

Spring 4-28-2014

Predictors of Success in Entry-level Master's Degree Programs in Athletic Training

Mary E. Murray
mary.murray@student.shu.edu

Follow this and additional works at: <https://scholarship.shu.edu/dissertations>

 Part of the [Higher Education Commons](#), and the [Sports Sciences Commons](#)

Recommended Citation

Murray, Mary E., "Predictors of Success in Entry-level Master's Degree Programs in Athletic Training" (2014). *Seton Hall University Dissertations and Theses (ETDs)*. 1972.
<https://scholarship.shu.edu/dissertations/1972>

PREDICTORS OF SUCCESS IN ENTRY-LEVEL MASTER'S DEGREE PROGRAMS IN
ATHLETIC TRAINING

by

Mary E. Murray

Submitted in partial fulfillment of the requirements for the degree

Doctor of Education

Department of Leadership, Management and Policy

Seton Hall University

2014

Copyright © by Mary E. Murray

2014

SETON HALL UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN SERVICES
OFFICE OF GRADUATE STUDIES

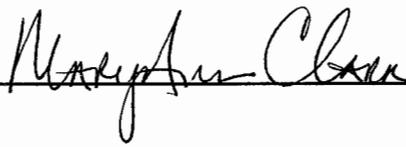
APPROVAL FOR SUCCESSFUL DEFENSE

Doctoral Candidate, **Mary E. Murray**, has successfully defended and made the required modifications to the text of the doctoral dissertation for the **Ed.D.** during this **Spring Semester 2014**.

DISSERTATION COMMITTEE
(please sign and date beside your name)

Mentor:
Dr. Joseph Stetar  4/30/14

Committee Member:
Dr. Rong Chen  4/30/2014

Committee Member:
Dr. MaryAnn Clark  4/30/2014

The mentor and any other committee members who wish to review revisions will sign and date this document only when revisions have been completed. Please return this form to the Office of Graduate Studies, where it will be placed in the candidate's file and submit a copy with your final dissertation to be bound as page number two.

ABSTRACT

Athletic training educational program directors use a variety of admission criteria to select qualified applicants who they anticipate will succeed academically and professionally. No standard sets of admission criteria exist for identifying a student's ability to succeed in an entry-level master's degree athletic training program or on the Board of Certification (BOC) examination. The purpose of this retrospective study was to investigate the relationship between entry-level master's degree athletic training student demographic and academic factors and first-attempt passing rate on the BOC examination. The research questions examined the relationship between age, gender, admission grade point average (GPA), final GPA, and BOC exam success. Data ($N = 73$) from 3 Commission on Accreditation of Athletic Training Education (CAATE)-accredited entry-level master's athletic training education programs were used in this study. The results of the Pearson correlation indicated a positive relationship between admission GPA and final GPA and a positive relationship between final GPA and passing the BOC examination on the first attempt. With an increased demand for athletic training professionals (Bureau of Labor Statistics, 2012) and a new focus on the program outcomes by the accrediting association (CAATE, 2013), the results of this study will assist athletic training educators in selecting and preparing students who have the greatest potential to succeed.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	9
1.0 INTRODUCTION.....	11
1.1 THE BOARD OF CERTIFICATION EXAMINATION	13
1.2 STATEMENT OF THE PROBLEM.....	15
1.3 STATEMENT OF THE PURPOSE.....	15
1.4 RESEARCH QUESTIONS AND HYPOTHESES	16
1.4.1 Subsidiary Questions.....	16
1.4.2 Hypotheses.....	17
1.5 THEORETICAL FRAMEWORK.....	17
1.5.1 Application of the theoretical framework to the study	19
1.6 DEFINITIONS.....	21
1.7 LIMITATIONS.....	22
1.8 SIGNIFICANCE OF THE STUDY	23
2.0 REVIEW OF LITERATURE.....	25
2.1 ATHLETIC TRAINING EDUCATION	25
2.2 PREDICTING SUCCESS IN HEALTHCARE EDUCATION	28
2.2.1 Athletic Training.....	28
2.2.2 Physical Therapy	32

2.2.3	Occupational Therapy.....	36
2.2.4	Physician Assistant	38
2.2.5	Nursing	40
2.2.6	Summary of predictor variables	44
3.0	METHODOLOGY.....	50
3.1	RESEARCH DESIGN.....	50
3.1.1	Population and sample	50
3.1.2	Independent Variables	51
3.1.3	Dependent Variable.....	53
3.1.4	Survey Instrument.....	53
3.2	DATA COLLECTION.....	54
3.3	DATA ANALYSIS.....	54
4.0	RESULTS	56
4.1	DESCRIPTIVE ANALYSIS.....	57
4.1.1	Participants	57
4.1.2	Age and gender of subjects	59
4.1.3	Admission GPA, final GPA and BOC first time pass rate.....	60
4.1.4	BOC First Attempt Pass Results	62
4.2	BIVARIATE ANALYSIS	63
4.2.1	Chi-square test of independence	63
4.2.2	Correlation Analysis.....	64
4.3	LOGISTIC REGRESSION ANALYSIS	65
4.4	CONCLUSION	68

5.0	DISCUSSION	69
5.1	SUMMARY OF THE FINDINGS	69
5.1.1	Age and Gender	70
5.1.2	Admission GPA and Final GPA	71
5.2	LIMITATIONS OF THE STUDY	72
5.3	RELATIONSHIP TO THEORETICAL FRAMEWORK	73
5.4	IMPLICATIONS FOR PRACTICE.....	74
5.5	RECOMMENDATIONS FOR FUTURE RESEARCH	76
	APPENDIX A	78
	APPENDIX B	83
	BIBLIOGRAPHY	85

LIST OF TABLES

Table 1 BOC Exam First-time Passing Percentage by Testing Year.....	14
Table 2 Predictors of Success in Healthcare Education.....	46
Table 3 Demographics of ATEP.....	57
Table 4 Frequency distribution of study variables by program	58
Table 5 Admission GPA, Final GPA (N=73).....	61
Table 6 Summary of Chi-square Test Results	64
Table 7 Bivariate Correlations between Predictor Variables and BOC (N=73).....	65
Table 8 Logistic Regression Results for Age, Gender, Admission GPA, Final GPA	66
Table 9 Total Model of Predicted Outcomes for BOC Success	67
Table 10 Logistic Regression Results for the Variables: Age and Gender.....	67
Table 11 Logistic Regression Output for the Variables Admission GPA and Final GPA	68

LIST OF FIGURES

Figure 1 Representation of Astin's Theoretical Framework.....	18
Figure 2 Application of Astin's Theoretical Framework to Study Variables	20
Figure 3 Age on Admission	59
Figure 4 Gender of Subjects	60
Figure 5 Admission Grade Point Average	61
Figure 6 Final Grade Point Average	62
Figure 7 BOC Exam First Attempt Result.....	63

ACKNOWLEDGEMENTS

Writing a dissertation is a very solitary experience, but I would not have been able to complete this journey without the support and encouragement of many.

I would like to thank the members of my dissertation committee for their steadfast support and guidance. I appreciate my advisor, Dr. Joseph Stetar, for his continuous input and direction throughout this entire process. I am thankful to Dr. Rong Chen for her feedback and suggestions. Dr. MaryAnn Clark provided candor at times when I didn't realize I needed it. She always had my best interest in mind and for that I am forever grateful.

I appreciate the support and encouragement from the faculty and students (former and present) at Seton Hall University and the University of Pittsburgh. They inspired me to keep moving forward.

I have been blessed with a generous and supportive family. My parents, siblings, nieces and nephews have all provided encouragement over these many years. They were my cheerleaders, babysitters, cooks and shoulders to lean on. I could not have completed this without all of them!

I am thankful for the patience that my children, Anna and Robbie, showed over these last few years. They have given up many hours of "mommy time" while not understanding the reason. I hope I can teach them the value of "finishing what you start." Finally, I am deeply

grateful for the many sacrifices that my husband Rob made so that I could complete this work.
He is my rock; he motivated me to work hard and never give up. Always and forever.

1.0 INTRODUCTION

Certified athletic trainers are healthcare professionals who specialize in prevention, recognition, management and rehabilitation of injuries that result from physical activity. In order to practice as an athletic trainer and obtain licensure in certain states, individuals must graduate from a program that has been accredited by the Commission on Accreditation of Athletic Training Education (CAATE) and successfully complete the Board of Certification (BOC) examination (BOC, 2012a).

Currently there are 359 accredited entry-level athletic training programs in the United States. Of these, 333 are baccalaureate degree-granting programs and 26 are post-baccalaureate (entry-level master's) degree-granting programs (CAATE, 2013). The terms entry-level master's degree and post-baccalaureate degree are used interchangeably. The first baccalaureate athletic training programs were approved by the National Athletic Trainers' Association (NATA) in 1969 (Delforge & Behnke, 1999). There has been a subsequent steady increase in the number of athletic trainers entering the profession. This growth may be attributed to more individuals seeking careers in athletics and health care.

Since 1969 there has been a continual increase in the number of accredited baccalaureate programs. In addition, public awareness of athletic training has spurred an increase in demand for admission to accredited athletic training education programs. This increase in programs and demand for admission has allowed program directors to be more selective in their admission

process. By only offering baccalaureate programs as a means to become a certified athletic trainer, the profession was potentially excluding candidates who were unable to pursue athletic training as undergraduate students, who discovered athletic training after earning a baccalaureate degree in another field, or who desired a change in career. In addition, the thought leaders at the time sought to align the profession of athletic training with other health care fields that require a master's degree to be eligible for the credentialing examination. For these reasons, the development of the entry-level master's degree programs in athletic training began.

The development of entry-level master's degree programs has steadily increased since 1996 when the faculty at Bridgewater State College developed the first accredited entry-level master's degree program (CAATE, 2013). Since then, 25 other entry-level master's degree programs have been developed. Examination of the admissions criteria of the 26 entry-level master's degree programs reveals a great deal of variability in the requirements, resulting from a lack of standards or guidelines for establishing admissions criteria. The responsibility for establishing the selection criteria and admission decisions is typically determined by the faculty from each athletic training education program.

In 2012, the NATA Executive Committee for Education (ECE) recommended that a detailed analysis be conducted to determine the most appropriate professional degree for athletic trainers (NATA, 2012). As a result, a professional education work group was created to analyze data and opinion to conclude whether the baccalaureate or entry-level master's degree is better for providing patient outcomes and longevity for the profession of athletic training. A determination by the ECE that the post-baccalaureate degree is best for the profession will result in program directors being tasked with creating or modifying their program and admission requirements to meet the needs of the student applicants.

Recruiting and retaining students who are likely to succeed in the program is a primary goal for athletic training program directors. As the number of applicants has increased, it has become necessary for the professional program personnel to utilize specific selection criteria to ensure only the applicants with the greatest chance of success are admitted. For the purpose of this study, success of an entry-level master's degree athletic training student is defined by passing the BOC examination on the first attempt.

1.1 THE BOARD OF CERTIFICATION EXAMINATION

Athletic training credentialing varies greatly from state to state. One prerequisite credential is required by 48 of the 50 states: certification by the BOC. Candidates become certified athletic trainers by graduating from a CAATE-accredited athletic training education program and passing a single 175-item test administered via computer, known as the BOC examination.

The first athletic training certification examination was administered in 1970 (Delforge & Behnke, 1999). From 1970 to 1986, there were two sections on the examination: 150 multiple-choice questions and practical evaluation of psychomotor skills in athletic training. A third component that evaluated critical thinking was added to the BOC examination in 1987. This section was known as the written simulation and allowed students to integrate cognitive and practical knowledge and apply decision-making skills (BOC, 2013).

The BOC examination format remained unchanged until 2006 when portions of the exam became computerized. Since 2007, the certification examination has consisted of a 175-item computerized exam, presented as one singular examination with varying types of questions.

The BOC makes public the examination report for each testing year. The reports differentiate between candidates who passed on the first attempt, those who retook the exam and the combination of first-time and re-take candidates. This study is concerned with first-time passing rates for students who graduated from entry-level master’s degree programs from 2007 to 2010. A testing year typically consists of five 14-day test windows: March/April, May/June, July/August, November and January/February. Table 2 shows all first-time candidates who passed the BOC examination on the first attempt from the 2007-2008 through 2010-2011 testing years. The BOC does not differentiate between candidates who graduated from either a baccalaureate or entry-level master’s degree program. Exam results are reported in aggregate.

Table 1 BOC Exam First-time Passing Percentage by Testing Year

Testing year	First-time candidates	Pass on first attempt	% Pass
2007-2008	1,495	584	39.1
2008-2009	2,762	1,423	51.5
2009-2010	2,852	1,235	43.3
2010-2011	2,963	1,800	60.7

1.2 STATEMENT OF THE PROBLEM

Athletic training program directors use a variety of admission criteria to select qualified applicants who will succeed academically and professionally. No evidence exists for identifying an entry-level master's degree athletic training students' ability to succeed in the program or on the BOC examination. There is a lack of published data in the field of higher education, specifically in the area of post-baccalaureate degree (entry-level master's) student success. To date, the literature includes one study on post-professional athletic training student success (Keskula, Sammarone & Perrin, 1995) and factors related to baccalaureate degree students in athletic training (Draper, 1989; Harrelson, Gallaspy, Knight & Lever-Dunn, 1997; Middlemas, Manning, Gazzillo, & Young, 2001; Platt, Turocy, & McGlumphy, 2001; Turocy, Comfort, Perrin, & Gieck, 2000). As a result, program directors lack sufficient empirical data to assist in the selection of qualified applicants to entry-level master's degree programs in athletic training. In addition, the absence of significant data puts program directors at risk of not selecting the applicants with the strongest potential to succeed.

1.3 STATEMENT OF THE PURPOSE

The purpose of this study was to predict first-time passing rate on the BOC examination by assessing factors related to students in entry-level master's degree athletic training education programs. The study improved the disparity in athletic training education research related to readmission criteria and first-time passing rate on the BOC examination. A large quantity of

research exists in other healthcare field such as physical therapy. However, published studies of this topic in athletic training are deficient.

In 2007, the BOC modified the format of the examination from a three-part examination (written, practical, and written simulation) to a single computerized examination. Existing research in the area of predicting success in athletic training was based upon the BOC examination in the previous format. This study examined athletic training student success on the computerized BOC examination.

1.4 RESEARCH QUESTIONS AND HYPOTHESES

What factors (age, gender, admission GPA and final GPA) contribute to the prediction of passing the BOC examination on the first attempt among graduates of entry-level master's degree programs in athletic training?

1.4.1 Subsidiary Questions

1. Is there a significant relationship between student demographic variables (age and gender) and passing the BOC examination on the first attempt among graduates of entry-level master's degree programs in athletic training?
2. Is there a significant relationship between academic variables (admission GPA and final GPA) and passing the BOC examination on the first attempt among graduates of entry-level master's degree programs in athletic training?

1.4.2 Hypotheses

The null hypotheses formulated for this study:

1. (H_{01}): There is no statistically significant relationship between student demographic variables (age and gender) and passing the BOC examination on the first attempt among graduates of entry-level master's degree programs in athletic training.
2. (H_{02}): There is no statistically significant relationship between academic variables (admission GPA and final GPA) and passing the BOC examination on the first attempt among graduates of entry-level master's degree programs in athletic training.

