC Certification Examination. Multiple discriminant analysis (MDA) allowed us to determine if a composite set of variables could predict success on the NATABOC Certification Examination. The alpha level ( $p < .05$ ) was established a priori for all analyses.

### RESULTS

This sample was primarily male, enrolled in a nonteaching track, with no fraternity or sorority affiliation, and a preference for a physical education minor (Table 1). Table 2 summarizes the descriptive data for the independent continuous variables of overall GPA, athletic training GPA, academic minor GPA, ACT composite score, and number of semesters at the univer-

**Table 4. Composite Set of Independent Variables and Criterion Variable of Number of Attempts Before Successful Completion: Multiple Correlation\***

Criterion Variable**	df	F	p	R <sup>2</sup>
Entire examination	5, 49	3.36	.01	.26
Written section	2, 52	3.60	.03	.12
Written simulation section	1, 53	6.62	.01	.11
Oral/practical section	2, 52	2.90	.06	.10

\* Composite set of independent variables includes overall academic GPA, athletic training GPA, academic minor GPA, ACT composite score, and number of semesters enrolled at the university.

\*\* Criterion variables include number of attempts before successful completion of the entire examination and the three sections of written, written simulation, and oral/practical.

sity. The descriptive data representing the criterion variables and the number of attempts to pass the entire NATABOC Certification Examination and each of its three sections are contained in Table 3. The greatest success occurred on the OP section, with 64% of the subjects successfully completing this section on the first attempt. The WS was the most difficult, with 42% of the subjects being successful in their initial attempt.

Data analysis using forward MLR (Table 4) indicated a significant relationship between the independent variables of overall GPA, athletic training GPA, academic minor, academic minor GPA, sex, fraternity or sorority affiliation, ACT composite score, teaching versus nonteaching degree track, and the number of semesters of university enrollment and the criterion variable of number of attempts before successful completion of the entire examination. A significant relationship was also found between these variables and the number of attempts before successful completion of the W and WS sections (df = 5, 49; F = 3.36; p = .01; R<sup>2</sup> = 0.26). However, the data indicated that the relationship with respect to the OP component was much weaker. As may be expected, no significant independent relationship was observed for any of the independent variables.

No single independent variable predicted success on the entire examination or its sections. However, MLR indicated significant interrelationships between the criterion variables of number of attempts and the independent variables of overall GPA, athletic training GPA, academic minor, academic minor GPA, sex, fraternity or sorority affiliation, ACT composite score, teaching or nonteaching track, and number of semesters at the university.

Therefore, we used MDA to determine if a composite set of independent variables could predict success on this test. The first analysis determined the efficiency of the composite set of predictor variables in predicting the attempt on which the entire NATABOC Certification Examination was passed by the subjects (Table 5). The Wilks' lambda of 0.62 indicates that 62% of the original variance was not explained by the

**Table 6. Standardized Canonical Discriminant Function For Each Predictor Variable and the Entire NATABOC Certification Examination**

Variable	Function
Overall GPA	.97
Athletic training GPA	-.39
Academic minor GPA	.24
ACT composite score	.19
Number of semesters at the university	-.18

classification power of the predictor variables. Table 5 also shows the result of applying function 1 to the analysis of the data. The canonical correlation of 0.65 indicates that 42.25% of the variance was explained by the variables used in predicting the attempt on which the subjects were successful.

Table 6 contains data on the standardized canonical discriminant function. This represents the weights for each independent variable used in predicting attempts on which the subjects passed the entire examination. These weights, in standard score form, are equivalent to beta weights in multiple regression in that they represent the value that would be multiplied by the standard score for each of the predictor variables. Also, these values represent a composite variable consisting of the weighted value of all predictors, which would change if any of the variables were not included in the set. In addition, the negative values for athletic training GPA and number of semesters at the university are arbitrary; they would become positive if the other variables were made negative. The variables in Table 6 indicate that, of the total number of predictor variables originally considered, only the five indicated were used in a composite set predicting the criterion variable.