1.5 THEORETICAL FRAMEWORK

The conceptual framework for this study is Astin's (1993) model for studying student outcomes. He developed an input-environment-output (I-E-O) model to use as a guide for assessment. He referred to assessment as gathering of information from student performance and using that information to improve the student and the university. The conceptual model of I-E-O is the most applicable model for assessment and pre-admission criteria. Input refers to the characteristics of the student upon initial entry into the institution. This includes previous academic experiences and, what students intend to accomplish in the academic program. Information such as this is helpful to assess a student's strengths and weaknesses. Astin (1993) described input as either fixed or changed over time. The fixed inputs are parts of the student that do not change, such as age or gender. Input data that undergo change include behaviors, values

and cognitive function. Admission committees assess student input data from application materials to determine admission into the university or program.

Environment includes the educational programs, faculty, peers and policies to which the student is exposed. This encompasses the students’ instructional experiences, degree or major field, social activities and institutional or program characteristics (Astin, 1993). Information on environment can be gathered from institutional records and student evaluations of faculty.

Output is the third component of the I-E-O model and incorporates the characteristics of the student subsequent to exposure to the environment (Astin, 1993). The outcome can be cognitive or non-cognitive in nature. Figure 1 presents a schematic of the various components of Astin’s model.

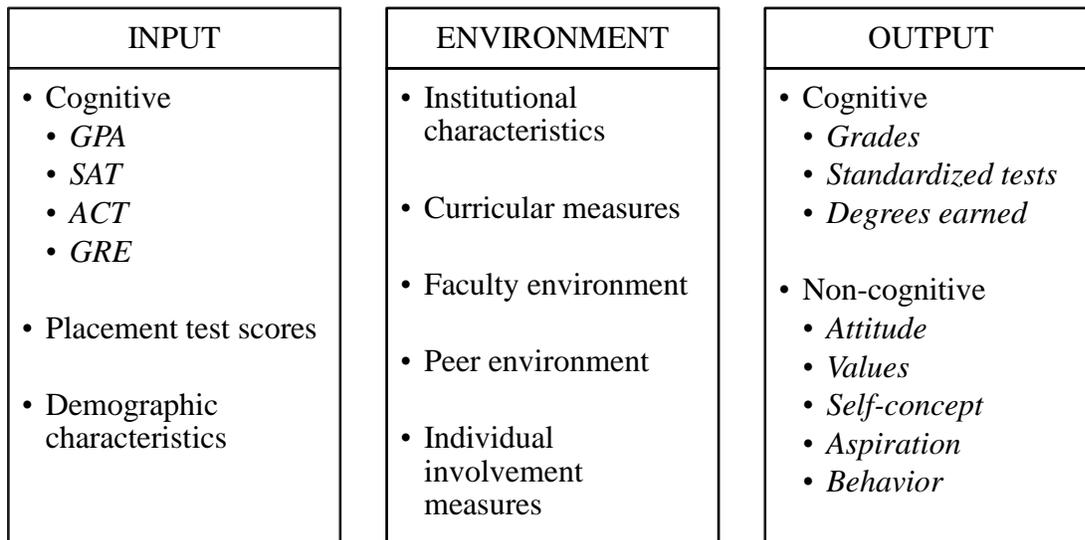


Figure 1 Representation of Astin’s Theoretical Framework

1.5.1 Application of the theoretical framework to the study

Astin's I-E-O model has been previously used as the theoretical framework in studies on student success in health care education (Esparza, 2012; Luoma, 2003). Esparza (2012) used Astin's model in a study that investigated undergraduate athletic training student success on both the BOC examination and the Texas athletic training licensure exam. Luoma (2003) applied Astin's model to examine academic and non-academic predictors of success on the NCLEX-RN examination for nurses. In this study, Astin's I-E-O model was used to designate the placement of specific variables available for prediction of entry-level master's degree student success on the BOC examination. The input variables included were academic (admission GPA and final GPA) and demographic (age and gender) variables. The environment included variables associated with the athletic training education program. These data consisted of the length of the educational program, number of credits, number of years of accreditation and location according to NATA district. The output component of the I-E-O model closely follows the intent of Astin's model, which is describing the students' characteristics at the end of the educational experience. The outcome variable in this study was the first-time passing result on the BOC examination. Each of these were applied to Astin's model and included in Figure 2.

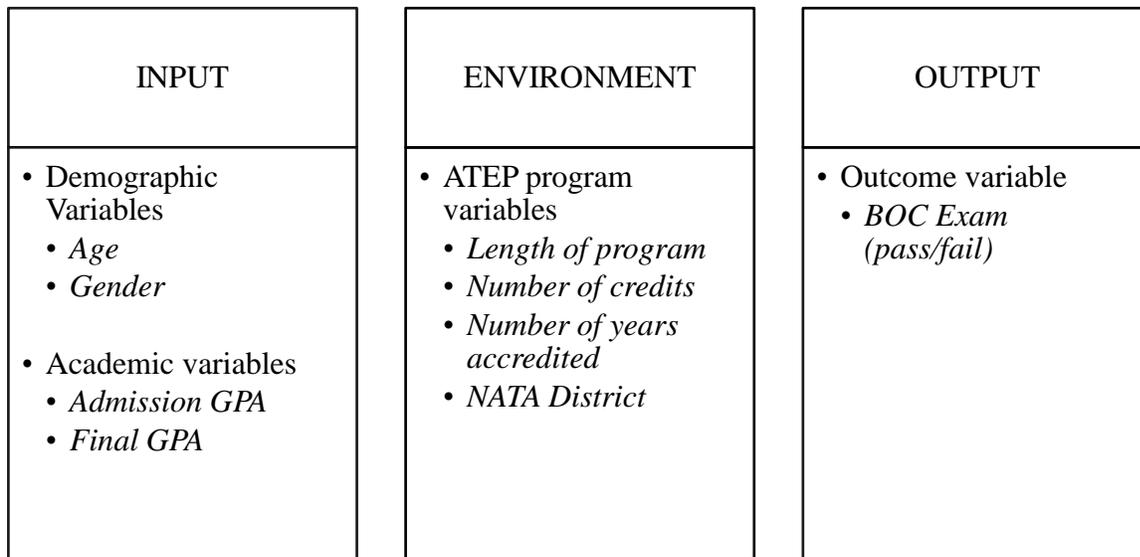


Figure 2 Application of Astin's Theoretical Framework to Study Variables

To summarize the application of Astin's I-E-O model to this study, the prediction of the output variable (success or failure on the BOC examination) can be obtained by determining the results of the correlation between the input variables (demographic and academic variables) and environmental variables (program characteristics).

This model is well suited as a theoretical framework for this study because athletic training education is a system composed of interdependent parts. It is an appropriate model to frame the analysis in this study to identify predictors of success of a well-defined group of students.

1.6 DEFINITIONS

1. Admission grade point average (GPA) – the students' GPA upon admission to the athletic training education program; the GPA is based on a 4.00 scale.
2. Athletic trainer (AT) – a highly qualified health care professional educated in the prevention, recognition, management and rehabilitation of injuries that result from physical activity.
3. Board of Certification, Inc. (BOC) – is the organization that sets the standards of practice for athletic trainers, provides certification for entry-level athletic trainers and recertification standards for certified athletic trainers (Board of Certification, 2012a)
4. BOC examination – the only credentialing examination for certified athletic trainers in the United States.
5. Commission on Accreditation of Athletic Training Education (CAATE) – the organization that sets the standards for and accredits athletic training education programs.
6. Entry-level master's degree – a specialized academic degree conferred upon an individual after completing at least 2 years of education beyond a bachelor's degree (also known as a post-baccalaureate degree).
7. Final grade point average (GPA) – the students' GPA upon completion of the academic portion of the athletic training education program.
8. National Athletic Trainers' Association (NATA) – the professional membership organization for certified athletic trainers and others who support the profession.
9. Success of entry-level master's AT student – passing the BOC examination on the first attempt.

1.7 LIMITATIONS

This descriptive, correlational, predictive, retrospective study was conducted to examine the relationship between demographic and academic variables on BOC success of graduates of entry-level master's degree programs in athletic training. Limitations of this study were related to research design, sampling methodology and method of data retrieval.

This study is limited by the small sample size. At the time of this study, athletic training program directors were not required to maintain student demographic and academic data that are easily accessible. This lack of organized, readily available retrospective data may have contributed to the incomplete responses and/or lack of responses from the program directors.

Due to the restriction of the sample to graduates of entry-level master's degree athletic training students, the results may not be applicable to baccalaureate degree students. Only students who completed all requirements and graduated from a CAATE accredited athletic training program were included. Students in this study were limited to the graduating classes of 2007 to 2010.

Graduate record examination (GRE) scores were not used. The GRE is not a consistent admission requirement for the entry-level master's degree athletic training programs. Neither race nor ethnicity was examined as a predictor of success on the BOC examination.

Collecting data in a retrospective manner does not allow for manipulation of the data. In addition, by collecting data retrospectively, the investigator must rely on the accuracy of the pre-recorded data.

1.8 SIGNIFICANCE OF THE STUDY

Knowledge of demographic and academic variables that predict success on the BOC exam for entry-level master's degree athletic training students provides several reasons that support the significance of this study.

First, the data provided make this study one of the few, if only, studies to investigate the demographic and academic variables that may predict the first-time BOC passing rate among entry-level master's degree students in athletic training. The results of this study provide foundational data regarding these variables for future study of this student population.

The results of this study provide information regarding admission variables and outcomes assessment. The ability of a program director to identify students who are predicted to pass the BOC examination gives him or her some measure of control over program outcomes. This has implications for current and future entry-level master's degree programs in athletic training. The NATA ECE presented a white paper to the NATA Board of Directors outlining the key findings regarding the "future of athletic training education" (NATA, 2013). From those key findings, a significant recommendation from this committee is that entry-level education in athletic training should occur at the master's level. If CAATE agrees with the ECE recommendation, the 333 baccalaureate degree program directors will be forced to decide to whether or not to make the change to an entry-level master's degree athletic training education program. That decision will most likely include a re-evaluation of the admissions criteria in order to meet CAATE requirements and select students with the highest potential for success on the BOC examination.

Results on the BOC examination are emerging as the most important outcome criterion in athletic training education. According to the current CAATE standards, all accredited athletic

training education programs must have a minimum aggregate (3-year) first-time BOC pass rate of 70% and must make these results available to the public on the program website (CAATE, 2013). Programs will be put on probation if first-time pass rates fall below 70%. The pass rate for the athletic training students on the BOC examination is a benchmark by which each program is judged. For institutions to continue to graduate students who are successful on the BOC exam, it is crucial that program directors identify the variables that predict BOC exam success.

Identifying which admission variables are the most valid predictors of academic success for entry-level master's athletic training students can enhance student success from the time of admission into the program, throughout the prescribed program of study and upon graduation. Although no single measure can identify student success all of the time, data that have been demonstrated to be predictive of success could be used to drive the admissions process.

2.0 REVIEW OF LITERATURE

Health care professional educational programs, including athletic training, have a goal of preparing students to successfully pass licensure and certification examinations. Prerequisite courses, GPAs, standardized test scores, and clinical performance can be used to predict student success. Program administrators and students should understand the relationship that these factors may have with success in a health care professional educational program. Because programs aspire to admit the applicants with the greatest chance of success, understanding this relationship can affect the admissions process and subsequently the advisement of students enrolled in these programs. The ultimate goal of these academic programs is to graduate competent individuals who have succeeded in the professional program and are prepared to take the certifying examination.

2.1 ATHLETIC TRAINING EDUCATION

Athletic trainers are “healthcare professionals who collaborate with physicians to provide prevention, emergency care, clinical diagnosis, therapeutic intervention and rehabilitation of injuries and medical conditions” (NATA, 2013). The National Athletic Trainers Association (NATA) was founded in 1950 to facilitate the exchange of ideas, knowledge, and methods of athletic training in order to strengthen the profession (Delforge & Behnke, 1999). It was through

the work of the members of the NATA that the first athletic training curriculum model was developed. A major milestone for the profession of athletic training came in 1990 when the American Medical Association (AMA) recognized athletic training as an allied health profession (Delforge & Behnke, 1999). Such recognition prompted the NATA to seek accreditation for the athletic training education programs from the Committee on Allied Health Education and Accreditation (CAHEA), which was part of the AMA. In 1994, the independent organization Commission on Accreditation of Allied Health Education Programs (CAAHEP) was created. CAAHEP is a programmatic accreditor of health science education and at the time included athletic training education (CAAHEP, 2013).

The first entry-level master's degree program in athletic training education was accredited in 1996 (CAATE, 2013). This type of program added another dimension to the evolving education reform in athletic training education. Until 2004, there were two routes for students to become eligible for the BOC exam. A student could either attend an accredited athletic training education program that combined both academic and clinical requirements, or a student could attend an internship program where the emphasis was more on clinical experience than didactic instruction (Weidner & Henning, 2002). The internship option was eliminated because data indicated that candidates from an accredited program consistently performed better on the BOC exam than those candidates who completed an internship program (BOC 2002, 2003, 2004). In 2001, the passing rate for all students taking the BOC exam for the first time was 33.94%, with candidates from an accredited athletic training education program having a first-time passing rate of 42.57% and candidates from the internship route having a first-time passing rate of 27.10% (BOC, 2002). In 2002, the passing rate for all students taking the BOC exam for the first time was 36.18%, with candidates from an accredited athletic training education

program having a first-time passing rate of 43.31% and candidates from the internship route having a first-time passing rate of 27.32% (BOC, 2003). In 2003, the passing rate for all students taking the BOC exam for the first time was 30.11%, with candidates from an accredited athletic training education program having a first-time passing rate of 35.29% and candidates from the internship route having a first-time passing rate of 24.78% (BOC, 2004). The consistent poor performance by the internship candidates was a critical reason for the elimination of that type of program. In order for students to be eligible for the BOC examination, they must graduate from an accredited program.

In 2006, the JRC, a committee on accreditation under CAAHEP, changed its name to the Commission on Accreditation of Athletic Training Education (CAATE) and became an independent agency responsible for the accreditation of professional and post-professional athletic training education programs (CAATE, 2013). The CAATE is sponsored by the American Academy of Family Physicians (AAFP), the American Academy of Pediatrics (AAP), the American Orthopaedic Society for Sports Medicine (AOSSM), and the National Athletic Trainers' Association, Inc. (NATA). Together, these organizations develop the Standards for Entry-Level Athletic Training Educational Programs (CAATE, 2013). These standards are designed to prepare entry-level (baccalaureate and entry-level master's degree) athletic trainers.

As athletic training has evolved, the expectation still remains for graduates to be competent practitioners and successful on the BOC examination. In order to meet this expectation, it is necessary to examine the requirements for entry into the profession. In 2012, a professional education work group was created in order to determine the most appropriate professional degree "to position athletic trainers to provide patient outcomes and ensure the longevity of the profession of athletic training" (NATA, 2012).

2.2 PREDICTING SUCCESS IN HEALTH CARE EDUCATION

Researchers conducted studies evaluating variables that predict student success in health care education. The various measures can be categorized into three major areas of academic, clinical, and demographic variables. Academic measures include undergraduate and prerequisite GPA, writing skills, and standardized test scores. Clinical measures include type and amount of clinical experience, as well as fieldwork grades. Demographic measures include age, gender, and race.

Research related to athletic training student success has been minimal. In addition, with the exception of one study (Keskula, et al, 1995) in which researchers investigated students in a post-professional master's program, the majority of research has focused on baccalaureate degree student outcomes. These data are not generalizable to graduates of an entry-level master's degree program. In order to identify predictors of success in an entry-level master's degree program in athletic training, it becomes necessary to examine other health care professions that educate students at the post-baccalaureate level, have admission criteria and prepares students for credentialing examinations. The following review includes research on predicting student success in the areas of athletic training, physical therapy, occupational therapy, physician assistant and nursing education.

2.2.1 Athletic Training

Keskula and colleagues (1995) conducted the first study regarding the prediction of academic success in athletic training education programs (ATEP). The researchers investigated the predictive values of a post-professional graduate athletic training program's admission

variables. This program admitted students who successfully completed the BOC exam and were pursuing an advanced degree in the field of athletic training. Students ($n=55$) enrolled in one graduate athletic training program during a 5-year period were included as subjects. The preadmission GPA, scores on the GRE and total hours of clinical experience were analyzed as predictors of academic success (Keskula et al., 1995). In this study, preadmission GPA was found to be the only significant predictor of the final GPA for the graduate students, accounting for 34% of the variance. The authors concluded that preadmission GPA was the best predictor of academic success in an advanced master's athletic training education program (Keskula et al., 1995). They also concluded that GPA should be used as a threshold and not an absolute determinant of acceptance. The authors stated that GPAs varied from school to school and may be influenced by where courses were taught, when they were taught and who taught them.

For many years this was the only predictive study of academic achievement in ATEPs. Platt, Turosy and McGlumphy (2001) examined preadmission criteria and academic success in entry-level athletic training and other health profession education programs. Data were collected on 373 students enrolled in baccalaureate athletic training and five other health professional disciplines at one private university in the northeast (Platt et al, 2001). Descriptive data including age, gender, and year of graduation were used. Academic data that included high school GPA, college GPA, and Scholastic Aptitude Test (SAT) scores were evaluated. In this study, academic success was defined as the final college GPA. Only one significant difference was noted in the preadmission profiles of the athletic training group compared with the other health professionals. The mean age of the athletic training subjects was significantly different from the mean age for all other groups. The ages of the athletic training students ranged from 21 to 33 years, whereas the ages of all students ranged from 21 to 56 years. Other preadmission criteria were similar

across all groups. The data analysis revealed that high school GPA and verbal SAT score predicted professional GPA when the group was considered as a whole (Platt et al., 2001). High school GPA accounted for 38% of the variance in the final GPA of athletic training students. For that reason, the authors recommended that high school GPA continue to be used to predict success in undergraduate athletic training students (Platt et al., 2001).

Little research exists on the factors that predict athletic training student success on the BOC examination. Factors such as overall grade GPA, athletic training GPA, and number of clinical hours have been investigated.

An early investigation into athletic training student performance on the BOC exam used subjects ($n=52$) from a single undergraduate athletic training education program (Harrelson, Gallaspy, Knight, & Leaver-Dunn, 1997). For this study, athletic training student success was investigated by reviewing performance on the BOC examination and its relationship to academic variables that included overall GPA, athletic training GPA, academic minor, academic minor GPA, and ACT scores. A multiple linear regression analysis and subsequent multiple discriminate analysis were used. Results indicated that the overall GPA, academic minor GPA, and athletic training GPA were significant predictors of success on the BOC examination (Harrelson et al., 1997). A concluding factor of this study was that it was not possible to isolate just one independent variable that would predict success on a credentialing examination.

Middlemas, Manning, Gazzillo and Young (2001) continued investigating this area and expanded the subjects to include all first-time undergraduate BOC exam candidates ($n=270$) during the April and June 1998 examination administrations. There was a positive, significant correlation between GPA and the final result of the BOC ($r=.20$, $p<.001$) (Middlemas, et al., 2001). Using a logistic regression, the authors regressed the final result of the certification

examination (pass or fail) on GPA to predict whether the candidate would pass the examination. The regression coefficient for GPA was significant ($p = .001$) which indicated that GPA could be used to predict a final outcome on the BOC examination (Middlemas et al., 2001). The authors recommended that students with lower GPAs be referred to support services to increase the likelihood of passing the BOC examination.

Factors related to the clinical education of athletic training students have been evolving with the profession. The clinical education requirements for athletic training students have undergone many changes since 2003.

Eligibility for the certification exam prior to 2003 required students to submit documentation of the number of clinical hours completed. In addition, documentation of the type of clinical experiences completed was required (CAATE, 2013). Previous studies indicate that the total number of clinical hours performed by an undergraduate candidate does not predict success on the BOC examination (Draper, 1989; Harrelson et al., 1997; Middlemas et al., 2001; Turocy et al, 2000). The type of clinical experience did not predict BOC examination outcomes (Turocy et al., 2000). Traditionally, clinical hours including football have been seen as essential experience for athletic training students. However, Turocy et al., (2000) concluded that a clinical experience involving football was not a predictor of success on the BOC exam. As a result, athletic training clinical education no longer requires a minimum number of hours or specific sports.

Few data exist nationally on athletic training student success and little research has been done in this area. Of the few studies available, the majority have focused on baccalaureate degree student outcomes. These data are not generalizable to graduates of an entry-level master's degree program. The use of admission criteria to predict success is not well documented in athletic

training education research. However, other health care fields have studied the predictability of various criteria on licensure and certification examination success. The literature on physical therapy, occupational therapy, physician assistant and nursing education suggests that academic and demographic variables can generally be used to predict academic success and performance on credentialing exams.

2.2.2 Physical Therapy

Predicting success in physical therapy educational programs has been thoroughly studied and is important because the profession is pursuing autonomous practice and will require clinical doctorate (DPT) degrees by the year 2020 (Agho, Mosley, & Williams, 1999). Physical therapy program directors need to identify the students who have the greatest opportunity to succeed. In a retrospective study, Kirchner, Holm, Ekes and Williams (1994) investigated a group of 46 physical therapy students. The researchers identified seven predictor variables, which included undergraduate GPA (uGPA), GRE scores, scores on letters of reference and writing ability scores. Graduate GPA (gGPA) was used as one of three dependent variables. Using a correlation coefficient and a multiple regression analysis, the investigators found that the gGPA was positively correlated with the uGPA and that uGPA contributed significantly to the prediction of the gGPA (Kirchner et al., 1994). In addition, GRE score and the scores on the essay were also useful in predicting the gGPA but were not as powerful predictors as the uGPA (Kirchner et al., 1994).

Subsequently, most researchers investigating physical therapy student success included prediction of outcomes on the National Physical Therapy Examination (NPTE) (Dockter, 2001; Guffey, Farris, Aldridge, & Thomas, 2002; Kosmahl, 2005; Thieman, Weddle, & Moore, 2003;

Utzman, Riddle, & Jewell, 2007b). Dockter (2001) investigated the relationship between preadmission variables and academic success and scores on the NPTE. In this study, academic success was defined as the GPA obtained at the end of the first professional year of physical therapy school. The predictor variables were age on admission, attainment of a bachelor's degree, prerequisite GPA, total admission score, preadmission clinical experience hours, interview points and writing sample scores. Subjects ($n=107$) from a single program were used in this study. Positive correlation coefficients were found to be significant between first professional-year GPA and prerequisite GPA and total admission score (Dockter, 2001). However, age was negatively correlated with first professional year GPA ($r = -.31, p < .01$). Student scores on the NPTE had significant correlations between first professional year GPA ($r = .65, p < .01$) and prerequisite GPA ($r = .34, p < .05$). In this study, Dockter (2001) found that the best predictors of first professional-year GPA were total admission score and age on admission, followed by total admission score alone. In addition, the best predictor of performance on the NPTE was the first professional year GPA.

Thieman and colleagues (2003) examined the predictive variables in another entry-level master's degree physical therapy program. The records of 121 students were included in this study. The five predictor variables included prerequisite GPA, preadmission GPA, GRE scores, number of undergraduate credits earned, and previous post-baccalaureate degrees. The prerequisite GPA was based on required credits including biology (8 credits), anatomy (4 credits), physiology (4 credits), and physics (4 credits). The dependent variables were graduate GPA (gGPA) and scores on the NPTE (Thieman et al., 2003). Data analysis revealed 37% of the variability in gGPA could be accounted for in preadmission GPA and GRE scores. The gGPA was positively correlated with prerequisite GPA ($r = .51$) and preadmission GPA ($r = .44$). Similar

to the findings of Dockter (2001), the researchers found age to be negatively correlated with gGPA ($r = -.32$). These researchers also found that gGPA was the best predictor of NPTE score ($r = .317, p < .01$) Still, when prerequisite course GPA was combined with overall preadmission GPA and GRE scores the regression model accounted for only 11% of the variance in NPTE scores (Thieman et al., 2003).

Kosmahl (2005), however, focused exclusively on factors related to NPTE scores. Records of 92 physical therapy graduates from the University of Scranton were used in this study. This sample size was consistent with the previously mentioned studies in this field. The predictor variables used in this study were age, gGPA, scores on a comprehensive examination (CE) and scores on the Clinical Performance Instrument (CPI). The dependent variable was NPTE score. The study showed highly significant positive correlations between NPTE scores and gGPA ($r = .60, p < .001$) as well as CE scores ($r = .62, p < .001$). Overall gGPA and CE scores accounted for 47% of the variance in NPTE scores. This regression equation explained a greater percentage of the variance than the equations discussed previously (Dockter, 2001; Thieman et al., 2003). The authors concluded that students who had a lower gGPA and who did worse on the CE designed by program faculty were less likely to pass the NPTE and that the academic program predicted failure of the NPTE (Kosmahl, 2005).

Utzman, Riddle and Jewell (2007b) assessed the utility of demographic and admissions data in predicting success on the NPTE. Only admission variables were examined. No post-matriculation variables such as professional program GPA were used. The sample ($n = 3585$) included students from 20 physical therapist educational programs. The dependent variable was NPTE score (pass or fail). During the study period two different versions of the NPTE were administered and data were analyzed separately for each version of the exam. The independent

variables were undergraduate GPA, (uGPA), verbal GRE (vGRE) scores and quantitative GRE (qGRE), as well as the demographic variables of age, race and gender. In comparing the populations, 93% of the students who took Version 1 of the NPTE passed on the first attempt, compared with 79% of those who took Version 2 (Utzman et al., 2007b). A hierarchical logistic regression model was developed. The odds ratio indicated that when other variables were controlled, the odds of failing the NPTE increased 12% for each 0.10 decrease in uGPA with a β coefficient of -0.126 ($p < .001$). The odds of failing the NPTE were more than 200% higher for students identified as African American, Asian/Pacific Islander or “other” as compared with White/non-Hispanic and Hispanic students (Utzman et al., 2007b). There was no interaction between race or ethnicity and uGPA, vGRE or qGRE. However, the percentages of students in this sample from some ethnic groups (African American = 2.5%, Hispanic = 2.5%) were small, which can decrease the ability to detect interactions (Utzman et al., 2007b). Verbal and quantitative GRE scores were consistent predictors of NPTE failure. The data from the two versions of the exam were examined separately and the contributions of uGPA, vGRE and qGRE to the prediction of NPTE were almost identical. The results indicated that uGPA was the most predictive variable of success in the graduate program in physical therapy. Specifically, an undergraduate GPA of 3.50 or higher was “protective against academic difficulty” (Utzman, et al, 2007b). However, students over the age of 27 with a uGPA of less than 3.50 had twice the academic difficulty as the younger students.

Although these studies indicated that preadmission GPA was a strong, consistent predictor of success, one study did not support this claim (Templeton, Burcham & Frank, 1994). These researchers assessed 12 preadmission academic scores to determine if a correlation with the cumulative GPA of 111 physical therapy students existed. When combined into related

categories, four criteria were studied which included preadmission GPA, cumulative science GPA, Allied Health Professions Aptitude Test (AHPAT) score, and the average of those scores. The cumulative sum of the science GPAs and the quantitative ability AHPAT raw score positively correlated with the final cumulative GPA. However, there were no significant correlations between final cumulative GPA and preadmission GPA, preadmission GPA in biology or math, or the remaining AHPAT scores (Templeton et al., 1994). These early results stand in stark contrast to the majority of later studies on predicting student success. The researchers mentioned that faculty should be cautious when identifying and weighing academic variables used as selection criteria for admission into health professions programs (Templeton et al., 1994).

2.2.3 Occupational Therapy

Research examining factors related to occupational therapy performance dates back over 50 years. In a landmark study, Englehart (1957) examined how well grades predicted performance in clinical education. The predictor variables were specific course grades in biological sciences, medical information, social recreation, sociology, occupational crafts and occupational theory. The independent variables were grades in the fieldwork courses (clinical rotations in pediatrics, physical disabilities, psychiatry and general medicine). The grades of 101 occupational therapy students were used in this study. The results showed statistically significant but weak correlations between only a few of the variables including the occupational crafts course and the general medicine ($r = .33$) and the pediatrics ($r = .28$) rotation; and the biological science course and the psychiatry ($r = .27$) rotations. Englehart was unable to identify any other

predictor variables. Certification examination performance was not used as a dependent variable (Englehart, 1957).

Kirchner and Holm (1997) stated that occupational therapy profession lacks systematic studies that evaluate the effectiveness of admissions processes. They used the predictor variable of undergraduate GPA (uGPA), GRE score, score on applicant's essay, and reference form score. In this retrospective study, the dependent variable was the occupational therapy GPA of 75 students from a single program. Correlation coefficients and regression analyses were used. Positive correlation coefficients were found to be significant between overall GPA and GRE scores ($r = .34$) and applicant's essay scores ($r = .24$) (Kirchner & Holm, 1997). This was the first study to have produced significant correlations between occupational therapy GPA and scores on the GRE for students in an entry-level master's program. The best predictors of overall GPA were uGPA and GRE scores. Scores on the reference forms were found not to be significant predictors of overall GPA (Kirchner & Holm, 1997; Kirchner, Stone, & Holm, 2000). These results support studies in athletic training (Keskula et al., 1995) and physical therapy (Dockter, 2001; Kirchner et al., 1994; Thieman et al., 2003; Utzman et al., 2007b) on the use of undergraduate GPA scores to predict success in health care education programs.

Designed to replicate and extend the work of Kirchner and Holm (1997), Kirchner and colleagues (2000) used overall GPA as a dependent variable. However, they used achievement of client therapy goals and ratings of student fieldwork placements as two additional dependent variables. The independent variables were undergraduate GPA (uGPA), GRE scores and scores on a written essay. Data were collected on a slightly smaller sample ($n=63$) from one master's degree program in occupational therapy. Similar to Kirchner and Holm (1997), the overall GPA was positively correlated with GRE scores and uGPA (Kirchner et al., 2000). There were no

significant correlations between the essay and any other variables. In addition, they found that uGPA and GRE scores accounted for 29% of the variance in overall GPA (Kirchner et al., 2000). The results of this study support the continued use of undergraduate GPA and GRE to screen students for admission into master's-level occupational therapy programs.

2.2.4 Physician Assistant

Since 1973, the Physician Assistant National Certifying Examination (PANCE) has been a critical tool to ensure that physician assistant (PA) graduates possess the entry-level knowledge and skills for the essential practice of medicine (Asprey, Dehn, & Kreiter, 2004a, 2004b). This exam is required by all 50 states for regulation and licensure of PAs. Much of the literature on PA success focuses on predicting outcomes on the PANCE (Asprey et al., 2004a; Cawley, 2002; Cody, Adamson, Parker, & Brakhage, 2004; Hooker, Hess, & CIPHER, 2002; McDowell, Clemens, & Frosch, 1999; Oakes, MacLaren, Gorie, & Finstuen, 1999). Although some of these researchers investigated characteristics of the PA program (Asprey et al., 2004b; Hooker et al., 2002; McDowell et al., 1999), this review focuses on studies that evaluate PA student demographic and academic variables (Asprey et al., 2004a; Cawley, 2002; Cody et al., 2004; Hooker et al., 2002; Oakes et al., 1999; Simmons, 2003; Weiner, 1981).