In an attempt to increase predictive power, we used the composite set of variables to determine the degree to which they could predict the success on attempts one and two in passing each section of the examination (Table 7). Inspection of these data shows that the highest canonical correlation between the composite set and the criterion was found for the WS (0.73), followed by the W (0.45) and the OP (0.42). As may be expected, the corresponding Wilks' lambda values show the same pattern.

Table 8 contains standard canonical discriminant weights for the set of predictor variables in predicting the attempt on which the subjects passed the sections of the NATABOC Certification Examination. These data indicate that the overall GPA had the highest weight for the W and OP sections of the examination. However, for the WS, the highest weight was observed in the academic minor GPA, followed by the athletic training GPA. Again, these weights represent the composite variable consisting of the weighted value for each variable in the set. Therefore, these weights would be applied to the standardized

**Table 5. Discriminant Power in Predicting Attempts Necessary To Pass The Total NATABOC Certification Examination**

Function	Eigen-value	Variance Explained	Canonical Correlation	After Function	Wilks' Lambda	Chi-Square	df	p
1	.6066	100.00	.6496	0	.622	14.46	5	.012

**Table 7. Discriminant Statistics in Predicting Attempts Necessary to Pass Each Section of the NATABOC Certification Examination**

Section	Function	Eigen-value	Canonical Correlation	After Function	Wilks' Lambda	Chi-Square	df	p
	1			0				
W		.25	.45		.80	7.92	5	.16
OP		.22	.42		.83	8.75	5	.12
WS		1.15	.73		.46	14.62	5	.07

**Table 8. Standardized Canonical Discriminant Function for Each Predictor Variable and Each Section of the NATABOC Certification Examination**

Predictor Variable	Written	O/P	WS
Overall GPA	1.39	.47	-.41
Athletic training GPA	-.92	.27	.85
Academic training minor	.11	.20	1.11
ACT composite score	.26	.05	-.64
Semesters at the university	-.08	-.34	.73

**Table 9. Results of the Composite Set of Predictor Variables in Identifying Successful Completion of the NATABOC Examination**

Examination	Actual Attempts	Prediction (%)	
		First Attempt	Second Attempt
Entire Examination	1st	76.2	23.8
	2nd	21.4	78.6
W	1st	97.0	3.0
	2nd	57.1	42.9
OP	1st	95.0	5.0
	2nd	80.0	20.0
WS	1st	95.5	4.5
	2nd	0	100

scores of the variables indicated in Table 6. Any other attempt to use the weights would result in an inaccurate data analysis.

Table 9 summarizes the classification results indicating the degree to which the composite set of variables can predict group membership of the subjects as successful and unsuccessful on the NATABOC examination. These data are in the form of the classification results for the entire examination and each of its component sections. The overall strongest discriminating value was for the WS section, followed by the W and OP sections, and the total examination score. Additional details in Table 9 show that prediction of first-attempt success was more accurate than for the second attempt. This trend was indicated by the high classification of the first attempt for the W section, followed by the WS and OP sections, and then the entire examination. The ability to predict success after the first attempt decreased greatly for the criterion variables. Accurate prediction of success on the second attempt was greatest for the WS section, followed by the entire examination.

## DISCUSSION

Research in nursing and physical therapy<sup>3-5,9</sup> has demonstrated that one or more independent variables could be used as

predictors of success on health care licensing/certification examinations. Our results support some of those same variables as predictors of ATEP student success on the NATABOC Certification Examination. Investigators in other allied health professions have used either correlations<sup>3-5,9</sup> or stepwise MLR<sup>9</sup> in their data analyses. These studies reported a relationship between the independent variables and the criterion variable(s), although the independent effects of these variables were not analyzed. In many cases, as in our study, variables selected in MLR may not demonstrate a significant independent effect. For this reason, we used MDA to determine the independent variables that, through their interrelationship, would form a composite set of variables that could predict success on the NATABOC Certification Examination.