One of the first reports predicting success on the PANCE was conducted by Oakes and associates (1999), and studied a sample of students ($n=88$) in a military-based program. The independent variables included seven demographic variables (age, gender, pay grade, service component, prior military occupation, education level, and class membership), three academic variables (summed test scores for three trimesters) and one clinical variable (scores from a 53-week clinical rotation) (Oakes et al., 1999). The results indicated a significant but low correlation

between PANCE and the demographic variables of gender, pay grade, education level, and service. A significant high positive correlation between PANCE score and the scores of the first ($r = .72$), second ($r = .75$) and third ($r = .76$) trimesters was also found. Subsequent regression analyses revealed that all three trimester scores accounted for 62% of the variance in PANCE scores. This demonstrated that the curriculum and instruction within this military-based PA program provided students with the knowledge and skills needed to pass the PANCE. The authors chose not to use GPA to predict academic performance and success on the PANCE. Including GPA in this study might have provided more conclusive results.

Similar to Oakes and colleagues (1999), Asprey et al. (2004a) investigated demographic characteristics that have the potential to influence performance on the PANCE. A retrospective study assessed 9,247 student scores on the PANCE for the years 1990 ($n=1523$), 1995 ($n=2874$) and 2000 ($n=4850$). The researchers studied the influence of age and gender on performance on the PANCE (Asprey et al., 2004a). The results showed a significant negative correlation between age and PANCE score for all 3 years. The data indicated that lower scores were obtained by older students with r equal to $-.15$, $-.16$ and $-.23$ for years 1990, 1995 and 2000 respectively (Asprey et al., 2004a). Multiple t -tests were performed to compare the performance of males and females. In each of the three years examined, females significantly ($p < .0001$) outperformed males. Additional correlations between age and PANCE scores were calculated separately for males and females because the mean age of the male subjects was higher than that of the females and age was shown to be negatively related to PANCE scores. Asprey and colleagues (2004a) considered the contribution of gender while controlling for age. The correlation between PANCE score and age within the female subjects was $r = -.10$ and for males $r = -.23$ indicating that the negative relationship between age and score was significantly more pronounced in the male

subjects. Overall, age and gender together could account for only 4% of the variance in PANCE scores. When calculated within gender, the weighted average of $r = -.16$ suggested that age, independent of gender explained 3% of the total variance in PANCE scores (Asprey et al., 2004a). Results of this study were consistent with previously mentioned studies related to age and certification exam performance (Dockter, 2001; Thieman et al., 2003).

In contrast to these studies, Hooker and colleagues (2002) investigated the influence of PA program characteristics and student demographics, including age and gender on PANCE scores from 1997 through 2001. Subjects ($n=18,276$) were students who took the exam for the first time during this period. This was the largest study conducted to investigate the prediction of PANCE scores. A multiple regression analysis was performed and showed that only 3% of the variance in PANCE scores was accounted for by the select program attribute variables, age and gender (Hooker et al., 2002). This showed that none of the variables explained a meaningful amount of PANCE score variance.

2.2.5 Nursing

There are three typical levels of educational preparation that lead to entry-level practice of registered nursing: associate's degree, diploma and baccalaureate degree. Diploma programs have declined greatly in number, while associates and baccalaureate degree programs remain widespread throughout the country. Accelerated second-degree programs have gained in numbers and popularity in response to the demand for licensed nurses and resemble the student population in the entry-level master's degree programs in health care education.

Accelerated second-degree nursing (ASDN) programs afford non-nursing college graduates the ability to receive a Bachelor of Science degree in nursing (BSN) with a rapid

transition into the nursing profession. ASDN programs are accelerated because their students are college graduates who have already completed many of the science and liberal arts requirements, who excel academically and who tend to be highly motivated (Penprase & Harris, 2013). The ASDN programs are comparable to the entry-level master's degrees in many ways. First, ASDN programs are intended for individuals who have completed a baccalaureate degree in a non-nursing discipline. These programs build on previous learning experiences and allow individuals to transition into nursing. Second, ASDN programs include intense instruction, full-time coursework and clinical rotations (ASDN, 2014). The length of the ASDN programs range from 11 to 24 months, the latter corresponding with the typical length of study of entry-level master's degree programs. Lastly, the ASDN programs attract a new, previously untapped pool of students into the profession, including mature, motivated individuals with higher academic expectations (Penprase & Harris, 2013).

The terminal requirement of each of these programs of study is successful completion of the licensure examination. Passing the National Council of State Boards of Nursing (NCSBN) National Council Licensure Examination (NCLEX-RN) ensures the public that the candidate has the competency to practice as an entry-level nurse (AACN, 2014). Because of a shortage in nursing professionals, nursing schools are exploring ways to increase capacity in their programs and admit students who will be successful on the NCLEX-RN (Everette, Salamonson, Trajkovski, & Fernandez, 2013).

Studies in the nursing literature examined ASDN student demographic data such as age and gender and outcome variables including final GPA, and NCLEX passing rate (Abbott, Schwartz, Hercinger, Miller, & Foyt, 2008; Aktan et al., 2009; Bentley, 2006; Everette et al.,

2013; Hamner & Bentley, 2007; Seldomridge & DiBartolo, 2005). These studies do not focus exclusively on accelerated baccalaureate degree students.

Nursing education literature presents a variety of studies that compare traditional baccalaureate and accelerated baccalaureate nursing programs on outcome variables such as final GPA, NCLEX-RN passing rate, and career plans (Aktan et al., 2009; Bentley, 2006; Hamner & Bentley, 2007; Seldomridge & DiBartolo, 2005; Shiber, 2003). These studies are comparative in nature and identify significant differences. The data analysis performed most often was the one-way analysis of variance to determine differences between the ASDN and traditional nursing students (Aktan et al, 2009; Bentley, 2006; Hammer & Bentley, 2007; Seldomridge & DiBartolo, 2005; Shiber, 2003). Researchers have identified accelerate nursing students to have higher course grades and GPAs (Aktan et al, 2009; Seldomridge & DiBartolo, 2005; Shiber, 2003) while other studies found no significant differences in academic variables (Bentley, 2006; Hammer & Bentley, 2007). Some researchers reported a higher NCLEX-RN passing rate for accelerated nursing students (Seldomridge & DiBartolo, 2005) while others noted no significant differences between baccalaureate and accelerated baccalaureate first-time NCLEX-RN passing results (Aktan et al, 2009, Bentley, 2006; Hamner & Bentley, 2007; Shiber, 2003). The design of these studies focused on outcomes for the purpose of nursing program evaluation and effectiveness. These studies did not attempt to investigate the predictability of demographic or academic variables.

Research by Abbott et al. (2008) explored predictors of success for accelerated baccalaureate nursing graduates on the NCLEX-RN. A retrospective design was used on a sample of 127 students. The variables examined included admission GPA, previous degree (science or non-science), senior complex care (SCC) grade, and Health Education Systems, Inc.

(HESI) score. The authors indicated that those students whose first degree was in science performed better than non-science degree candidates on their first-attempt of the NCLEX-RN. Multivariate analysis of covariance with discriminant analysis follow-up was completed (Abbott et al, 2008). The admission GPA, SCC grades, and HESI scores were higher in those students with science degrees who passed the NCLEX-RN. In addition, the admission GPA for science and non-science students was higher for those students who passed the NCLEX-RN than for those who failed (Abbott et al, 2008). The authors did not investigate the relationship between the demographic variable and NCLEX-RN first-time pass rate. This study was limited by the homogeneity of the sample: Most were Caucasian females who were science majors. In addition, only 7 (5.5%) of the 127 students in the sample failed the NCLEX-RN. The authors of this study provided insufficient statistical data from which to draw conclusions or analyze critically.

In a descriptive exploratory study, Penprase and Harris (2013) tracked outcomes of 363 students enrolled in an ASDN program from 2005 to 2009. Student outcomes were final grades in 22 courses, test scores on the NCLEX-RN predictor examination and the Test of Essential Academic Skills (TEAS) (a baseline assessment of math and reading ability), and NCLEX first-time passing attempt. Demographic variables of age, gender, race and attrition rates were also collected. The results indicated that the developmental psychology course ($r = 0.32, p < .001$), the health assessment course ($r = 0.44, p < .001$), the TEAS ($r = 0.50, p < .001$) and the NCLEX-RN predictor exam ($r = 0.40, p < .001$) all demonstrated significant moderate correlation with NCLEX-RN success (Penprase & Harris, 2013). The authors conducted a multiple linear regression and found a significant predictive relationship ($F = 19.39, p < .001$), between the TEAS, the NCLEX-RN predictor exam, and the two courses (developmental psychology and health assessment) on NCLEX-RN first-attempt success. They found that 22% of the variance in

first-time NCLEX success among students in this sample could be accounted for by performance in the two courses and the predictor examination. Similar to Abbott et al. (2008), the majority of students in the study (88%) passed the NCLEX on the first attempt and was predominantly White (76%) and female (82%). The demographic variables were not investigated as predictors of NCLEX-RN first-attempt passing success. Although the authors did not include GPA as a predictor, they did identify academic variables (developmental psychology and health assessment courses) that are most linked to student success on the NCLEX-RN which can assist in identifying students at risk of failing.

2.2.6 Summary of predictor variables

The variables that may predict student success have been discussed relative to professional programs in athletic training, physical therapy, occupational therapy, physician assistant and nursing. Some of the previously mentioned research is limited in its methods as a result of using stepwise regression analysis (Dockter, 2001; Keskula et al, 1995; Oakes et al, 1999; Platt et al, 2001; Theiman et al, 2003). The step-wise method uses an automatic selection of data which can result in models suggesting that the remaining variables are more important than they really are, and the R^2 values of the sub models may be misleadingly large (Cook & Weisberg, 2009). The current study addresses this limitation by using a theoretical framework to guide the variable choice and uses simultaneous entry to conduct a regression analysis.

Studies pertaining to predictor variables in the field of athletic training are primarily at the baccalaureate level, with one study at the advanced degree level. Research related to physical therapy, occupational therapy, physician assistant and nursing has identified predictors of success for post-baccalaureate degree programs.

Athletic training is a relatively young profession, recognized by the American Medical Association (AMA) as a health care profession in 1990 (Delforge & Behnke, 1999). As the profession grows and the demand for entry into accredited entry-level master's degree athletic training programs increases, it is crucial for admissions officers to be able to select the students with the highest potential to succeed in the program and to successfully complete the BOC exam. Since 1996, athletic training education has added the entry-level master's degree as a means to become a certified athletic trainer and the number of these programs in AT has increased from 1 in 1996 to 26 in 2013. Since this number is expected to increase, research in the area of predicting student success is essential. Due to the lack of admission guidelines provided by CAATE, the admission process for entry-level master's degree programs in athletic training is highly variable and established by individual program faculty.

Currently there are no published studies that investigate predictors of success for the entry-level master's degree athletic training student. The literature across physical therapy, occupational therapy, physician assistant and nursing education identifies factors that predict academic success and performance on credentialing exams. Table 1 summarizes the findings of these studies and identifies the variables and the significant predictors. The most consistent predictor of success on credentialing exams was GPA (Abbott et al, 2008; Dockter, 2001; Harrelson et al., 1997; Keskula et al., 1995; Kirchner et al., 1994; Kirchner & Holm, 1997; Kirchner et al., 2000; Middlemas et al., 2001; Platt et al., 2001; Thieman et al., 2003). Although one study found no significant correlations between preadmission GPA and GPA in the professional program (Templeton et al., 1994), it is reasonable to assume that prior academic success can predict future success. The GPA earned prior to entering a health care profession education program is likely to forecast whether a student will succeed. Based upon the studies

mentioned, GPA remains the most consistent, objective quantitative variable that administrators can use to predict success of potential applicants.

Table 2 Predictors of Success in Healthcare Education

Author/year	Study population	Degree	n	Significant predictors	Outcome measure	p value
Kirchner (1994)	PT	MS	46	uGPA	Professional GPA	<.05
Keskula et al. (1995)	AT	MEd	55	uGPA	Professional GPA	<.05
Harrelson et al. (1997)	AT	BS	55	uGPA Minor-GPA AT-GPA	BOC	<.05
Kirchner & Holm (1997)	OT	MS	75	uGPA GRE	Professional GPA	<.05
Oakes et al. (1999)	PA	MS	88	Gender Test scores	PANCE	<.05
Kirchner et al. (2000)	OT	MS	63	uGPA GRE	Professional GPA	<.01
Middlemas et al. (2001)	AT	BS	270	uGPA	BOC	<.001
Platt et al. (2001)	AT	BS	373	HS-GPA vSAT	Professional GPA	<.01
Dockter (2001)	PT	MS	107	uGPA TAS Age	First year GPA NPTE	<.01
Hooker et al. (2002)	PA	MS	18,276	None	PANCE	<.05
Thieman et al. (2003)	PT	MS	121	Prereq GPA	Professional GPA NPTE	<.01
Asprey et al. (2004a)	PA	MS	9,247	Age Gender	PANCE	<.001
Kosmahl (2005)	PT	MS	92	GPA CE scores	NPTE	<.05
Bentley (2006)	Nursing	BSN/ ASDN	224	HESI	NCLEX-RN	<.01
Utzman et al. (2007b)	PT	MS	3,585	uGPA vGRE qGRE	NPTE	<.001
Abbott et al (2008)	Nursing	ASDN	127	Course grades HESI	NCLEX-RN	<.05
Penprase & Harris (2013)	Nursing	ASDN	363	2 courses Predictor exam	NCLEX-RN	<.001

GPA= grade point average; uGPA = undergraduate grade point average; HS-GPA= high school GPA; AT-GPA= athletic training GPA

GRE = graduate record examination; GRE sub-scores are [(GRE verbal) = vGRE, (GRE quantitative) =qGRE]

TAS = total admission score (TAS=60% uGPA, 32% interview and 8% writing sample)

CE = comprehensive exam; CPI = clinical performance instrument

BOC = Board of Certification examination; NPTE = National Physical Therapy Examination; PANCE = Physician Assistant National Certifying Examination; NCLEX-RN = National Council Licensure Examination for Registered Nurses

Standardized test scores are used in many health care professions admissions processes to evaluate student potential to succeed. The most common scores used are GRE scores that provide a standardized, general exam that assesses ability to perform in graduate education. As a computerized multiple-choice exam, it is similar to the credentialing exams for which health professional students are preparing. However, the GRE is not designed to assess the ability of a student to succeed specifically in a health profession education program. Some studies have supported the use of GRE scores in the admissions process (Kirchner et al., 1994; Kirchner & Holm, 1997; Thieman et al., 2003; Utzman, Riddle, & Jewell, 2007a, 2007b). The use of GRE scores by health care profession education programs as one of the tools to select applicants is inconsistent. Because of a lack of consistent predictability of GRE scores and health care profession student success, individual programs faculty are left to decide for themselves whether to include GRE scores in the admission criteria.