Previously, Draper<sup>10</sup> reported no relationship between GPA and score on the WS and OP components of the NATABOC Certification Examination. Our results, however, demonstrated a significant relationship between GPA and initial success on these sections. Our findings do support Draper's<sup>10</sup> report that there is a relationship between GPA and success on the W section of the examination.

Our investigation demonstrated that none of the variables could independently be used to predict ATEP students' success on the NATABOC Certification Examination or its component sections. This may be because there is no relationship between success on the examination or its sections, or both, and these variables. However, a plausible reason for the failure to demonstrate a relationship between the independent and criterion variables is that we used the subjects' number of attempts, rather than NATABOC Examination test scores, as the criterion variable. Other studies<sup>3,4,9,10</sup> (personal communication, P. Grace, September 29, 1993) examining predictor variables for success on health care licensing/certification examinations used the subjects' actual test scores as their criterion variable.

Although no one variable could independently predict success, a composite set of variables correctly classified a large percentage of the students on their first attempt at the NATABOC Certification Examination. In rank order, these variables included overall academic GPA, athletic training GPA, academic minor GPA, ACT composite score, and the number of semesters of university enrollment. Of the five variables in the composite set, three are GPA variables. Therefore, we might extrapolate that GPA is a very important consideration in predicting first-attempt success on the NATABOC Certification Examination. The ability to predict success after the first attempt decreased greatly for the criterion variables.

These data reflect initial success rates on the NATABOC Certification Examination and its components that are similar

to those reported by the NATABOC<sup>1</sup> for undergraduate ATEP first-time and retake candidates. A review of student records and telephone survey results demonstrated that 40% of the subjects passed the entire NATABOC Certification Examination on their initial attempt, while 27% had not passed the examination at the time of data collection. With respect to the components of the test, the OP appears to be the easiest for these subjects, with 77% passing on their initial attempt. Twenty-seven percent of the subjects had not passed the W section and 17% had not passed the WS.

Limitations of this investigation include changes that occurred in the ATEP over the time period of data collection. The subjects were exposed to different instructors as well as a trend toward more psychomotor skills testing and instruction. A second limitation is the changes that occurred in the NATABOC Certification Examination. These would include changes in the test questions; however, we assumed that the NATABOC Certification Examination is reliable and valid. The WS was also added during this time frame, but the only effect this addition should have on data analysis is a decrease in the number of subjects who took this section of the examination.

Our results support the premise that success on the total NATABOC Certification Examination and each of its sections may be predicted by the variables we used. However, these data strongly indicate that, in this sample, success in passing each of the sections of the NATABOC Certification Examination could be more accurately predicted than could overall examination success. In addition, those successful in passing each section of the examination on the first attempt could be predicted at a higher rate as compared with success on the second attempt. These results indicate the value in specifying test sections as the unit of classification rather than a composite total of the examination.

## CONCLUSIONS

Our study provided data that may be used in classifying subjects relative to their successful attempt in passing the overall NATABOC Certification Examination and each of its three component sections. No one independent variable was able to predict success on the NATABOC examination, but rather a composite set of variables had the best predictive power. Five predictor variables were selected by the discriminant analysis technique from a total of nine original variables. In rank order, the selected variables were overall academic

GPA, athletic training GPA, academic minor GPA, ACT composite score, and the number of semesters of university enrollment.

Academic variables are the strongest predictors of first-time success on the overall NATABOC Certification Examination and its component sections. Thus, ATEP directors need to stress to students that the higher their GPAs in the areas identified in this study, the greater the probability of successfully completing the NATABOC examination on the first attempt. Additional research is needed to further investigate variables that may be linked to success on the NATABOC Certification Examination. For future research, we suggest using actual NATABOC Certification Examination scores for criterion variables and including several undergraduate ATEPs in order to apply the results to a larger population.

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