A few clinical variables have been considered for their predictability of student success. Ensuring clinical competence is the responsibility of the faculty of the educational program. The means by which faculty does so varies widely across health care profession education. Most healthcare education programs require students to successfully complete a variety of clinical experiences. The emphasis is on the quality of the experience and competence of the student, not on quantity of time spent in the clinical setting. In 2003, athletic training education changed the clinical education requirement from a minimum amount of clinical hours (quantitative) to proficiency in clinical skills (qualitative). This change was based upon studies that showed the amount of time spent in the clinical experience was not predictive of student success (Draper, 1989; Harrelson et al., 1997; Middlemas et al., 2001).

Demographic variables and their influence on student success have been studied by many health care professions. Age has been negatively correlated with student success (Asprey et al., 2004a; Dockter, 2001; Thieman et al., 2003). These studies indicate that as the age of the student increases, the likelihood of student success decreases. In addition, gender has also been shown to influence success on certification examinations. Oakes et al. (1999) reported that males were more likely to succeed on the PANCE, but because of the small sample size ($n=88$), generalizations cannot be made. In contrast, another study showed that females were more likely to pass the PANCE on the first attempt (Asprey et al., 2004a). Success of minority students in health care professions has some predictability as demonstrated in the literature (Simmons, 2003; Utzman, Riddle, & Jewell, 2007a; Utzman et al., 2007b; Weiner, 1981). In some cases, minority students have a greater chance of not succeeding than White/non-Hispanic students. Factors such as perception of social isolation at the institution, financial problems and a lack of minority faculty and mentors could also play an important role in predicting minority student failure (Simmons, 2003). Although age, gender and race correlate with success in health care profession education, faculty should be cautious not to assume that students who possess certain demographic characteristics will succeed.

Based upon this review of literature, the variables that may predict athletic training student success are: (a) age on admission, (b) gender, (c) admission GPA, and (d) professional program GPA. In the review of literature, these variables have been identified as predictors of success for physical therapy, occupational therapy, physician assistant and nursing students. Currently, there are no data on the predictability of success for the entry-level master's degree athletic training student. Overall, research in athletic training education is lacking rigor; therefore it is necessary to rely on other health care professions for evidence of predictors of success.

Many athletic training education programs are housed in schools or colleges that offer other health care education programs such as physical therapy, occupational therapy, physician assistant and nursing. Therefore, it is logical to look to predictors of success that have already been identified in those fields. Further research is necessary to provide information that may assist admissions committee faculty in the selection of applicants who have the qualifications to potentially succeed in the academic and professional aspects of an athletic training program.

In summary, exploring admissions criteria allows athletic training program directors to better predict the outcome of athletic training students enrolled in an entry-level master's degree program. Admitting students who are predicted to succeed would most likely increase the number of graduates qualified to take and pass the BOC examination and to obtain employment as a certified athletic trainer. Athletic training education program quality is in part determined by the first-time pass rate on the BOC examination.

3.0 METHODOLOGY

3.1 RESEARCH DESIGN

This retrospective quantitative study examined the significance of possible predictors of student success in professional entry-level master's degree athletic training education programs. Student data were collected from entry-level master's degree athletic training program directors. Given the nature of the dependent variables, both multiple regression and logistic regression methods were applied to investigate the relationship among student demographics, academic variables, and first attempt passing rate on the BOC examination.

3.1.1 Population and sample

The population investigated was defined as students from all CAATE-accredited entry-level master's degree athletic training education programs in the United States. At the time of this study there were 20 accredited entry-level master's degree athletic training programs and data were solicited from all (CAATE, 2013). The subjects eligible for inclusion in this study were students who were admitted to entry-level master's athletic training education program and graduated from 2007 to 2010. Students who were admitted, but did not graduate were not included.

Sample size can be determined if alpha, the effect size, and power are specified (Green, 1991). The alpha level was set at 0.05, based upon previous research in this area (Abbott et al, 2008; Harrelson et al, 1997; Hooker et al, 2002; Keskula et al, 1995; Kirchner et al., 1994; Kirchner & Holm, 1997; Kosmahl, 2005; Oakes et al, 1999). The power was set at .80. Green (1991) developed a rule-of-thumb to determine sample size for a logistic regression, based on the number of predictors and effect size with a power of .80 (alpha =.05). This study has four predictor variables (age, gender, admission GPA and final GPA). A typical study in education or the social sciences has a medium effect size, where .02, .13 and .26 (the squared partial correlation), represents the small, medium and large effect sizes (Green, 1991). Sample size was calculated using Green's (1991) rule-of-thumb: $N \geq (8/f^2) + (m-1)$, where $f^2 = .13/(1-.13) = .149$ (medium effect size) and $m = 4$ (number of predictors). It was determined that a sample size of 56 subjects was needed to perform a regression analysis.

3.1.2 Independent Variables

Age

Age was defined as the student's chronological age in years upon admission to the entry-level master's degree athletic training education program. Studies by Asprey (2004a) and Dockter (2001), concluded age was a significant predictor of success in physician assistant and physical therapy students. Because the entry-level master's degree programs have the potential to an age-diverse student population, age was included as a variable in this study.

Gender

Gender was included in the independent variables because previous studies in physician assistant education (Asprey, 2004a; Oakes et al, 1999; Penprase & Harris, 2013) concluded gender to be a predictor of student success. Gender was coded as 1 = *male* and 0 = *female*.

Admission Grade Point Average

Health science education programs include GPA in the admission selection criteria. The undergraduate or admission GPA has consistently been shown to be a predictor of success in the professional-level program or on the credentialing examination in athletic training, physical therapy, and occupational therapy (Dockter, 2001; Harrelson et al, 1997; Keskula et al, 1995; Kirchner et al., 1994; Kirchner & Holm, 1997; Kirchner et al., 2000; Utzman et al., 2007b). Grade point average is an objective measurement of a student's prior achievement and is a continuous variable. Scores were reported on a 4.0 scale.

Final Grade Point Average

In this study, the final or graduate GPA was studied as a predictor of success on the BOC examination. Final GPA in health science education programs in athletic training, physical therapy, and occupational therapy has been identified as a predictor of success (Dockter, 2001; Harrelson et al., 1997; Keskula et al., 1995; Kirchner et al., 1994; Kirchner & Holm, 1997; Kirchner et al., 2000; Kosmahl, 2005; Middlemas et al., 2001; Utzman et al., 2007b). Final GPA is an average of the student's grade in the professional program that is converted to a numerical scale. Scores were reported on a 4.0 scale.

3.1.3 Dependent Variable

The dichotomous dependent variable was success on the BOC examination. The BOC examination is the primary credentialing examination for athletic trainers. Successful completion of the BOC examination is the mandated standard to pursue the practice of athletic training. The accreditation status of athletic training education programs is in part determined by the outcome measure of BOC first-time pass rates. In this study, BOC success was defined as passing the exam on the first attempt. BOC success was coded as 0 = *fail* and 1 = *pass*.

3.1.4 Survey Instrument

A survey was designed to gather data regarding students that graduated from entry-level master's degree programs in athletic training from 2007 to 2010. The research instrument was field tested by a panel of experts. The panel consisted of three current and former athletic training education program directors from the University of North Carolina (Chapel Hill, NC) and Seton Hall University (South Orange, NJ). Each was instructed to complete the survey with sham student data. There was agreement among all three experts. It was inferred from this field test that the survey was understandable and that program directors would be expected to complete the survey in similar ways. This served as evidence of the survey's internal validity.

The first part of the survey included questions regarding program demographics: length of the program (in years), number of program credits, years since initial accreditation and geographical location (NATA district). The second part of the survey asked for student demographic (age and gender), academic (admission and final GPA), and BOC exam (first-

attempt pass or fail) data. Appendix A includes the survey instructions and the data collection survey.

3.2 DATA COLLECTION

Permission to conduct this study was granted by the Seton Hall University Institutional Review Board (see Appendix B). Following IRB approval, athletic training education program directors from all of the accredited entry-level master's degree programs were surveyed to obtain the required study data. The email addresses for the program directors were obtained from the CAATE website. Non-respondents were sent follow-up emails every 2 weeks for a total of 6 weeks.

The survey was administered through *SurveyGizmo* (www.surveygizmo.com, Boulder, CO), a web-based software company. Once completed, the data were compiled in the form of an Excel spreadsheet. All data collected were stored on a USB memory key and kept in a locked file cabinet.

3.3 DATA ANALYSIS

Descriptive statistics were calculated to summarize the sample. Frequency, mean and standard deviation were reported for all student demographic and academic variables. Data included age upon admission, gender, admission GPA, final GPA, and BOC first-time pass

results. In addition, descriptive data were used to check the statistical assumptions for all the analytical procedures used in this study.

Correlation coefficients were calculated to determine any relationship between the variables of age, gender, admission GPA, final GPA, and first-time attempt result on the BOC examination.

Regression analyses were performed to examine the nature of the relationship between the independent and dependent variables. A logistic regression was conducted to model the relationship between the predictor variables and the dichotomous dependent variable of BOC exam success or failure. Logistic regression is a procedure for investigating relationships between multiple variables and a categorical dependent variable (Menard, 2010). The data were then analyzed using the Statistical Package for the Social Sciences (SPSS) 21.0 for Windows.

4.0 RESULTS

The purpose of this study was to identify the relationship of BOC examination success to admission GPA, final GPA, gender, and age for graduates of entry-level master's degree athletic training education programs. This study also identified characteristics of athletic training programs which included number of credits, number of years accredited, length of program and NATA district.

This chapter includes analysis of the results to examine the relationship between the independent variables (admission GPA, final GPA, gender, and age) and the dependent variable. The dichotomous dependent variable was success on the BOC examination that was defined as passing the exam on the first attempt. This section also presents a summary of the data collected, including relevant statistical information and results. Descriptive statistics of the variables include frequency distributions, means, and standard deviations. Chi-square was used to examine the relationships among study variables. Logistic regression was performed to determine the predictive value of the independent variables.

4.1 DESCRIPTIVE ANALYSIS

4.1.1 Participants

A total of 12 (60%) out of 20 program directors of CAATE-accredited entry-level master's degree athletic training program directors responded to a web-based survey about their program demographics and students that graduated from the ATEP from 2007 to 2010. Of those responses, 3 (25%) of the 12 program directors completed an online survey. A survey was considered complete when both program and student data were entered. Data on 74 students from 3 ATEPs were collected. The BOC outcome was not known for one subject; therefore that student data was not used. As a result, data on 73 subjects from 3 ATEPs were analyzed and is displayed in Tables 3 and 4.

Table 3 Demographics of ATEP

Characteristic	Program 1	Program 2	Program 3
Total number of ATEP credits	48	39	64
Length of ATEP, in years	2	2	2
Number of years accredited	6	7	7
Location of program by NATA district	3	1	2

For information purposes, this study reported the demographic characteristics of each program that had complete responses (program and student data entered). The homogenous demographic information for each program included the total number of athletic training

education program credits, length (measured in years) of the athletic training education program, number of years accredited, and location of the program according to NATA district.

Table 4 Frequency distribution of study variables by program

Variable		Program 1	Program 2	Program 3	Total
Age	<i>N</i>	29	9	35	73
	Mean	23.7	27.2	23.6	24.1
	<i>SD</i>	2.186	6.200	2.075	3.091
Gender	Male	11 (38%)	3(33%)	15 (43%)	29 (40%)
	Female	18 (62%)	6 (67%)	20 (57%)	44 (60%)
Admit GPA	Mean	3.310	3.071	3.181	3.22
	<i>SD</i>	0.347	0.336	0.347	0.351
	4.0 - 3.5	9 (31%)	1 (11%)	8 (23%)	18 (25%)
	3.5 - 3.0	13 (45%)	4 (44%)	19 (54%)	36 (49%)
	3.0 - 2.5	7 (24%)	4 (44%)	8 (23%)	19 (26%)
	Final GPA	Mean	3.65	3.680	3.699
	<i>SD</i>	0.218	0.160	0.201	0.202
	4.0 - 3.5	23 (79%)	7 (78%)	27 (77%)	57 (78%)
	3.5 - 3.0	6 (21%)	2 (22%)	8 (23%)	16 (22%)
BOC	Fail	1 (3%)	4 (44%)	5 (14%)	10 (14%)
	Pass	28 (97%)	5 (56%)	30 (86%)	63 (86%)

4.1.2 Age and gender of subjects

The students in the study ranged in age from 21 to 41 with a mean age of 24.1. More than half of the students ($n=41$) were between the ages of 22 and 23, with the majority (89%) of the students being 26 years of age or younger upon admission to the program. These data are presented in Figure 3 and are not normally distributed.

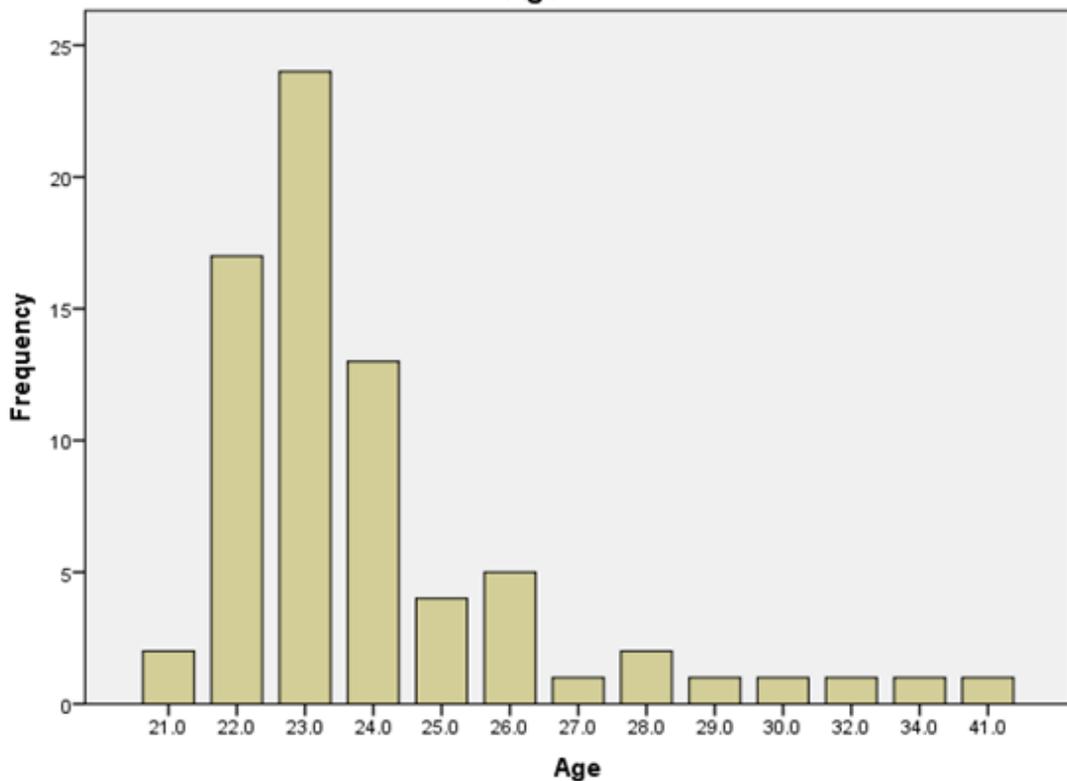


Figure 3 Age on Admission

Of the 73 students, 44 (60.3%) were female, and 29 (39.7%) were male. The frequency distribution is shown in Figure 4, where “0” was coded for males and “1” was coded for females. Gender composition of the study population was consistent with current demographic data from

the NATA which indicated that males accounted for 47% of all Certified Athletic Trainers in the United States (NATA, 2013)

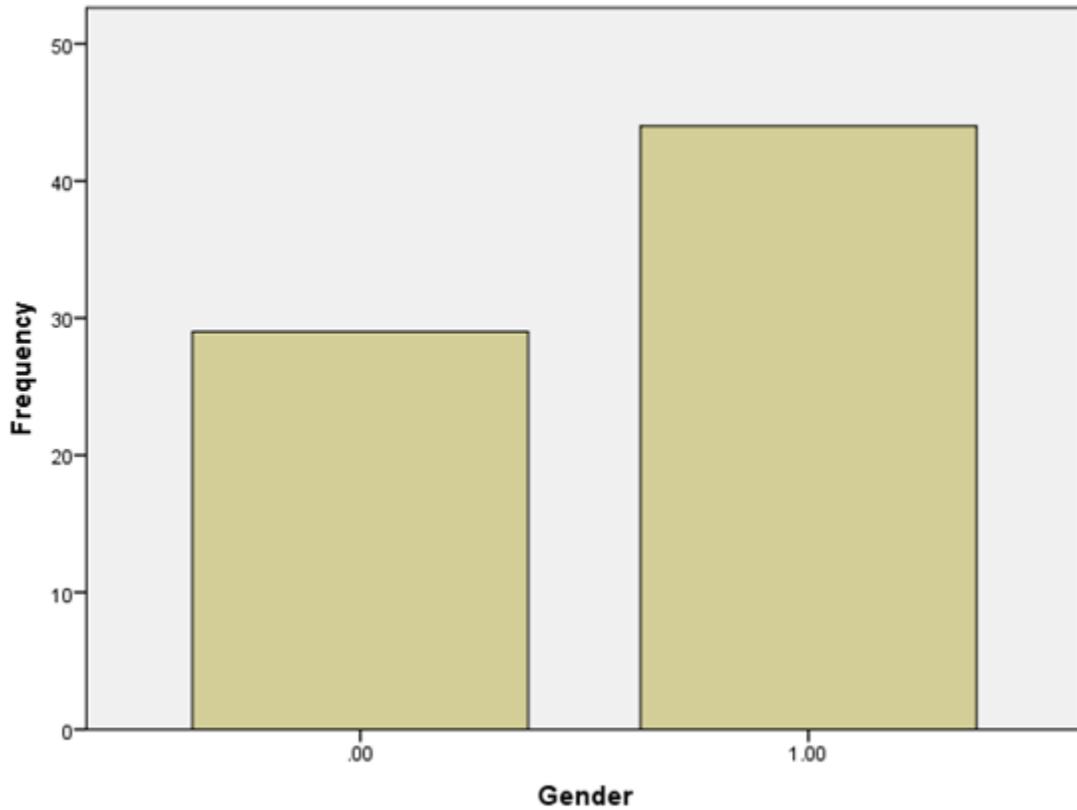


Figure 4 Gender of Subjects

4.1.3 Admission GPA, final GPA, and BOC first time pass rate

Table 5 presents the descriptive statistics on both the admission and final GPA scores. The admission GPA for the student population ranged from 2.55 to 4.00, with a mean of 3.22 and an *SD* of .351. A total of 26% ($n = 19$) of students entered the ATEP with a GPA less than 3.00. The final GPA for the student population ranged from 3.08 to 4.00, with a mean of 3.68

and an *SD* of .202. The findings indicated that 78% of the students ($n = 57$) had a final GPA greater than 3.50. Figures 5 and 6 show the distribution of admission GPA and final GPA data.

Table 5 Admission GPA, Final GPA (N=73)

Variable	Mean	<i>SD</i>	Range
Admit GPA	3.22	0.351	2.55 to 4.0
Final GPA	3.675	0.202	3.08 to 4.00

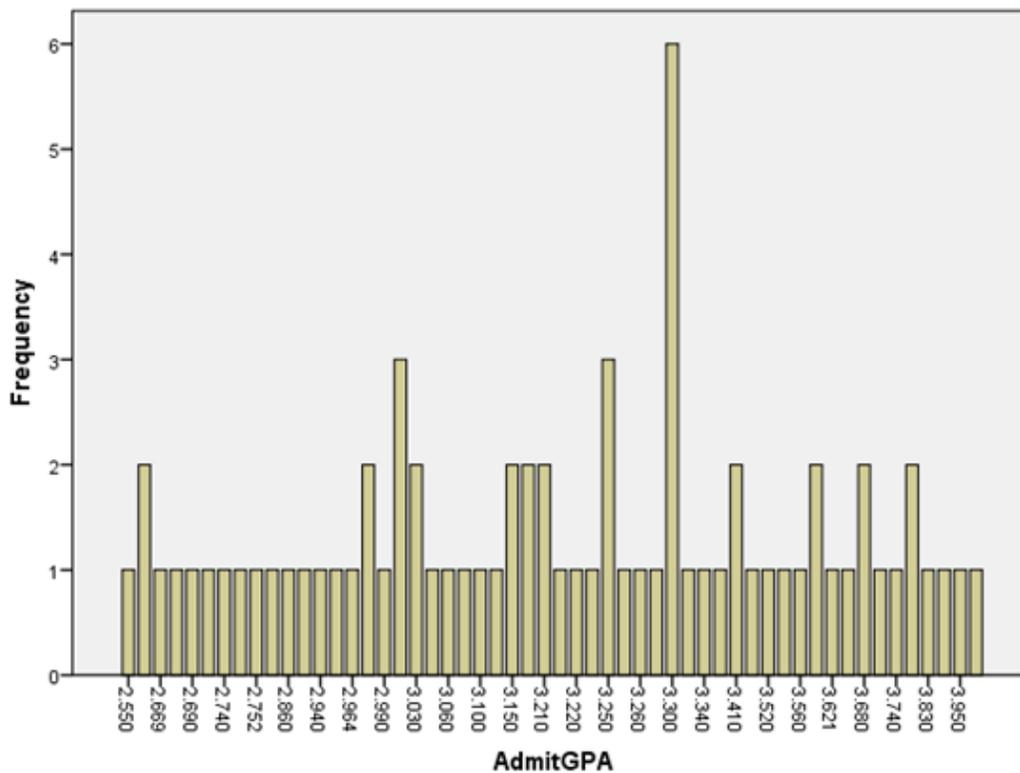


Figure 5 Admission Grade Point Average

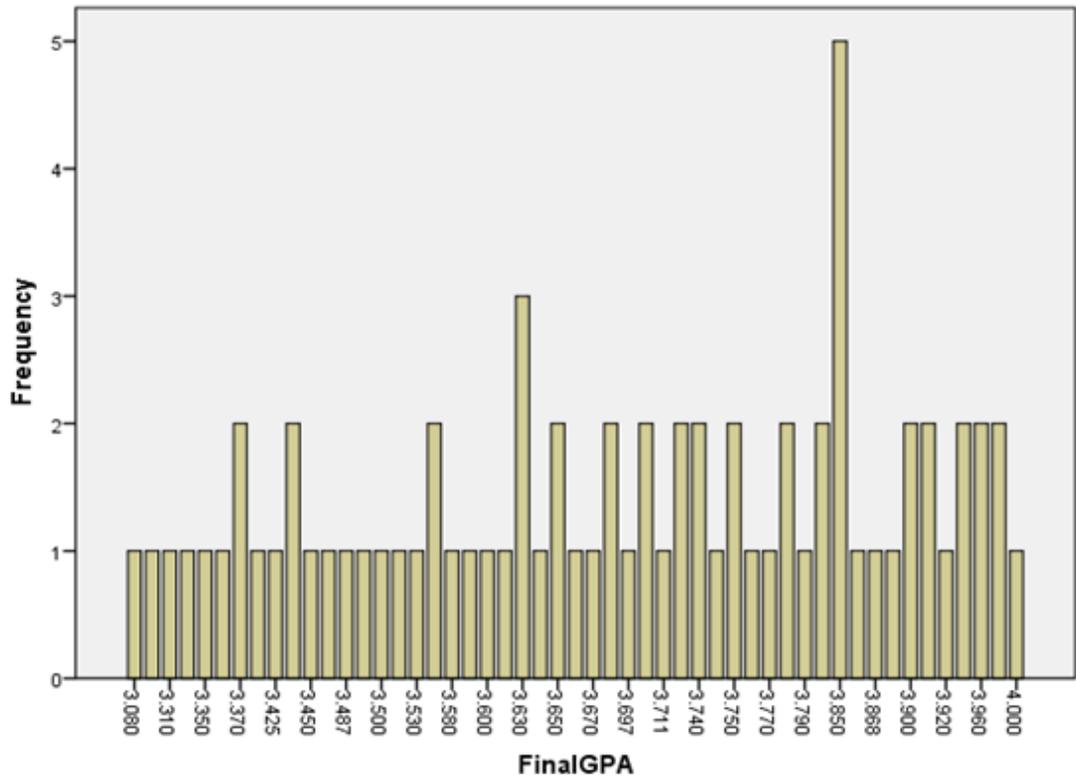


Figure 6 Final Grade Point Average

4.1.4 BOC First Attempt Pass Results

The BOC first-attempt pass rate for the student population was 86% ($n = 63$). The BOC fail rate on the first attempt for the same population was 14% ($n = 10$). This is shown in Figure 7, where “0” equals failure and “1” equals passing on the first attempt. The first-time passing rate for this pool of subjects surpassed the first-time passing rate for all candidates in 2007 – 2008 through the 2010 – 2011 BOC testing years as shown in Table 2. The BOC scores were reported in the aggregate and did not delineate baccalaureate degree or entry-level master’s degree candidates in the published results.

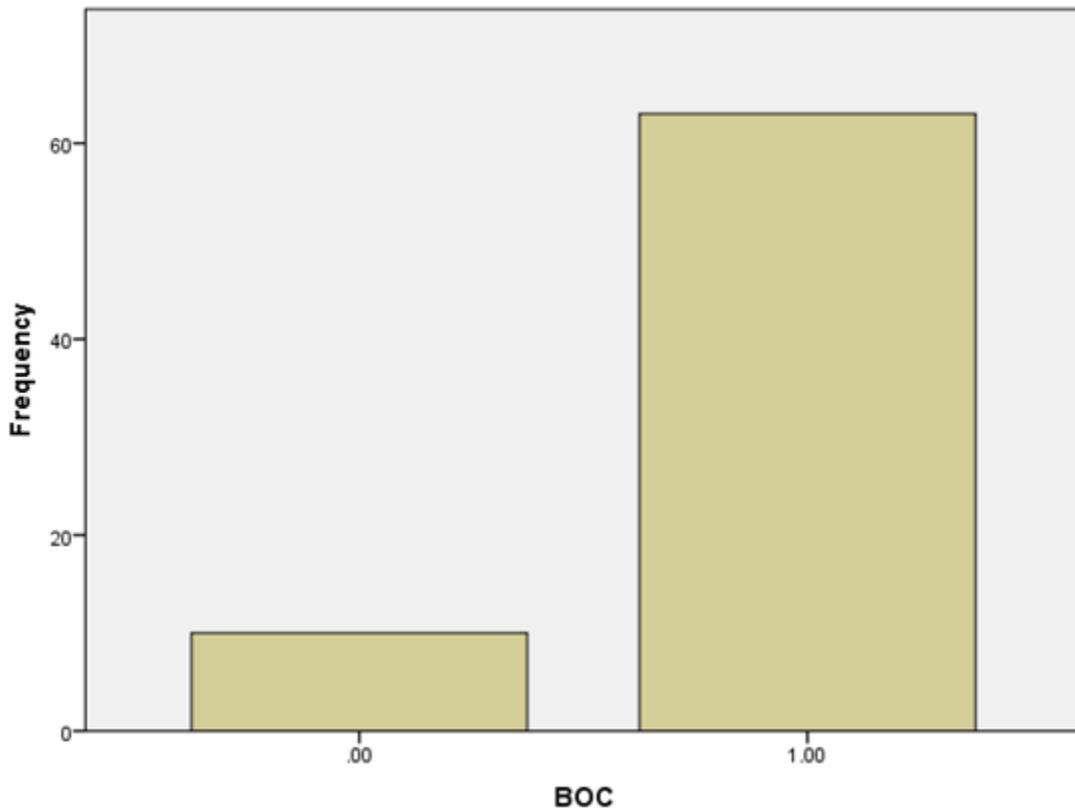


Figure 7 BOC Exam First-Attempt Result

4.2 BIVARIATE ANALYSIS

4.2.1 Chi-square test of independence

A chi-square test of independence was used to determine if the frequency of each categorical variable is different from what would be expected by chance. The chi-square indicates whether a frequency distribution fits the predicted distribution but does not predict the direction of that relationship (Portney & Watkins, 2000). All expected cell frequencies were less

than five. As shown in Table 6, there is no significant relationship between the variables of gender and BOC exam, indicating that there is no association between gender and performance on the BOC examination.

Table 6 Summary of Chi-square Test Results

Variable	Variable	<i>df</i>	X^2	Phi
BOC	Gender	1	.000	0.985
<i>p</i> =.05				

4.2.2 Correlation Analysis

Research Question:

What factors (student demographics, academic variables and program characteristics) contribute to passing the Board of Certification (BOC) Examination on the first attempt among entry-level master’s athletic training students?

Subsidiary Research Question 1

Is there a significant relationship between student demographic variables (age and gender) and passing the Board of Certification (BOC) Examination on the first attempt among graduates of entry-level master’s degree programs in athletic training?

A Spearman rho was performed on the variables to identify the direction and magnitude of the association between the variables prior to performing a logistic regression. Table 7 identifies significant correlations between two independent variables, admission GPA, and final GPA as well as a significant correlation between final GPA and BOC first attempt result. The results indicate that final GPA had a positive statistically significant correlation with passing the BOC examination. The weak positive relationship indicates that students who did not pass the BOC exam on the first attempt tended to have a lower final GPA ($r = .236, p = .05$). In addition, admission GPA had a positive moderate association with final GPA, indicating that students with a low admission GPA tended to have a lower final GPA ($r = .356, p = .001$).

Table 7 Bivariate Correlations between Predictor Variables and BOC (N=73)

Variable	Age	Gender	Admit GPA	Final GPA	BOC
Age	1	-.135	.007	.002	-.075
Gender	-.135	1	-.187	.062	.002
Admit GPA	.007	-.187	1	.378**	.063
Final GPA	.002	.062	.378**	1	.236*
BOC	-.075	.002	.063	.236*	1

*Correlation is significant at the 0.01 level (2-tailed).

**Correlation is significant at the 0.05 level (2-tailed).

4.3 LOGISTIC REGRESSION ANALYSIS

Logistic regression was selected to analyze the relationship between the multiple independent variables (categorical and continuous) and the dependent variable (dichotomous categorical). After completing the chi-square and Spearman rho, a logistic regression was conducted to identify which variables contributed to the variance of the dependent variable and

BOC success on the first attempt and to what degree the independent variables had predictive values.

Logistic regression was used to determine the predictability of passing the BOC examination on the first attempt. First, all independent variables (age, gender, admission GPA, final GPA, length of program, number of credits, and years since initial accreditation) were entered into a logistic regression using the enter method. The predictive logistic regression model using the enter method was not statistically significant: $X^2 = 3.26$.

The -2 log likelihood value was 55.06 for the overall evaluation of this model. All of the independent variables were not significant: age, $p = .902$; gender, $p = .956$; admission GPA, $p = .830$; and final GPA, $p = .100$. This model explained between 4.40% (Cox and Snell R square = .044) and 7.90% (Nagelkerke R square = .079) of the variance in passing the BOC examination. The model successfully predicted 100% of the students who passed the BOC examination. This model classified 86.3% of students overall (see Tables 8 and 9). The omnibus tests of coefficients was not significant ($X^2 = 3.260$, $df = 4$, $p = .515$), indicating that the predictive model for this logistic regression was not significant.

Table 8 Logistic Regression Results for Age, Gender, Admission GPA, and Final GPA

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Age	0.015	0.125	0.015	1	0.902	1.016	0.795	1.297
Gender	-0.041	0.745	0.003	1	0.956	0.96	0.223	4.136
Admit GPA	0.242	1.126	0.046	1	0.83	1.274	0.14	11.581
Final GPA	2.879	1.749	2.708	1	0.1	17.79	0.577	548.413
Constant	1.545	2.805	0.303	1	0.582	4.689		

Table 9 Total Model of Predicted Outcomes for BOC Success

Observed	Predicted			
	BOC results		Percentage correct	
	Fail	Pass		
BOC	Fail	0	10	0.0
	Pass	0	63	100.0
Overall percentage				86.3

The cut value is .500

The analysis examined the contributions of age and gender to the outcome of passing the BOC examination on the first attempt. The omnibus test of model coefficients was not significant, ($X^2 = .012$, $df = 2$, $p = .994$), indicating the predictive model for this logistic regression was not statistically significant. The -2 log likelihood value was 58.308 for the overall evaluation of this model. The overall percentage of cases correctly classified was 86.3%. The Wald ratio for the coefficient associated with age was not statistically significant ($X^2 = .012$, $df = 1$, $p = .914$). The Wald ratio for the coefficient associated with gender was not statistically significant ($X^2 = .001$, $df = 1$, $p = .977$). (see Table 10).

Table 10 Logistic Regression Results for the Variables: Age and Gender

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Age	.013	.116	.012	1	.914	1.013	.806	1.272
Sex(1)	-.020	.698	.001	1	.977	.980	.249	3.850
Constant	1.545	2.805	.303	1	.582	4.689		

The analysis also examined the contributions of GPA upon admission and the final GPA to the outcome of passing the BOC examination on the first attempt among entry-level master's degree athletic training students. The omnibus test of model coefficients was not significant, (X^2

= 3.224, $df = 2$, $p = .198$), indicating the predictive model for this logistic regression was not statistically significant. The -2 log likelihood value was 55.077 for the overall evaluation of this model. The Wald ratio for the coefficient associated with admission GPA was not statistically significant ($X^2 = .043$, $df = 1$, $p = .836$). The Wald ratio for the coefficient associated with final GPA was not statistically significant ($X^2 = .2733$, $df = 1$, $p = .098$). (see Table 11).

Table 11 Logistic Regression Output for the Variables Admission GPA and Final GPA

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Admit GPA	.227	1.101	.043	1	.836	1.255	.145	10.852
Final GPA	2.885	1.745	2.733	1	.098	17.904	.586	547.428
Constant	-9.362	6.452	2.106	1	.147	.000		

4.4 CONCLUSION

The results of the data analysis for determining relationships between demographic and academic variables and passing the athletic training credentialing examination demonstrated the significant relationship between the final GPA and passing the BOC examination on the first attempt. The other variables of age, gender, and admission GPA were not significant contributors to the success on the BOC examination. Correlation analysis revealed a positive relationship between admission GPA and final GPA.

5.0 DISCUSSION

The purpose of this retrospective study was to identify factors that contributed to the passing of the BOC examination on the first-attempt, among students who graduated from CAATE-accredited entry-level master's degree athletic training programs between 2007 and 2010. Data on age, gender, admission GPA, final GPA, program characteristics and first-attempt result on the BOC examination was collected from program directors representing three different ATEPs. The results of this study are useful to athletic training program directors, because there is limited research to date on predictors of success among graduates of entry-level master's degree programs in athletic training.

5.1 SUMMARY OF THE FINDINGS

This study explored the predictive relationships among demographic and academic characteristics of graduates of entry-level master's degree athletic training programs and their success at passing the BOC examination on the first attempt. The study sample ($N = 73$) included students who graduated in the years 2007 – 2010 from three different entry-level master's degree athletic training education programs.

5.1.1 Age and Gender

The first null hypothesis (H_{01}) stated that there was no statistically significant relationship between student demographic variables (age and gender) and passing the BOC examination on the first attempt among graduates of entry-level master's degree athletic training education programs. The results of the Spearman rho correlation for age on admission ($r = -.075$; $p < .05$) and gender ($r = -.135$; $p < .05$), as well as the logistic regression for age ($p = .914$) and gender ($p = .977$) indicated that these two measures were not statistically significant in relation to the success on the BOC examination. Therefore the null hypothesis was retained.

Entry-level master's degree programs attract an age-diverse population and increase the likelihood that some students are at academic risk due to extra-curricular responsibilities, outdated pre-requisite scholarly work and re-learning study skills required to succeed. This current study does not reflect an age-related difference in success, which contradicts the findings in other areas of health science education (Asprey et al., 2004a; Dockter, 2001; Theiman et al., 2003; Utzman et al., 2007a).

In addition, this study revealed no relationship between gender and success on the BOC examination. The results of this study refute the findings in previous literature (Asprey et al., 2004a; Oakes et al., 1999; Penprase & Harris, 2013) which indicated that females outperformed males on the health care credentialing examinations. There were no gender differences in the first-time attempt on the BOC examination.

5.1.2 Admission GPA and Final GPA

The second null hypothesis (H_{02}) stated that there is no statistically significant relationship between academic variables (admission GPA and final GPA) and passing the BOC examination on the first attempt among graduates of entry-level master's athletic training education programs. Admission GPA ($p = .830$) and final GPA ($p = .100$) were not significant predictors of BOC success in the logistic regression model (CI of 95%). The results of the Spearman rho correlation for admission GPA ($r = .007$; $p < .05$) and final GPA ($r = .236$, $p < .05$) showed that while there was not a statistically significant relationship between admission GPA and BOC success, there was a statistically significant relationship between final GPA and BOC success. Therefore, the null hypothesis must be rejected due to the relationship of final GPA with success on the BOC examination.

The results of this study conflict with the findings of previous studies which identify admission GPA (Abbott et al., 2008; Keskula et al., 1995; Utzman et al., 2007a) and final GPA (Dockter, 2001; Harrelson et al., 1997; Kosmahl, 2005; Theiman et al., 2003; Utzman et al., 2007b) as predictors of success on credentialing examinations. The homogeneity of GPA results for all students in the sample may have contributed to these findings.

Admission GPA had a positive, moderate correlation ($r = .378$; $p = .001$) with final GPA. These results support findings in the current literature (Kirchner & Holm, 1997; Kirchner et al., 1997; Platt et al., 2001; Thieman et al., 2003; Utzman et al., 2007a) identifying prior academic success as associated with future academic success.

5.2 LIMITATIONS OF THE STUDY

The study is limited by its small response rate, despite aggressive follow-up with the program directors in the form of additional reminder emails to non-responders. One likely cause is the growing number of survey e-mails that the program director receives. With an increasing number of AT programs recently created as entry-level master's programs or recently converted to entry-level master's degree programs, there is an increased emphasis on research activities by students enrolled in AT programs. Research in AT education is seen as involving a convenience population of program directors who have traditionally been eager to assist student researchers. Many times, a program director gets inundated with email requests and has to decipher the value and academic rigor of the survey. Some program directors may choose to disengage from the process altogether.

Another factor that may have adversely affected return rate is that the program directors may not have kept detailed, easily accessible student data. Program directors were able to answer the program demographic survey questions, but many (75%) ended the survey at that point. This resulted in incomplete results. If the student data were organized, categorized and easily accessible, the program directors may have been more likely to complete the entire survey. Starting in October 2013, CAATE required athletic training programs to submit student demographic and academic data such as age, gender, GPA, and BOC pass rate. The only data that the CAATE previously required was the program overall BOC passing rate. In that case, the program directors only needed to submit to the CAATE general program results, which are supplied to them by the BOC. Students were not identified; the program directors would have to speculate on which students passed the examination. In order for program directors to identify which students passed the BOC exam on the first attempt, the students had to self-report to the

program director directly. In light of these new data reported to the CAATE, it is foreseeable that program directors will now have student data readily available and organized so that a future study of this nature may result in more data to analyze.

This study was also limited by the homogeneous composition of the subjects. The majority of the subjects were female ($n = 44$, 60%) and under the age of 26 ($n = 65$, 89%). For that reason, results of this study may not be generalizable to all entry-level master's degree athletic training students. However, it does provide a foundation for further inquiry into this growing student population.

Another limitation was the self-reporting of the BOC results. At the time of this study, the BOC did not provide program directors with student-specific outcomes. The program results were reported with the number of first-time candidates, how many passed, and how many re-took the examination. The students themselves would self-report to the program directors first-time attempt results. Program directors were left to decipher student outcomes based upon which student self-reported, and not official BOC documentation.

5.3 RELATIONSHIP TO THEORETICAL FRAMEWORK

The theoretical model used for this study was Astin's input-environment-output (I-E-O) conceptual model. Input refers to the characteristics of the student such as age, gender and GPA. The environment in this study was the educational programs, faculty, peers and policies to which the student was exposed. Output refers to the characteristics of the student subsequent to exposure to the environment (Astin, 1993). In this study, output was the students' success on the BOC examination.

This study indicates that the input of GPA has an influence on the output of passing the BOC exam on the first attempt. Gender did not have an effect on student success on the BOC exam. The environment was not a focus of this study. Three programs responded and were homogenous in demographics such as length of program, number of years accredited, and number of credits. No relationships were investigated between these characteristics and BOC outcome.

5.4 IMPLICATIONS FOR PRACTICE

Employment of athletic trainers is expected to grow by 30% by the year 2020 as predicted by the Bureau of Labor Statistics (2012), which is considered much faster than what is expected for all other occupations. In order to enter the workforce, individuals must successfully pass the BOC examination, and it becomes the responsibility of the athletic training educators to ensure that students are prepared to take this credentialing exam. Initially selecting the best candidates for the programs becomes important in the success of the students. The CAATE recently revised the Standards for the Accreditation of Professional Athletic Training Programs (Standards, 2012). These new standards require athletic training education programs (ATEP) to make public their 3-year aggregate BOC passing rates. This is a step to make programs more accountable for the outcomes and success of the students. As a result, athletic training program directors will want to admit students who will succeed on the BOC examination.

The students in this study ranged in age from 21 to 41 years with a mean age of 24.1. More than half the students ($n = 41$) were between the ages of 22 and 23, with the majority (76.7%) of the students being 24 years of age or younger. Age was not found to be a significant

predictor of success on the BOC examination. This information can be useful to entry-level master's degree programs in athletic training, since these programs may attract an age-diverse population. The outcome of this study contradicts previous research that indicated that academic performance declines with age (Asprey et al., 2004a; Dockter, 2001; Thieman et al., 2003).

Gender composition of the study population was predominantly female ($n = 44$), which is consistent with the current demographics of the membership within the National Athletic Trainers' Association (2013). The NATA (2013) reported that males accounted for 47% of all Certified Athletic Trainers in the United States. The number of males in this study was somewhat below the national average: females, 60.3% ($n = 44$) and males, 39.7% ($n = 29$). Contrary to previous research (Asprey et al., 2004a; Oakes et al., 1999), gender was not found to be a predictor of student success in this study, so athletic training programs should strive to admit cohorts of students that have a balance of males and females.

This study revealed the positive relationship between GPA and first-time success on the BOC examination. Admission GPA has been reported as a predictor of success in other health sciences (Abbott et al., 2008; Dockter, 2001; Harrelson et al., 1991; Keskula et al., 1995; Kirchner et al., 1994; Kosmahl, 2005; Utzman et al., 2007b). Admission GPA had a positive weak correlation with final GPA, indicating that students with a low admission GPA tended to have a lower final GPA ($r = .356, p = .001$).

Final GPA ($p = .100$) was not a significant predictor of BOC success in the logistic regression model (CI of 95%). However, the results indicate that final GPA had a positive statistically significant correlation with passing the BOC examination. The positive weak correlation indicates that students who did not pass the BOC exam on the first attempt tended to

have lower final GPA ($r = .236$, $p = .05$). This finding was consistent with the research with undergraduate athletic training students (Harrelson et al., 1991).

5.5 RECOMMENDATIONS FOR FUTURE RESEARCH

After reflecting on these results, there are several recommendations for increasing the value of this type of study to the higher education community. First, because of the small sample size, it is suggested that this study be replicated with a larger number of subjects to increase the applicability to the population. In order for this to occur, athletic training program directors would need efficient access to student records in an organized fashion. This should not be a problem for future researchers on this topic since CAATE has now required program directors to report demographic and academic data as part of their accreditation documentation (CAATE, 2013). Second, including other academic variables such as prerequisite coursework and standardized test results (GRE) in the study may provide more insight into athletic training program directors when creating admission criteria. Prerequisite coursework requirements for admission into the ATEP are inconsistent and not dictated by the CAATE. In addition, GRE scores are not consistently required for admission because of a lack of consistent predictability of GRE scores and health care professions student success. Third, including race in the demographic data may provide insight for program directors. Attracting a diverse student population into the entry-level master's programs is critical to expand the diversity of the profession as a whole.

Future studies should also focus on the varying program characteristics of the entry-level master's athletic training education programs. The results of this study show that among just

three programs, there exists quite a difference in the number of credits required (see Table 3). In addition to examining the number of credits, other program characteristics should be included such as the number of full-time faculty devoted to the ATEP, the school in which the program is housed (School of Health Sciences, School of Education, etc.), online course offerings, number of preceptors, and number of on- and off-campus clinical rotations. Identifying program characteristics that predict the success of the athletic training student can be valuable information for those programs that may choose to transition from a baccalaureate degree to an entry-level master degree or for those institutions that want to create a program.

This study serves as an important first step in the investigation of student success in entry-level master's degree athletic training education programs. Currently, the body of literature does not support the movement of the degree in athletic training to an entry-level master's degree. There is not enough evidence at this time to support or refute the entry-level degree requirement as a baccalaureate or post baccalaureate (entry-level master). However, the CAATE standard requiring all programs, regardless of degree type, to have a 70% or better passing rate on the BOC examination (CAATE, 2013) applies to all accredited programs. Athletic training educators want students to be successful on the BOC examination, because it is now a benchmark of success for the programs. With the increase in demand for athletic training professionals (Bureau of Labor Statistics, 2012) and a new focus on the program outcomes by the accrediting association (CAATE, 2013) athletic training educators have the responsibility for selecting and preparing students who have the greatest potential for success.

APPENDIX A

SURVEY INSTRUMENT

Dear Program Director,

My name is Mary E. Murray, MA, ATC of Seton Hall University, School of Education and Human Services, Department of Education, Leadership, Management and Policy. I am inviting you to participate in a research project titled “Predictors of Success in Entry-level Master’s Degree Programs in Athletic Training Education”. This research is a necessary component for the completion of my doctoral degree in Higher Education at Seton Hall University.

The purpose of this study is to determine which variables may best predict final grade point average (GPA) and first time attempt (pass/fail) on the Board of Certification (BOC) examination in students enrolled in CAATE accredited entry-level master’s degree programs in athletic training.

You are receiving this message via an email distribution to all Program Directors from entry-level master’s degree athletic training degree programs listed on the CAATE website. This is a survey about students who graduated from your entry-level masters athletic training program from 2007-2010. (Class of 2007-2010). It should take you about 15 minutes to complete this survey. Do not include students who did not graduate from your program. The survey includes questions regarding the student’s: age upon admission to your program, gender, pre-admission GPA, final graduate GPA and first time attempt (pass/fail) on the BOC exam as well as program demographics.

By completing this survey, you are giving your consent to participate in this research study. The survey has been designed so that you can complete it anonymously using an on-line survey using the following link: <http://edu.surveymoz.com/s3/299025/Predictors-of-Success-in-Entry-level-Masters-Degree-Programs-in-Athletic-Training>.

Your participation is voluntary and there is no penalty if you choose not to participate or withdraw from the research study. Regardless of whether you choose to participate or not, you may contact me to obtain a summary of my findings.

All data will be received anonymously. Do not include student names or any identifying information to ensure anonymity. The data you provide will remain confidential, and it will only be reported in the aggregate. All data received will be stored on a USB memory drive which will be stored in a locked file cabinet in my office.

As the Principle Investigator, I should be contacted for answers to pertinent questions about the research. I may be reached at 400 South Orange Avenue, South Orange, NJ 07079 or by phone at (973) 275-2220. Questions may also be directed to the Research Advisor, Dr. Joseph Stetar, Department of Education, Leadership, Management and Policy at (973) 275-2730 or IRB Director, Dr. Ruzicka, Presidents Hall, (973) 313-6314.

Respectfully,

Mary E. Murray, MA, ATC
Doctoral Candidate
Seton Hall University

Predictors of Success in Entry-level Masters Degree Programs in Athletic Training

Introduction

Welcome. Please answer these questions as they pertain to your entry-level masters degree program in athletic training and the students who have graduated from your program from 2007-2010. You have option to save the survey and continue at a later time.

Next

0%

Predictors of Success in Entry-level Masters Degree Programs in Athletic Training

AT Program Information

1. Total number of AT Program credits *

2. Length of AT Program, in years *

3. Number of years since initial accreditation. If less than one year, type in a zero. *

4. Location of program by NATA District (i.e. 1-10) *

Back

Next

5. Please enter information about students who graduated from your AT program from 2007 through 2010.

	Age on admission, in years	Gender (M or F)	Pre-admission GPA (i.e. 2.75, 3.40)	Overall Graduate GPA (i.e. 2.75, 3.40)	BOC First Attempt P=pass, F=fail
Student 1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Student 2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Student 3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Student 4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Student 5	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Student 6	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Student 7	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Student 8	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Student 9	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Student 10	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Student 11	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Student 12	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

APPENDIX B

INSTITUTIONAL REVIEW BOARD APPROVAL



OFFICE OF INSTITUTIONAL
REVIEW BOARD

SETON HALL UNIVERSITY

June 30, 2010

Mary E. Murraray
334 Dunellen Avenue
Dunellen, NJ 08812

Dear Ms Murray,

The Seton Hall University Institutional Review Board has reviewed your research proposal entitled "Predictors of Success in Entry-Level Masters Degree Programs in Athletic Training" and has approved it as submitted under exempt status.

Enclosed for your records is the signed Request for Approval form.

Please note that, where applicable, subjects must sign and must be given a copy of the Seton Hall University current stamped Letter of Solicitation or Consent Form before the subjects' participation. All data, as well as the investigator's copies of the signed Consent Forms, must be retained by the principal investigator for a period of at least three years following the termination of the project.

Should you wish to make changes to the IRB approved procedures, the following materials must be submitted for IRB review and be approved by the IRB prior to being instituted:

- Description of proposed revisions;
- *If applicable*, any new or revised materials, such as recruitment fliers, letters to subjects, or consent documents; and
- *If applicable*, updated letters of approval from cooperating institutions and IRBs.

At the present time, there is no need for further action on your part with the IRB.

In harmony with federal regulations, none of the investigators or research staff involved in the study took part in the final decision.

Sincerely,

Mary F. Ruzicka, Ph.D.
Professor
Director, Institutional Review Board

cc: Dr. Joseph Stetar

Presidents Hall • 400 South Orange Avenue • South Orange, New Jersey 07079-2641 • Tel: 973.313.6314 • Fax: 973.275.2361

A HOME FOR THE MIND, THE HEART AND THE SPIRIT

BIBLIOGRAPHY

- Abbott, A., Schwartz, M., Hercinger, M., Miller, C., & Foyt, M. (2008) Predictors of success on national council licensure examination for registered nurses for accelerated baccalaureate nursing graduates. *Nurse Educator*, 33(1) 5-6.
- Agho, A. O., Mosley, B. W., & Williams, A. M. (1999). A national survey of current admission practices in selected allied health educational programs. *Journal of Allied Health*, 28(1), 8-14.
- Aktan, N.M., Bareford, c.G., Bliss, J.B., Connolly, K., DeYoung, S., Sullivan, K.L., & Tracy, J. (2009). Comparison of outcomes in a traditional versus accelerated nursing curriculum. *International Journal of Nursing Education Scholarship*, 6(1), 1-11.
- American Association of Colleges of Nursing (2014). Fact sheet: Accelerated baccalaureate and master's degrees in nursing. Retrieved from <http://www.aacn.nche.edu/media-relations/AccelProgsGlance.pdf>
- Asprey, D., Dehn, R., & Kreiter, C. (2004a). The impact of age and gender on the physician assistant national certifying examination scores and pass rates. *Perspective on Physician Assistant Education*, 15(1), 38-41.

- Asprey, D., Dehn, R., & Kreiter, C. (2004b). The impact of program characteristics on the physician assistant national certifying examination scores. *Perspective on Physician Assistant Education*, 15(1), 33-37.
- Astin, A. (1993). *What matters in college? Four critical years*. San Francisco, CA: Jossey-Bass.
- Astin, A. (2002). *Assessment for excellence. The philosophy and practice of assessment and evaluation in higher education*. Westport, CT: Oryx Press.
- Bentley, R. (2006). Comparison of traditional and accelerated baccalaureate nursing graduates. *Nurse Educator*, 31(2), 79-82.
- Board of Certification (2002). *2001 Annual Examination Report*. Retrieved from <http://www.bocatc.org/images/stories/public/2001examreport.pdf>.
- Board of Certification (2003). *2002 Annual Report*. Retrieved from <http://www.bocatc.org/images/stories/public/2002examreport.pdf>
- Board of Certification (2004). *2003 Annual Report*. Retrieved from <http://www.bocatc.org/images/stories/public/2003examreport.pdf>
- Board of Certification, (2012a). *BOC Exam Candidate Handbook*. Retrieved from http://www.bocatc.org/images/stories/candidates/boc_candidate_handbook.pdf
- Board of Certification (2012b). *Examination Report for 2011-2012 Testing Year*. Retrieved from http://www.bocatc.org/images/stories/public/boc_exam_report_1305af.pdf

Board of Certification (2013). Retrieved from

<http://www.bocatc.org/component/content/article/76-history/415-2000-2009>

Bureau of Labor Statistics. (2012). Athletic Trainers. In *Occupation Outlook Handbook, 2012-*

2013 edition. Retrieved from <http://www.bls.gov/ooh/healthcare/athletic-trainers.htm>

Cawley, J. F. (2002). Physician assistant education and PANCE performance: A passing controversy? *Perspective on Physician Assistant Education, 13*(2), 79-80.

Cody, J. T., Adamson, K. A., Parker, R. L., & Brakhage, C. H. (2004). Evaluation of the relationship between student performance on the PACKRAT and PANCE examinations.

Perspective on Physician Assistant Education, 15(1), 42-46.

Commission of Accreditation of Athletic Training Education. (2012). *Standards for the*

Accreditation of Professional Athletic Training Program. Retrieved from

<http://caate.net/wp-content/uploads/2014/01/2012-Professional-Standards.pdf>

Commission of Accreditation of Athletic Training Education. (2013). *Commission of*

Accreditation of Athletic Training Education. Retrieved from <http://caate.net/>

Commission on Accreditation of Allied Health Education Programs. (2013). *Commission on*

Accreditation of Allied Health Education Programs. Retrieved from <http://www.caahep.org>

Cook, R. D., & Weisberg, S. (2009). *Applied regression including computing and graphics* (Vol. 488). Hoboken, NJ: Wiley.

- Delforge, G. D., & Behnke, R. S. (1999). The history and evolution of athletic training education in the United States. *Journal of Athletic Training, 34*(1), 53-56.
- Dockter, M. (2001). An analysis of physical therapy preadmission factors on academic success and success on the national licensing examination. *Journal of Physical Therapy Education, 15*(1), 60-64.
- Draper, D. O. (1989). Students' learning styles compared with their performance on the NATA certification exam. *Journal of Athletic Training, 24*, 234-235, 275.
- Engelhart, H. V. (1957). An investigation of the relationship between college grades and on-the-job performance during clinical training of occupational therapy students. *American Journal of Occupational Therapy, 11*:97-101.
- Esparza, S.D. (2012). *Predictors of success on professional credentialing examinations of athletic training undergraduates*. (Doctoral dissertation) Retrieved from UMI database. (3517526)
- Everette, B., Salamonson, Y., Trajkovski, S., & Fernandez, R. (2013). Demographic and academic-related differences between standard-entry and graduate-entry nursing students: A prospective correlational survey. *Nurse Education Today, 33*, 709-713.
- Green, S. B. (1991). How many subjects does it take to do a regression analysis? *Multivariate Behavioral Research, 26* (3), 499-510.

- Guffey, J. S., Farris, J. W., Aldridge, R., & Thomas, T. (2002). An evaluation of the usefulness of noncognitive variables as predictors of scores on the national physical therapy licensing examination. *Journal of Allied Health, 31*(2), 78-86.
- Hamner, J.B., & Bentley, R. (2007). Lessons learned from 12 years of teaching second-degree BSN students. *Nurse Educator, 32*(3), 126-129.
- Harrelson, G. L., Gallaspy, J. B., Knight, H. V., & Leaver-Dunn, D. (1997). Predictors of success on the NATABOC certification examination. *Journal of Athletic Training, 32*(4), 323-327.
- Hooker, R. S., Hess, B., & Cipher, D. (2002). A comparison of physician assistant programs by national certification exam scores. *Perspective on Physician Assistant Education, 13*(2), 81-86.
- Keskula, D. R., Sammarone, P. G., & Perrin, D. H. (1995). Prediction of academic achievement in an NATA-approved graduate athletic training education program. *Journal of Athletic Training, 30*(1), 55-56.
- Kirchner, G. L., & Holm, M. B. (1997). Prediction of academic and clinical performance of occupational therapy students in an entry-level master's program. *American Journal of Occupational Therapy, 51*(9), 775-779.
- Kirchner, G. L., Holm, M. B., Ekes, A. M., & Williams, R. W. (1994). Predictors of student success in an entry-level master in physical therapy program. *Journal of Physical Therapy Education, 8*(2), 76-79.

- Kirchner, G. L., Stone, R. G., & Holm, M. B. (2000). Use of admission criteria to predict performance of students in an entry-level master's program on fieldwork placements and in academic courses. *Occupational Therapy in Health Care, 13*(1), 1-10.
- Kosmahl, E. M. (2005). Factors related to physical therapist license examination scores. *Journal of Physical Therapy Education, 19*(2), 52-56.
- Landry, L.G., Davis, H., Alameida, M.D., Prive, A., & Renwanz-Boyle, A. (2010) Predictors of NCLEX-RN success across 3 prelicensure program types. *Nurse Educator, 35*(6), 259-263.
- Luoma, K. L. (2003). *Admission, progression and end-of-program predictors of success on the NCLEX-PN among practical nursing students.* (Master's thesis). Retrieved from UMI database. (1413066)
- McDowell, L., Clemens, D., & Frosch, D. (1999). Analysis of physician assistant program performance on the PANCE based on degree granted, length of curriculum and duration of accreditation. *Perspective on Physician Assistant Education, 10*(4), 180-184.
- Menard, S.W. (2010). *Logistic regression: From Introductory to Advanced Concepts and Applications.* Newbury Park, CA: SAGE Publications, Inc.
- Middlemas, D. A., Manning, J. M., Gazzillo, L. M., & Young, J. (2001). Predicting performance on the national athletic trainers' association board of certification examination from grade point average and number of clinical hours. *Journal of Athletic Training, 36*(2), 136.

- National Athletic Trainers Association (2012) Executive Committee for Education, June 25, 2012. *Future Directions in Athletic Training Education*. Retrieved from <http://www.nata.org/sites/default/files/ECE-Recommendations-June-2012.pdf>
- National Athletic Trainers Association (2013) Professional Education in Athletic Training, December 2013. *An Examination of the Professional Degree Level*. Retrieved from http://www.nata.org/sites/default/files/The_Professional_Degree_in_Athletic_Training.pdf
- National Council of State Boards of Nursing, (2014). Fact sheet: Accelerated baccalaureate and master's degrees in nursing. Retrieved from <http://www.aacn.nche.edu/media-relations/fact-sheets/accelerated-programs>.
- Oakes, D. L., MacLaren, L. M., Gorie, C. T., & Finstuen, K. (1999). Predicting success on the physician assistant national certifying examination. *Perspective on Physician Assistant Education, 10*(2), 63-69.
- Penprase, B.B., & Harris, M.A. (2013) Accelerated second-degree nursing students: Predictors of graduation and NCLEX-RN first-time pass rates. *Nurse Educator, 38*(1),26-29.
- Platt, L. S., Turocy, P. S., & McGlumphy, B. E. (2001). Preadmission criteria as predictors of academic success in entry-level athletic training and other allied health educational programs. *Journal of Athletic Training, 36*(2), 141.
- Portney, L. G., & Watkins, M. P. (2000). *Foundations of clinical research: Applications to practice* (2nd ed.). Upper Saddle River, NJ: Prentice Hall Health.

- Seldomridge, L.A., & DiBartolo, M.C. (2005). A profile of accelerated second-bachelor's degree nursing students. *Nurse Educator*, 30(2), 65-68.
- Shiber, S. M. (2003). A nursing education model for second-degree students. *Nurse Educator*, 24(3), 135-138.
- Simmons, S. W. (2003). Predictors of academic success of underrepresented minorities in physician assistant programs. *Perspective on Physician Assistant Education*, 14(2), 110-113.
- Templeton, M. S., Burcham, A., & Franck, L. (1994). Predictive study of physical therapy admission variables. *Journal of Allied Health*, 23(2), 79-87.
- Thieman, T. J., Weddle, M. L., & Moore, M. A. (2003). Predicting academic, clinical, and licensure examination performance in a professional (entry-level) master's degree program in physical therapy. *Journal of Physical Therapy Education*, 17(2), 32-37.
- Turocy, P. S., Comfort, R. E., Perrin, D. H., & Gieck, J. H. (2000). Clinical experiences are not predictive of outcomes on the NATABOC examination. *Journal of Athletic Training*, 35(1), 70-75.
- Utzman, R. R., Riddle, D. L., & Jewell, D. V. (2007a). Use of demographic and quantitative admissions data to predict academic difficulty among professional physical therapist students. *Physical Therapy*, 87(9), 1164-1180.
- Utzman, R. R., Riddle, D. L., & Jewell, D. V. (2007b). Use of demographic and quantitative admissions data to predict performance on the national physical therapy examination. *Physical Therapy*, 87(9), 1181-1193.

Weidner, T. G. & Henning, J. M. (2002). Historical perspective of athletic training clinical education. *Journal of Athletic Training*, Dec;37(4 Suppl):S222-S228.

Weiner, T. (1981). Black attrition in physician assistant training programs. *American Journal of Public Health*, 71(4), 425-427.